



News from Hudsonia

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Grass Carp and Aquatic Weeds: *Treating the*

Symptom

Instead of the Cause



C. Lavett Smith

"If you dig a pond anywhere...you will soon have not only waterfowl, reptiles, and fishes in it, but also the usual water plants, as lilies and so on. You will no sooner have got your pond dug than Nature will begin to stock it. Though you may not see how or when the seed gets there, Nature sees to it. She directs all the energies of her Patent Office upon it, and the seeds begin to arrive."

—Henry D. Thoreau

Indeed, anyone who has spent time around a pond or lake can testify to the proficient establishment of aquatic plants. Pondweeds, milfoils, coontail, waterlilies, and similar aquatic species can form thick beds along muddy lake bottoms or dense floating mats at the surface. These extensive weed beds are often considered undesirable because of perceived interference with swimming, boating, and fishing, or reduced aesthetic appeal of recreational and residential lakes.

The philosophy that "no weed is a good weed" has led to various methods of aquatic vegetation control. Over the last 40 years, the most common eradication

By *Laura T. Heady and Erik Kiviat*

efforts included mechanical removal of weeds, temporary reductions in water levels (drawdowns), and use of aquatic herbicides. In an effort to increase long-term effectiveness and decrease associated costs, both financial and environmental, current weed control experiments are focusing on biological controls, such as bacteria, fungi, and plant-feeding insects like the aquatic weevil *Euhrychiopsis lecontei*.^{1,2,5}

Today in the Hudson Valley, as in much of the United States, the most common (and often encouraged) method of weed suppression is a different biological control: the grass carp, a voracious, weed-eating fish.

Also known as "white amur," this exotic species was introduced to the U.S. in the 1960s from Asia, where it has been used

for centuries to suppress aquatic weeds. In New York, the Department of Environmental Conservation regulates use of grass carp in inland waters, and permits must be obtained before fish are stocked. All fish introduced in the state are said to be certified triploid (sterile and incapable of reproduction) by the U.S. Fish and Wildlife Service.

"Comb-like throat teeth"

The grass carp's Latin name, *Ctenopharyngodon idella*, describes the "comb-like throat teeth" which it uses to consume a variety of submerged aquatic plants.^{2,4} Young fish will eat at least their body weight in plants each day, eventually reaching an adult size of up to 30 pounds. To satisfy its voracious appetite, the grass carp has reportedly headed to the shoreline to eat plants within its reach, after the vegetation underwater had been devoured.⁹ While such eradication of weeds may appear a "silver bullet" to some lake enthusiasts, the grass carp's ability to drastically alter

Inside: Biodiversity and Land Use Planning, p.4; Hudsonia Gala, p.3; Mosquito Surveillance Program, p.7; Hudson River Photography, p.7; and more.....



Illustrations © Kathleen A. Schmidt

A lake with thick beds of watermilfoil and pondweed (left) may also harbor rare plants such as spiny coontail (right). Because grass carp will consume more than just the targeted nuisance weeds, a rare plant survey should be carried out before introducing grass carp.

component of functioning pond and lake habitats. Eliminating this bottom rung of the food chain may have serious implications at higher trophic levels.^{3,4}

As aquatic vegetation is rapidly consumed, the macroinvertebrate community must compete for food with grass carp. Most species of warmwater fish rely on invertebrate food resources that live on submerged plants, as well as the refugia and, in some cases, spawning substrates provided by submerged vegetation. Aquatic plants provide shelter for amphibian egg masses, tadpoles, frogs, newts, and turtle hatchlings and adults, and are a food resource for waterbirds and muskrats.

Some of the lakes that have been stocked, or that may be in the future, support State-listed threatened animal species. For example, the northern cricket frog (*Acris crepitans*) lives in marsh and aquatic vegetation both as an adult and as a tadpole; we're still learning which features of lakes in Orange, Ulster, and Dutchess counties are necessary for the survival of the cricket frog. Blanding's turtles (*Emydoidea blandingii*) utilize ponds and lakes for drought refugia and for rehydration during nesting migrations. In addition, they probably depend on submerged vegetation for shelter as well as for gleaning the mollusks, crustacea, and insects that live among the plants.

Reducing a symptom vs. fixing the problem

As the passage from Thoreau states, our ponds and lakes are naturally full of seeds and plants. However, when aquatic plant growth becomes *excessive*, this is usually a symptom of an underlying nutrient problem. Most lakes in settled areas of New York have been "over-fertilized" by sewage, siltation from construction activity, lawn fertilizers, and agricultural runoff.

Aquatic weeds respond to these high nutrient inputs with equally excessive growth. Employing an exotic species like grass carp to reduce the weeds fixes the symptom, not the problem.

its environment raises many ecological concerns.

Impacts on the plant community

Grass carp do not eat all species of aquatic plants and are known to show preferences.^{2,3,4,8} For example, they favor rooted aquatic plants like pondweeds (*Potamogeton* spp.), waterweeds (*Elodea* spp.), and naiads (*Najas* spp.), but ignore waterlilies (*Nymphaea* spp.), and only consume Eurasian watermilfoil (*Myriophyllum spicatum*) if preferred plants have been eliminated. Palatability differences due to local variations in soil and water chemistry also appear to affect preference; i.e., grass carp may readily eat a particular plant in one location, but ignore it at another. This feeding selectivity may reduce habitat heterogeneity by altering plant species composition. If desirable plants are eliminated, populations of less palatable plants may explode due to lack of competition, reaching densities that were higher than pre-stocking levels.

Rare species of aquatic plants, some in need of conservation such as clubrush (*Scirpus subterminalis*), spiny coontail (*Ceratophyllum echinatum*), and certain *Potamogeton* species, also occur in lakes with weed problems. Since grass carp will consume more than targeted nuisance weeds, thorough rare plant surveys should be conducted before a

lake or pond is stocked. Not only are rare plants important components of our natural resource base, but they also have genetic, esthetic, scientific, and economic values to society.

Grass carp may also indirectly cause increases in algal populations.^{3,8} A single grass carp digests only about half of the plant material that it consumes each day. The remaining material is expelled into the water, enriching it and promoting blooms of algae and duckweeds. These blooms can reduce water clarity and decrease oxygen levels, possibly even causing fish kills. In addition, algal blooms may be unsightly, malodorous, and unpleasant to swim in.

Grass carp stocking programs require installing screens at inlets and outlets of lakes, to prevent carp dispersing to other water bodies. While intact, these screens may affect the native fish community by preventing natural movement of other fish species in and out of the lake. There is a strong likelihood, however, that screens will be damaged within a few years by ice, floating debris, corrosion, or vandalism, thus creating unwanted introductions of grass carp into other waterways.

Interactions further up the food chain

Although some aquatic plants may be considered "bothersome" weeds when too abundant, they are an essential

What *should* lake owners do to solve aquatic weed problems and keep lakes healthy?

- Erosion and sedimentation from construction sites in areas surrounding lakes should be prevented.⁶
- Fertilizer use should be minimized and applications should be timed to maximize uptake by plants and minimize runoff and infiltration to groundwater. Broad buffer zones of seminatural soil and vegetation should be maintained around lakes, streams, and wetlands to absorb nutrients in runoff and shallow groundwater.
- Septic systems (and new homes) should not be installed next to shorelines. Existing septic tanks should be pumped out frequently, and regularly tested for integrity. For larger lakes with many homes and malfunctioning septic systems, central sewage treatment with a high level of nutrient removal is recommended. Proper sewage treatment is costly, but improper treatment is more costly downstream or in the future.⁶
- Alternative sewage treatment may be appropriate for older homes close to the water or located on wet or rocky soils (e.g., composting toilets).

Strong efforts to reduce nutrient problems in lakes and ponds should in turn help to reduce the need for weed control. However, there may be a lag time for nutrients to be flushed out of lakes or immobilized. If removal of unwanted vegetation in swimming and boating areas is still deemed necessary, herbicide use is strongly discouraged. Herbicides are relatively indiscriminate, kill many species of plants in addition to the target species, can inhibit microorganisms, and may be toxic to small fish and animals.^{7,8}

Weed harvesting may relieve symptoms. Environmentally-sensitive weed harvesting avoids rare plant localities, does not disturb sediments, and opens paths through weeds rather than eliminating entire weed beds. Care should be taken to collect harvested weeds from water, as some will re-root after settling to the

bottom.¹⁰ (Harvested plants can be used in the garden as mulch or compost.⁶)

If your community decides to introduce grass carp to control weed growth, recommend a conservative stocking rate. Grass carp are a potent weed control agent, and if overstocked, may completely remove the plant life from your lake or pond. Make sure the grass carp have been certified triploid. In addition, be certain that inlet and outlet barriers are installed correctly, and plan for long-term monitoring and maintenance of the barriers. Grass carp may live up to 15 years, and will need to be restricted to the lake or pond throughout their life span. Several individuals have been found in the tidal Hudson, providing evidence that confining them is not always easy.

Thanks to Robert E. Schmidt for reviewing this article.

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Calendar

April 24-29, Monday to Saturday, New York Natural History Conference, with Hudsonia poster session on *Biodiversity Assessment Manual for the Hudson River Estuary Corridor*. At New York State Museum, Albany. Registration info: (518) 486-4845.

May 6, Saturday, 10:00 a.m. Slide show, musical celebration (with members of Betty and the Baby Boomers), lunch and afternoon nature walk, with Esther Kiviat (photojournalist and author of *Changing Tides: Tivoli Bays*) and Jean McEvoy (educator for Hudson River National Estuarine Research Reserve), Village Hall, Tivoli. Rain date May 13. Bring your lunch. Registration required: (914) 758-7012.

May 13, Saturday, Opening reception: exhibition of Hudson River photographs of Thomas Teich, Greene County Council on the Arts, Catskill. Call (518) 943-3400 for time and other details.

June 2, Friday, 7:30 p.m., Erik Kiviat is featured speaker, Hudson River Lecture Series, at Beczak Environmental Center, Yonkers. Info: (914) 376-0859.

June 4, Sunday, 12:00 noon. Gala luncheon at the magnificent Callendar House, on Tivoli North Bay, to benefit Hudsonia. Tickets go on sale late April. Please mark your calendar for this very special event.



Biodiversity Manual Introductory Workshops for Potential Community Partners.

June 2, Friday, 2 to 4 p.m., Beczak Environmental Center, Yonkers;

June 16, Friday, 2 to 4 p.m., New York State Museum, Albany;

June 28, Wednesday, 7 to 9 p.m., Dutchess County Environmental Management Council. Call (914) 758-7053 for information and to reserve a space.

“Smart Growth”: The View from the Science Department

Using Biodiversity Information in Land Use Planning

Part 2 By Gretchen Stevens and Melissa Everett

Our friend Jim McDougall, of the Metropolitan Conservation Alliance (MCA), has developed an interest in taking local officials out to the woods, slopes, and wetlands of the lower Hudson Valley, to see firsthand what they have to lose if unwise land use decisions are made. The MCA, a project of the Wildlife Conservation Society, reflects an important and rapidly evolving movement to protect biodiversity through more ecologically sophisticated land use planning.

Starting with projects in the Stewart State Forest and the Eastern Westchester Biotic Corridor, the MCA has been providing technical assistance to local decision-makers about habitat protection, along with the inspiration that comes from direct exposure to those habitats.

“When you take people out and lift up a log and show them a five-inch long, indigo-colored salamander with yellow spots, they get excited,” he reports. “It casts our work in a whole new light.”

Many of the land use decisions that will configure the ecological landscape for the foreseeable future are made by local decision-makers about local development projects. While protection of bio-

logical diversity may be an unfamiliar notion to local officials, it is often compatible with other planning objectives, and can be easily incorporated into land use planning using the common tools of the trade such as Master Plans and zoning ordinances.

The general procedures for identifying biodiversity resources on a particular site - or in a whole town, watershed, or region - are outlined in Hudsonia’s *Biodiversity Assessment Manual for the Hudson River Estuary Corridor*, available later this spring. A “biodiversity overlay” of significant habitats, important habitat complexes, and rare species occurrences can be used along with existing map overlays of steep slopes, watercourses, aquifers, wetlands, prime farmland, and other landscape features to inform the planning and permitting processes.

Goals and Strategies

The first step in incorporating biodiversity into land use planning is to establish clear goals for conservation. Some kinds of goals for consideration are:

- protection of rare, declining, or vulnerable species, and their habitats;
- protection of habitat for certain “flagship species” such as Blanding’s

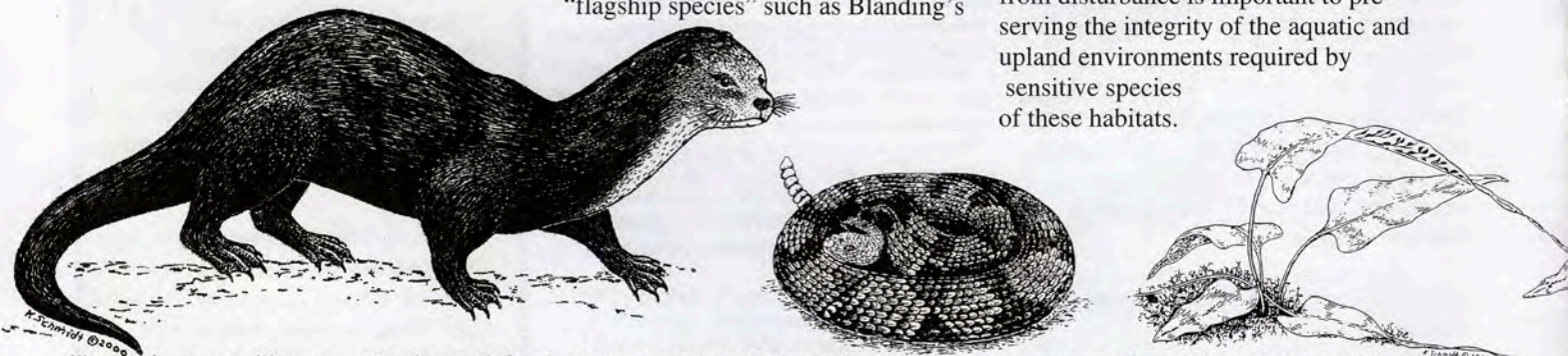
turtles in Dutchess County, or bald eagles along the Hudson River; or

- preservation of an array of “exemplary habitats” possessing most of the biological components and interactions present in wild, undisturbed systems.

Thinking about biodiversity requires thinking about habitats and habitat complexes that often straddle property and political boundaries. It requires an integrated view of potential land uses, addressing not only their isolated effects, but also the cumulative impacts on habitats and species.

Planners should keep in mind some basic precepts when crafting biodiversity conservation plans:

1. Preserving large tracts of undeveloped land, and undisturbed connections between diverse habitats is important to many species of rare and declining plants and animals.
2. Preserving movement corridors can be just as important to populations of certain mobile species as protecting their primary breeding or foraging habitats.
3. Preserving the isolation of streams and woodland pools, lakes, and ponds from disturbance is important to preserving the integrity of the aquatic and upland environments required by sensitive species of these habitats.



Illustrations: on this page, starting at left: river otter, timber rattlesnake, walking fern; on page 8, starting at top: southern flying squirrel, long-eared owl, least bittern, eastern prickly-pear, northern hog sucker, slimy sculpin © Kathleen A. Schmidt in Biodiversity Assessment Manual for the Hudson River Estuary Corridor. Drawings not to scale.

This article is adapted from Hudsonia’s *Biodiversity Assessment Manual for the Hudson River Estuary Corridor*, by Erik Kiviat and Gretchen Stevens, available this spring. (Call us for ordering information.)

4. Preserving old systems (e.g., mature forests, or wetlands with deep organic soil) intact may be more important than preserving younger counterparts of those systems (e.g., a young forest, or a recently created marsh) because old systems tend to possess greater complexity of biological communities and of microhabitats.

5. Open space preserved for moderate or intensive recreation, or for visual relief in highly developed areas, though otherwise valuable to the human community, may do little to protect biodiversity. The different goals of open space and biodiversity protection should not be confused; they are often but not always compatible.

Regulatory and Voluntary Tools

Once a biodiversity assessment has been conducted and a community has articulated its conservation goals, a conservation plan can be implemented using tools familiar to the planner. These include overlay districts in the Master Plan and zoning innovations such as:

- cluster zoning: Concentrating development in a small area, usually with reduced lot sizes, to help preserve large areas of undisturbed land and natural features.
- overlay zoning: Applying one zoning district, usually with more restrictive requirements, over one or more other districts. For example, a turtle migration corridor overlaid on a rural residential district might require special measures to protect turtles during nesting or drought migrations. Or, a special "needs" justification might be required for any development in large forested tracts.
- incentive zoning: Encouraging developers to adopt certain approaches - such as "infill" development or redevelopment, instead of new development on undisturbed land - in return for benefits such as increased density allowances, or rapid processing of applications.*

Additional tools for implementing biodiversity conservation goals include:

- tax incentives
- development and design recommendations
- conditions attached to developments permits
- land purchase
- conservation easements
- encouragement of voluntary conservation efforts.

A biodiversity assessment, by itself, does not tell a community what to preserve, or how to establish goals for conservation.

It only provides a scientific basis to help citizens and local officials determine what aspects of their natural heritage have greatest value. Public support is essential to any land protection strategy. A biodiversity conservation plan that is ecologically sound and politically viable must be arrived at through public consensus-building and an authentically democratic process.

*Descriptions of zoning options are from *SprawlWatch Clearinghouse Web site: www.sprawlwatch.org*. □



Archaeological Research Confirms Importance of Bard Site

Bard College Archaeologist-in-Residence Christopher Lindner has confirmed that the Gardener's Cottage on campus – built around 1836 and discovered in the course of the first excavation for possible siting of the Performing Arts Center – is the prototype for Gothic Revival cottages in the United States. “When somebody wanted to do an artistic house, this is what they emulated,” says Lindner. This image was highlighted in the *Treatise on the Theory and Practice of Landscape Gardening* by A.J. Downing, the foremost writer on the aesthetics and philosophy of country residences in the mid-19th century. Excavation in the yard has brought to light even earlier artifacts, suggesting that some structure had existed on this location since the mid-18th century.

But this appears to be only the last few heartbeats of the site's long history. A flint projectile point and debris from making stone tools, found in the Gardener's Cottage yard, demonstrate that the spot was used as a campsite as early as 7000 years ago.

Lindner, who is launching a Hudsonia-sponsored study of the prehistory of Dutchess and Columbia County riverfront areas, manages the on-campus archeological site at the beginning of the Greenway Trail. He expresses hope that its increasing prominence will help to tie together a number of historic and scenic preservation efforts. “This could easily be the start of a ‘scenic-historical path’ at Bard that will link at least four archeological sites on the Greenway trail,” says Lindner. “Ongoing archaeological research and an educational exhibit currently in the works could begin a body of work in research and interpretation on the Saw Kill Glen area, and even give rise to a center for history and archaeology.”



Late Breaking News

The New York State Museum has generously donated 150 copies of **E.O. Wilson's** readable and beautifully illustrated paperback, *Biological Diversity: The Oldest Human Heritage*, to Hudsonia for biodiversity education. Sets are available for loans to classes and other groups. Please inquire.

Initial training sessions for the **Invasive Plant Volunteer Observer Network** were held in New York City March 20 and in Westchester County March 23. Thanks to the Central Park Zoo School and to Ken Soltesz at Cranberry Lake Preserve for hosting these, and to the New York City Improvement Fund and Westchester Community Foundation for support. Thanks also to the Hudson River Foundation for a \$22,000 grant, just awarded, to synthesize available scientific information on phragmites.

If you have some naturalist skills and an interest in the ecology of invasive plant species, consider spending a few hours in the field watching phragmites and purple loosestrife as part of our research program. Contact Laura Heady at Hudsonia for details: (914) 758-7274.

To house its expanding staff, **Hudsonia is moving into a second office** at 25 E. Market St., Red Hook, NY. The Bard College Ecology Field Station will continue to be our research lab and primary base. (914) 758-1522

Hudsonia T-shirts!

100% cotton T-shirts come in white or buff with this Blanding's turtle in dark green, with a bright yellow throat, on the back. Hudsonia's chickadee logo in dark green is on the front. Adult S,M,L,XL short-sleeved \$15, long-sleeved \$18; child S,M,L short-sleeved \$13; plus tax and shipping.



News from Hudsonia

Welcome to Our New Board Members...

Norene Coller of Clinton has been a secondary school biology and earth science teacher for 29 years. She has done substantial volunteer work for the Dutchess County Environmental Management Council since the 1970s, and was Chair for 11 years. She has also chaired the Clinton Conservation Advisory Council for 12 years.

Leslie Farhangi of Millerton is a former lawyer who moved to this area ten years ago and learned about environmental issues as a landowner. Farhangi and her husband, John Tuke, chose to put conservation easements on their own farm, and through the process became active in many local environmental issues.

Bill Hogan of Clinton Corners worked for Cornell Cooperative Extension for 27 years, the last ten as its Executive Director in Dutchess County. He was the first Executive Director of the Dutchess County Environmental Management Council, and has had a lifelong involvement in environmental education, management and leadership development, and community participation projects.

Thanks for donations: books and journals: James Beemer, Lin Fagan, IAMSLIC member libraries; equipment: Matthew D. Rudikoff Associates; specimens: Sven Hoeger; technical and professional help: Sam Adams, Joseph T. Bridges, Norene Coller, Paul F. Connors, Rob Doscher, Nancy Engel, Barbara Kendall, Gary Lachmund, Philip La Porta, David Perry, Ellen Peterson, Nancy Slowik, Ken Soltesz, David Strayer, Mike Trimble.

Hudsonia needs a car and/or a van, plus office furniture and shelves in good condition.

Hudsonia, Ltd.

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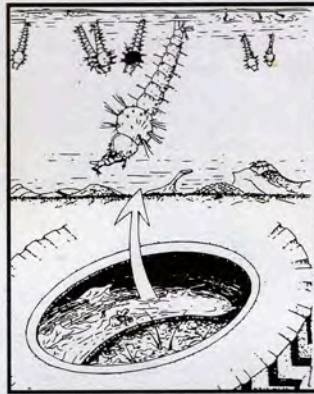
Gifts are tax-deductible to the full extent of the law.

Hudsonia has signed a \$303,000 contract with the Dutchess County Department of Health to carry out an arbovirus surveillance program. The program has been launched to search for signs of the West Nile virus detected in New York City last year, as well as other arthropod-borne viruses (called arboviruses) such as Saint Louis encephalitis virus. Under the agreement, Hudsonia will sample and analyze data on mosquitoes, ticks, wild birds, and sentinel poultry flocks. Hudsonia's county-wide field study will provide up-to-date

Hudsonia to Conduct Dutchess Mosquito Surveillance

scientific information about mosquito populations and breeding sites, as a basis for the county's decisions regarding public education and mosquito control strategies.

The Dutchess program emphasizes public education and data collection rather than the use of pesticides. However, in the event of a public health crisis, the use of least-toxic larvicides and ground-based spraying is



Rainwater in discarded tires provides mosquitoes with a place to breed. Upper part of sketch shows mosquito larvae, highly magnified, hanging in water. © Kathleen A. Schmidt

not ruled out. The house mosquito (*Culex pipiens*), thought to be the principal vector for transmission of West Nile virus, breeds in seriously polluted waters. Prime breeding areas include open sewage treatment plants, and in artificial containers like old tires, unchlorinated swimming pools, clogged gutters, barrels, and unused wading pools. According to Michael C. Caldwell, M.D., M.P.H., Commissioner of Health, the program's main early thrusts will be surveillance and prevention, the latter by concerted public action to eliminate many of the places where house mosquitoes breed.

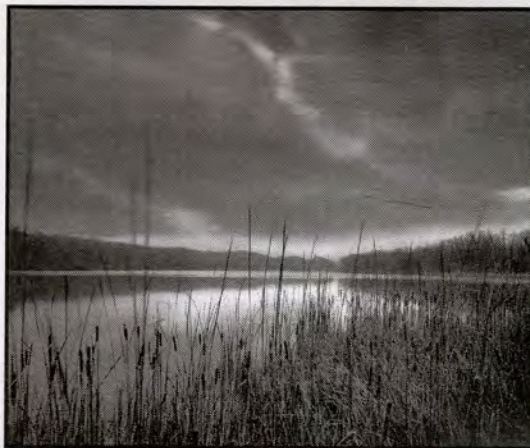
Science Director Erik Kiviat, Ph.D., will direct Hudsonia's project, which will be staffed by a Medical Entomologist, Farida Mahmood, Ph.D., a Research Assistant, Kate Wallen, and two seasonal Technicians. Erik views this project as a challenge in applying science to the solution of a potential public health problem: "There are many recent advances in medical entomology and mosquito management that allow detection of disease organisms and intervention in disease systems with less negative impact on the environment. The Department of Health-Hudsonia collaboration aims to monitor for arboviruses, to increase the chances that problems will be discovered while they are still localized and easy to solve."

To learn more: "Mosquito Ecology, and Management of Mosquitoes and People," by Erik Kiviat, *News from Hudsonia*, v.10 no.1, 1994, p.1-6. Call (914) 758-7053 to order reprints. □

Hudsonia Partners with Fine Arts Photographer on Hudson River Project

Hudsonia will team up with fine art landscape photographer, Thomas Teich, on his new project creating a photographic portrait of the islands and shoreline habitats of the Hudson River. Teich, an award-winning landscape photographer who uses large format cameras (as Ansel Adams did), recently received funding from the New York State Council on the Arts through the Greene County Decentralization Grants Program toward the costs of producing exhibitions of this new work. A portion of these funds will come to Hudsonia to assist Teich in locating island and shoreline areas of ecological significance and to provide written and oral educational information to complement the exhibitions.

The first exhibition of this work will run from May 13 to July 8, 2000, at the Greene County Council on the Arts, 398 Main Street, Catskill, New York. The



public is invited to attend the opening reception on May 13th. Please call the Greene County Council on the Arts at (518) 943-3400 for details.

Hudsonia's assistance in the exploration of such places as Cocksackie Island, Vosburgh Swamp, Ramshorn Swamp, and Duck Island in Greene County, and

Mill Creek, Nutten Hook, Rogers Island, and Stockport Flats in Columbia County, will help Teich to create the first fine-art, large-format photographs ever made in these environments. Teich plans to exhibit large scale and mural-size black and white prints of these images. He reflects, "While many people are drawn, first, like I was, to the beauty of color in nature, I have learned that color can distract from or overwhelm the less obvious but even more beautiful combinations of light, shadow, form and texture in the landscape."

Long concerned about conservation, Teich hopes the project will introduce local residents and visitors to the aesthetic value of some of the least known, imposing, and beautiful places on the Hudson River, and will encourage protection and conservation of sensitive habitats. □

Dear friends,

Hudsonia is on the move. Your investment is needed...and valued...more than ever.

Thank You.

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Chair, Board of Directors

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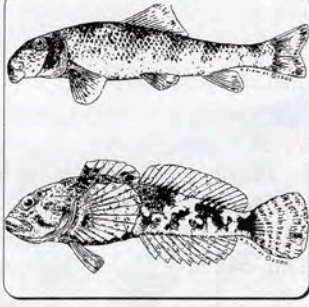
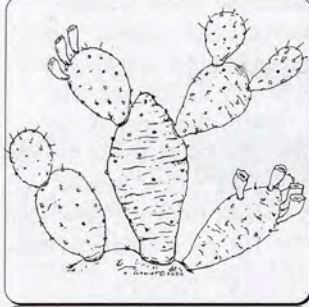
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