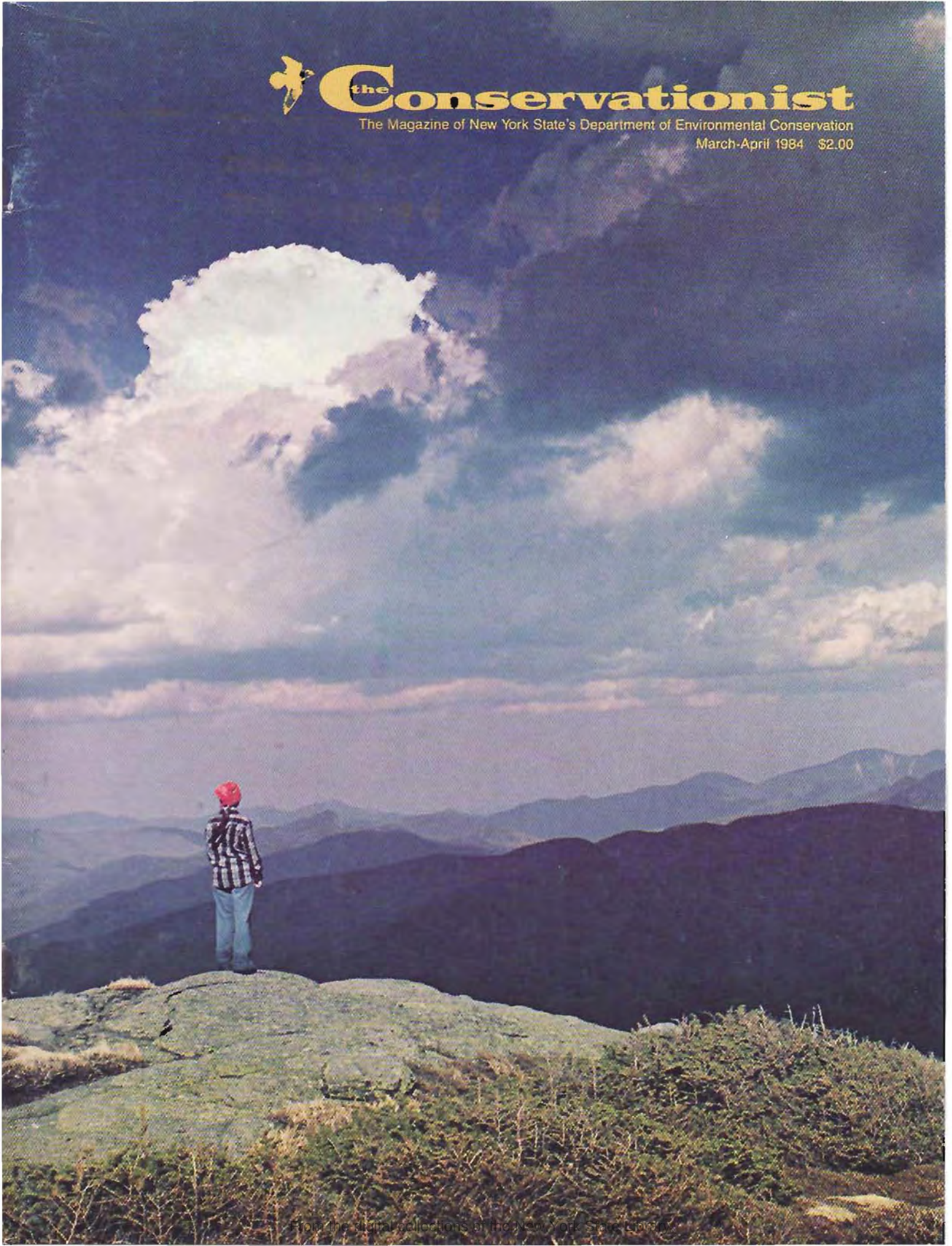

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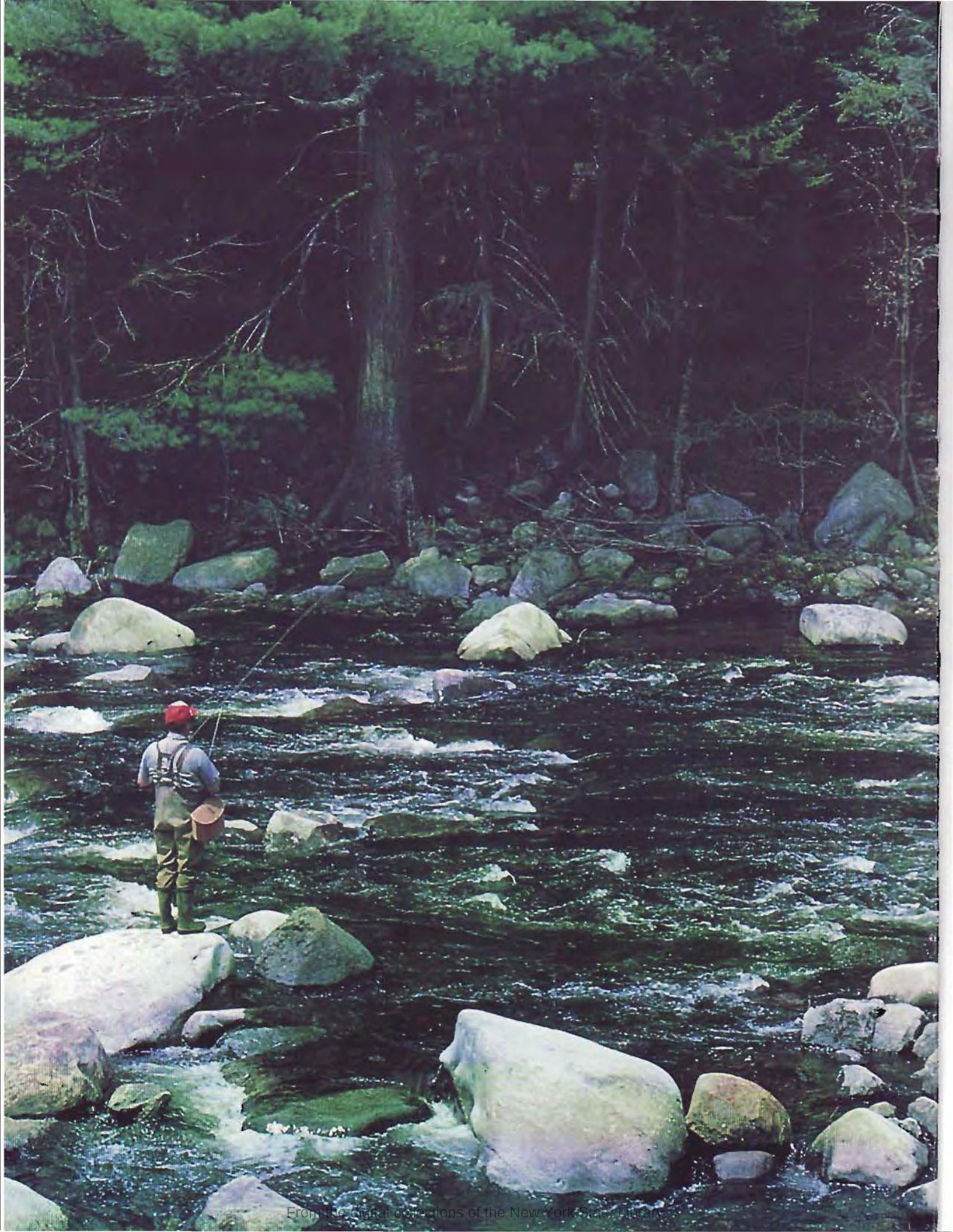

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Front cover: Weather Building by Lee Rentz / Cover II: Opening Day by Fred Knauss / Cover III: Pussywillows © by Tony Allegretti

Beaver meadow on Tug Hill Wildlife Management Area / The Hill is a place of wild forests, swamps, small streams and few people.

by Lee Chamberlaine

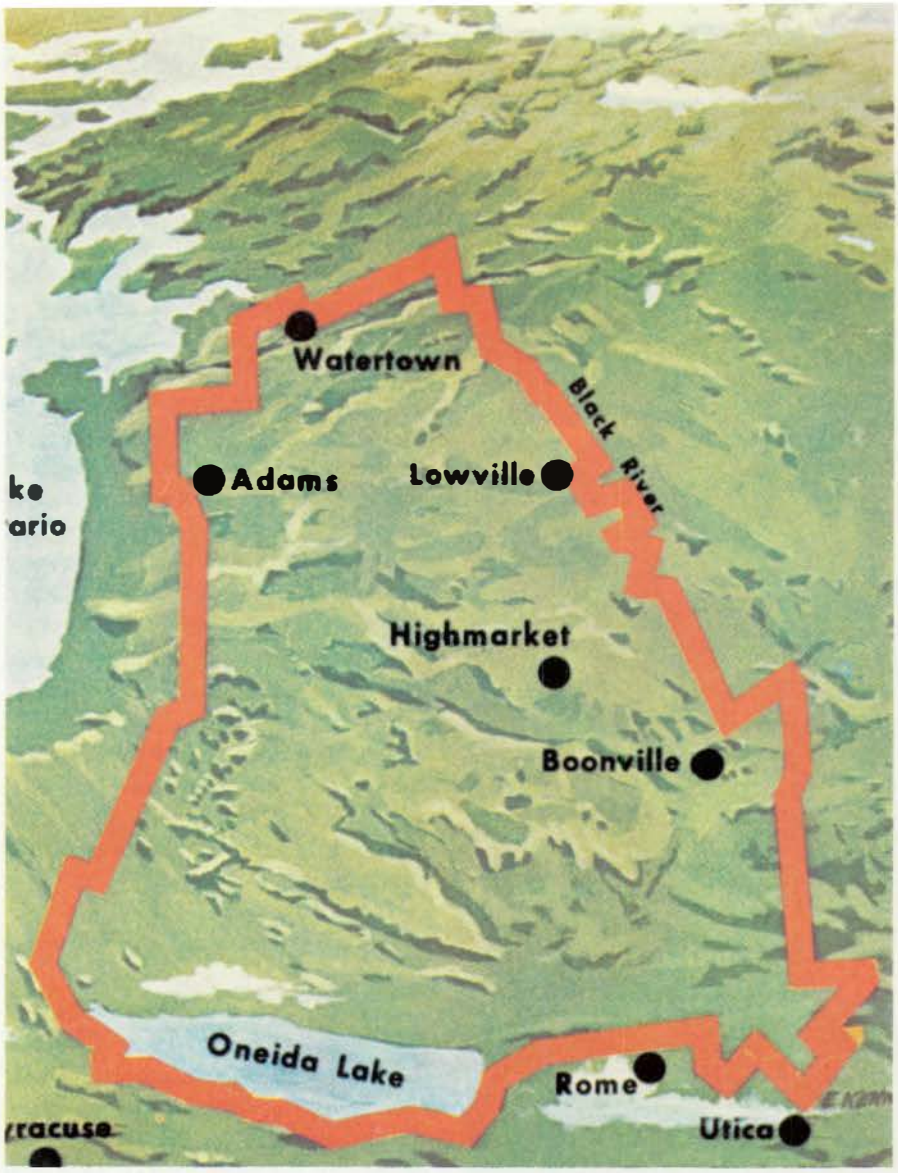
Tug Hill
A Place — A Time

Photos by Author
(unless otherwise indicated)

FOR many New Yorkers who are just passing through, the name "Tug Hill," if it means anything at all, suggests a sense of brooding mystery, loneliness and even desolation — of vast trackless forests and severe snow-filled winters. But to those who live there, it is more than a place. It is also a point in time — a place behind the time if you will. This is not meant to be derogatory. In fact it is a downright compliment. The people who live and work on the Hill have been able to hold on to an era that has passed by the rest of us, a time when everyday things were more simple, less complicated. It was a time when people seemed more honest and forthright, when people cared more about each other, and the family and community were the mainstay of the social fabric. In the press of our daily lives, many of us have forgotten this time or perhaps are too young even to have known it. But these symbols are not gone from the scene: they are alive and well on Tug Hill, and to visit is to be able to return to the present, refreshed and better able to cope.

Randy Kerr, a 37-year veteran of DEC and now chief forester for Lewis County, runs a sugarbush with his wife Elizabeth near Greig in Lewis County. He and his wife planned and built a house on the Hill over a nine-year period as part of their planned retirement. "Of course, both my wife and I were born and raised here, so in a sense we've come home," he says. "For people like us who enjoy living near the woods, this area is ideal — good hunting, good fishing, cross-country skiing." He pauses reflectively. "Sure, we're a little out of the mainstream and the winters are pretty severe. But you can't beat the clean air and water. And things are generally easier — the pace is slower. And the cost of living isn't as high. All in all, it's a good place to live."

The Tug Hill Plateau, Tug Hill or just the Hill, as it is called by the locals, is located in northern New York between Lake Ontario on the west and the Adirondacks on the east. It can be roughly described as a triangle lying between Syracuse, Watertown and Rome. Most of Tug Hill lies in Lewis County, but also spills over into portions of Oswego, Jefferson and Oneida

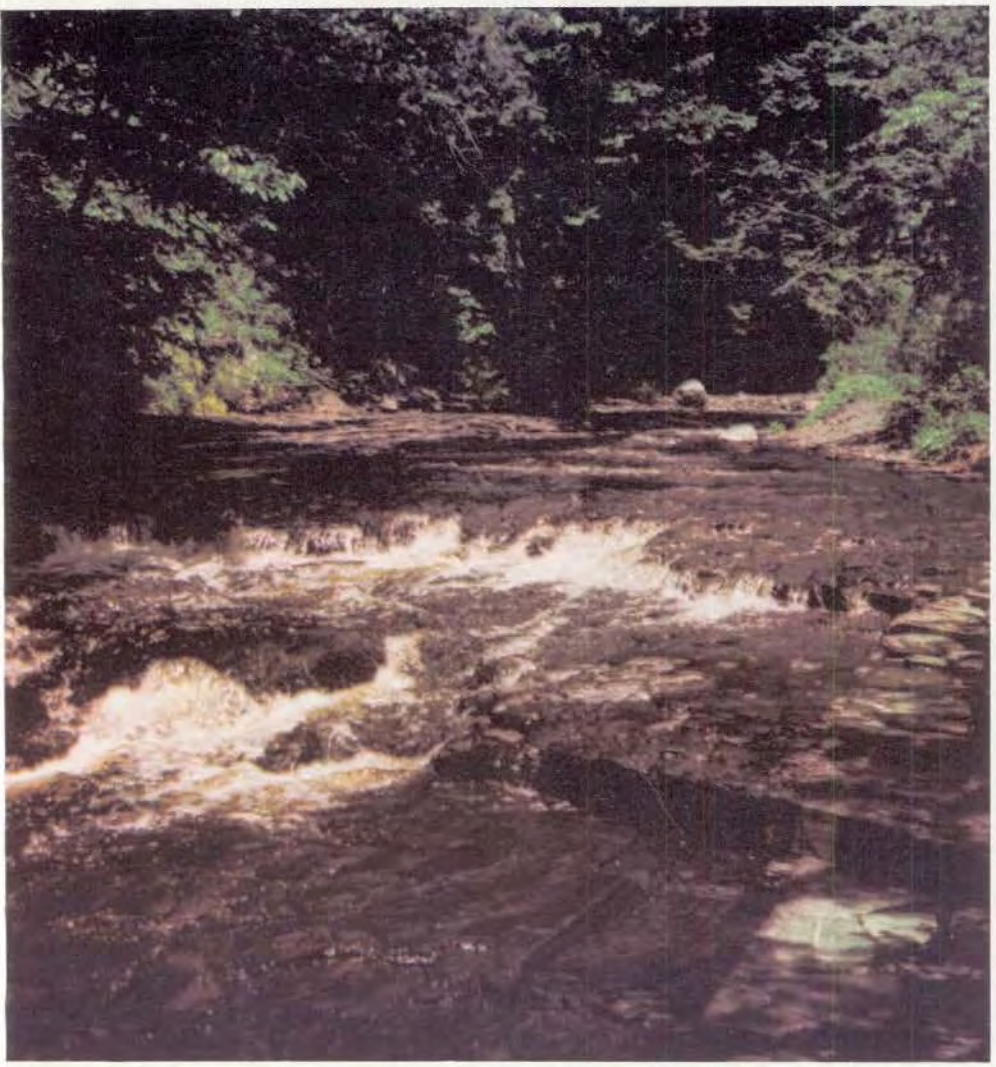


(Top) Tug Hill is sometimes called the Lesser Wilderness.
(Above) The Hill possesses some spectacular ravines and gorges like Inmon Gulf.

Counties. Tug Hill is not really a hill but a plateau rising abruptly to 500 feet above the Black River Valley on the east and 400 feet above the Lake Ontario Plain on the west. It is an area of densely forested land interspersed by small streams, softwood swamps, old beaver meadows and active beaver ponds. There are few roads and not too many towns. With the exception of the Adirondack Preserve, it is the largest unspoiled, relatively undeveloped land mass of its size in New York State.

Tug Hill is, in effect, a large perched water table with a multitude of streams and rivers having their sources there. Some of these streams are well known, primarily due to their outlets in Lake Ontario and the salmonid fishery that has subsequently developed. Salmon River, Sandy Creek's north and south branch, Mad River and Sugar River are well known. The headwaters of the Mohawk River rise in southern Lewis County. Some of the smaller, lesser known, but excellent brook trout streams on the hill include Raystone, Cottrell, Abijah, Pigeon, Bear, Mulligan and many, many others.

With this abrupt elevation change, the many streams and rivers coming out of the area have created some spectacular gorges and ravines that are relatively unknown because of their inaccessibility. The more spectacular of these are Whetstone Gulf, Lorraine Gulf, Inman Gulf and Shingle Gulf. The gorges composed of sandstones and shales are longer and deeper than the limestone gorges. All are of considerable depth and, in some gorges, of extensive width. The streams along the bottoms have over the centuries cut down through the slate or limestone to as much as 300 feet, depending on the substrate. Vegetation from the Lake Plains and Black River Valley invades these drainage channels and works its way up onto the Hill proper. For this reason, oak trees which normally do not occur, can be found growing on the edges of these gorges at considerable elevations. The gorges also act as a pathway for air as well as for water, moderating temperatures, whereas on Tug Hill itself, killing frosts can come as early as August and as late as May or early June.



(Top) This church and stark landscape near Haymarket are reminiscent of an Andrew Wyeth painting. But the waters of this gently flowing stream near Whetstone Gulf (above) are more typical of Tug Hill's beauty.

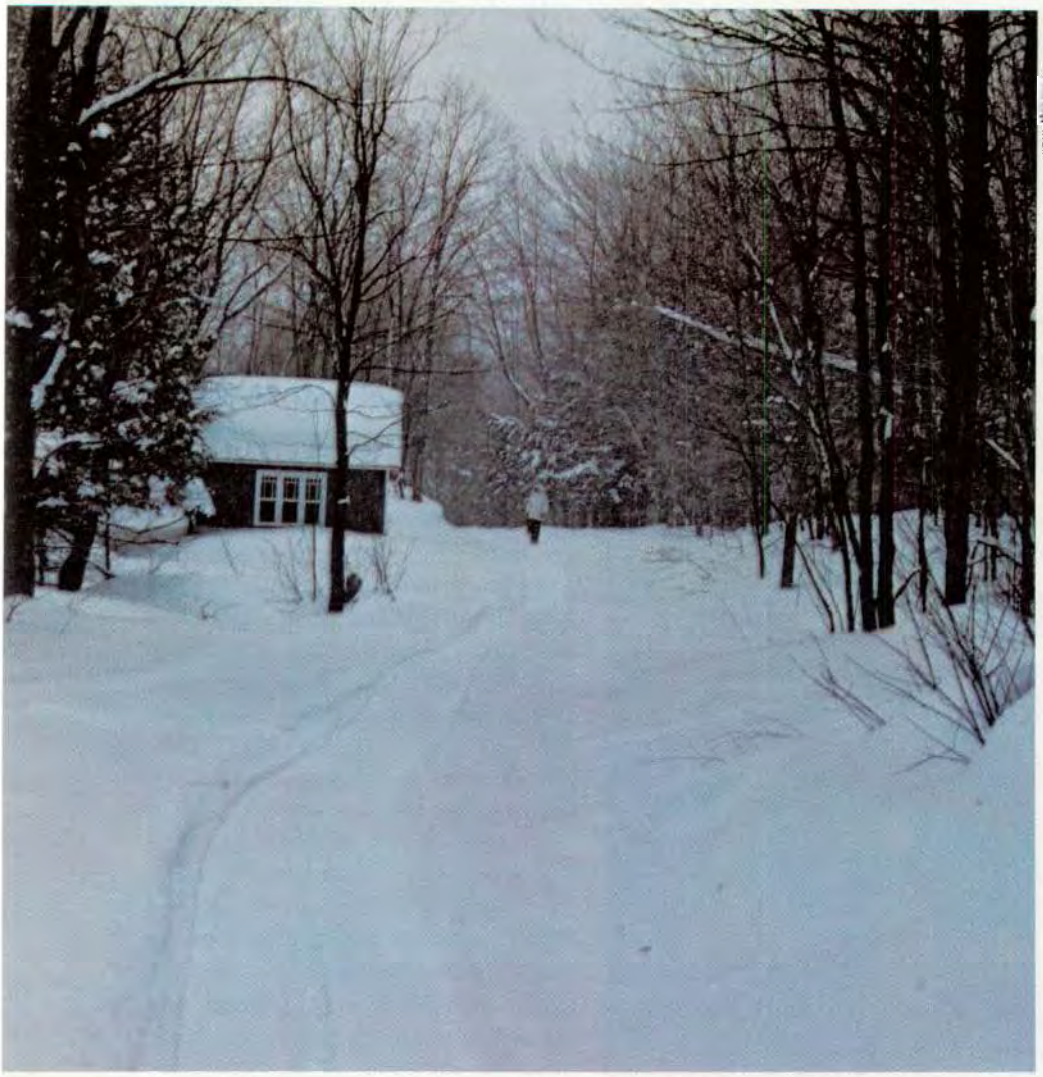
Many of the towns of the Tug Hill Plateau were cleared and settled late in the 19th century. Small active communities sprang up at scattered locations such as Parkers, Michigan Mills, Osceola and Redfield to name a few.

Many of these villages were once thriving communities with diversified industry. The Village of Parkers, for example, became the site of a broom and basket factory and sawmill. Most of the industry was based on the natural products of the area. Logging communities at Page, Monteola, Swancott Mills and Greenboro were well known statewide for the annual volume of lumber they produced. Much of this lumber boom ended in the 1920's, although wood cutting for chemical production continued into the 1930's.

From the 1930's to shortly after World War II, much of the land remained relatively unused, and brushlands and woodlands increased as small farms disappeared in the changing agricultural, social and economic situation. The postwar period was one of extensive logging, increased interest in hunting, fishing and other outdoor recreational interests, and Tug Hill became a highly attractive recreational area, although not so well known as other areas.

Extensive tracts of northern hardwoods — beech, birch, maple — and the scattered softwood swamps that follow the myriad of streams on the Hill account for a diverse animal and plant community. The old field reversion in the past 10 years has resulted in a tremendous mixture of woodland and old field types called "edge." This, plus the ever constant tree harvest for lumber, fiber and now fuel (see "Bull of the Woods" in this issue) has provided constant habitat change and diversity.

Wildlife species represent a mix of the Adirondacks and Appalachian upland. A few common species such as the cottontail rabbit, grey squirrel and opossum are not so frequent here as in other parts of the state. But the fisher, the river otter and the snowshoe or varying hare exist in fairly high numbers. In fact, hare hunting is legendary to the houndsmen who pursue their recreation from January through mid-March under the most extreme winter



C. W. Severinghaus

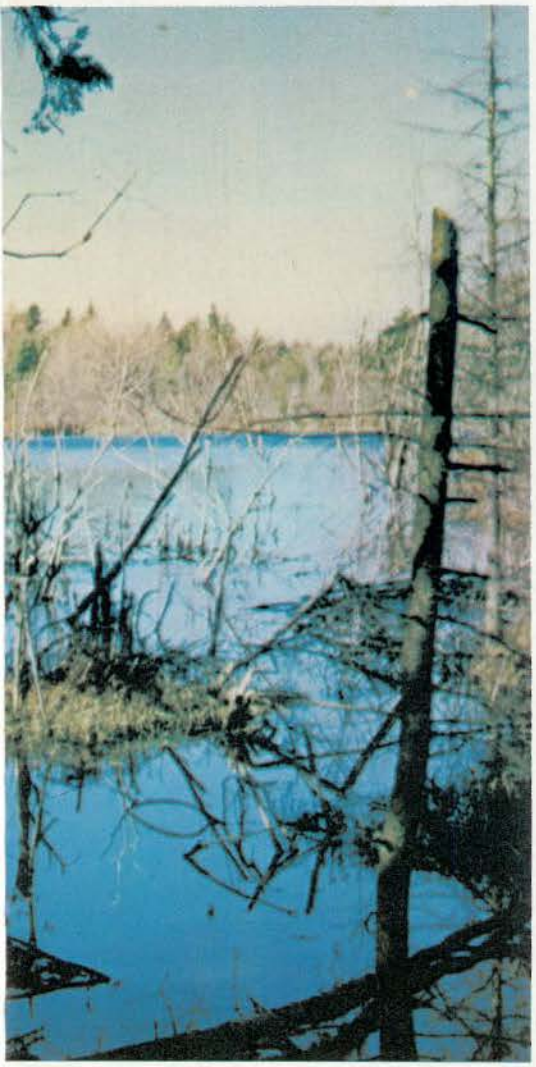
(Top) This beaver lodge is a salient feature of the Tug Hill Plateau, as is a plentitude of snow (above) — 100 to 188 inches per year.

conditions of snow and cold. The white-tailed deer is probably the most conspicuous mammal on the Hill, although some might think the ubiquitous beaver with the problems that it causes to roads, camps and timber should hold that honor.

Deer numbers rate from fair to excellent depending on the severity of winters. There are four main deer wintering areas, where large acreages of softwood cover provide protection from wind and deep snows. These "yards" are located near Barnes Corners on the west, Highmarket on the southeast near Constableville, Osceola on the south near the Oneida County line, and the Otto Mills-Redfield complex near Redfield on the southwest. Through the Fish and Wildlife Management Act (FWMA), DEC's bureau of wildlife has ongoing programs in the Barnes Corners and Highmarket areas in cooperation with private landowners whose property adjoins state lands. The agreement allows DEC to close these lands to hunting snowshoe hare with dogs and to snowmobile use when deep snow causes the declaration of a deer emergency. Additionally, forest management applications have been carried out at the Otto Mills-Redfield complex and Highmarket Cooperator Area to increase available browse and to reduce winter losses.

While some activities are forbidden during a deer emergency, cross-country skiing and snowshoeing are allowed and even encouraged to make people aware of the conditions under which deer are restricted in winter. Black bear, while not unknown, are uncommon and usually are summer visitors from the Adirondack sections across the Black River Valley.

Because of unique conditions on Tug Hill, some creatures occur in higher numbers than elsewhere, or are restricted in distribution due to special habitat requirements found at higher elevations. Among this latter category will be found the mink frog which is very common in streams and marshes. It gets its name from the fact that when handled, it gives forth an odor similar to that of the mink. It has been said that this musky fluid is poisonous to other species of frogs. The semi-aquatic



From a bleak winter landscape (top) to the beauty of this wetland in the Littlejohn Wildlife Management Area (above) Tug Hill's uniqueness is worth preserving.

water shrew, about the size of a very small mouse, lives primarily on insects, along the waterways of the area. It free dives for food and has the ability to run across the water without breaking the surface film. Among the birds that can regularly be seen are goshawk, winter wrens, broad-winged hawks, Nashville warblers, mourning warblers and Louisiana water thrushes. Waterfowl in spring and fall migrations can be seen in sizable flocks as they move to either the migration route along Lake Ontario or the Black River Valley. Flights of migrating hawks can at times be seen moving here on strong southerly winds in March and April.

There are literally thousands of acres of public lands available on Tug Hill for recreational purposes, whether it be a state forest, wildlife management area, forest preserve parcel or a state park. Facilities are available for camping, hiking, swimming, hunting, fishing, snowmobiling, cross-country skiing and just a family picnic. Some of the areas are the Tug Hill Wildlife Management Area, 4,980 acres; Littlejohn Wildlife Management Area, 8,020 acres; Winona State Forest, 8,233 acres; the Tug Hill State Forest, 11,788 acres. There is a busy downhill ski area, Snow Ridge, at Turin.

The Hill is a year-round recreation area, but a few words of caution are in order here, particularly for hikers. The number of streams, softwood swamps, beaver meadows and beaver dams intermixed with extensive wooded areas make cross-country travel without compass and topographic map ill-advised. Spring and summer insects can be very bad at times; winter, spring and fall snowstorms can develop very rapidly and snowfall can be very heavy. The Tug Hill Plateau receives more total annual snowfall than any area east of the Rocky Mountains — 100 to 188 inches. In winter be sure that you have sufficient clothing and footwear.

Overseeing and protecting the uniqueness of the area is the Tug Hill Commission whose nine members, all residents, are appointed by the Legislature to study and make recommendations on all factors affecting the quality of life in and around the plateau. These include the conservation and development of natural and cultural resources, strengthening the economy, and protection from unplanned population growth and development.

According to Benjamin Coe, its executive director, a major effort of the commission is to "Keep Tug Hill the way it is." Its main accomplishment to date has been the completion of a resource management plan for 11 towns. These towns, located in four counties, recognize the central forest watershed as the single most important entity, overriding all other interests. A model has been reviewed locally, and seven towns have adopted a version of the code, signing an intermunicipal agreement for its administration and enforcement. A coordinator from the planning board provides technical assistance to towns involved. "Such cooperation," says Coe, "is only a sample of the benefits of planning from the local level up."

The work of the commission is a reflection of the desires of most of the people who recognize that the way of life they have evolved is worthwhile preserving. For as author Harold E. Samson noted in the introduction to his *Tug Hill Country Tales from the Big Woods,* the entire area is "... not just a hill, or a jumble of hills, or a region. It is also forest solitudes and wild beasts and tumbling trout streams that were once sources of unlimited water power. It is lumber camps and backwoods farms and high stony pastures. It is desolation in winter and breathtaking beauty at all other times of the year. It is wild flowers and bird song and the music of the winds in the evergreens. It is humor and tragedy, courage and high resolve, success and failure. It is legend and fact, folklore and reality. It is self reliance and ingenuity and the will to survive. It is patriotism and motherlove, pride and honor, memory of the past and trust in the future. It is America."

Lee Chamberlaine is a senior wildlife biologist who works out of DEC's Region 6 office in Watertown. A 1963 graduate of SUNY's College of Environmental Science and Forestry, he began his career as a park ranger and naturalist at the Everglades National Park in Florida.

This Morbark wood chipper can effortlessly chew up a 22-inch diameter tree.

by Randy Kerr

Bull of The Woods

Wood chips have become a major source of fuel in Lewis County.

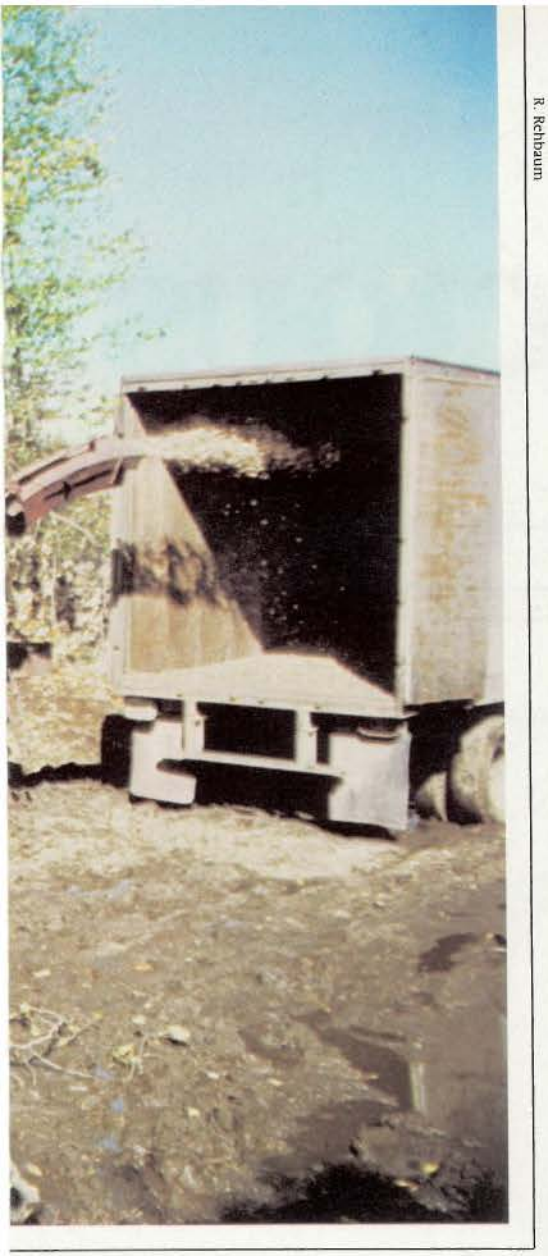
TRADITION holds that the Iroquois were the first lords of the Adirondacks. Further, that Paul Bunyan, unmatched for size and strength, undertook great logging jobs throughout the area combining his lumberjack skills with the strength of his blue ox "Babe" who was born during the winter of the blue snow and who, the stories claimed, could drink rivers dry.

As Paul Bunyan was noted for solving difficult problems with little effort, likewise his modern descendant has at least in part solved the problem of combating the high costs and the potential shortages of modern fuels by utilizing wood chips to help run industrial steam plants.

Such chips are obtained from a number of sources — standing trees, tree tops and logging residue, sawmill slabs and bark.

The Lyons Falls Division of Georgia Pacific Corporation is one of the several large industrial, municipal and educational facilities in northern New York that have converted either all or part of their generating systems to accept wood chips. By so doing they have created a need for wood residue formerly discarded and have provided a market for certain species of trees of smaller diameters that otherwise could not be economically harvested.

Georgia Pacific's wood chip supply is obtained from all of the above-mentioned sources including, of



R. Rehbaum

course, from their own forest holdings. Lewis County forests within a reasonable distance from the mill share this potential with a contract being recently let to supply a portion of their chip needs from forest lands owned by Lewis County. These lands, for the most part acquired in the early 1930's, consist primarily of abandoned farmlands planted to various species of pine and spruce with some natural intermixing of hardwoods. On the better sites, many of these forest stands have now reached sawlog size and some selected harvesting has begun as well as the removal of firewood. Many stands, however, particularly on the poorer sites, have not reached this size and are in need of thinning to reduce the number of stems per acre. With no pine pulp market available in the immediate vicinity, the fuelwood chip market fills this economic void.

Recent studies indicate that fuel costs, using wood chips averages $1.28 to $1.35 per million BTU while the cost per million BTU for coal is $1.44 and for oil is $4.10. Initial capital costs for fuelwood chip conversions and operations are relatively high.

Although chipping whole trees doubles the nutrient removal from the site, no ill effects from such harvesting is anticipated if done judiciously.

The four northern counties of the state have timber stands at the present time of approximately 6.75 million tons of pole size trees; 5.25 million tons of those stands are of no value; and 50 million tons of waste materials are suitable for fuel. There is an average annual growth of about two million tons per year which could accommodate a daily usage of about 5,000 tons per day. (Georgia Pacific at present uses about 250 tons per day.)

The ownership of the forest resource throughout the state is, for the most part, in the hands of many small landowners, and the wood chip market provides an opportunity to up-grade the quality of these existing forests by thinning to stimulate growth and at the same time improving the habitat for most wildlife populations.

Renewability of the wood resource is the underlying factor which, over the long haul, makes such use worthwhile. If the harvest is geared to annual growth, something like a ton per acre per year can be harvested on a regular basis. Further the chip market will not fluctuate as does the timber and pulp market and will provide a variety of jobs for rural dwellers with money spent on wood harvesting being distributed within the region.

Research has shown that wood chips delivered direct from the chipper will average up to 60 percent moisture content and have 5,000 BTU content per pound of green wood. When dried this same pound of wood will deliver between 7,000 to 9,000 BTU content equaling about 80 percent efficiency.

Although in woods operations oxen, horses and logging railroads have all met their demise, one cannot help but feel that both Paul and "Babe" would feel right at home on a fuelwood chipping operation where the size and strength of the machinery dominate the logging scene.

The contractor cutting on Lewis County lands is George Getman from Turin. His equipment consists of a Morbark chipper manufactured in Winn, Michigan by Morbark Industries Inc. This particular unit is 32 feet long, weighs 35½ tons and is powered by a 450 horsepower Cummins Diesel power unit, which turns a 75 inch-three blade chipper that can digest a 22-inch diameter tree with ease. As with most other modern logging equipment, hydraulic pumps provide auxiliary power to operate other components of the unit.

Two skidders are being used with each operator doing his own cutting. On these lands, access roads serve as skid trails and are usually well under one-quarter of a mile in length. Volume being removed varies, but where no previous thinning has been undertaken approximately 40 to 50 tons per acre is removed initially equaling about 40 percent of the total volume. Within a relatively short time the total volume will once again approximate 100 tons per acre plus and be represented, of course, in fewer stems per acre.

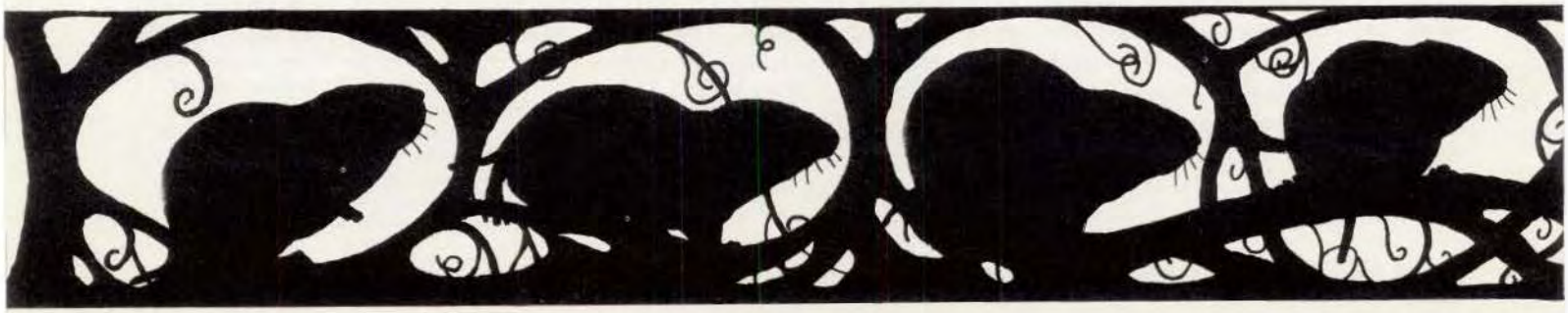
During operations some damage, although minimal, does occur to the residual stand, the extent of which is determined for the most part by the ability and concern of the skidder operators. Most damage occurs where the trees being skidded scrub against the "bumper" trees as the hitch enters the skid trail. Those trees loosened or badly damaged are cut and utilized.

Old-time loggers bragged about "letting daylight into the swamp," and the stories about Paul Bunyan and his blue ox are humorous chiefly because of their exaggeration. Such are the things of which folklore is made. But in the present case, all these stories pale when confronted with the real thing.

Randy Kerr, a 37-year employee of DEC before his retirement, served as a forest ranger, a district forest ranger, a park superintendent and finally as chief of DEC's Bureau of Recreation Operations. He is now chief forester for Lewis County.

The VORACIOUS

The Pine Vole



VOLE

by Pamela Nielsen Miller
and Milo E. Richmond

Photos by Milo E. Richmond

This small pest causes a large problem in apple orchards.

MOST of us are aware of the wild turkey, white-tailed deer, ruffed grouse and cottontail rabbit as highly valuable aesthetic and economic assets to our New York wildlife populations. Simply knowing that many of these species abound in the state, and that we may one day catch a glimpse of a turkey flock or a black bear, is richly rewarding to many of us. The real dollar value to sportsmen and the related dollar flow that is subsequently generated by hunting certain of these species is tremendous, with all types of hunting said to be worth $272 million each year.

These statistics, however, reflect only the positive side of the coin in assessing wildlife values. There remains the important issue of negative values of certain species, and clearly one of the prizewinners in this category is the tiny pine vole. Certainly this native New Yorker has occupied the time and effort of numerous animal damage experts. Its collective rapacious appetite has raised the ire of Hudson River Valley apple growers because of its damage to apple trees. When the damage caused by the closely related meadow vole is added to that caused by pine voles, the impact on the fruit industry is extensive, untold millions in damage.

The effects of vole depredation can be easily seen by comparing the damaged tree in the middle with the healthy trees on each side of it.

The pine vole is a member of the rodent subfamily Microtinae, which includes all of the vole and lemming type animals. Known also as the microtine rodents, voles differ from most other mice in that they are specialized for foraging on grasses, herbaceous plants and their succulent roots. Pine voles are small (two to three inches in total length) with small beadlike eyes and smooth chestnut brown fur. The ears are small and well hidden by thick fur. The tail is short measuring about one-half inch in length.

Voles in general are short-lived animals with very high reproductive rates. Like others of their kind, their numbers are often subject to periodic and dramatic fluctuations. Reproductive efforts seem to vary with the season and their population density. The gestation period is approximately 25

days with three to four litters of two to four young born each year, although reproductive potential is much higher.

Large populations are seen on truck farms, grasslands and orchards in states east of the Mississippi River. They can also be found at forest edges where the soil is moist, easily broken up and high in organic matter. There are numerous natural predators of the pine vole, including owls, hawks, snakes, foxes, weasels and skunks. Even the tiny short-tailed shrew depends somewhat on voles for its food.

Pine voles are semi-fossorial (adapted to digging), constructing subsurface burrows in the soil and occasional surface tunnels through the grass. Vole nests, constructed underground of dead leaves and finely shredded grasses, may contain several adults of both sexes and their young. Usually three or four sub-surface tunnels lead to the nest and a network of connecting burrows, ranging from just below the surface to a depth of two feet or more. Only rarely does this underground system open to the surface; however, fresh piles of dirt from the burrow system are often seen on the surface.

In apple orchards, the burrow system seldom extends beyond the shaded drip line of the trees.

In orchards pine voles are known to reach population densities up to 300 voles per acre. This level is far above vole populations to be found in their natural habitat of hardwood forests and forest edge. Populations in orchards are unnaturally high because ideal vole habitat is inadvertently created by mowing, which leaves a protective cover of thatch, and by fertilization, which results in dense ground vegetation. Such thick ground cover is perfect for protecting voles from predators. Then, during periods of extreme temperatures, and periods when the desired diet of grasses, tubers and forbs are unavailable, apple roots become the only available food source. By eating away the cambium layer of the root, voles weaken and, depending on tree size, may actually destroy trees within a single year. Weakened and dead trees result in substantial economic losses to the fruit industry. Needless to say, apple growers do not look upon this situation with favor.

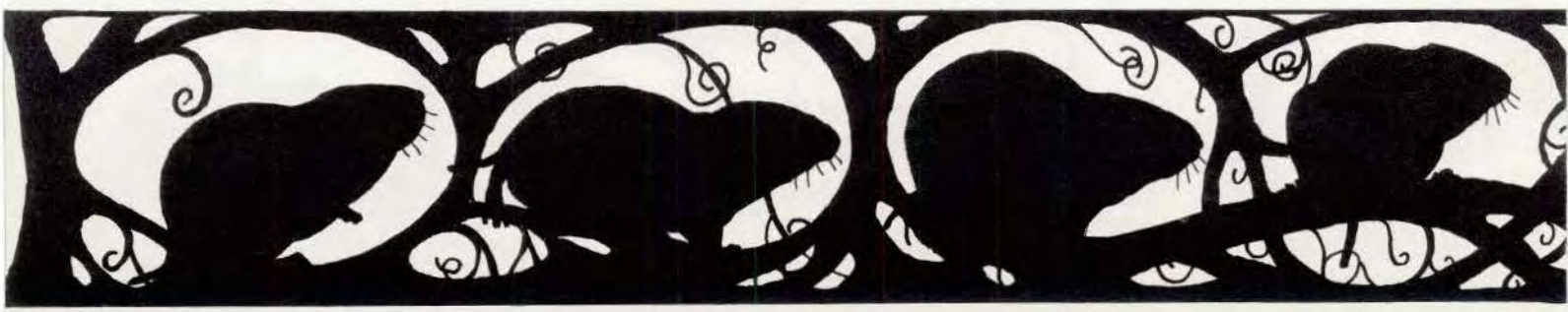
Girdled trees often die.

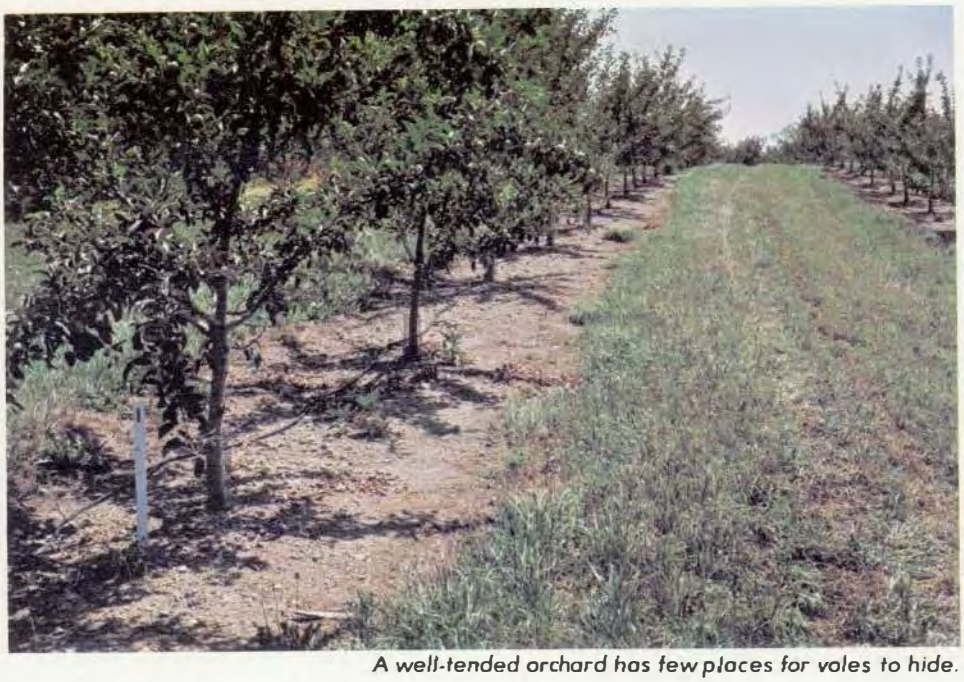
Due to their fecundity and ability to burrow underground, pine voles are difficult to control. After World War II a substantial part of this nation's pest control efforts relied upon chlorinated hydrocarbons. Endrin, one member of this highly toxic and persistent pesticide group, was used for controlling pine voles through the 1950's and 1960's. Rodenticide spray application coats the ground vegetation which is then ingested by foraging voles.

Although this chemical was of great value to orchard growers, accumulating evidence of its damaging effects on the environment resulted in the ban of endrin in New York in 1971. A substantial increase in vole populations in the absence of other effective control methods resulted in an emergency lifting of the ban in 1977 for rodent control purposes.

The emergency application provided an opportunity for documentation of environmental effects of endrin in New York as a basis for decisions on future use. Studies that monitored the effects of endrin throughout the application area found residues of the chemical in some water sources and terrestrial organisms, particularly slugs, snails and a group of ring-necked pheasants brought into the treated area as part of the wildlife monitoring program. These findings, combined with additional evidence of endrin's toxicity to man and other animals, and the promise of effective alternate control methods for the pine vole, resulted in the denial of a request by orchard-growers in 1979 to allow further use of endrin as a rodenticide.

The past 10 years have been devoted to finding safe cost-effective alternatives to endrin. In 1979, the Depart-





A well-tended orchard has few places for voles to hide.

ment of the Interior appropriated a $1.3 million grant to Cornell University for research in controlling these animals in orchards. Research efforts are taking place in Ithaca and at the Hudson Valley Experimental Research Station in Highland, a Cornell facility specializing in research on fruit and vegetable growing.

Vole research at the Hudson Valley Laboratory is directed at determining cost-effective biologically safe controls to reduce pine and meadow vole damage to apple trees. Habitat manipulation can make orchards less attractive to voles. Cultural practices, including frequent close mowing, disking and the use of herbicides have been found to discourage resident voles and limit population buildup. Alternative ground covers which discourage voles are being investigated both in the laboratory in Ithaca and in the field in Highland. Habitat manipulation has resulted in vole population reduction and changes in reproduction, survival and dispersal.

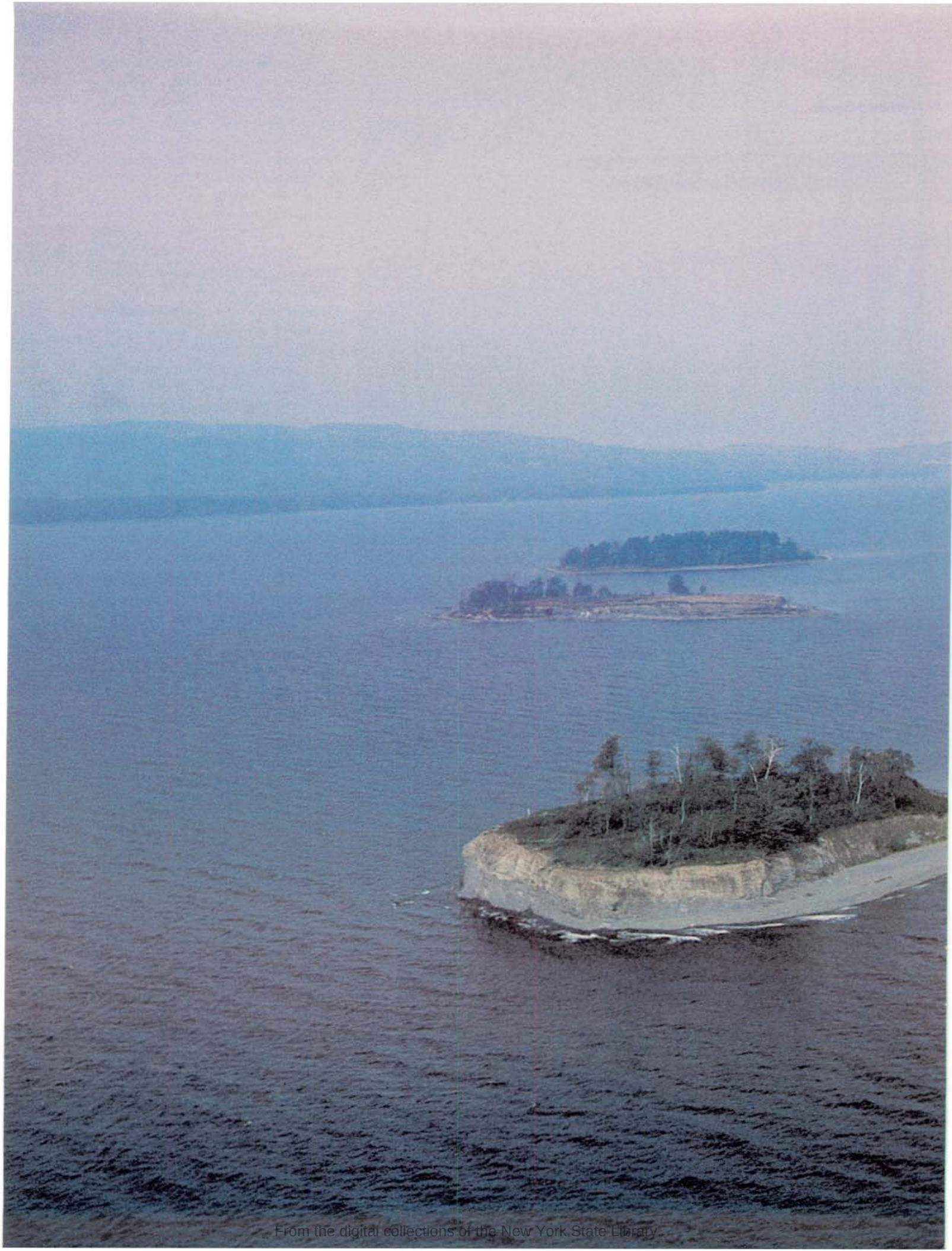
Natural control methods alone are not adequate to satisfactorily relieve vole damage, but they can be combined with chemical control methods to reduce the use of chemical rodenticides. Two pelletized baits now being used for control are zinc phosphide pellets and Rozol (chlorophacinone), an anticoagulant. Rodenticide pellets can be placed directly in tunnels at any time of the year or can be broadcast during the dormant period. The best time to apply pellets is in the fall when the vole populations are high. Cornell's current recommendations for control of pine voles include broadcast baiting with toxic pellets after apple harvest and emphasizing the importance of frequent close mowing to prevent thatch buildup which lowers the vole population biologically and decreases the need for rodenticides. Wire mouse guards are recommended on young trees to protect the trunks from gnawing voles. These guards, of course, can only protect the tree from damage that occurs above the ground.

Research will continue on more effective control methods, including alternative ground covers, habitat manipulation and rodenticide screening. Environmental and biological factors which influence bait acceptance and effectiveness are two important factors in testing new methods of rodenticide application. In an effort to achieve a cost-effective vole control program, a long-term study in the Hudson Valley Laboratory orchards is aimed at estimating the economic threshold of vole damage. Additional studies at the New York Cooperative Wildlife Research Unit, Cornell University, are investigating the physiological ecology and sociobiology of the pine vole under laboratory conditions.

Research efforts and management recommendations aimed at reducing vole damage in orchards have successfully reduced economic losses over the past five years. The success of this research has been due in part to a well-integrated pest management program developed by scientists at Cornell University and a cooperative group of fruit growers who were sorely in need of help in combating this persistent pest. Vertebrate research presents a constant challenge for new and better ways to control problem populations in areas where conflict with man occurs.

Pamela Nielsen Miller received her B.S. at SUNY New Paltz and currently works at the Hudson Valley Agricultural Experimental Station in Highland. Her work involves developing effective methods for controlling voles and other vertebrate pests in orchards. She is currently working on her M.A. at Cornell University.

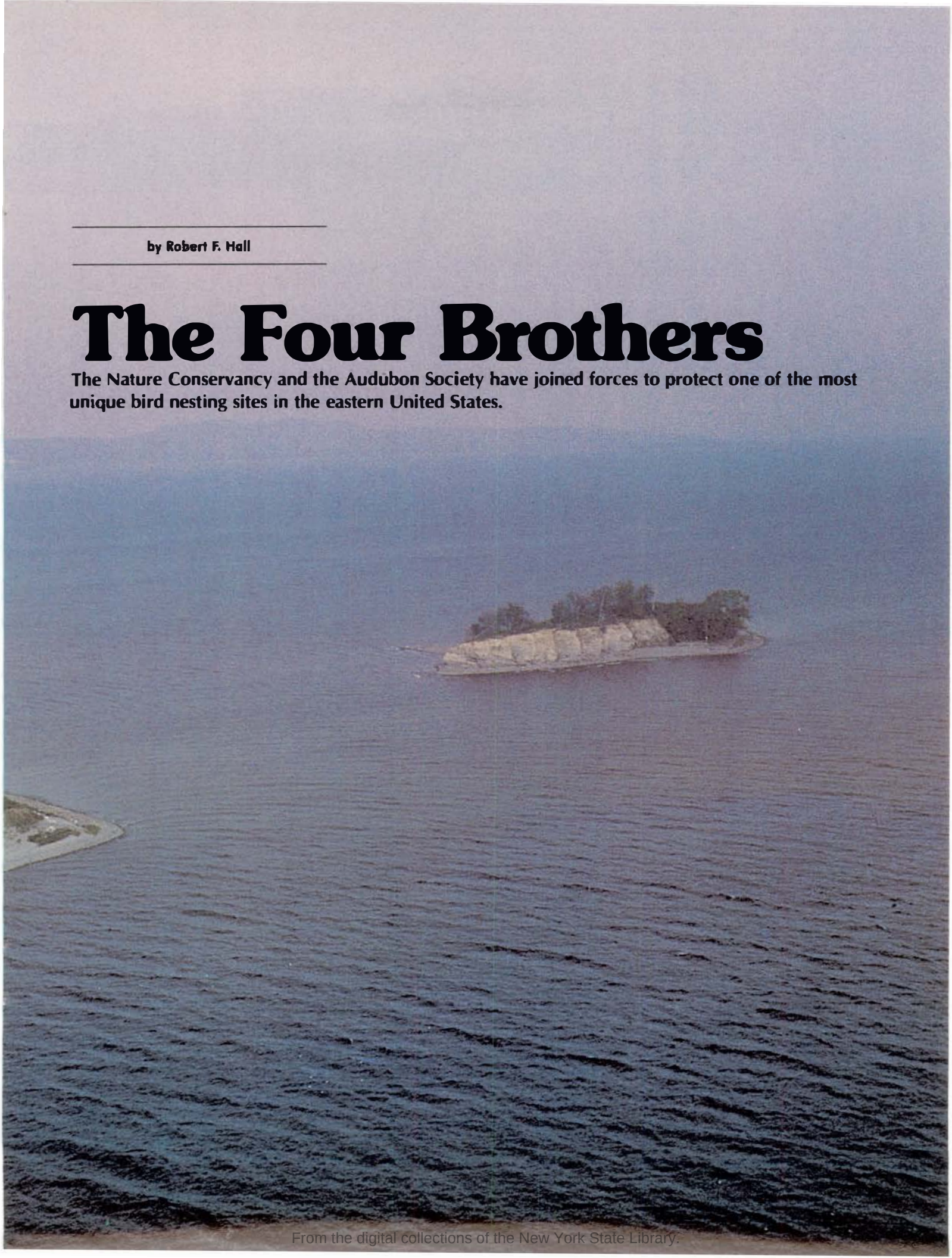
Milo E. Richmond, a native of Illinois, holds a PhD. from the University of Missouri. After teaching zoology and mammalogy in Tennessee, he came to Cornell University where he presently serves as a leader for the Cooperative Wildlife Unit.



by Robert F. Hall

The Four Brothers

The Nature Conservancy and the Audubon Society have joined forces to protect one of the most unique bird nesting sites in the eastern United States.



T. Barnett

(Top) The Four Brothers teems with millions of colonial birds. (right) Herring gull eggs / One of them is about to hatch.

T. Barnett

Photo pages 14 and 15 by R. Rehbaum

T. Barnett

Banding a black-crowned night heron / Some of the birds from The Four Brothers have turned up in South America and even in Ireland.

ALMOST a century ago, two teen-aged boys were studying the birds of the Town of Willsboro in Essex County, bordering Lake Champlain. One was Augustus G. Paine, whose family founded a paper pulp industry with a plant on the Boquet River. The other was his close friend and cousin, Alvah H.B. Jordan. They collected sets of eggs from the nests of a variety of bird species, making careful note of such details as date and habitat. With a specially-designed, smooth-bore collecting gun they shot the birds they wanted for their studies. Although such activities would be illegal today, they were then an acceptable way of building informative collections for the study of natural history. John James Audubon and Alexander Wilson, pioneer students of ornithology, both did it. The Paine and Jordan Collection of birds' eggs and stuffed study skins of birds is now housed in some 15 drawers and contained in two cases in the Paine Memorial Library in Willsboro, each specimen carefully preserved, ticketed and catalogued. A large ledger relates the place, date and details of acquisition of each item. One item is a study skin of the now-extinct passenger pigeon, collected October 9, 1891.

Paine and Jordan were probably the first to recognize the importance to naturalists of The Four Brothers Islands in Lake Champlain, about two miles off the east shore of Willsboro Point. They visited the islands as early as 1887, dutifully noting their finds in the ledger. Young Jordan subsequently published an account of their trip, "A Visit to The Four Brothers, Lake Champlain," in what was then a prestigious journal, *Ornithologist and Oologist,* (the latter word refers to a student of birds' eggs). As Jordan describes it, "The woods were alive with warblers and the air discordant with the screams of the herring gull." It must have been a highly exciting time for them. These four islands, with a combined land area of less than 18 acres, were then, as they are now, a vast breeding ground for colonial nesting birds — species that nest in colonies — thanks to the fact that they are uninhabited by humans and accessible only by boat.

According to Jordan, the large colony of herring gulls that nested on the islands in the 1870's had been reduced to some 50 pairs at the time of his visit with Paine a decade later. He attributed the decline to the relentless persecution by the farmers and small boys, who gathered eggs by the basketful for commercial purposes, concluding, "I do not think [the gulls] raised a single brood last season." During their stay on The Four Brothers, Paine and Jordan observed 28 species of birds including several pairs of common loons, a nesting American black duck, a bald eagle and large numbers of tree swallows which employed holes and crevices in the cliffs as nest cavities, a curious location for these tree-cavity nesters later commented on by other visiting ornithologists.

The studies initiated in the late 19th century by Paine and Jordan are being continued today under the direction of naturalist Mike Peterson of the High Peaks Audubon Society and wildlife manager of The Four Brothers. What interests him, he says, is the changing pattern of birdlife on the islands. This is a contradiction, albeit a familiar one, because so many species of birds have a site tenacity, returning year after year to the place where they were hatched. Niko Tinbergen, the world authority on the herring gull, describes how banded gulls return not only to the site of the colony, but often to the very spot of the nest from which they first flew. During the past century, however, a number of new avian species have colonized the islands, including several unknown in the eastern United States or even in North America back in the days of Paine and Jordan.

According to Peterson, the double-crested cormorant has been seen near the Four Brothers since the early 1950's, and as many as 35 counted in recent years, but no proof of nesting has

T. Barnett

T. Barnett

(Above) Double-crested cormorants have been on The Four Brothers since the 1950's, but do not nest there. (right) A newly-hatched herring gull

been obtained. The same is true of snowy egrets, with several sightings in the mid-1970's, but no nesting proven. Cattle egrets, however, have nested on the islands since 1973; this is an Old World species that crossed the Atlantic from Africa to South America and then spread explosively northward, arriving in New York State in 1954.

Peterson says the black-crowned night-heron probably arrived during the 1940's with 90 nests counted in 1955. He believes the population to be stable. DEC conducted a three-year study of egret and heron nests during 1979-81 under the direction of Gary Will, then a senior wildlife biologist with the Region 5 office at Ray Brook. During the final year of that study, the number of productive nests of black-crowned night-herons stood at 88, quite close to the figure obtained a quarter-century earlier.

American black ducks still nest on The Four Brothers as they did a century ago, but have since been joined by a number of other waterfowl species including Canada geese, mallards, gadwall, and both common and red-breasted mergansers. Non-breeding snow geese and brant have also been recorded in June. Common loons are also regularly seen. Noted as "common, breeding" by Alvah Jordan in 1887, the spotted sandpiper is still the only nesting shorebird species, although there are summer records for ruddy turnstones and short-billed dowitchers. Even a long-tailed jaeger was spotted off The Four Brothers in early June 1977, according to Peterson.

But most exciting to Mike Peterson and his Audubon colleagues is the role of The Four Brothers in the population explosion of the ring-billed gull. This species is slightly smaller than the herring gull, 19 compared to 24 inches, and mainly distinguished by the black ring encircling the bill and the yellowish or pale greenish legs.

Widely distributed in Audubon's time, the breeding range of the ring-billed gull was gradually curtailed as North America was settled. Apparently it could not survive the egging depredations which the herring gull withstood successfully. By the turn of the century it was mainly restricted to the interior of the continent. Its stronghold, Peter-

son says, was the western prairies and plains of Alberta and Saskatchewan, but around 1940 it became familiar on the Great Lakes. It arrived at The Four Brothers about 1949.

John Bull, author of the authoritative *Birds of New York State*, reports 2,500 pairs of ring-billed gulls on The Four Brothers in 1967. Within just 15 years that figure has increased six-fold. During 1982, as part of a census of colonial nesting birds, Peterson directed a careful ground-count of ring-billed gull nests by a team of Audubon volunteers, tallying 15,033. With such safe breeding grounds, and each nest with three eggs tended by a pair of adults, Peterson noted that this represents a potential population of 75,000 ring-bills on The Four Brothers by the end of the nesting season.

Although herring gulls have recovered from the persecution noted by Jordan in the last century, their population is still estimated at less than 250 pairs. The great black-backed gull, a newcomer, was first found breeding in 1975 and now numbers several pairs. There are also several summer records for the Iceland gull.

Researchers have been banding birds on The Four Brothers since 1925, placing numbered metal bands around the leg to gain information on distribution, longevity and mortality. All bird-banding activities on the islands are now conducted under a master-station permit issued by the U.S. Fish & Wildlife Service to High Peaks Audubon Society to insure consistent monitoring of the avian population. During 1982 alone a total of 29 black-crowned night-herons, two common mergansers, two spotted sandpipers, 1,000 ring-billed gulls, 108 herring gulls, and one great black-backed gull left the islands wearing numbered bands. Recoveries after a little more than a half-century now total around 600. Most have come from along the Atlantic Coast and in Florida. But departing from that pattern, a black-crowned night-heron was recovered in Nicaragua, a ring-billed gull in the Dominican Republic, and herring gulls have turned up in places as far apart as Newfoundland and Vera Cruz.

Although the ring-billed gull is a fairly common bird in much of North America, it is considered quite rare in Europe. In fact, it is not even listed as a rarity or accidental in one of the most popular field guides there. A few days after Christmas 1981 Michael Boner went for a walk along the banks of the Gweebarra River near the village of Doochary in County Donegal, Ireland. Finding a dead gull with a band around its leg bearing a number, Boner followed the engraved instructions and notified "Bird Band" in Washington, D.C., U.S.A. In time, he received a certificate of appreciation from the Bird Banding Laboratory in the United States, telling him that the bird was a ring-billed gull, banded when it was still too young to fly by Mike Peterson on The Four Brothers Island in far-off Lake Champlain during June 1980. This was only the fourth encounter in or near Europe of a ring-billed gull banded on the North American continent, the other three recoveries all coming from the Azores or Spain of birds banded on the Great Lakes. This was the first recovery of a banded ring-billed gull from Ireland or anywhere in the British Isles. While it is difficult to say how far this bird flew, Peterson estimates the distance at about 3,000 to 3,500 miles. Although birds banded on The Four Brothers have been recovered from Canada, Mexico, Central America, the Carribean and St. Pierre et Micquelon, this was the first to make it all the way to Europe.

The Four Brothers have been owned since November 1981 by the Adirondack Conservancy Committee with headquarters in Elizabethtown. The National Audubon Society has signed a lease agreement with The Nature Conservancy, accepting responsibility for management of the wildlife resources of the islands. Through a letter-of-agreement, the regular duties of managing The Four Brothers colonies are carried out by members of High Peaks Audubon, the local chapter, who conduct an annual census, operate the banding station and compile records of population changes with the help of photos and tape recordings. As wildlife manager, Mike Peterson cautions that the Nature Conservancy and Audubon Society do not encourage unauthorized visits to the islands. Permission to land will be confined to serious students of natural history, especially in the breeding season when disturbance can lead to the abandonment of eggs or the exposure and death of young birds.

From 1882 until 1939 The Four Brothers were owned by the Hatch family of Willsboro, who had purchased them from the Shipmans. When ornithologist L.R. Wolfe visited the islands in May 1922 he noted that the herring gulls, "are making a nice increase, and I believe this is due to the protection and interest of Mr. Hatch." Next owner was John Jacob Astor III who, in 1977, gave them to the University of Vermont. The university attempted to establish their tax exemption with the Town of Willsboro, but the islands meanwhile accrued over $13,000 in unpaid county, town, and school taxes, which the educational institution declined to pay.

Credit for the protection of these important New York State nesting colonies today is largely owed to Tim Barnett, executive director of the Adirondack Conservancy Committee, and Bob Klein, director of The Nature Conservancy's field office in Vermont. As a result of their efforts, the conservancy acquired the four islands from the university, paid back taxes, and has since received tax-exemption on the grounds that now, at last, they are fulfilling a valuable educational function. The conservancy has a distinguished record of land stewardship, while the Audubon Society is noted for protection of colonial nesting birds.

The future looks bright for The Four Brothers Islands. Interestingly, the idea of joint care came from Peter Paine, Jr., of the Lake Champlain Committee, a descendant of Augustus G. Paine who set sail with his cousin and ornithological partner nearly a century ago. "We owe a lot to Paine and Jordan for their specimens, careful records and published account," says Peterson. "I think about them a lot, and we are all looking forward to making a centennial visit to The Four Brothers on May 22, 1987. Maybe if we're lucky we'll even see a bald eagle."

Robert F. Hall is former editor of THE CONSERVATIONIST. Now retired, he lives on a farm near Willsboro in the Champlain Valley.

The Fine Art of Discovery

by James H. Moerschel

Photos by Author

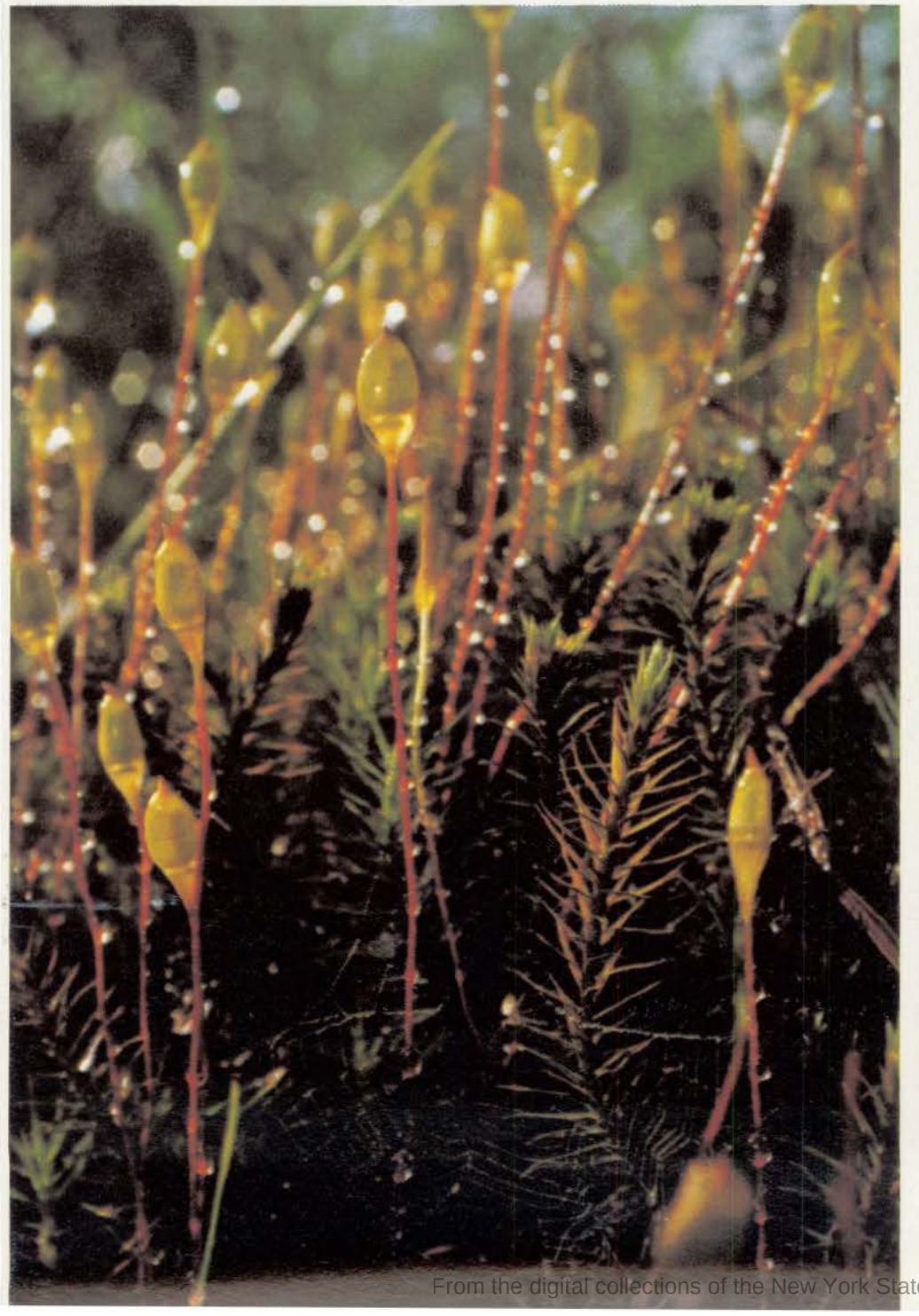
IT was magnificent. The field lay before me like a giant mirror sparkling with the morning dew. As the sunlight silently crept over the hillside, millions of tiny droplets clinging to a sea of grass were bathed in the first golden rays of the day. Each droplet created a jewelled appearance to the thick carpet. Spider webs were everywhere, draped gracefully like finely crocheted doilies from nearly every bush and blade of grass. The webs still hiding from the rays of light appeared silky and soft reminding me of some fine work of Japanese art, while the ones in the sun were already gleaming like strings of pearls in the delicate patterns in nature's showcase.

I parked my car by the roadside and for several minutes I sat there absorbing the beauty of this pristine scene. The roar of a passing car jarred my senses, and I responded automatically by starting the engine and speeding toward town to catch my bus bound for New York City, just as I have done for many years. As I gazed out the window during the next hour of my bus ride, I wondered why I had never noticed that field before. I had passed it countless times and it had never mattered. It seemed to my casual eye to be a conglomeration of weeds and bushes thrown haphazardly together forming a mundane, natural barrier between man's great achievements. Surely the dew had glistened on grasses and webs in this very field many times before, and yet my senses had never taken notice. Could it be that I was always too busy in my daily rituals or had familiarity dulled my senses to what was close to home? Maybe that was it. I had always been intrigued with far away places for my vacation and photographic endeavors. The thought of photographing the rugged, sawtoothed Rockies, the colorful depths of the Grand Canyon or the bubbling paint pots and steamy geysers of Yellowstone made my adrenalin flow. My senses were perceptive to the beautiful and the unusual as long as they were cast on a grand scale and the greater the distance the more alluring. I had indeed become dulled to the beauty right in my own backyard.

I returned home that evening with a new sense of awareness. I wanted to take a closer look at my new discovery. Not only did I want to observe it, I wanted to record it. I realized I would have to purchase some special photographic equipment in order to do close-up photos. A few days later I purchased a macro lens, bellows, extension tubes and a small electronic flash. The next several weeks were spent practicing with the new equipment, getting tips from fellow photographers and researching the art of macro photography. I then felt ready for my first expedition.

The alarm woke me at 6:30. I peered out the window and could see the ground fog hovering in the valley near the field. But the sky was clear, indicating a brilliant sunrise. I gulped down a cup of tea, grabbed my camera bag and headed out. As I walked onto the field I was engulfed with excitement. The sun hadn't peeked over the

I had become dulled to the beauty right in my own back-yard.



hillside yet, and the soft reflected light created muted pastel colors to the scene. The dew lay heavily upon the grasses as it had the day I discovered this tranquil sanctuary. I stretched out full length on the wet grass and brought my camera to my eye carefully focusing on a few blades of grass. I was trembling as I gazed for the first time at the tiny segment of the microcosm in which I was intruding. I took several quick photos and stood back to view the entire scene once more. It suddenly occurred to me that a photographer could spend a lifetime right here trying to record it all.

Just then the sun rose above the hillside, and the radiant scene became overwhelming. When the sun is near the horizon it moves quickly, and I realized that the beautiful backlighting would remain for only a short time. I had to select and shoot quickly. Panic nearly overtook me as I tried to search out only the most graceful compositions from the millions of microscenes before me. How would I ever know that I found the best ones? Perhaps that elusive perfect photo was only inches away or a different angle of approach created the best composition. With the sunlight changing every minute, a great photo could instantly change into a mediocre one.

I gathered my senses and brought the camera to my eye to invade that tiny world once more. Scanning with the camera made me realize that each clump of grass is an ecosystem by itself, containing both predator, prey and the life sustaining water and plant life necessary for both. The lens revealed the fragile beauty of tiny wild flowers rimmed with dew, the crisscrossed network of spiders' webs, the wing structure of tiny butterflies and carpets of green hairy-capped moss. Additional magnification enlarged a tiny dew drop clinging tenaciously to the tip of a blade of grass. I marveled at the inverted scene of the surrounding grasses transmitted through the convex surface of the droplet. Pressing the lens right into a grass-spider's flat web revealed dozens of tiny seeds tangled in the dew-covered silken strands, creating a cosmic atmosphere. I was discovering worlds within worlds. An hour

later I walked home thoroughly soaked and thoroughly elated. I couldn't wait to have my slides developed.

Within two days I was viewing the results of my first macro safari. I cringed at the sight of out of focus grass and dew, caused by a hand trembling with excitement of new adventure. Only a few shots were barely acceptable from my first roll, but I knew that I was embarking upon a lifetime search and shoot mission which would make me return to this field many times in each of the four seasons for years to come.

I fear for the future existence of this tiny Eden. With each passing year, more and more of our fields are falling prey to condominiums, sprawling industrial complexes, shopping centers and row on row housing developments. There is little or no opposition to this haphazard, unplanned development of our suburban and rural areas. Building is considered "progress" and preserving valuable fragments of our natural scenery is considered wasteful and unproductive. This urban sprawl has become the cancer of our environment, eating relentlessly into every wooded lot, marshland and open field. With the loss of this habitat we lose those species of wildlife unable to adapt to closer surroundings. We lose those little oases so necessary for the rejuvenation of the human spirit.

Several years have passed and several hundred rolls of film have recorded the inhabitants and plant life of that field. I feel fortunate to have been able to capture the fragile beauty, the life and death struggle of the predators and prey, but most important I have captured my own inner sense of the things around me. Cultivating an awareness of the subtle beauty of the remaining quiet little places left in the towns across America is not unlike cultivating a taste for fine wine or a gourmet dish. We must first be exposed to its delicate, refined flavor and then learn to savor it. Hopefully we will discover this subtle taste before our voracious appetites consume it all.

James Moerschel owns and operates Photographic Art Studio in Monroe. His enthusiasm for nature and travel photography has taken him to many exotic places including Africa, the Canary Islands and the Yucatán.

I have captured my own inner sense of the things around me.

Mysteries of

MIGR

THE migration of birds is a spectacular phenomenon. In the fall and spring huge waves of migrants pass into and through New York on their way to summer or wintering grounds. Impressive as the skeins of geese overhead or the flocks of robins moving through the trees are, looking at bird migration on radar reveals the true scale of the phenomenon. Using one of the airport surveillance radar systems or the long range weather radars shows that at the peak of the migratory season huge clouds of birds, literally uncountable millions, are moving through the night sky on their annual migrations.

In the past people watching swallows feeding close over the surface of ponds thought that the swallows, like frogs and turtles, spent the winter under the water hibernating in the mud. Others reported watching birds cross the face of the full moon and concluded they flew to the moon for the winter. Still others, desperately trying to explain how a tiny hummingbird could migrate for thousands of miles, suggested they made the journey nestled in the feathers of swans. Fanciful as these ideas may be, the truth is in many ways stranger yet. Imagine making a journey of thousands of miles, mostly at night, over totally unfamiliar terrain, to a destination where you as a young bird have never been before. Think of the problems of winds and weather, and of finding places to stop and feed enroute. It is truly an astonishing performance.

WHY do birds go to all the trouble of migrating? We really do not know, but the supposition is that the advantage of rearing young in the temperate climates where there is an ample food supply outweighs the risk of the

ATION

Do you ever wonder how birds know when to fly south in fall or find their way back home in spring?

by Charles Walcott

Illustration by Wayne Trimm

long migration. Because the migration of birds is tied to the seasons, they must have some way of predicting the onset of fall and spring. Some birds kept in the constant conditions of the laboratory continue to go through their annual cycle of laying down fat for migration, migratory restlessness, preparation for breeding, molting and so on. But under the artificially constant conditions the sequence of these activities gradually drifts out of phase with the real season. Apparently under natural conditions birds monitor the length of the days in order to synchronize their migrations to the seasons. But even with the migrations properly synchronized, the exact onset of the migratory journey remains to be determined.

The decision to migrate or not is largely a function of the weather, and suitable weather for migration differs markedly between fall and spring. The reason for this is the wind. Birds seem to choose weather patterns that will provide them with a tail wind. To appreciate the importance of this, consider a small bird, say a robin. A migrating robin can probably fly between 25 to 35 miles per hour. Yet at the altitude of a few thousand feet above the Earth's surface where the bulk of songbird migration occurs, winds of 20 to 50 mph are common. Obviously a robin bucking a 40 mph head wind will be blown backward, but if the wind were on its tail it would have a 40 mph boost, making a ground speed of 70 mph. No wonder birds are careful to pick following winds.

But how do they do it? How can they predict what the wind is likely to be over a period of several days? It appears that they rely on the general pressure patterns of the weather. In the fall a low pressure center moves through New York, typically accompanied by

T. S. Knight

The tiny ruby-throated hummingbird migrates across the Gulf of Mexico.

H. R. Comstock

Many small birds, like this Blackburnian warbler, migrate at night.

D. Spier

southwest winds and rain. This is followed by a clearing high pressure system with northwest winds. And it is on the first day of this high pressure system with northwest winds that the bulk of fall migration occurs. That is why on a warm drizzly fall day our trees may be just swarming with robins but, after the passage of the cold front, they all disappear.

In the spring the pattern is simply reversed. The bulk of migrations takes place in front of a low pressure system with southwest winds.

The most dramatic example of the importance of following wind and accurate prediction of winds comes from the work of Timothy and Janet Williams of Swarthmore College, Swarthmore, Pennsylvania. Watching bird migration on radar, they have found that there is a substantial population of migratory birds that leaves New England in the fall heading roughly southeast out over the ocean. These birds continue on this path crossing over Bermuda still heading east until they encounter the easterly trade winds which blow them in to South America. It appears that the advantage of having a substantial tail wind outweighs the risk of such a long migration so far from land.

Given the onset of migration, how do birds determine which direction to fly? For day-migrating birds, the sun is an important cue. Birds are able to choose the correct migratory direction using the sun and are able to compensate for its movement through the sky using an internal, biological clock.

The reason for this is as follows: Suppose a bird wants to fly south. If it starts its trip at sunrise the sun will be off its left wing. As the day progresses the sun will move progressivly in front and above the bird until at noon the bird will be flying directly toward the sun. As the afternoon wears on, the sun moves toward the west until just before sunset it will be off the bird's right wing.

That birds are able to do this rather complex trick of allowing for the sun's movement has clearly been shown for homing pigeons. If one takes a homing pigeon away from its loft and releases it at up to several hundreds of miles away, it will fly home. Now, if before you release them you put a group of pigeons in a large box where the artificial lights turn on at noon and go off at midnight, the pigeons' activity rhythm and internal clock will gradually become synchronized to this new, artificial day. For us it is like suddenly being transported to Hawaii — gradually we become adjusted to the local time, six hours or so later than New York.

Photo by Griswold

Arctic terns migrate further than almost any other species of bird, moving from the Far North to near Antarctica.

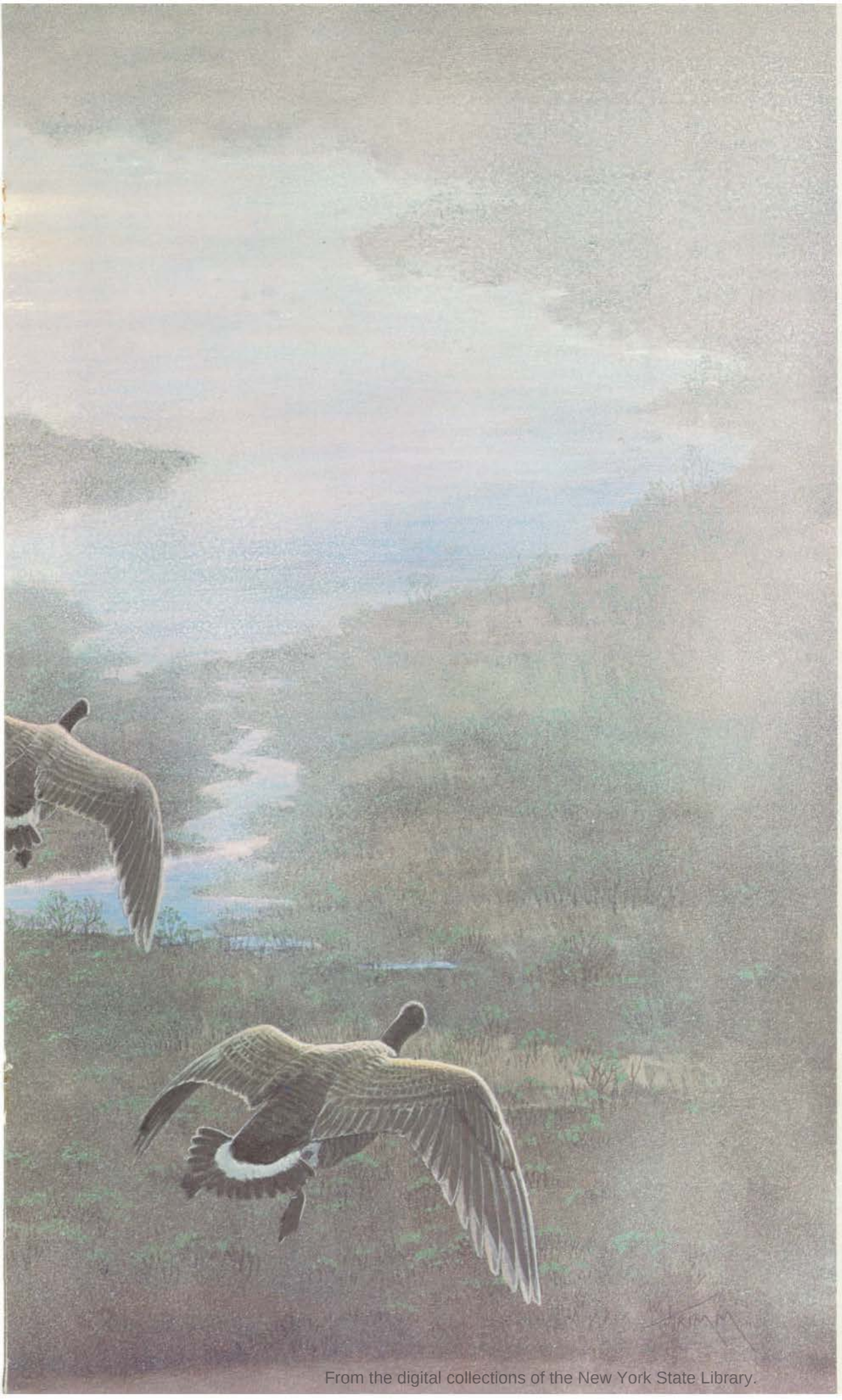
Now suppose we release such a pigeon at noon north of its loft. Home is now south. When the bird is released at noon, because it has been in the artificial day in the box, the bird thinks it is six a.m., about sunrise. Therefore, to fly south it believes it should fly with the sun off its left wing. And that is exactly what it does, heading west instead of south.

For night-migrating birds one would think that the sun would not be of much importance. Yet there is evidence that some night migrants use the sunset glow to choose their direction of flight. If in experiments one shows such birds the sunset in a mirror, their migratory direction is reversed.

Yet for night migrants, the stars are another important source of information. Professor Stephen Emlen, now here at Cornell, captured indigo buntings during their migratory season and put them in cages. During the migration season, the buntings, like many migratory birds, do not spend the night asleep but are very active hopping and moving about in their cages. This is called migratory restlessness. Emlen found that if the buntings were placed in blotting paper funnels, the top of which was covered by screen so the birds could not escape and the bottom equipped with an ink pad, the buntings left little inky footprints on the side of the funnel as they hopped about. With this elegantly simple recording device, now universally called an Emlen funnel, Emlen was able to show that most of the buntings' footprints recorded under the clear night sky were in the proper migratory direction, south in the fall and north in the spring.

Moving buntings and cages indoors to a planetarium it became clear that the buntings were using the stars for a directional cue. Reversing the planetarium sky reversed the buntings' orientation. Blocking off stars in sections of the sky showed that the critical stars for orientation were all located within about 30 degrees of the North star Polaris.

Yet sun and stars, important as they are for directional cues, cannot be the whole story. Radar has clearly shown that birds migrate under heavy overcast



COMING HOME

Painting by
Wayne Trimm

when neither sun nor stars should be visible. A suggested answer came from some German experimenters — Fredrick Merkl and his student Wolfgang Wiltshko. They were able to show that European robins were able to use the Earth's magnetic field as a compass. By artificially reversing the direction of magnetic field around a caged robin in the basement of the Frankfurt Natural History Museum, they were able to reverse the direction of the robin's orientation.

The experimenters have gone on to show that of the several different compass systems birds have — the stars, sunset and the magnetic field — different species of birds appear to prefer to use one or another and will frequently even use one, the magnetic compass for example, to calibrate another. So we now have a clear understanding that there are several possible compass systems birds can use.

But is a compass enough to explain the birds' migratory feat? Probably not. Birds are able to return with remarkable precision to nesting areas. Indeed, during migration it is a common occurrence for the same handed sparrow to turn up at a banding station year after year within a day or two. This suggests that birds are doing much more than simply flying north or south; it implies that they are able to return to a particular location. The most spectacular examples of this come from birds that are displaced from their nests. The Manx shearwater, taken from its nesting burrow on an island off the coast of England and then released in Boston, Massachusetts, was found back in its burrow 12 days later. Another example is the homing pigeon who finds its way home when released at an unfamiliar site. The birds are navigating — that is, they are figuring out where they are relative to home. This is a much more complex and difficult problem than simply flying in a set direction.

To appreciate the problem a displaced pigeon or shearwater faces, imagine that you are in a small boat on a large body of water. Which way should you paddle? A compass which tells you the direction of north, south, east and west is no help unless you know where

L. Snyder

G. Walcott

(Above and below) A portable magnetic field is induced by current in wires on the pigeon's head and neck which overrides the natural magnetic fields.

you are with relation to home. And it is that critical first step that we call navigation or position finding or simply "the map."

WHAT could this navigational ability be based on? We simply do not know. But many years of work on the navigation of homing pigeons has given us some tantalizing hints. For the pigeons there are two active ideas at present. An Italian group led by Floriano Papi believes that pigeons use odors to find home; we at Cornell suspect that the Earth's magnetic field may not only serve as a compass but may be part of the map as well.

The Italian group believes that pigeons in their lofts learn the characteristic odors which are carried by wind from each direction. Perhaps wind from the north might smell like chocolate, wind from the south like the ocean, and so on. As the pigeon grows up in its loft, it learns which odors are associated with which wind directions. Then, when the bird is released at some unfamiliar site, it sniffs the breeze and decides which direction it is in relation to home. This is a wonderfully complicated idea, but Papi and his colleagues have performed a large series of experiments which seem to support the idea.

Pigeons made anosmic by cutting their olfactory nerves do not home, and pigeons raised in lofts which give birds a false idea of which direction the wind is coming from show orientation when released which is correspondingly altered. Jerry Waldvogel and John Phillips, here at Cornell, have repeated the last experiment, called the deflector loft experiment, with essentially the same results as the Italians. But they made a number of interesting observations: they found that although the deflection was present in the spring and summer, it disappeared in the fall. Furthermore, the deflection also tended to disappear when the birds were released under overcast rather than sunny skies. These results, among others, lead us to suspect that the deflector loft results may be due to disturbing the sun compass rather than to the deflection of the wind. This finding, plus the difficulty the Cornell group has had in repeating the Italian group's experiments, makes us wonder if olfaction is really as important to pigeons as they suggest.

The other idea, that pigeons might use the Earth's magnetic field as part of the "map" as well as an auxiliary compass, is not particularly new — it has been suggested countless times by others. (See "The Mysterious Genius of Homing Pigeons," by Connie Bart, THE CONSERVATIONIST, January-February 1979.) The observation that makes us wonder if there might be something to it is that when we released homing pigeons at places where the Earth's magnetic field is disturbed by deposits of magnetic iron, the birds were disoriented. Following them with an airplane we saw that as soon as they were outside the magnetically disturbed area, they headed for home. The disturbances such as the ones we have used are very small; small enough so that they would deflect a magnetic compass only a few degrees. Furthermore, all our releases were conducted under sunny skies when the pigeons should have been able to use their sun compass. So, all in all, it leads us to wonder if there is some involvement of the Earth's magnetic field in the pigeons' navigation.

Further work may tell, but only when we learn enough to ask the birds the right questions. And who knows, the map, like the compass, may have many bases. The more we study birds, the more they seem like humans, with many alternative strategies to accomplish each end. It seems likely that there is no simple answer to how birds find their way. There are probably different strategies used by different birds under different conditions, and the search for a simple, single answer is foredoomed to failure.

In the meantime, the birds themselves seem to have no confusion and continue their seasonal migrations without any heed to the confusion they are causing us.

S. Johnson

A hooded pigeon is about to be released to check need for visual orientation during "homing".

Charles Walcott is executive director of Cornell University's Laboratory of Ornithology and professor of neurobiology and behavior at the same institution. He is an international expert on bird migration.

Spring in the swamps:

S. Camazine

Mating of spotted salamanders

THE SALAMANDER MIGRATION

by Scott Camazine

EVEN before spring officially arrives, on the warmer evenings in mid-March, the spring peepers (*Hyla crucifer*) will begin to chorus. They won't begin to breed until the first week in April but the first few early arrivals are getting ready. It is surprising that even at temperatures below 40 degrees Fahrenheit these small amphibians begin their mating calls. As the high-pitched almost insect-like sounds fill the rainy nights of early spring, I use their songs as a cue to start my own forays to the swamps in search of other amphibians that mate very early, at times even before the snow has melted.

They are the spotted salamanders (*Ambystoma maculatum*) and the Jefferson's salamanders (*Ambystoma jeffersonianum*), two species of mole salamander found commonly in the northeastern United States. Both species are difficult to find during most of the year. They are scattered throughout deciduous woods near ponds or slow-moving streams that lack fish, predators of the young larval salamanders. They can occasionally be found under stones and logs and, as the name mole salamander implies, they can burrow within the soil to a depth of one or two feet. The one time of the year when they are most likely to be found is in the early spring, some time between mid-March and mid-April when they make their annual mating migrations to the ponds. Like most amphibians they require an environment that is constantly moist, and their eggs must be laid in the water. Over a period of a week or two, dozens or even hundreds of salamanders can be found marching through the woods to the ponds, to find a mate and reproduce. Why they choose to mate so early in the spring and how they manage to find their way to the ponds is still a mystery.

The Jefferson's salamander usually arrives several days ahead of the spotted salamanders, and has often laid its eggs before the spotteds arrive. Both salamanders are roughly the same size, about six and one-half inches long, although the Jefferson's are usually the slightly smaller of the two. They are easily told apart, however, because the dingy grey-brown Jefferson's lack the brilliant yellowish row of spots located along either side of the head, trunk and tail of the spotted salamander.

Several days after the Jefferson's have begun to appear, the spotted salamanders will often be in the majority. Usually the males arrive first by a day or two. The best time to go searching is after dark, on the first warm rainy evening in spring. Be sure to take along your boots (hip-waders if you have them) and a flashlight. The salamanders will return year after year to the same places to mate. Visit the ponds, slow streams and temporary pools in deciduous woods. If you do not have luck at one place try another.

If you have arrived at the proper time and place, the shallow waters will be alive with writhing salamanders. In

a so-called "nuptial dance" the salamanders swim about rubbing against each other vigorously and occasionally rising to the surface for air. At times the water seems to virtually boil with activity. In the course of this mating ritual the males deposit a small packet of sperm about one-fourth inch in diameter, called a spermatophore. It is partly clear and gelatinous and partly milky in color. These spermatophores are deposited on the leaves and twigs under the water. The female picks up this sperm packet with the lips of her cloaca, the opening in back of the hind legs which transmits both eggs and wastes. The spermatophore is stored, and the sperm fertilizes the eggs before they are laid. Unlike frogs and fish which lay their eggs in the water unfertilized and simply have the males squirt their sperm nearby over the eggs, the salamanders' method assures that the sperm and the eggs have a better chance of coming into contact with each other and thus being fertilized. By keeping the sperm in her body the eggs are fertilized internally. You can see the living sperm by taking one of the spermatophores, teasing it apart and looking at it under a microscope. A myriad of wriggling sperm will be seen, undulating like a dish of living spaghetti, just waiting for an egg to fertilize.

Among these salamanders both sexes look quite similar. They can be distinguished, however, by examining the opening to the cloaca. In the males, this vent is swollen by the enlarged gland that produces the spermatophore.

About a week or so after the mating frenzy has begun, all that remains in the ponds are the eggs and some of the unused spermatophores. The adults have returned to the woods just as suddenly as they came, and are now hiding under logs and stones or buried within the soft earth, where they subsist on a diet of earthworms, snails, slugs, spiders, millipedes and various small insects.

The conspicuous activity has ceased, but don't forget that the real activity has just begun. Observe the eggs with a hand lens (or preferably with a binocular microscope). You will see that they pass through a number of stages typical of developing embryos — the blastula, the gastrula and so forth — until finally a small wriggling larva can be seen within the egg membranes ready to break out and wiggle free to feed. It takes a month or two for the eggs to develop fully and hatch, and then the larvae take two to three months before they are mature and ready to leave the water. During this time they lose their gills and become able to breathe air.


S. Camazine

Larva of the spotted salamander

As an egg or a larva the salamanders are most susceptible to both predation and the harsh environment. At these stages they suffer their greatest losses. A spell of freezing weather or even a particularly warm spell can wipe out all the eggs. Although studies have shown that the thick gelatinous egg masses are well-protected against predators such as dragonfly larvae, crayfish, minnows, and whirligig and diving beetles, the young salamander larvae are not so fortunate and fall prey to many animals. In the late spring, the temporary ponds begin to shrink, concentrating the larvae into small pools where they may be eaten by all the animals just mentioned above as well as by other salamander larvae, garter snakes and birds. It is no surprise therefore that more than a hundred eggs may be laid by each female in order to assure the survival of the species.

Even so, large numbers of eggs are of no avail against other dangers in the environment. Increasingly common is the filling-in of temporary ponds and swampy areas, in an effort to reclaim land or cut down on mosquito populations. Nearby, drier land is developed for housing or industry, destroying the areas where the salamanders live throughout most of the year. One also wonders how large a toll is taken by avid collectors and passing vehicles that kill salamanders as they cross the roads en route to the mating areas. Finally, little is known about the effects of acid rain and pesticides that leach into the nearby breeding ponds. Yet, despite all these hazards, these salamanders continue in their clandestine ways completing their yearly cycles.

And each spring I plan to venture to the ponds to visit these secretive creatures.

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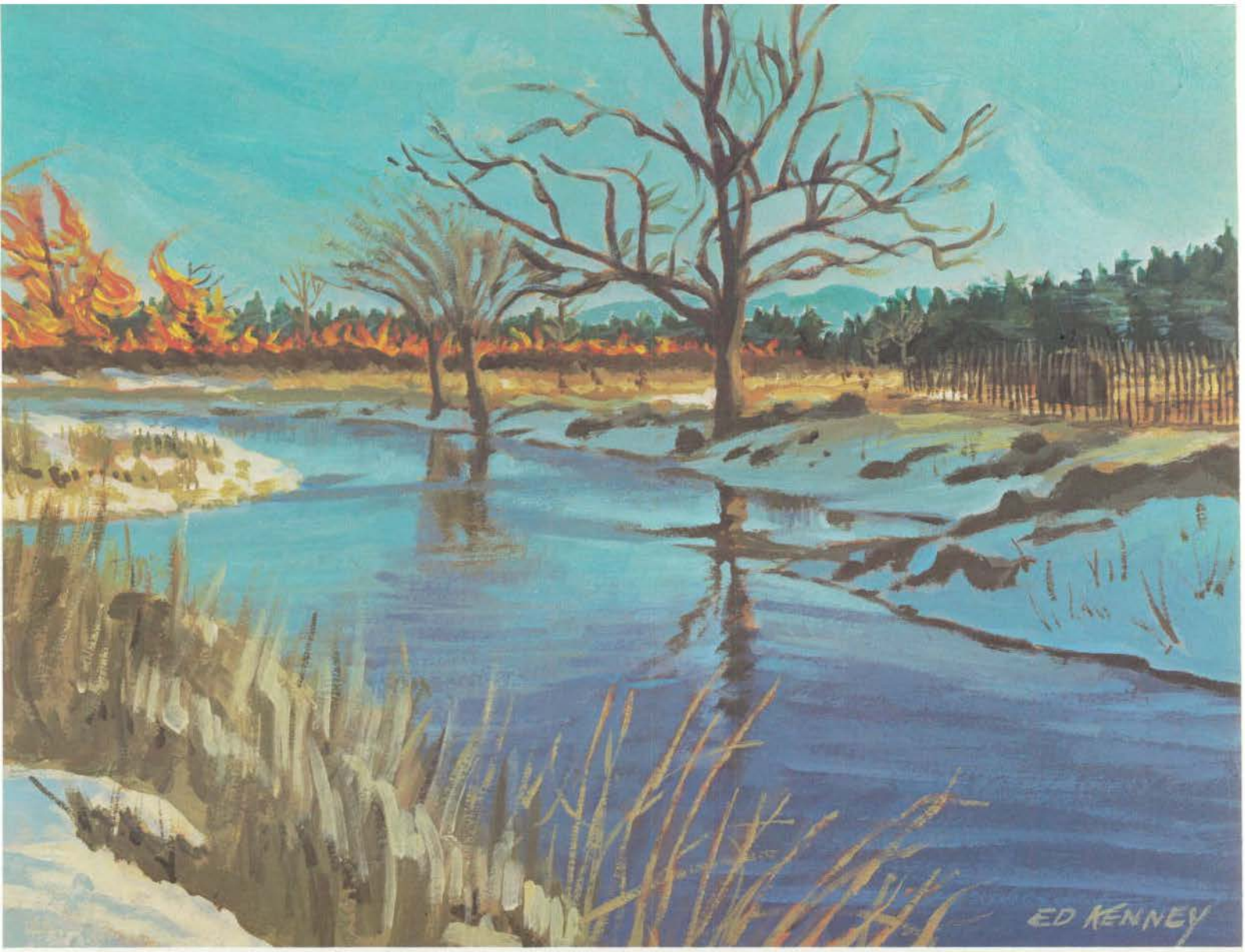
Illustration by Edward Kenney

Burning off old fields and forest edges was a common Indian custom. Forest managers are rediscovering the value of fire.

by Julian Harris Salomon

Indians That Set the Woods on Fire

NOW that my fine old Ramapo Mountain friends and neighbors are all doing their blueberry picking in the happy hunting grounds of their Munsee Indian ancestors, I can tell who it was that set the fires in the Palisades Interstate Park every year in the early spring. They were the incendiaries the park police were never able to catch up with. But there was nothing mean or malicious in what they did. They were simply doing what Indians had done for countless generations: burning the woods in the spring. Particularly, they burned over Pine Meadow and the Brown Swamp so they could be sure to produce a good crop of blueberries that could be gathered and sold. As soon as the berries ripened, we would see them; men, women and children, trooping



Artist's depiction of Munsee Indians (lower Hudson Valley) using fire to prepare their fields for spring planting

down the mountain with baskets and buckets overflowing with the tart blueberries that made pies and jellies of a kind the tame berries we get today just cannot equal. And they sold them, "a quart for a quarter." But that was a long time ago when a dollar was still a potent sum.

It was David Pieterzoon De Vries, that doughty mariner, merchant, scholar and settler, who first recorded the New York-New Jersey Indian's custom of burning over the land. On a pleasant morning in 1632, when he was sailing along the Jersey coast he "smelt the land which gave a sweet perfume as the wind came from the northwest, which blew off the land and caused those sweet odors." "This," he continued, "comes from the Indians setting fire at this time of year to the woods and thickets in order to hunt; and the land is full of sweet smelling herbs, as sassafras, which has a sweet smell. When the smoke is driven out to sea, it happens the land is smelt before it is seen."

De Vries was correct in assuming that the "sweet perfume" came from hunters' fires for in the fall and early winter the Munsee conducted great communal deer hunts. In them a hundred or more people might take part. They built a great ring of small fires around a wide area and upwind from a natural barrier, such as a river, or from an artificial one such as a V-shaped pound with fences of poles and brush. With fire and noise the deer were stampeded into the enclosures and traps. In the burned over areas where trees had been destroyed, shrubs, grass and brush grew vigo-

DEC photo

Wild Blueberries

Indians felled trees by burning the trunk and then removing the charred wood with gouges and stone axes, repeating the process until the tree fell.

DEC photo

Ground fire in the Pine Bush near Albany

DEC photo

Fire is essential for new growth in some plants, e.g. this pitch pine.

rously. This abundance of food helped the deer population prosper and multiply. So fire became the agent that kept the herds in balance. In the unbroken forest, game was scarce so Indians seldom hunted there. It was in the fire-opened meadows that the individual bow-hunter found his best chance to find and stalk his game. It was in areas like that in western New York that wood-bison and elk were to be found.

The part of the New World to which the Dutch and English came was not the dense and dark forest that some of them imagined it might be. Along the shore, rivers and small streams wherever the land was fairly high and level, the settlers found ready-made fields and pastures which were once Indian village sites. Over the years they had been maintained by being burned over and periodically occupied.

Clearing land required a lot of patient and heavy labor that was performed by the men. Trees were felled by controlled fires while their trunks and branches were cut to length in the same way. In felling, the fire was concentrated by a band of clay that was formed around the trunk so that it was just above the intended burn. From time to time the charred wood was removed with stone axes and gouges and the process repeated until the tree fell. Very large trees were killed by girdling and left standing. Eventually they fell and were used for firewood. Stumps were burned with piles of brush and branches piled around them but it often took years before heavy roots could be removed.

In the meantime planting was done around them. Old fields, left to lie fallow and the ones about to be planted were burned over by the women and children. They first burned a strip around the village to keep the field fires from spreading. Bunches of wet rushes and old mats were used to beat out flames about to spread. This burning cleared the fields of old cornstalks and other debris. It had a limited fertilizing effect by returning some minerals to the soil, while the ashes, being alkaline, helped reduce the soil's acidity.

Under the Indian farming method the fertility of the soil would become exhausted in eight or 10 years. Their repeated crops of corn, beans, squash and tobacco hastened the process. Planting beans and squash with the corn and allowing their vines to rot, or putting fish into the cornhills, as some tribes did, provided a little nitrogen, but not enough. With the soil depletion the village itself and its bark houses became insanitary and nearby supplies of firewood depleted. Then the whole village moved to a new site or to an old one that time had restored to fertility.

In about 10 to 20 years an abandoned field had restored itself. Archaeological evidence shows that good sites were occupied over and over again. In them the gardens were quite extensive. On Manhattan Island there were fields of 140 to 160 acres. In Virginia, Captain John Smith reported: "Their houses are in the midst of their fields and gardens, which are small plots of ground, some 20, some 40, and some 100 to 200 acres." He also mentions that the Appomattox Indians had fields of 100 acres each. His and other early accounts tell of great quantities of corn

M. Richmond

Forest and wildlife specialists use fire as a management tool.

This burned-over field will bring forth new growth and new life in late spring.

M. Richmond

held in storage and how some of it saved the colonists from starvation. It also helped the Pilgrims, who, landing on Cape Cod, told how they dug into a sand mound to find, "a little old basket full of faire corne of the yeare, with some 36 goodly eares of corne, some yellow and some red, and •thers mixt with blew which was a very goodly sight; the basket was round and narrow at the top, it held three or four bushels, which was as much as two of us could lift up from the ground, and was very cunningly and handsomely made."

What the newcomers had found was probably one of the bark-lined storage pits that were built around the villages and sometimes inside the wigwams.

Indian families in New England raised from 24 to 60 bushels of corn each and in addition all the green corn they could eat. To produce such crops the women had to be careful and skillful gardeners. Their only tools were digging sticks and hoes with a blade of shell, stone or a deer shoulder bone. Their helpers were the older children, one of whose special jobs was t• act as "scarecrow" to drive off maurauding flocks of birds. An early engraving shows a half round shelter on a platform where the bird chaser took his station. An early visitor to New England, William Wood, writing in 1684, admired the skill and care of Indian women in "their planting of corne, whereby they exceed the English husbandmen; keep it so cleare, with their clamme shell hoes, as if it were a garden rather than a corne field, not suffering a choking weed to advance his audacious head above the infant corne or an undermining wormc to spoil his spurnes."

At the end of the season and after the harvest, fire was again used to clear fields and to get rid of accumulations of dead plant material on the f•rest floor. Adrianen van der Donck, the Dutch administrator of the manor of Rensselaerwyck on the upper Hudson wrote in 1641:

> "The Indians have a yearly custom (which some of our Christians have adopted) of burning the woods, plains and meadows in the fall of the year, when the leaves have fallen and when the leaves and vegetable substances are dry. Those places which

are then passed over are fired in the spring, in April. This practice is named by us and the Indians "bush-burning," which is done for several reasons: first, to render hunting easier, as the bush and vegetable growth renders the walking difficult for the hunter, and the crackling of the dry substances betrays him and frightens away the game; secondly, to thin out and clear the woods of all dead substances and grass, which grow better the ensuing spring; thirdly, to circumscribe and enclose the game within the lines of the fire, when it is more easily taken, and also because the game is more easily tracked over the burned part of the woods . . .

"Notwithstanding the apparent danger of the entire destruction of the woodlands by the burning, still the green trees do not suffer. The outside bark is scorched, three or four feet high, which does them no injury, for the trees are not killed. It, however, sometimes happens that in the thick pine woods, wherein the fallen trees lie across each other, and have become dry, that the blaze ascends and strikes the top of the tree, setting the same on fire, which is immediately increased by the resinous knots and leaves, which promotes the blaze, and is passed by the wind from tree to tree, by which the entire tops of the trees are sometimes burned off, while the bodies remain standing. Frequently great injuries are done by such fires, but the burning down of an entire woods never happens. I have seen many instances of wood-burning in the colony of Rensselaerwyck where there is much pine wood."

Burning on the shorelines of lakes, ponds and streams was done in the early spring when the soil was damp or frozen so fire did not damage the underground parts of dormant plants. The Indians said burning made reeds and rushes grow more profusely. It was done just after the snow melted and before the nesting season so as not to harm the birds. As the practice stimulated the growth of roots and stems which were the principal foods of ducks and other waterfowl and muskrats, it helped increase those species. At the same time the burning of marshes and thickets increased the berry crop and so attracted berry eating birds and animals. Moose and beaver were particularly benefited because aspen, one of their principal foods, grew only where there was plenty of light. It quickly appeared and prospered in the fire-opened lands.

Over the years the Native-American had developed a culture, adapted to and in harmony with the land in which he happened to live. It included a great practical wisdom of bird, animal and plant life. Some of this he passed on to the Dutch and English newcomers, who, in order to survive, followed Indian methods in hunting, fishing and planting. They killed trees by girdling, planted corn between the stumps, used a log corn pounder, learned to make and like hominy, succotash, johnny-cake and maple sugar. But when it came to the idea of setting fire to the woods, the colonists were a little hesitant and slow to learn.

Only in recent years have our national park and forest services learned that it is not necessary to rush out and quickly extinguish lightning-started fires that break out in wild and uninhabited areas. During almost the same time we have learned of the many benefits conferred by controlled burning. Now too, we have learned that forest fires are part of the natural cycle of events and that archaeological evidence shows they have been frequent over many centuries.

Fire is one of the best ways to control tree diseases caused by fungi and insects and to hold down pests like flies and mosquitoes. It is also needed to generate enough heat to stimulate the germination and growth of some tree species. One of these is jack-pine, whose cones release seeds only when they are opened by heat. Fire removes layers of leaves, twigs and other dead plant material so tree seeds may reach mineral soil and start to grow. Then quick-growing plants provide partial shade which is needed for germination. Later the opening made by fire, gives seedlings the direct sunlight needed for growth. Plant life is apt to be more diverse in burned over areas than in those where fire has been eliminated. However, it affects different species in different ways and, of course, all are not beneficial. Some birds follow fires and prosper. Among them are the house wren, bluebirds, quail and grouse. On the other hand some low-nesting species may be destroyed by fire that occurs in mating season. That is why Indians burned marshes only in late winter. Rodents, such as squirrel and beaver, could also be adversely affected. Ashes worked both ways: washed into streams they could kill fish, but eaten by deer and other animals they provided a source of needed minerals.

During the 1960's and early 1970's, DEC's division of fish and wildlife supported research at Cornell University directed at answering the question, "Can fire be used under present times and conditions to manipulate wildlife habitat in New York?" The answer was a resounding "Yes." Since the mid 1970's, prescribed fire has been an accepted habitat manipulation practice on wildlife management areas throughout the state. About 200 to 300 acres are burned annually according to plan (See "Connecticut Hill Wildlife Management Area," by Ward Dukelow, THE CONSERVATIONIST, May-June, 1983.) While no longer needed to fell our trees, fire is still an effective technique to shape wildlife habitats. With broader understanding and acceptance of the role of fire, the public may eventually be comfortable with the burning of areas such as the Albany Pine Bush which depends on fire for its continued existence.

When the descendants of the Munsee set fire to the blueberry swamps in the Palisades Interstate Park, they were accused of being wanton incendiaries. Today specialists in plant diseases know that the best way to get rid of blueberry red leaf disease and blueberry leaf spot is by burning. The Indians never knew those names. They just said: "Fire makes the forest live again."

Julian Harris Salomon is a retired landscape architect who served in the National Park Service. His lifelong interest in the American Indian is evidenced by his authorship of *The Book of Indian Crafts, Indian Lore, Indians of the Lower Hudson* and many articles. Mr. Salomon is a member of the American Society of Landscape Architects, the American Camping Association, and is a trustee of the American Scenic and Historic Preservation Society.

Sea Lamprey in New York State

by Paul C. Neth and Thomas M. Jolliff

Second of two parts

R. Rehbaum

This is the second part of a two part article about the sea lamprey in New York. The first section appeared in the January-February 1984 issue and dealt with the life history of the sea lamprey, its origins and close relatives in New York. It also dwelled on lamprey-host interactions, and methods used by DEC and other governmental agencies for its control.

In this second part we shall focus on present management of the sea lamprey in several large, important New York lakes, talk about ongoing control activities, environmental problems and take a look at the future of lamprey control in New York State.

Lake Ontario

IN the early 1950's the commercial lake trout fishery in the upper Great Lakes collapsed. While a number of factors, including commercial fishing, were thought to have contributed, the sea lamprey was believed to be the major culprit. As a result, fishery restoration programs in Lakes Superior, Michigan and Huron, from the start, emphasized sea lamprey control. On the other hand, since lake trout and sea lampreys had coexisted for many years in Lake Ontario, fishery scientists from that region doubted that lampreys were responsible for decimation of the native lake trout population there. Thus, by stocking additional lake trout in the 1950's, fisheries managers tested the theory that the lake trout could be restored in Lake Ontario without lamprey control.

Events proved them wrong. Although stocked fish exhibited good initial survival and growth, most disappeared before reaching sexual maturity. Larger plantings were tried in the early 1960's but with the same results. Sea lamprey predation was indeed a major obstacle to successful restoration.

Then, in the spring of 1968, the first coho salmon were planted in New York's Salmon River. "Jack" returns the following fall were very encouraging. Anticipating a large return of coho adults in 1969, a weir was constructed at the Spring Brook planting site near Pulaski, to capture and monitor runs of

g. Neth

These scarred lake trout attest to the damage caused by lampreys.

adult salmon. But few returned and those that did were riddled with lamprey-inflicted lesions. Stocking continued but returns were consistently poor.

New York finally joined the Province of Ontario in urging the Great Lakes Fishery Commission (GLFC) to extend sea lamprey control to Lake Ontario. As a result, 23 Canadian streams were treated with lampricides in 1971 while 21 New York streams were treated in 1972.

Following control, survival of coho salmon increased about tenfold; sea lampreys had been killing over 90 percent of the cohos that had survived their first summer in the lake. Chinook salmon, steelhead and brown trout also showed substantial improvements in survival. But there was another pleasant surprise. As a result of lamprey control, average sizes of salmon increased by as much as 120 percent.

Since that time, with continuing lamprey control and increased stocking, there has been a dramatic and exciting expansion in the Lake Ontario salmonid sportfishery. Long-range projections anticipate an annual harvest of 380,000 salmon and trout. An incidental but important benefit has been the improved economic climate in what had been a chronically depressed region in the state.

Unfortunately, the program for lake trout to date has not been completely successful and survival has consistently fallen below guidelines for spawning stock buildup. Thus the level of sea lamprey control which led to development of a thriving salmonid sportfishery has not been sufficient to permit restoration of a self-maintaining lake trout population. And since lake trout rehabilitation is one of the primary objectives of the GLFC, that agency has extended the lampricide program into the Oneida Lake watershed, an area long known to be a very large producer of sea lampreys. Continued treatment of the Oneida system will depend on results obtained from a five-year experimental control project. Evaluation will focus on changes in sea lamprey abundance and lake trout survival in Lake Ontario, and effects on fishes in Oneida Lake — particularly walleye, cisco and burbot.

The Finger Lakes

SEA lamprey have been abundant in Seneca and Cayuga Lakes for about 100 years. Presently more than 90 percent of the lake trout, rainbow trout, brown trout and landlocked salmon over 20 inches show evidence of lamprey attack.

In the past, Seneca Lake was nationally famous for its lake trout and rainbow trout fishing including many trophy fish. Abundance of adult and trophy lakers and rainbows has declined within the past 25 years, and lake trout densities are presently the lowest on record. The sport catch is characterized by smaller, younger fish, and sea lamprey attacks have increased substantially, possibly due to colonization of Keuka Lake outlet following pollution abatement there. There is strong concern for lake trout not only because of effects on the quality of fishing, but also because Seneca Lake is DEC's primary egg supply for the Finger Lakes strain of lake trout which are planted in many New York lakes to improve fishing. A strong lake trout

P. Neth

Lamprey kill vast numbers of salmonids in the Finger Lakes Region.

stocking program is in place while rainbow production from Catharine Creek is supplemented by hatchery-reared plantings of wild fish originating from Cayuga Lake.

In Cayuga Lake, fine fisheries for lake trout and rainbow trout were developed despite the presence of sea lamprey following changes in management strategies in the late 1940's and early 1950's. Improvements in stocking increased the abundance of both lake trout and rainbow trout. Today, Cayuga Lake serves as the "back-up" egg supply source for Finger Lakes strain lake trout and provides wild rainbow trout eggs for statewide needs. It may become an important source of eggs for DEC's landlocked salmon program.

But current mortality rates for lake trout are high, approximating 60 to 70 percent. Brown trout survive well into their second year but are then heavily attacked by lampreys and suffer 95 percent loss by the next year. Landlocked salmon also do well until they reach the size where they are vulnerable to lampreys after which they rapidly disappear. Information from DEC's ongoing monitoring program reveals that lamprey attack rates on lake trout have increased about 60 percent. These are clear indications that lampreysare having a significant impact on the salmonid populations in Cayuga Lake.

Past Sea Lamprey Control Efforts

In the late 1800's the first attempt to control sea lamprey in the Finger Lakes was made by removing spawning adults from Cayuga Inlet. It was unsuccessful. In 1960, after lampricides were available, preparations were made for experimental application of TFM (3-trifluoromethyl-4-nitrophenol), in the Cayuga and Seneca Lake systems. Although surveys and pretreatment bioassays were completed, treatments were never undertaken.

In 1969, the United States Army Corps of Engineers constructed a flood control structure on Cayuga Inlet and incorporated a fishway. Designed to pass or capture wild rainbow trout, the fishway was also used to capture adult sea lamprey blocked by the dam. But today, after 14 years of operation and the removal of more than 40,000 adults, lamprey are still abundant.

The Present Situation

Finger Lakes lamprey control became a public issue in the early 1970's. In 1974, DEC made a commitment to implement control in Seneca and Cayuga Lakes and encouraged the GLFC to incorporate these lakes into their sea lamprey control operations for Lake Ontario. But the commission took the position that it would consider the Finger Lakes only if sea lamprey populations there were found to contribute significantly to the Lake Ontario problem. Subsequent studies failed to prove this, thereby effectively removing GLFC involvement. At that time, DEC personnel could not use lampricides because of restrictions imposed by the Environmental Protection Agency (EPA). But in June 1978, EPA issued a supplemental label permitting TFM use by properly certified state personnel. The Bayer 73 label was similarly revised in March 1980.

By 1978, DEC had accepted full responsibility for control of sea lamprey in the Finger Lakes. A feasibility study concluded that such a control program was possible, and that it should place major emphasis on use of lampricides along with increased stocking of salmonids. As a demonstration project, DEC proposed to pursue sea lamprey control on an experimental basis by treating the Seneca Lake system with lampricides while holding Cayuga Lake as a no-treatment control against which Seneca results could be compared. A draft Environmental Impact Statement (EIS) was prepared for the proposal pursuant to the State Environmental Quality Review Act (SEQR) and issued in October 1980, followed in November 1980 by a public hearing to air the proposal.

Concerns raised during the public review process were addressed in the EIS completed in May 1981. The Statement of Findings issued the following September concluded that use of lampricides in a five-year program to control sea lamprey should be accomplished as soon as practical in Seneca Lake, and that sea lamprey control should be considered as well in Cayuga Lake "in view of the overwhelming public sentiment supporting such action." DEC fisheries staff was then directed to prepare a supplement to the Seneca EIS which would also consider treatment of Cayuga Lake.

The Seneca Lake Operations

Sea lamprey control began in Seneca Lake in the fall of 1982. In September 1982, Bayer 73 was applied by aircraft to 111 acres of ammocoete infestations in Seneca Lake while in October, TFM was successfully applied

to Keuka Lake Outlet. Scheduled TFM treatment of Catharine Creek was postponed when bioassay results revealed that the safety margin for non-target fishes had been substantially reduced by the combination of very cold water temperature and high alkalinity, a situation remedied the following September when improved conditions prevailed. Overall results indicate that TFM treatments were very successful with ammocoete mortalities estimated at 95 percent. Bayer 73 treatment effectiveness at Dresden was about 80 percent while at a nine-acre area in Watkins Glen it was about six percent. Treatments also confirmed that the major lamprey producing areas in the Seneca Lake system in order of importance are Catharine Creek, in-lake at Dresden and Keuka Lake Outlet.

Few other fishes were killed during TFM treatments even though thousands were exposed to the lampricide. A modest loss occurred at Dresden following application of Bayer 73.

All objectives of the complex research and monitoring program required for Bayer 73 use were accomplished and all Department of Health and DEC permit requirements were met to protect humans and livestock from exposure to lampricides. Aside from the non-target fish loss at Dresden, no other adverse effects were observed from use of the two lampricides.

Although the first complete treatment of the Seneca system for sea lamprey control was successfully accomplished, parasitic-stage lamprey already in the lake at the time of treatment, were not affected by the lampricides. Since these will repopulate available nursery habitat a second full treatment of the Seneca Lake system will be required by 1985 or 1986. Lampricide treatments will not eradicate the sea lamprey in Seneca Lake, but will reduce their abundance to about 10 percent of precontrol levels.

Trouble on Cayuga Lake

IT is on Cayuga Lake where DEC's lamprey control efforts have met with the greatest difficulty. A supplemental EIS was prepared for Cayuga Lake and discussed at a public meeting in Ithaca in December 1982. The final EIS was issued in mid-July 1983, and a decision to implement sea lamprey control was made later that month. The Cayuga program was similar to that for Seneca Lake.

During public review of the proposal, concern about the safety of water supplies emerged as a strong issue. This led DEC to undertake a tracer dye study to simulate a TFM treatment in Cayuga Inlet. Results were used to anticipate where exposure of water supplies to lampricides was likely to occur and to develop solutions to potential problems. The study and a subsequent household water user survey were reviewed by DEC, the state and Tompkins County health officials, representatives of the Bolton Point Water Systems and the Southern Cayuga Lake Intermunicipal Water Commission. DEC then formulated measures to ensure there would be no human exposure to lampricides through water supplies and contacted water users to inform them of treatments and to arrange for alternate water sources during the treatment period. All studies and plans were reviewed with and approved by officials of state and local health agencies and municipal water supplies.

Treatments planned for 1983 were to have been confined to Cayuga Inlet and its tributaries.

The Legal Challenge

Operational planning for DEC's 1983 TFM treatments of Catharine Creek and the Cayuga Inlet system were essentially completed by mid-August with treatments scheduled for early September.

Treatment of Catharine Creek was in progress when it was abruptly halted by legal action brought by an Ithaca-based group opposed to the sea lamprey control program. An automatic stay was obtained from the Freshwater Wetlands Appeals Board on grounds that DEC failed to obtain a wetlands permit for its planned use of lampricides in Catharine Creek and Cayuga Inlet. Following a hearing before the board, the stay on Catherine Creek was lifted and the control program there proceeded without further incident.

The same group also petitioned DEC's general counsel for his opinion on DEC's proposed use of lampricides. One of the group also commenced litigation in Supreme Court of Tompkins County, challenging DEC's compliance with its own pesticide regulations. This led to a temporary restraining order, prohibiting DEC's application of TFM to the Cayuga Inlet system.

The board's stay on use of lampricides in Cayuga Inlet remained in effect pending issuance of the declaratory ruling by DEC's general counsel. That ruling concluded that no wetlands permit was required because "where no wetlands activity is contemplated and no wetlands impact likely, there is no legal requirement to obtain any Freshwater Wetlands Permit." The ruling also dismissed other issues brought by the petitioners, indicating that agency actions were legal and proper. Rehearing of the Cayuga Inlet wetlands issue, led the board to direct DEC to conform to the requirements of the Freshwater Wetlands Act and apply for a permit.

Anticipated delays to pursue legal appeals or to apply for a wetlands permit combined with the onset of very cold weather and its effect in reducing TFM's selectivity margin for non-target fish, forced DEC to cancel treatment of Cayuga Inlet in 1983.

Presently DEC is considering the course of action to follow to resolve this matter and move forward with sea lamprey control in Cayuga Lake in 1984. While the Finger Lakes story remains to be completed, it has been evident that there are strong feelings for both sides of this issue and that some concerns remain about environmental effects of the program even after a lengthy and thorough public review process by DEC.

Lake Champlain

A formal interagency program for restoring sportfisheries for lake trout, landlocked salmon and steelhead in Lake Champlain was started in 1973 following formation of the Lake Champlain Fish and Wildlife Management Coopera-

tive. The early history of the lake and small plantings of lake trout and salmon in the 1950's and 1960's, provided evidence that the program could succeed. Although sea lamprey were known to be present, it was not known at the time to what extent they might hamper satisfactory development of the salmonid fisheries. This was to be assessed as the program developed.

Today the program is well along and has shown strong progress. Although current estimates of annual harvest approximate 8,000 to 10,000 salmonids these are still far below the levels which can be reached.

But sea lampreys are abundant and ammocoetes have been found in 16 stream systems, seven of which are considered to be major producers. Incidence of lamprey wounds on salmonids has since been found to be four to eight times higher than in the Great Lakes. No decision on sea lamprey control has been made at this time.

The Future

THE next few years will be crucial to development of a sea lamprey management program in New York.

The five-year experimental program in Seneca Lake will see the final round of lampricide treatments implemented in 1985 or 1986. While some benefits from the first treatment are expected as early as the spring of 1984, a much clearer picture of program success will emerge by 1985. The experimental program will terminate in 1988.

As we have seen, the five-year experimental program in Cayuga Lake has been delayed and legal issues must be cleared up before it can proceed. Anticipating this will be accomplished by 1984, the first round of lampricide treatments would be completed in the fall of 1984 with second and last round between 1985 and 1988. Final schedules will depend upon the overall effectiveness of initial treatments plus the abundance and growth of reestablished larval sea lamprey populations. This experimental program would terminate in 1989.

Map of Seneca Lake / Checkered areas showing main areas of lamprey activity

The Seneca and Cayuga Lake programs will provide considerable information about the effects of sea lamprey reduction on salmonid populations, on the sea lamprey itself and the cost-effectiveness of the program. These results, along with availability of new information on alternative methods of control and on lamprey-host interactions, will permit DEC to formulate the best long-term course of action to manage sea lamprey in these two lakes.

In Lake Champlain, ongoing studies dealing with sea lamprey impacts on salmonids and sportfisheries will be completed by September 1984 and a report on findings by January 1985. This will set the stage for a decision by members of the Cooperative on whether or not to proceed with sea lamprey control.

In Lake Ontario, sea lamprey control will proceed on its normal course with lampricide treatments of infested streams being rescheduled on an as-needed basis. Treatment of the Oneida Lake system and its effects on sea lampreys, lake trout and other salmonids in Lake Ontario as well as key fish in Oneida Lake, will be watched with great interest by sea lamprey control experts throughout the Great Lakes. A long term control strategy will be formulated for this system if it is demonstrated that the Oneida system contributes significantly to the Lake Ontario population; that control substantially benefits Lake Ontario lake trout, and has no detrimental effects on Oneida Lake fishes.

In Lake Erie, sea lamprey were not considered a problem until recently. Improved water quality in tributary streams has led to an expansion of suitable spawning and nursery habitat for lampreys. Recent stockings of trout and salmon, including efforts to reestablish once native lake trout, have provided many more available hosts. Wounding rates on lake trout now exceed 20 percent, and there is concern that rehabilitation efforts may be hampered by losses to sea lamprey predation. A plan for experimental integrated management of sea lamprey for Lake Erie has been drafted and is being reviewed by working groups of the GLFC's Lake Erie Committee. A formal recommendation for action will be considered by the Lake Erie Committee early in 1984.

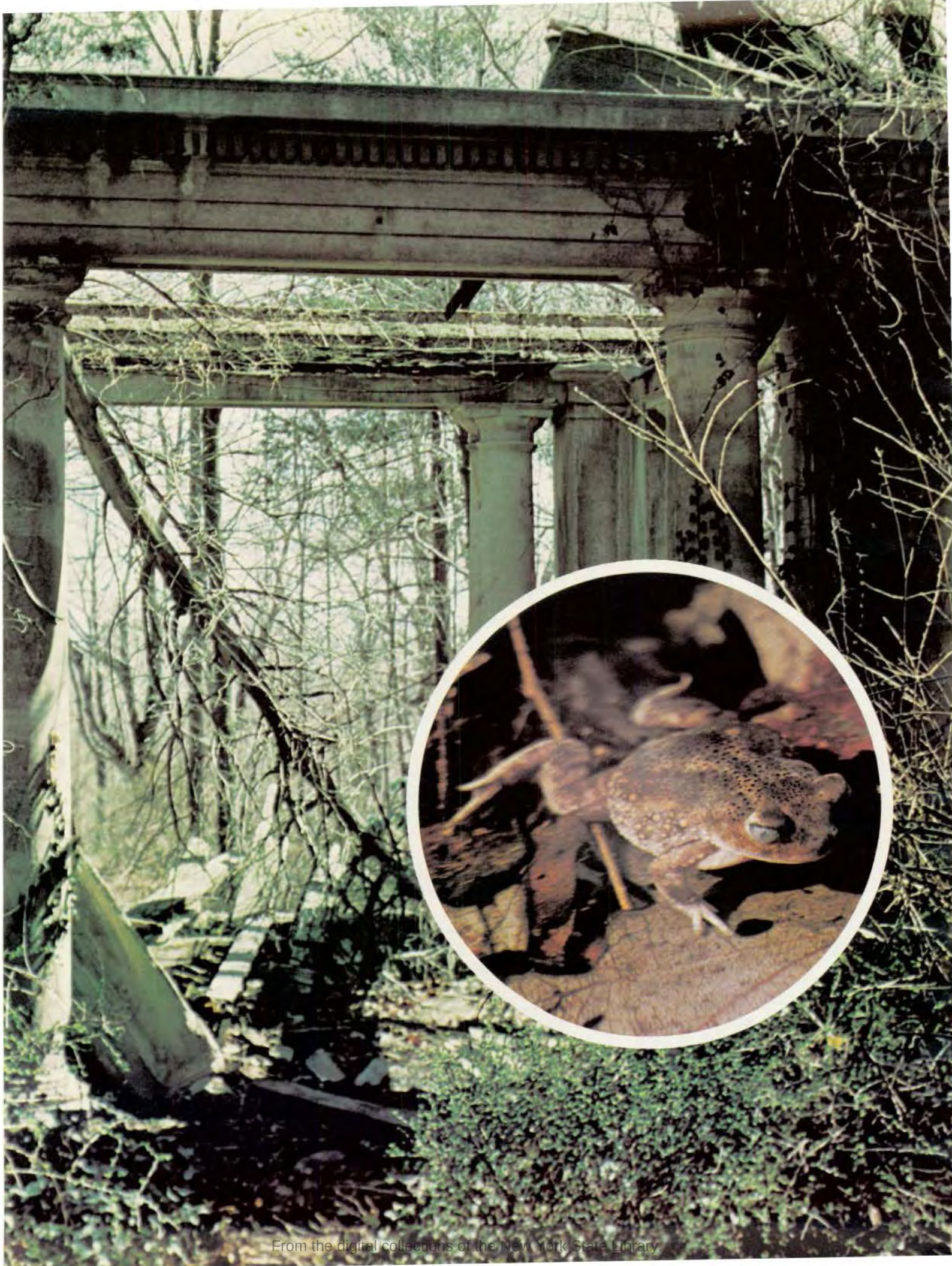
Conclusion

LET there be no doubt about the seriousness of the problem of the sea lamprey. This hardy predator has caused untold damage to the fisheries of the Great Lakes system as well as to several important fisheries in New York State. At one time it ruined an entire industry — the lake trout fishery in Lakes Michigan, Huron and Superior. Moreover, the early history of sea lamprey containment and control efforts both in New York and throughout the Great Lakes has been a story of repeated failures and limited success. Breakthroughs did not occur until the advent of lampricides. Today fishery biologists, using techniques developed over the past 25 years, feel that they have a "handle" on this problem. But by no means do they feel confident that the problem has been solved. The sea lamprey will continue to be a force to be reckoned with for the foreseeable future.

Paul C. Neth presently supervises DEC's inland fisheries management programs. **Thomas M. Joliff** is an associate aquatic bilogist who heads DEC's Bureau of Fisheries lamprey control unit.

◀ *The first step in lamprey control is to take o survey. These DEC biologists are electroshocking lamprey in a Lake Ontario tributary.*

Photo on page 44
by R. Rehbaum



Pat Santora

Of Kings and Spadefoots

by Pat Santora

THE Muttontown Preserve in Nassau County is historically, geologically and naturally special. It took the fancy of a king and a succession of millionaires with vast residential options. Today it is an outdoor museum for study and pleasure, combining crumbled masonry and enduring clumps of iris from a lost garden with many of nature's beauties and oddities, sometimes unexpected even by the curators.

The king who left the ruins was Zog, self-proclaimed monarch of Albania. He had ascended to the throne by the pragmatic method of military coup, aided by his family of warlike sisters. When Italy expropriated his country, king, queen and princeling fled, prudently taking the crown jewels and the royal treasury. Like the recent Shah of Iran, the deposed ruler finally drifted to Egypt, from whence he sought a home in the United States.

On Long Island, Zog found just what he wanted: "Knollwood," a 19th century mansion in a gentlemen's farming community. His new role would be that of country squire. Rumor has it that he paid with pearls, or diamonds, or emeralds. Nothing so banal as cash was used.

But Zog never enjoyed his hall. Immigration restrictions, taxes and the collapse of his lucrative Egyptian business postponed occupancy. Not-so-gentlemanly locals brutally vandalized Knollwood in the search for gold, although how or why it would be there without the king was not thought through. After Zog sold his holdings in 1955, Knollwood had to be torn down. Today even the massive wrought iron gates have been worked loose. The scattered ruins afford speculations about their original use, and the walled garden hosts foxtail and goldfinches.

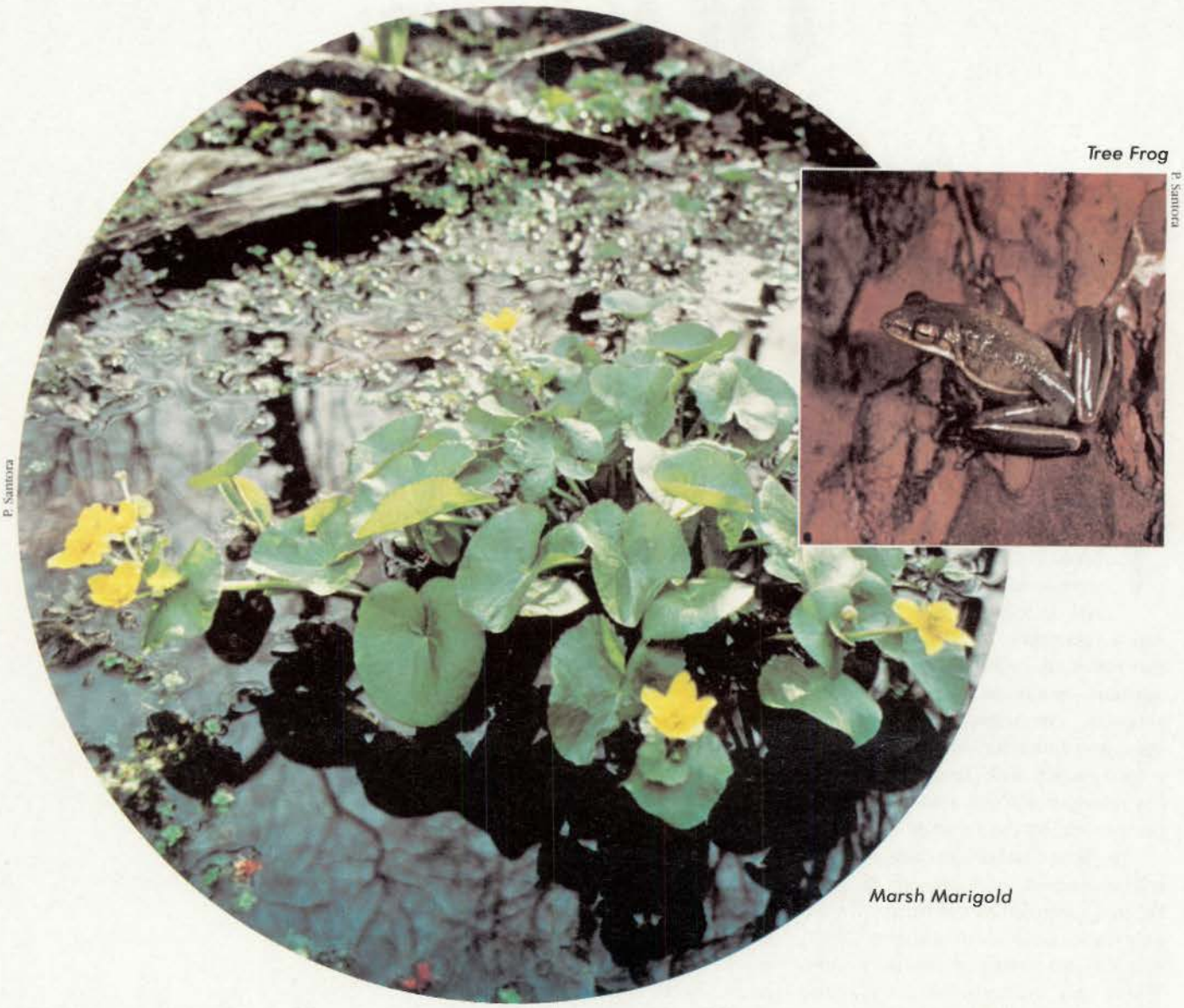
Next came Landsdell Christie, a former World War II flier blessed by serendipity, who on one of his reconaissance passes over Africa spotted mineral reserves which later formed the basis of his wealth. Christie expanded Zog's purchase with the adjacent estate, including a 1907 Georgian-style house. In the manner of his new peers, Christie improved the original landscaping with formal plantings, exotic trees and statuary.

These properties plus two others, the Hammond place with its revolutionary period house and parts of the magnificent Moore-McKay manor, "Chelsea," have become merged by purchase and gift into the Muttontown Preserve, a division of the Nassau County Museum system. The "museum" (like the State University) is not a single establishment but comprises 10 units with different perspectives.

The activities of the preserve radiate from the Nature Center on Muttontown Lane. A staff of full and part-time naturalists plus 35 volunteers conduct school groups in a variety of programs.

◄ *Opposite: Ruins of King Zog's summer house at "Knollwood"/(inset) Adult spadefoot*

Photo on page 46
by A. J. Lindbergh



P. Santora

Tree Frog

P. Santora

Marsh Marigold

Volunteers are trained in a 20- to 40-hour course sponsored in part by the Friends of the Long Island Heritage, a dedicated non-profit group.

In these 550 acres, the birder can train his glasses on a red-tailed hawk riding the invisible columns of the sky. Schoolchildren spy a little pile of classy, pointed tail-feathers, remnants of an encounter between a red fox and a ring-necked pheasant (descended from sportsmen's birds). Mycologists exclaim over brilliant splotches of *Poria spissa*, as if an artist with an orange palette had stumbled. Bright-cheeked riders canter along aisles of bittersweet and flaming creeper. Cross-country skiers estimate the pitch of the kame, a conical hill formed by the glacier that once squatted here. They usually leave the slope to kids on sleds. From March to August, amphibians chorus their hopes and possessions from kettle-hole ponds, the result of "ice cubes" that broke off the glacier and melted millennia later.

At one of these ponds, on April 24, 1983, staff naturalist Allan Lindberg made a discovery notable even among this largesse.

In 1976, when we first met Allan, he was a mounted policeman, patrolling the preserve. Allan married part-time museum staffer Lois Alfano. Guided by Muttontown's naturalist-in-charge Bill Paterson (whose childhood came under the tutelage of the legendary Edwin Way Teale), both young people have developed into capable naturalist-teachers and nature artists.

Allan Lindberg will be best remembered in Muttontown annals as the one who discovered the spadefoot toads.

He tells of a night of light rain following a heavy rain. The wood chorus frogs had already paired off and gone into their disappearing act, but the *Hylas* in particular were still sounding forth. Allan heard a crow-like dissonance in the pond chorus and went to investigate. In the gloaming, he saw enough to justify his surmise that the preserve was now hosting spadefoot toads. On April 27, he took Bill Paterson and Richard Ryder, curator of the Tackapausha Museum of Natural History, to confirm the sighting. They counted 57 singers, which means a much larger population, since only unmated males sing.

Herpetologists, not noted for amicability toward each other's point of view, predictably disagree about the rarity of the northeastern spadefoot toad (*Scaphiopus holbrooki*), one of five species in North America. Some contend they are not infrequent but are crepuscular (active in the twilight) and unobserved. In *Defenders* magazine of August, 1979, Michael Lipske, editor, listed the spadefoot toad as one of "three species considered rare, . . . extinct in parts of New York State," which is where we are. In an area so thoroughly prowled over as Muttontown by dusk or day, their previous presence here could not have gone unnoticed.

The question buzzing around the Nature Center now is, "Where did they come from?" Spadefoot toads do migrate, but in such large numbers that an arrival would be as unlikely to go unnoticed as their dissonance. Allan's own theory is that possibly Muttontown did have a minute inconspicuous population, but in the last year, the increased rains kept water in the ponds longer, favoring a population explosion of sorts.

Like anyone in the know, Lindberg finds the tailless amphibians fascinating. For one thing, they are most alien among our fellow animals, having branched off the evolutionary tree before the reptiles, forerunners of birds and mammals. The spadefoot family, Pelobatidae, is especially ancient, only slightly less primitive than the tailed toad, a mountain stream species hardly to be found in Muttontown. These old fellows have characteristics in common, one being the beautiful golden eye with an elliptical pupil. (Does the toad see more with his gleaming eye than the frog, which we are told perceives only fields of black and white, like a TV screen with no picture, and motion only as a black dot, like early movie animation?)

The spadefoot toad points up the basic ambiguity of our distinctions between toad and frog. Everyone who has studied high school biology knows that a frog has a thin, smooth, moist, even slimy skin; a toad has a thick, dry, rough, warty skin. Frogs live in trees or water. Toads live on land, even desert land. Out of the agile frog, imagination makes a Kermit; but what inspired Jabba the Hutt?

Like many other things "everybody knows," this doesn't test out. The names are carelessly applied. The fish-eating Surinam toad, for example, would never be invited to a toad family gathering. The *Hylas* or tree frogs are more closely related to toads.

The spadefoot has a smooth, moist skin. It lives on land, even desert land, but as befits an amphibian, breeds in water. Unattached males, swimming, floating or sitting near the bank, inflate their vocal pouches, like tiny white balloons, and raise a chorus, albeit unmusical to human ears. The ears for which it was intended perceive it differently. Ovulating females come zigzagging in from wherever they have been. At a nudge from a female, a suitor grabs her and leaps aboard. The male helps the female to extrude her eggs in enormous numbers over a stick or water plant close to the surface but above the mud in the shallows. The male fertilizes them in passing, and the pair separates. As the eggs touch the water, a protective membrane swells and encloses each in gel.

Southern or southwestern spadefoot eggs, in very warm, temporary water, hatch in a few hours. Though vernal and subject to summer diminishment, the pond at Muttontown is shaded. Still, it wasn't long before our curious naturalists found spadefoot larvae feeding on the aquatic vegetation. Richard took some of these tadpoles to raise at Tackapausha, and watched their transformations in captivity. At Muttontown, Allan and Bill saw various stages of the metamorphosis: tadpoles, tailed toads still in the pond, and tiny young land toads in July. Now the vegetarian diet was abandoned, and the animals settled down to their life work of catching, by a flash and tuck of the sticky tongue, anything of gullet size that crawled, hopped or flew past but didn't eat toad. The mosquito and the worm, that both prey in their season on man, are favored fodder to our friend, the toad.

Although not the smallest of the family, this animal is at most two and one-half inches long, about the length of one of Lois Lindberg's fingers, to say nothing of Allan's. Not that they handled the toads: unfeasible, presumptuous and rash. Literally! Though toads do not "give you warts," spadefoots do excrete a smelly substance that can burn, itch and even cause strong allergic reactions in some people.

What makes the spadefoot, which looks like a cross between a toad and a frog, different from most species of either? Why, the spadefoot. On each hind tarsus, near the innermost toe, is a horny black growth, sharp as a mandarin's pinkie-nail but sturdier. The possessor of these implements can shovel backwards, rotating as it goes, disappear in minutes and stay underground for periods no one has yet calculated. In dry, hot climates, like our Southwest, the spadefoots burrow down as much as 10 or 12 feet, following the underground moisture, and remain buried for a year or until the next suitable rain.

All the summer nights here, the spadefoots foraged, probably not submerging daily but aestivating in dry spells. When the New England aster bloomed in September, the Muttontown toads put their digging equipment to work, burrowed beneath the brilliant autumn vines or berried bushes and settled in to sleep off a summer of gorging. Respiration, greatly slowed, would occur only through the skin, which also absorbs moisture. (Below or above ground, spadefoots, like other amphibians, cannot drink or obtain moisture from the air.)

When the chrome-yellow marsh marigold returns, the spadefoot toads hear the clarion of spring and desire, leave their meadow bunkers and add their unmelodious voices to the batrachian chorus. Like so many sleeping princesses, the females waken.

And the naturalist, standing at the dark rim of the wood, catches in his flashlight a gleam of gold. The captains and the king have departed, but timeless treasure is to be found at the Muttontown Preserve.

Pat Santora is a regular contributor to THE CONSERVATIONIST. She lectures professionally on "Exploring Long Island" and is a Muttontown volunteer.

Letters

Our policy on letters

THE CONSERVATIONIST *welcomes letters from its readers. But since we are always pressed for space, letters should be short and to the point. We also reserve the right to edit letters for the sake of brevity, conciseness and clarity. Furthermore, we will not publish any letter or portion thereof which we deem to be libelous.*

The Appalachian Trail—A Favorable Comment

The anonymous "small, neat white cottage with open door" referred to in "The Appalachian Trail," (September-October issue), is Ralph's Peak Hikers' Cabin, a bona fide Appalachian Trail shelter. For specific information about the cabin or its location, see the latest edition of the *New York-New Jersey Appalachian Trail Guide.*

The local volunteer group that maintains the cabin is Ralph's Peak Hikers, a Dutchess County based club that also maintains over 20 miles of the Appalachian Trail, and is responsible for all trail shelters in Dutchess County. RPH members devoted many volunteer hours, and many volunteer dollars, to convert the former "decrepit shack" into one of the most unique, interesting shelters on the Appalachian Trail. Ask any of the over 400 hikers who have passed through the always open, orange door in the past two hiking seasons.

Ralph Joseph Ferrusi II, President
Ralph's Peak Hikers, Wappingers Falls

And A Not So Favorable Comment

The idyllic description of the Appalachian Trail by Elizabeth D. Levers conceals the fact that there is a darker side to the National Park Service's and the state's land-buying activities to relocate the trail.

The trail project itself is disturbing not only to many landowners but to local officials and ordinary citizens. There are several reasons:

- *The scale of the project*—Land acquisition for the Appalachian Trail aims at acquiring ownership of an average of 125 acres of running trail miles, from Maine to Georgia. A total of 250,000 acres is involved, which makes the trail "protection" program the second-largest land-buying program in park service history.
- *The total absence of responsible management*—Once the park service has secured ownership of a one-thousand-foot-wide swath of land cutting across Dutchess and Putnam Counties and, to the west of the Hudson, in Orange County, NPS will turn all responsibility for patrolling, law enforcement, litter cleanup and fire and emergency services to the coalition of hiking groups called the Appalachian Trail Conference. The hiker's notion of management is the physical maintenance of the trail. The ATC lacks both the money and the interest in managing the so-called protective corridor.

Your readers should also be made aware of the restrictions on land use that Appalachian Trail enthusiasts favor and try to enforce, e.g. bans on horseback riding, hunting, snowmobiles and other vehicles. They and you should also be reminded that hikers are neither environmentalists nor naturalists. They are trampers and campers, and their ethic, all too often, is: What's mine is mine and what's yours is mine.

James Gollin, Secretary
Appalachian Trail
Landowners' Organization
Salisbury, Connecticut

Genesee Oaks

I was inspired by the Genesee Oaks article in the September-October issue.

It would be hard to see much of that happen today; current hedge removal practices being a fact. However, there is an excellent opportunity now to go to roadside planting where trees are needed. That area is public right-of-way and should be planted. Off the roadside would be even better when the landowner is willing.

I have tried it myself and feel better for it.

Tom Wilson, Newark

The article on large trees in New York State intrigued me as I know of a very large oak near my home at Sheldrake on the west side of Cayuga Lake, Town of Ovid, Seneca County.

I am enclosing a picture where you can see that the tree dwarfs my grandson and my collie dog. The oak measures 14 feet three inches in circumference at shoulder height and is magnificent.

I would be glad to show your representative where the tree is as it is not readily seen or identifiable from the road. As a former assemblyman from Seneca County and state senator from the Finger Lakes area I am very interested in identifying and preserving all the natural beauties of this region.

Ted Day, Interlaken

Credit Given Where Credit Due

In June 1983, Val DeCesare, President of the Schroon Lake, New York Fish and Game Club, and myself had the privilege of working for a week with six staff members of DEC.

I was impressed with, in fact amazed at, their dedication and team

work. Their careful handling of lake trout resulted in no fatality whatsoever.

Every one of these gentlemen is a college gradute, coming from the finest schools. Yet the majority are seasonal workers, hoping to become full-time staff.

I feel that due recognition is in order for these men and have listed their names and titles below:

Tom Melville, Seasonal Fish & Wildlife Technician
John "J.J." Feurer, Seasonal Fish & Wildlife Technician
Gary Pratt, Seasonal Fish & Wildlife Technician
Les Saltsman, Senior Fish & Wildlife Technician
Dave Armstrong, Seasonal Intern
Larry Nashett, Senior Aquatic Biologist
Ollie Lessard, Schroon Lake

Snakes on Long Island

While reading the 1983 September-October issue, I read the letter from Fred Nickees, of Oceanside. He asked if there were any poisonous snakes in the wild, living on Long Island. The answer that you gave him, was that there weren't any. The answer really is that there are timber rattlesnakes in at least Suffolk County. I read an rticle in an issue of the *Amityville Record,* that a timber rattlesnake was captured in a wooded area of Smithtown by a DEC official living in Amityville. The snake was captured at the end of June in 1983. They were then going to search for the den when it got cooler.

Danny Wade, Centereach

• *You are right. A timber rattler was found in Smithtown. DEC officials are at a loss to know what it was doing there since Long Island is not currently in the timber rattler's range. Timber rattlers were historically located on Long Island, but populations have not been documented there in over 60 years. The animal was probably released or escaped. Incidently, the timber rattler is now listed as a threatened species in New York State.*

Editor

I read with great interest the article concerning snakes in New York State.

As a boy living in Brookville, way back in the early 1920's, I attended a small wooden school there. Each recess or lunch break a group of young boys would run out into the woods adjacent to the school and hunt for black snakes. It was not unusual to encounter several in the course of a day. Back then, not having the knowledge about the importance of snakes and other creatures in our environment, we proceeded to club them to death with large sticks, thinking that such ugly looking things were harmful to us. Looking back, I am sure they must serve some beneficial purpose in our ecological scheme.

My Dad who preceded me by 27 years, used to tell me stories about seeing a large black snake that climbed up on a split rail fence to sun itself, stretched out the whole length of the top rail, which is about 11 feet long. Has anyone ever had a similar experience?

Alfred V. Mollitor, Sr., Oyster Bay

The Forgotten Oswegatchie

My husband and I, along with four friends, discovered the Oswegatchie this past July 4th weekend. We were enjoying an outdoor hobby which Ms. Stegemann does not mention: rockhounding. In Talcville, where a bend in the river below a shallow rapid forms a pool about eight feet deep, the remains of the abandoned U.S. Talc Company mine litter the river bank. We were primarily interested in fluorescent minerals, which we would find after dark with the aid of a battery operated black light. We felt it wise to locate the old mine during the day.

As supper time approached, we drove up to the nearby International

Talc Company mine, also abandoned, where we set up our hibachi and grilled dinner. Near dusk we returned to the river, and shortly began our search. The ordinary white (by daylight) rocks turned to fire: brilliant reds and pinks, yellows, oranges. In less than an hour all sacks were full and very heavy. So much treasure for the picking!

The Oswegatchie certainly provided us with a memorable day, and lovely minerals and photographs. We plan to return.

Jane Cross, Manchester, Connecticut

Thanks for Book Review

We have received a copy of the review of the NRA *Basic Hunter's Guide* you wrote for the September-October, 1983 edition of THE CONSERVATIONIST.

To date, it is the most comprehensive and impressive review we have received, and the color repro from the cover does much to enhance it as a promotional piece for the publication.

We wish to extend our thanks for the excellent review. We owe most of the success this book has had, enabling it to go into its second printing after only 11 months, to those in state conservation agencies who have recommended it so highly.

Doug Pifer, Manager
Hunter Information Department
National Rifle Association of America
Washington, D.C.

Books conducted by Joan Taylor

The Atlantic Salmon, by Lee Wulff, 280 pages, Nick Lyons Books, Winchester Press, $24.95.

IF you would like to learn to fish for Atlantic salmon, you couldn't find a better place to begin than with Lee Wulff's *The Atlantic Salmon.* This updated and expanded version of Wulff's 1958 book is much more than just an instructional manual, however, and contains material to entertain and educate even the most experienced angler.

Sections on the biology and behavior of salmon and the history, traditions and ethics of salmon angling introduce the reader to the "sport of the gentry." The description of salmon biology is generally accurate and suffers but little from an occasional anthropomorphism, statements fishermen will enjoy and biologists endure. Wulff's writing style makes this discussion much more entertaining than most descriptions of fish life history I have waded through.

The second chapter, on the past and present of salmon angling, presents thoughtful discussions on private versus public control of salmon rivers and the general application of fly-fishing only restrictions on North American salmon rivers. In spite of some editorial oversight, the piece on fly-fishing only regulations makes a point that is frequently overlooked by the angling fraternity. The regulation is imposed because it is a practical method to limit harvest and protect salmon, not because fly-fishing is inherently more ethical or noble than any other angling techniques.

The strength of this book lies in the chapters on catching salmon, everything from what provokes a rise to the fly to evaluation and selection of a guide. These chapters are logically ordered and lead the reader effortlessly through matters of equipment and technique. The discussion is detailed, but by no means dry. Numerous examples from Wulff's extensive ex-

perience enliven and lend authority to the material. A careful reading will improve any salmon angler's success rate. Much of the information has application beyond Atlantic salmon fishing. Anglers after landlocked salmon in Lake Champlain tributaries or steelhead in Lake Ontario streams can learn much here.

The book is well-illustrated with high-quality black and white photographs throughout the text and an eight-page spread of fine color shots. The author's margin drawings complement the text and add emphasis to important points.

I thoroughly enjoyed reading this volume and find little in it to fault. The editing could have been tighter and some of the material in the chapter on salmon management will raise the eyebrows of professional resource managers, but this book held my attention while I read it and is already becoming a bit dog-eared from being referred to since. I plan to reread it just before my next trip to the Boquet or Salmon River.

— Gerald Barnhart

The Marshland World, by Ron Wilson and Pat Lee, 152 pages, Blandford Press, $17.95.

MARSHLANDS are often thought of as stagnant, unproductive, unmanageable areas: a waste of good acreage! Fill it in, drain it, dredge it out, would be the "remedy" for many people. But if you were to take a good look at the marsh you would soon discover it to be an exciting, dynamic, irreplaceable part of our environment. To help you explore the world of the marsh there is now *The Marshland World.*

Written not as a field guide but as a book to be read at leisure, it is also a good reference for quick information. The book is split into sections, each concerned with a different variable, and the index is extremely thorough. All technical terminology is italicized and defined within the text. Beautiful color and black and white photographs help the reader visualize the diversity and beauty of the world of the marsh.

An enormous amount of information is contained within this book, yet the writing style makes it difficult to retain what one has read. The text ends interpretation of one species and then begins another without more separation than the indentation of a new paragraph. This bombardment of new topics soon becomes very confusing, until you have to stop and think where you were.

The book begins with an introduction of peoples' dependence upon marshes. Craft materials from the marsh have long been gathered as they are unattainable elsewhere. Reed husbandry, thatching and basketry are presented in such detail that it makes you muse over the time and skill required for the crafts. The marsh has long proven itself valuable as a source of food. The art of eel catching and waterfowling, accomplished by a number of techniques, nets and traps is detailed in this book. Special sailing crafts necessary for navigation of the shallow marsh waters are also covered briefly.

The bulk of the book is devoted to thorough descriptions of marshland plants and animals. Basic anatomy and structure, flowering times of plants, site significance, animal behavior, ecology and management are just a few of the diverse topics. This book contains a

wealth of information and is recommended for those who have the patience to read it slowly and thoroughly.

— Patricia M. Boyle

Acid Rain, by Robert H. Boyle and R. Alexander Boyle, 145 pages, Schocken Books, $8.95.

PERHAPS the most insidious aspect of the acid precipitation problem is the benign nature of its intrusion: why get upset about a rainshower? The accepted strategy, therefore, in arousing a complacent public from their sheltered comfort is to shake them up a little. With Robert Boyle's *Acid Rain*, it becomes an assault.

The book, a polemic description of acid rain from pollution to solution, does stir the emotions. Chapters on the scope of the problem and its global effects jog even the most apathetic of dispositions. Specifically, discussions of dry deposition, mobilization of metals, and supercharged spring runoff are, frankly, scary. Boyle has collected a wealth of information from a number of arcane sources otherwise inaccessible to the general public, translating impossible technical research into a digestible (but unpalatable) "big picture."

Unfortunately, however, the acid rain problem has already raised a great flood of emotionalism, which now gets even higher. At a time when we all might benefit from a little less belligerence, Boyle would have us shake fists rather than hands. But Boyle has a very definite political statement to make which requires the reader to carry a goodly burden of the author's emotional baggage.

Generally, it is doubtful that any problem of such deep socio-economic concern and so complex a geochemical nature can properly be addressed in such a brief manner. Of the many thousands of position papers and technical reports to appear on the subject, Boyle's effort is just another "drop in the bucket," a primer at best. And it is indicative of our modern predicament that only five of the 129 pages constitute Boyle's "solution." The book falls into the propaganda trap of "proving" the effects of acid rain. That is the odd thing about the problem: we know the causes, and the cure, but we prefer to exhaust our energies "documenting" as many esoteric effects of acid rain as possible to incontrovertibly win our case. It would be poor medicine, however, to allow a patient to die while we insisted on further defining his illness.

The most recent study Boyle summons to his cause was conducted in 1981. This is old news. Boyle further erodes his own credibility by suggesting that acid rain is responsible for, among many other things, the Con Ed power blackout of 1977, increased urban crime and urban decay. Throughout the text, poorly documented evidence of the effects of acid precipitation is circumstantially linked through Boyle's "Chicken Little" logic in a manner that only true believers will understand. Like a sunshower, Boyle's book is too light to penetrate or do much good.

— Craig Thompson

365 Starry Nights, An Introduction to Astronomy for Every Night of the Year, by Chet Raymo, 225 pages, Prentice-Hall, Inc., $12.95.

ONE of the most difficult challenges which faced me as an earth science teacher was presenting apparent motion of celestial objects — stars, star groups (constellations), our sun and planets — so that students could conceptualize this fairly abstract study. I wish now that Chet Raymo had published his book sooner so I could have supplemented my classroom and field investigations.

The author's approach to star study is unique — to present descriptive material about a constellation for *every* day of the year.

> *"If you make it through all 365 starry nights, you will have completed a kind of mini-course in descriptive astronomy."*

Informational content and understandings are introduced, developed and woven throughout the text — sort of "sneaked in" amongst each nightly diary entry. The author reveals some often ignored but very real enlightenments.

> *"May 1st — The first wild flowers of the new season push up green leaves . . . each leaf is a complex chemical factory designed to convert carbon dioxide, water, and starlight into the fuels of life."*

Terms are highlighted in bold print and defined for the layperson, e.g. celestial sphere — the imaginary sphere that surrounds and encloses the earth. Directions for finding star groups are given with the help of easy-to-understand sky maps. Star locations given are for a hypothetical observer at a mid-northern (approximately 40° N) latitude. Raymo shows you a convenient way to describe the positions of stars in the sky by using the spread of your fingers on your outstretched arm.

A glossary defines words and refers to the date of application within the text. A short list of recommended atlases and references is included. However, an index of constellation names for any night you are under the stars is needed.

The real worth of *365 Starry Nights* is its usefulness for the field — a soft-covered resource to be kept in a convenient place for quick reference. My copy is on the shelf next to my bird, wildflower, geology and other field books!

—Darwin J. Roosa

Your questions answered by Alan Mapes

Snake Identification

Last summer I saw a snake near my home on Long Island. I hope you can identify it for me. It was about two feet long and slender-bodied, cocoa brown in color with distinctive white rings around the body. Each ring was about one-fourth-inch wide and there was a ring about every two inches along the body.

John David Bennet, Cutchogue

The snake you saw sounds like an eastern milk snake, although the color pattern is a little more complex than you describe. Colors will vary between individuals with the blotches brown to reddish brown and the background color grey to white. This secretive snake preys largely on mice and for that reason is typically seen around barns where mice are plentiful. This behavior apparently gave rise to the old and completely untrue tale that these animals suck milk from cows — thus the name "milk snake."

Reclaiming Ponds

While spending a few days in the Adirondacks last summer, we passed by Quiver Pond which is between Old Forge and Inlet. A sign posted there stated that the water had been made toxic to fish, and indeed, there were lots of dead fish along the shore. Why is this done before a pond is stocked with fish? What is the effect on other animals living around the pond?

Mrs. George Yager, Rome

Ponds in the Adirondacks often offer poor fishing because they become overpopulated by so-called "trash fish" such as yellow perch and brown bullhead. These species, which were introduced into the area since its settlement, multiply rapidly and produce large numbers of small, stunted fish. They also eat the eggs and fry of the more desirable trout. To reclaim the pond for trout fishing, DEC fisheries personnel first kill the trash fish with a chemical which stops the intake of oxygen through the gills. Fish killed in this way are not dangerous for other animals to eat. After a six-week waiting time, the pond can be stocked with trout. In the case of Quiver Pond, the stocking will be done this spring. Biologists expect three or four years of good trout fishing before trash fish—unwittingly introduced by anglers—take over the pond again. To help maintain good trout fishing, it is especially important that anglers *not* use live bait fish or otherwise release other kinds of fish in trout ponds.

Wasp-eating Mammals

One recent evening I returned home to find a skunk digging up the ground along the edge of our driveway. Neither the car nor our house cat, who watched from a few feet away, seemed to disturb it in the least. The next day I investigated the area and found what appeared to be the remains of a yellowjacket nest. Do yellowjackets live underground? What does a skunk feed on when digging into a nest like this?

William Carlson, Salt Point

Yellowjacket wasps do build fragile grey-colored paper nests underground. I recently had the painful experience of finding such a nest in my lawn when I ran a lawnmower over the entrance hole. Skunks frequently dig into these nests to feed on the larval wasps. Although stung repeatedly, they do not seem to be affected. Skunks are not especially wary animals—they do not have to be. Their natural protection system insures that few animals will bother them as they travel about, scavenging for food.

Uses for Hemlock

I have a large stand of hemlock trees that need thinning. Can this wood be burned in a wood furnace? Will it create a lot of creosote? Does hemlock have any value for rough lumber?

R. F. Bingeman, Forestville

Hemlock is frequently used for rough lumber—also for paper pulp and even plywood in certain areas of the state. For information on marketing your timber, contact your DEC regional forestry office. It would be wise to get advice from a professional forester on managing your woodlands. Your regional forestry staff can provide this service also. As for using hemlock for firewood, it should not cause undue problems of creosote buildup if handled properly—dried well and burned in a fairly hot fire. Its heat value is rated as "medium," providing more heat per cord than basswood but only two-thirds as much as red oak.

Black Spots on Fish

I caught some smallmouth bass in an Essex County pond last summer. While cleaning one of the fish—a five pounder—I noticed several small black spots in the surface of the meat just under the skin. The spots were about one-sixteenth-inch in diameter, and I assumed they were some kind of parasite. Can you tell me what kind of parasites these might be and what kinds of fish they are found in? Also, are the fish containing these spots safe to eat?

Robert J. Stamm, Springfield, New Jersey

The spots you found are commonly known as " black grub" and are one life stage of a common parasite found in most kinds of freshwater fish in New York. They present no danger in eating the fish. In fact, there are no parasites that humans can catch from eating New York State fish if they are cleaned and cooked in the normal manner. The black grub is one of the trematodes (or flatworms) and has an interesting life cycle, depending on three different hosts. The larvae which are present in fish are picked up by fish-eating birds such as the kingfisher. The grub

matures in the bird and produces eggs which pass out with the feces. Snails are the third host, from which the organism goes back to a fish. The presence of black grubs does *not* indicate polluted waters, only that there are snails present in the water.

Virgin Forest

I have visited Hartwick Forest in Michigan which features about 70 acres of magnificent virgin white pine trees. Are there any stands of virgin timber in New York State? If so, are there plans for providing for their future?

James S. Rouff, Rochester

There are many areas in New York State where very old, large trees are to be found. However, it is very difficult to certify that an area has never been influenced by humans (if that is our definition of virgin timber). For instance, we know that Native Americans used fire to maintain openings in the forest long before European settlers arrived. Most of the state has undergone timber cutting at some time since colonial times. There are, of course, some relatively inaccessible areas that have not been logged as far as we can tell. The largest area is found in the Herkimer County portion of the Five Ponds Wilderness Area. There you can find many majestic old white pines. In western New York, there are remote or inaccessible areas of Allegany and Letchworth State Parks and the Zoar Valley State Forest that have probably never been logged.

As to the management of these areas, many of the old-growth timber stands on state lands are found on areas that are set aside for uses other than timber production. The state constitution prohibits the cutting of trees on the approximately 2.75 million acres of State Forest Preserve in the Adirondack and Catskill Parks. To locate stands of old-growth trees in your area, contact the regional DEC forestry office.

Some Further Answers on Steel Shot

As a result of our article on the steel shot program (November-December 1983), several concerns were voiced by the sportsmen required to use steel shot for the first time. The major concern, one which still persists, relates to the crippling loss of ducks. Steel shot is one-third less dense than lead shot for any given shot size and does not retain as much energy when hitting a target. The density deficiency is somewhat compensated by the use of larger shot size. If you normally use #6 or #4 lead shot while hunting ducks, with steel shot you should use #4's or #2's. Two other characteristics of steel shot help further in offsetting the energy deficiency resulting from the lighter steel shot. It has a higher muzzle velocity, coming out of the barrel faster with more energy than lead shot. Because it starts out faster, forward allowance on short shots (under 30 yards) will be less. Being less dense, steel slows up faster than lead. Therefore, on long shots (in excess of 45 yards) the forward allowance will be more. At midrange (30-45 yards) the lead is about the same for both types of shot. These leads all relate to steel shot's performance and capabilities, not those of hunters using it. The average hunter's ability to hit and cleanly kill waterfowl in the field drops off sharply at ranges in excess of 35-40 yards with all shot types. The average hunter should not be making long range shots.

Steel shot is much harder than lead shot and unlike lead retains its form when fired. The result is a more dense pattern and a short shot string. Lead shot tends to produce some disfigured pellets when fired, resulting in a long shot string. When using steel shot for the first time the tendency is to catch ducks in the edge or fringe of the pattern. You can compensate some for the dense shot patterns by going to a more open choke shotgun. A modified choke instead of a full choke works better for pass shooting. Over decoys an improved cylinder performs nicely with steel shot.

Steel shot is much more demanding. With it you must learn to shoot all over again. Once you have mastered the new technique you will find that steel shot does the job most admirably.

The second major concern sportsmen have with steel shot relates to gun damage. Many believe barrel scratching, choke expansion and burst barrels will result. Tests with modern shotguns, double barreled included, have produced only infrequent cosmetic changes. Heavier lead shot loads produce similar changes and have done so for many years before steel shot was developed. The new steel shot shells have thick-walled plastic or nylon shot cups that prevent the shot from even touching the barrel. Gun damage is no longer a valid issue.

— **Jack D. Moser**

Spring Canticle

ONCE, while waiting in the parking lot of a vast shopping center as a cold spring rain beat down upon the blacktop barrens, I heard an old familiar chorus, shrill and jubilant, ring out clearly above the din of the noisy crowd.

Shoppers scuffled in and out of the bright labyrinth, under the flaring lights, to the distant accompaniment of engines and horns. And yet, despite the distant thunder of traffic and the shrill commotion of many people, I heard the jingling recitative clearly. From some forgotten slough, some lost pocket of muck and wetness beyond the concrete maze, there rose up, sweet and clear on the rainy wind, the celebratory chant of *Hyla crucifer*, the spring peeper.

Hyla crucifer—a tiny, earth-colored lump of cold flesh with a dark St. Andrew's cross upon his back—leads a long procession of amphibians to the swamps and mudholes of this world, there to celebrate the rites of procreation. From the deathly torpor of hibernation they come: leopard frogs, common toads, pickerel frogs, green frogs, little grey tree frogs and great rumbling bullfrogs, each in its timeless order, each with its distinctive song.

When the hours of daylight have lengthened sufficiently, when the temperatures remain moderate for several days and nights, then, one evening, or one rainy day, the irrepressible chorus, the spring canticle, of the peepers will ring out sweetly, just as it did long eons ago before there were human ears to hear it.

Therefore, when I stand some evenings in the suck and seep of the swamp, I am waiting for an ancient signal of renewal, for an earnest of a new beginning.

It is a strange, compelling impulse that takes me there—an aging gaffer with a bootful of icy water—to stand amongst broken blades of cattails and sweetflag, where redwings flaunt their scarlet chevrons against the silvery fur of pussywillow aments, and killdeer voice their ancient griefs.

Indeed, all who foregather in the swamp are members of a strange and diverse company, mysterious aggregates of living matter, variously organized, and fashioned—so say the astrophysicists—from elements that were forged in the depths of dying stars. We are, all of us, improbable delegates from the kingdoms of life, assembled in an immemorial meeting place, in confident anticipation of earth's renaissance.

And it jolts a man to realize that of all the celebrants in the slough—man, bird, seed, bulb and root—only one member of the company is uncertain as to the precise moment when the celebration must begin. It is a bitter, galling truth, however hackneyed, that says: *In gaining a measure of knowledge, Man has lost an ancient wisdom.*

Although I shall not find that lost wisdom in the swamp (being neither wise enough nor sufficiently simple) I am content to go there sometimes when the venerable company is meeting, to stand and wait, to watch and listen.

—Forrest M. Brownell