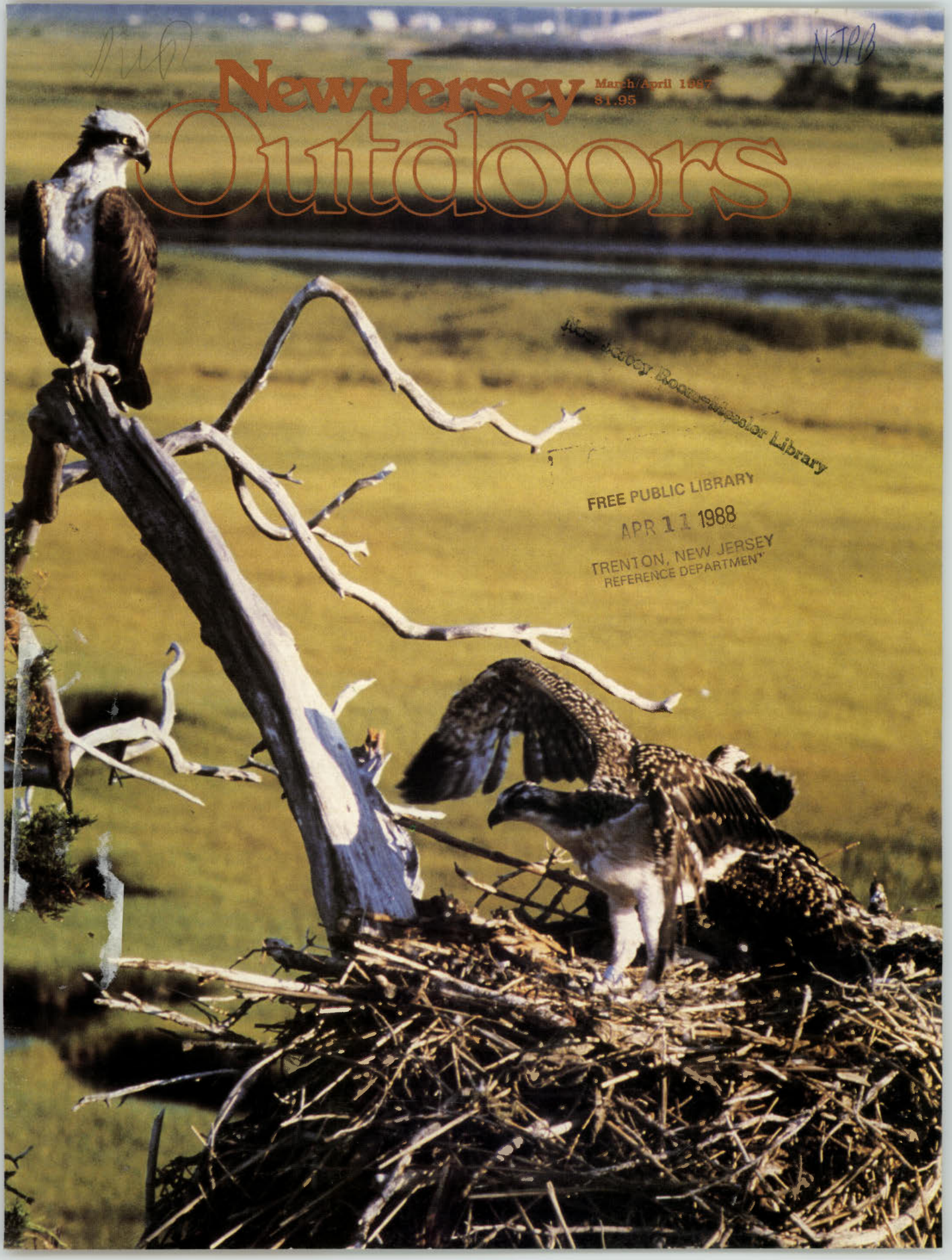
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New Jersey Outdoors

NEW JERSEY OUTDOORS CREDO
This publication is dedicated to the wise management and conservation of our natural resources and to the fostering of greater appreciation of the outdoors. The purpose of this publication is to promote proper use and appreciation of our natural, cultural, and recreational resources, and to provide information that will help protect and improve the environment of New Jersey.

(Note: Costs of publishing the magazine not covered by subscriptions are met from general revenues available to the Department of Environmental Protection.)

The views and opinions of authors do not necessarily represent the opinion or policies of the Department of Environmental Protection or the State of New Jersey.

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03-20-87 Fel

Guest Editorial

Wildlife can prosper in a highly urbanized state. The key is the protection, development and enhancement of excellent habitat. New Jersey has had the biggest challenge of the 50 states and has met it admirably.

The New Jersey Endangered and Nongame Species Conservation Act of 1973 was one of the first of its kind in America, and it was followed by an opportunity for substantial funding with the 1981 creation of the Endangered and Nongame Species of Wildlife Conservation Fund—the Check-Off. It tied together the nongame and endangered wildlife resources and those citizens who benefit from and appreciate their existence. We all have an opportunity to invest in New Jersey's wildlife.

Our interest is soaring! The peregrine falcon, once gone east of the Mississippi River, is now a symbol of successful restoration. More peregrines breed and soar in New Jersey today than in history. They thrive on pigeons and often choose bridges and buildings for their nests. Our urbanized state produces so many peregrines that young New Jersey falcons are used to restore populations in our wilder neighboring states.

A similar success story has come from the management of ospreys, which easily adapt to the hustle and bustle of the busy summer shore. Julie Aberger's article *"Check-Off Time Again"* outlines the great strides made in New Jersey's endangered species restoration through the Endangered and Nongame Species Program.

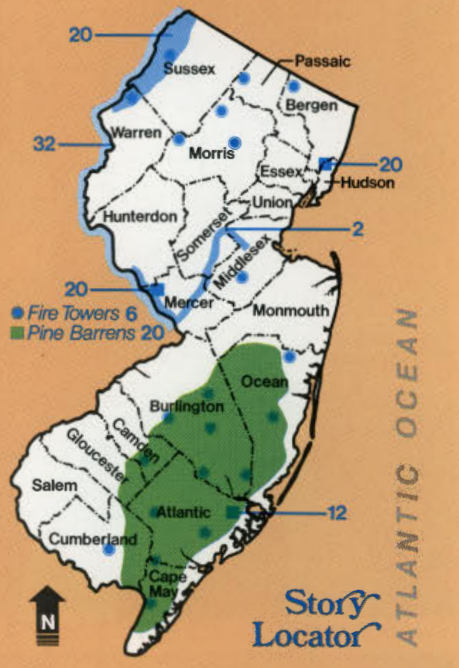
The sources of financial support for wildlife restoration have been diverse, from a Haddonfield Middle School year-long fundraiser to the benefit polo match highlighted in Steve Brush's *"The Eagle Flies in New Jersey."* The citizens of New Jersey appreciate their wildlife and show their interest in very positive ways.

Wildlife of all kinds abounds in our state. Sometimes species adapt to the urban lifestyle as well as we do. The problems some wildlife may cause *("Wildlife in the Delaware and Raritan Canal State Park")* are far outweighed by the pleasure afforded by others. New Jersey is one of the best places in the nation for birding, whether in the Hackensack Meadowlands or Liberty State Park in view of the Manhattan skyline or in the wilderness of Cape May County. Birding is of New Jersey's best natural resource recreations.

The Department of Environmental Protection has a commitment to preserving habitat for wildlife, managing wildlife to provide recreation and maintaining all wildlife, abundant or rare, as participants in New Jersey's ecosystem. In spite of having the most dense population in the United States, New Jersey monitors its wildlife resource and provides assistance when necessary. The wildlife is here for you to enjoy.

Jo Ann Frier-Murza is Chief of the Division of Fish, Game and Wildlife's Office of Endangered and Nongame Species. With a Master's degree in Zoology from New York College of Environmental Science and Forestry at Syracuse, she has been with the Department of Environmental Protection since 1975.

In this Issue



On the map of New Jersey, areas that are referenced in articles in this issue are highlighted. The article page numbers listed in the table of contents appear on the location map. A quick glance shows points of interest throughout the state.

Response was favorable to the New Jersey Outdoors Explorer's premier edition in the September/October 1986 Issue of New Jersey Outdoors. That prompted us to extend the publication of Explorer into the first three issues of 1987. Continuation will depend entirely on response by both our readership and the educational community. Explorer was designed to complement curriculums of 4, 5, and 6th grade studies. Only with positive feedback, will Explorer continue past the May/June issue. We look forward to hearing from all of our readers who have used and enjoyed Explorer.

PHOTOGRAPHS BY
BRECK P. KENT

Wildlife in the D&R Canal State Park

By Paul Stern & Dorna Cooper

The Delaware and Raritan Canal State Park, a long and narrow strip of land following the banks of the D & R Canal, cuts a meandering Y through the slender waistline of central New Jersey.

The State Park consists of 3,155 acres; some run through quiet, rural areas, and other traverse the hearts of busy urban areas such as downtown Trenton and the neighborhoods of Princeton and New Brunswick. Thus, the wildlife that is found in the State Park has a wide range of habitat.

What about the animals that share the Park in urban areas? Some of them have earned the label "pest." Is that reputation due only to the state of their congested environment? Perhaps in other sections of the Park they're a pleasant attraction. What keeps these animals in the urban areas, and what does one do to get rid of them?

To begin with, we'll have to describe the animals that dwell in the Park's urban regions.

In the Princeton area, both deer and geese can at times be considered pests. Within park lands, the white-tailed deer *(Odocoileus virginianus)* finds ideal habitat with ample forage and cover. Can such a shy, gentle creature be a problem? Yes, these animals can be dangerous to motorists. With a healthy environment and an increasingly large population, the deer's range is often forced to extend across roadways. A collision between deer and car, or between the car and other objects by motorists attempting to avoid hitting the animals, can cause extensive damage.

Canada geese *(Branta canadensis)* utilize the open fields of the Princeton area as a stopover on their southerly migration, and some even choose to stay for the entire cold season. These beautiful heralds of winter on the wing can quite often be peril on the green lawns of corporations. Large grazing flocks can turn manicure into mulch, and fecal remnants can turn picturesque pools into slushy sloughs.

In Trenton, where open land is scarcer than in Princeton, a problem animal is the Norway rat *(Rattus norvegicus)*. No one can deny that the rat is truly a pest with few, if any, redeeming qualities. The rats find cover in the dense underbrush that grows in this section of the State Park and forage in refuse sometimes carelessly strewn in certain areas of the city. Rats have been known to bite humans and are also known for spreading serious diseases.

Often mistaken for the Norway rat, but quite different in lifestyle, is the muskrat *(Ondatra zibethica)*; which makes its home in the D & R Canal banks. This creature stays close to the water and feeds on a variety of water plants such as sedges, reeds and roots, and occasionally it will eat freshwater mussels and crayfish. The muskrat is trapped for its valuable fur, which is often used for coats. A major problem posed by the muskrat is the maintenance of the canal's embankments, since these can be perforated repeatedly by the animals' abodes. In the days when the canal was in full-swing operation, "path walkers" were employed by the canal company. Their main task was to fill in the many muskrat holes dotting the banks.

Skunks, Opossums, Raccoons . . .

The Delaware and Raritan Canal State Park does not actually run through New Brunswick, but it does hold lands starting at the southern rim and continuing southward. Dwelling in this heavily populated area are skunks *(Mephitis mephitis)*, opossums *(Didelphis virginiana)* and raccoons *(Procyon lotor)*.

The common striped skunk's status as pest is olfactorily obvious. The skunk's diet consists mostly of insects, with occasional snacks of toads, frogs or bird's eggs. Skunks sometimes play in refuse containers and can also

Whitetail Deer Fawn

Adult raccoon fishing

Canada goose with nest

tangle with household pets, causing problems ranging from simply unpleasant odors to serious eye damage to the pet from the skunk's ejected fetid spray.

The skunk can find cover, food and nesting space on the Park property, as can the opossum and raccoon. These latter two do not create such an olfactory disturbance, but they also tend to be garbage explorers and scatterers.

The opossum wanders about at night, and it appears that nothing is too rancid to be included in its diet. Also at night, the raccoon may be found in garbage pail or tree limb, striking playful poses in the beam of a flashlight before scampering off into the dark beyond. A birdfeeder or garden may never be the same after an evening visit from one of these fur-bearing mammals.

. . . and Beavers

James Amon, Executive Director of the Delaware and Raritan Canal Commission, has come across many chewed trees in the Canal Park near his office just north of Stockton. This evidence of beaver *(Castor canadensis)* is not prevalent throughout most of the State Park, but it is conceivable that beavers could become pests in certain areas by their extensive damage to trees. Mr. Amon states that there is something "cute and wonderful" about having a beaver nearby, but he does wish that the beavers would change their habit of gnawing dogwood and oak to that of devouring the ever-abundant multiflora rose.

The previous paragraphs briefly describe only a few of the many and varied types of wildlife that can be found in and around the Delaware and Raritan Canal State Park. Since this area became a State Park in 1974, a large portion of the land once farmed or kept as open field has been allowed to go back to its previous, wooded state. The State Park increases wildlife habitat by allowing some areas to become overgrown and by creating edge where woods and fields adjoin lawn areas, trails and the canal.

As parks have preserved and managed areas for their watershed, historic, ecological or recreational value, wildlife populations have established new ranges or have regained areas previously lost to single-crop farming or development. The Delaware and Raritan Canal State Park provides such sanctuary for a large number and variety of animal inhabitants. Within the boundaries of the Park they provide enjoyment to a great many people. Protection of these animal resources is necessary for

Paul Stern and **Dorna Cooper** work in the Delaware and Raritan Canal State Park. Paul is the Superintendent and Dorna is part of the administrative staff. Dorna is also a published newspaper writer.

Opossum

the preservation of the Park in general.

By law DEP is charged with the management and control of the animals within the Park boundaries. However, how much of the responsibility for control of pests should rest upon the adjacent property owners? Mr. Amon takes a dual stance in answering this question. The DEP should take part in controlling habitat in the Canal Park harboring pests; for example, it should be the DEP's responsibility to get rid of rats' nests found on Park property. However, many of the problems faced by homeowners, such as raccoons spilling trash cans, are not serious, and the DEP should not be obliged to eliminate the animals from the Park area in cases such as these.

The existence of wildlife outside the Park boundaries may be less than desirable. What can you do?

One route to take is to find out why your property is so desirable to the animals. Eliminate or make inaccessible any food, water or cover your property may be providing. Try scare tactics such as a scarecrow. In the case of deer, drive with caution when passing by fields or wooded areas. Deer are most active during the hours just after sunrise and sunset.

The NJDEP Division of Fish, Game and Wildlife has a Wildlife Control Center located at the Clinton Wildlife Management Area; it is supervised by John Piccolo. If you have a problem with pests, you can call the Center at (201) 735-8793.

The Control Center responds throughout the state to all homeowner complaints about pests, from moles to black bears. The geese, however, are not in their jurisdiction; this is handled through Federal agencies because many states are encompassed in the birds' migration.

Help is Available in Controlling Wildlife

Most remedies recommended by the Wildlife Control Center are simple and inexpensive. They include keeping garbage-can lids secure with flexible cords, storing garbage cans in the garage and installing one way (out!) doors in attics with unwanted visitors. There are also programs for homeowners who experience continual damage to their property; these include chemical repellents, a box-trap loan program and a hunting permit program. Anyone with a pest problem can take advantage of these.

The Delaware and Raritan Canal State Park is a resource everyone can enjoy. It is a green strip of land that runs through the densely populated central section of the State. In 1974 legislature found the canal to be an "extremely attractive and lucrative asset to the State" and "a vital source of water supply ... of historic, ecological and recreational value to the citizens of New Jersey," and in so doing created the Delaware and Raritan Canal State Park.

Perhaps, as suggested by James Amon, an attitude adjustment is what is required to develop a tolerance for the animals that live around us. Many people have a fear of the snakes that inhabit the Park area. Mr. Amon states that these snakes "are not going to hurt anyone and should not be eradicated, as they are a valuable part of the ecosystem." Mr. Amon also cited the complaints of joggers and bikers who have been "attacked" by aggressive geese in spring months. It is important that the geese are allowed a sense of security during their time of nesting. We step aside to allow a horseback rider to pass—why not express the same courtesy to a goose?

It seems it might be worth a try to learn to appreciate the wild things around us and adapt our ways to reach harmonious coexistence with the animals that share our earth.

Fire Towers

Far Seeing eyes

BY JOE HUGHES

"B6, this is Lebanon"
"Go to B6, Lebanon"
"You have a dark smoke at 45° 4 miles"
"B6, that smoke's 303° from Cedar Bridge"
"21° from Apple Pie Hill"

and so the conversations go, repeated many times throughout the year as part of the State's "early warning" or "detection system" in the battle against forest fires, a constant visual of the forest, carried out from 21 lookout towers strategically located throughout the state. The towers and the forest fire observers who man them have the responsibility of protecting 2.7 million acres statewide. They are the eyes of the State Forest Fire Service. The horizon is continually scanned, as they look for the first telltale signs of smoke and beginnings of a forest fire.

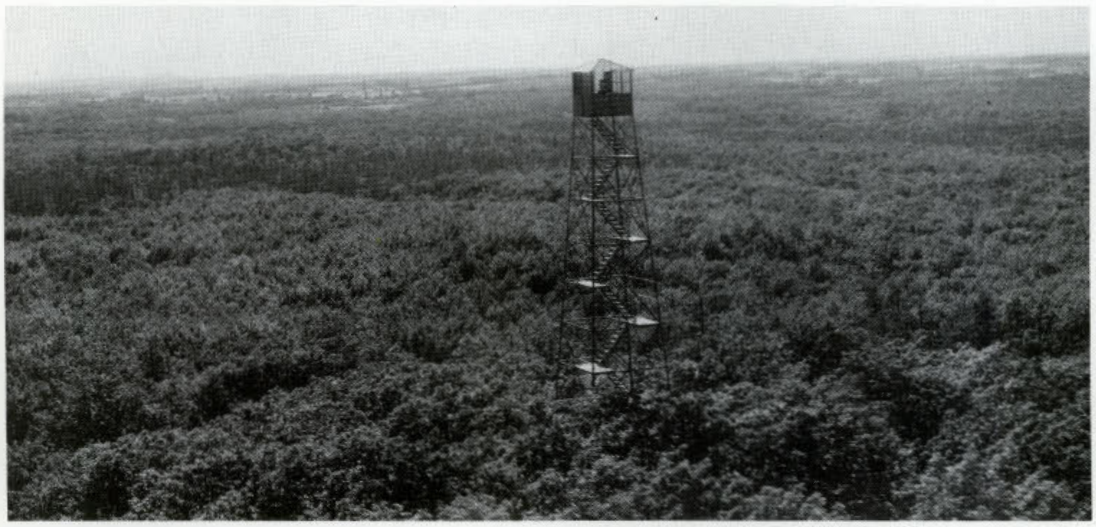
The importance of this job cannot be over emphasized. Rapid initial detection, reporting and attack within the first 10-15 minutes of a fire's origin can spell the difference between one that is easily controlled and a roaring conflagration that burns over many thousands of acres, threatening life and property.

Fire towers continue to be the most effective means of detecting forest fires in their early stages. Observers report approximately 50 per cent of the average 1700 forest fires each year. The majority of these are during the spring fire season, when early detection is critical.

The origins of the State's forest fire detection system go back to the beginnings of the Forest Fire Service itself. In 1905, the first forest protection laws in New Jersey were enacted and in 1908 a township firewarden system was initiated. A series of crude log towers were constructed during the early 1900's. Rural mailmen, on their routes, would periodically climb the towers (see picture) and look for forest fires. If any were detected, they were reported to the nearest township Fire Wardens, who would respond with local crews.

The first fire tower, built as we know them today, was constructed for the Forest Fire Service by the Atlantic City Water Department in 1917. Known as McKeetown Station, this was a wooden structure that was later replaced by a steel tower. It is located right on Route 40 near the site of the former Zaberer's Restaurant and is still in use today.

Culvers Towers was constructed in 1918, under cooperative agreement between the Forest Fire Service and U.S. Government. It was erected on a 1500-foot promontory on the Kittatinny Mountains near Culvers Gap. It still commands an excellent view both up and down the ridge, including all of High Point and Stokes State Forests.



Photographs show changes in fire towers over the years.

PHOTOGRAPHS COURTESY OF THE NJ FOREST FIRE SERVICE, DIVISION OF PARKS AND FORESTRY, DEP

Joe Hughes is the Assistant State Forest Warden.

Several towers were constructed in the early 1920's, including Edison, Windbeam and Penn Station in 1920; Blue Anchor and Belleplain Station in 1921; Catfish and Millville in 1922.

In 1924 the present state system of organized forest fire control was established and several towers were constructed, including Budd Lake, Farmingdale, Retreat, Cedar Bridge, Batsto and Mizpah. Additional towers were constructed in the '30's and '40's, including Bearfort, Milton, Bass River, Lebanon, Medford, Dias Creek, Lakewood and Old Bridge.

Nearly all of these towers are still in use today. A couple have been moved from their original locations to take advantage of better vantage points. Farmingdale Tower was moved to Bear Swamp Hill, Old Bridge Tower went to Jamesburg, Retreat Tower to Apple Pie Hill and Windbeam to Ramapo. Cedar Bridge has been moved two times and is in the process of being moved a third.

In addition to moving towers, several have been raised in height from their original 50 to 100 feet to take in a greater area or oversee an obstruction.

Other structures have also been used over the years for the detection of forest fires. The cupola on top of the Batsto mansion was constructed in 1878. It was used as a fire observation post in the early 1900's, up until the present tower was constructed on the site in 1924.

Kinnelon Station was a stone tower on the private estate of the Kinney family. It was similar in appearance to the tower on Bowman's Hill on the Pennsylvania side of Washington's Crossing State Park. Being a private structure, it was not open to the public but was used as an auxiliary tower during times of high forest fire occurrence.

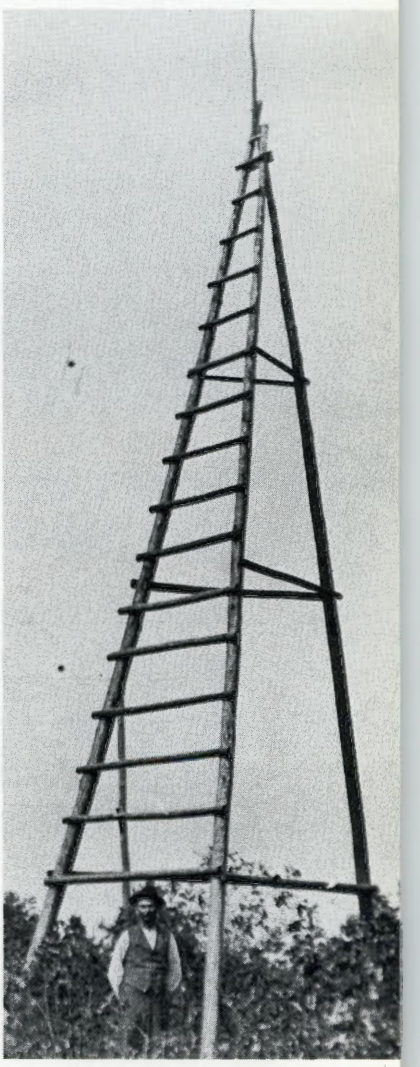
An auxiliary lookout tower was in use at the Pine Crest Sanitarium. A two story structure, with cupola, was located on the Summit of Apple Pie Hill near Chatsworth. The structure has long since disappeared, but the State still takes advantage of this excellent vista and has replaced that structure with a steel tower, aptly named "Apple Pie Hill."

Probably the most interesting auxiliary lookout tower was the Lakehurst Station. This vantage point was established atop the world famous Lakehurst hanger in 1922. It was very unique and has truthfully been called the "biggest lookout" tower in the world. It was also probably the highest, being more than 200 feet above the ground. It was used in cooperation with the Navy up until World War II.

The airplane lookout station on top of the cold storage building, owned by R.P. Manny of Glassboro, was temporarily used as an auxiliary fire lookout in 1942.

At its maximum, the State had a total of 22 forest fire lookout towers. However, an Air National Guard jet leveled Bear Swamp Tower in 1971 during a training run at the Warren Grove Bombing Range. This tower was never rebuilt, leaving the current 21.

The fire towers and their observers perform a valuable service. Other than the addition of the radio several years ago, the operation of the tower and its basic function has remained essentially unchanged from its beginnings at the turn of the century. Despite technological advances in many other areas of forest fire control, they still remain the most effective means of rapidly detecting and reporting forest fires. NJ



New Jersey Outdoors welcomes letters from readers. Letters for publication should include the writer's name and address and should be mailed to: Editor, New Jersey Outdoors, CN 402, Trenton, NJ. 08625. Letters may be edited for reasons of length or clarity. Please keep the letters coming. We'd like to hear what you think about the magazine. We'll also try to answer questions and if we cannot, we'll ask our readers for help.

Dear Editor

Times Remembered

I would like to thank you for the article on the Osage Orange (January/February 1987). When I was growing up, my brother and I would pass the osage orange trees. We loved to find the fruit on the ground. We called them "brains", perhaps because we grew up in a medical family. What else could these be but brains to children. We often used them as weapons in play or as bowling balls. Now I see them quite often along the roadside and I relive my youth. I even use them as centerpieces in the fall and recently showed them to our neighbors who lived here for over fifteen years and never noticed them. They just never looked. They are all around in Ocean County.

Stephanie Belvedere
Jackson

Thank you for reminding us that the wonders of nature are all around. With open eyes and open minds, there is so much to be appreciated and enjoyed.

Seniors Outdoors

The Batona Hiking Club of Philadelphia is opening a new section of the Batona Trail in Lebanan and Wharton State Forests. Ten more miles will be added to the forty mile trail on May 16.

This section is being made for the Senior Citizens of the Hiking Club. It will go from Evans Bridge to Absegami through Martha Furnace. Everyone is invited to come to the opening (10:00 a.m. on May 16 at Evans Bridge, eight miles below Chatsworth on route 563) and hike all or part of this new section.

Peggy Flanagan
Westville, NJ

New Jersey's outdoors has so much to offer—from the wonders of discovery to active sport and recreation opportunities to quiet walks and more.

Suggestion Appreciated

Since I believe I was the first of your readers to suggest the printing of a map of New Jersey to better enable readers to locate sites described in the magazine's articles, I would like to thank you for your doing so in the January/February 1987 edition. It has proved to be helpful and it is also done very attractively.

I will now continue to enjoy your fine magazine even more than I did previously.

Lawrence L. Hlavacek
Pennington, NJ

You were right. A picture is worth a thousand words. NJO welcomes all suggestions and invites our readers to express their opinions.

Comments on Explorer

Congratulations on a job well done! I just finished reading NJO *Explorer*. I think it is a terrific addition to the magazine.

Explaining some of the terms found in the magazine articles is going to be a big help for kids so that they can better enjoy and, more importantly, understand what they read in the articles. I especially liked the "Explorer in Action" article. It is so important that kids understand that they can have a part in making or keeping the natural world around them a bit nicer. Listing the pages of the corresponding NJO articles is also very helpful.

Cathy Smith
Atlantic County Park
Naturalist

Thank you for permission to reproduce, in our newspaper, the "Constitution Crossword Puzzle" which appeared in the Jan/Feb 1987 issue. We are dedicating the February 1987 issue of our *Whitehorne News* and *Messenger* supplement to the Bicentennial of the Constitution, and your publication arrived just as we were preparing our issue.

Mary Lou Purpura
Jean Rappaport
Whitehorne News Advisors
Henry B. Whitehorne Middle School, Verona

Radon-

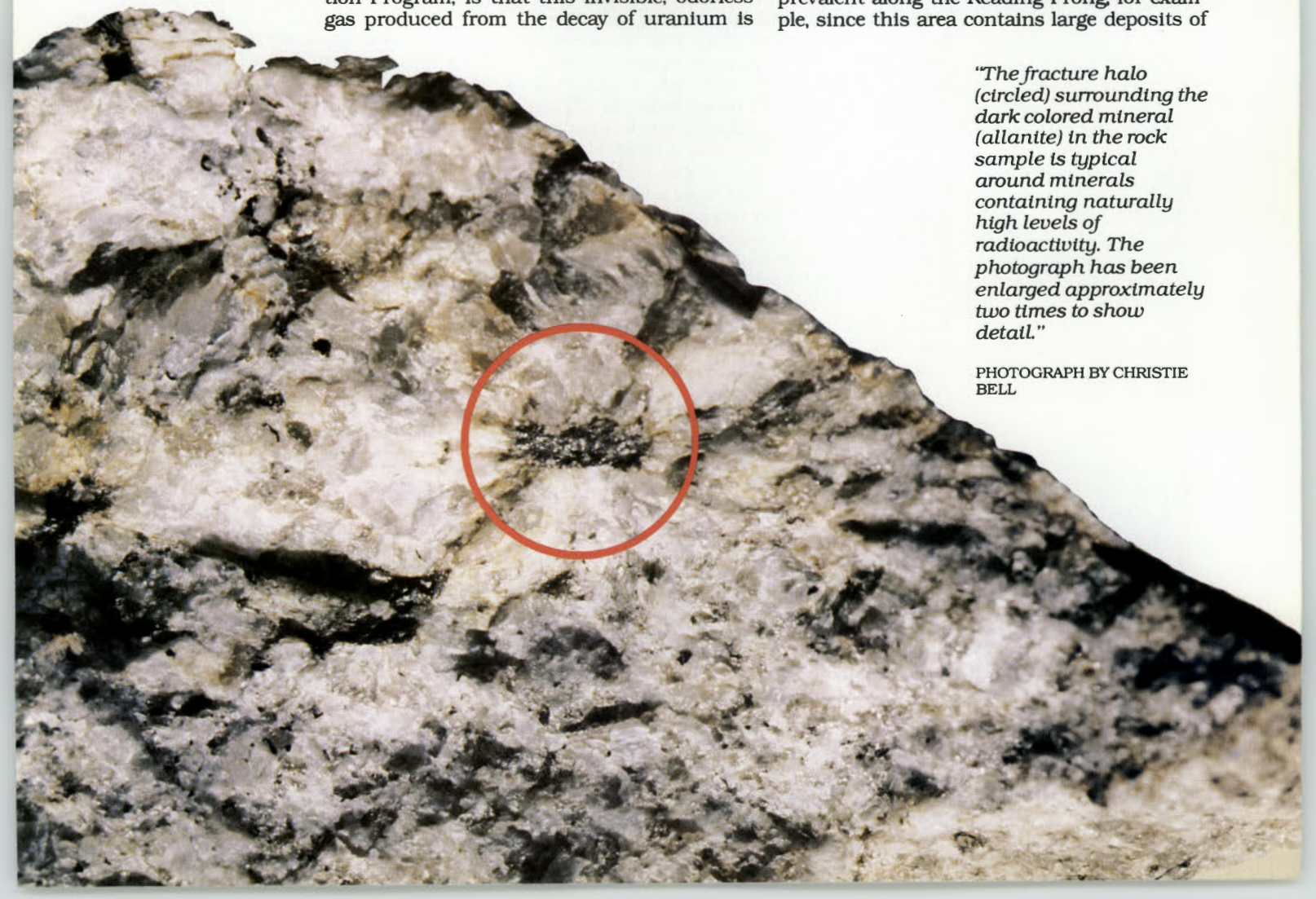
Naturally Occurring in New Jersey

By Rachelle DePalma Garbarine

Tucked away in a corner of New Jersey stands a three-bedroom, Cape Cod-style home like almost any other. A family of four resides here as they have for the past eight years, living safely and comfortably in their solid, little house made of brick with a sturdy concrete-block foundation. On the surface it looks perfect, but further investigation reveals that the house contains radon, a naturally formed radioactive gas emitted from the earth that can slip into a house through openings in floors and walls.

Although the family and the house are fictitious, the scenario is not, and New Jersey is among numerous states dealing with what scientists describe as one of the most serious environmental problems confronting people in this century. Experts agree that the nation has just begun to identify which regions and which homes face the highest risks from radon. The reason, said Dr. Gerald P. Nicholls, acting assistant director of the Department of Environmental Protection's Radiation Protection Program, is that this invisible, odorless gas produced from the decay of uranium is located in low concentrations everywhere on earth. It has been found in soils and rocks containing uranium. "Perhaps the only place radon won't be found," said Dr. Nicholls, "is over a coral formation somewhere in the Pacific Ocean."

However, some areas have been known for years to have high levels of uranium, one such region is the Reading Prong, a geographic province containing geological formations over a billion years old stretching from Reading, Pennsylvania, across the Delaware River through much of northern New Jersey and into New York State. According to Christie Bell, principal geologist at the NJ Geological Survey, the Reading Prong is one of four main geological provinces comprising New Jersey. The others are the Appalachian Valley and Ridge, covering the state's northwestern corner; the Piedmont, encompassing the Newark Basin area; and the Coastal Plain, framing the southern half of New Jersey. Each, said Bell, has radon only in varying degrees. It is more prevalent along the Reading Prong, for example, since this area contains large deposits of



"The fracture halo (circled) surrounding the dark colored mineral (allanite) in the rock sample is typical around minerals containing naturally high levels of radioactivity. The photograph has been enlarged approximately two times to show detail."

PHOTOGRAPH BY CHRISTIE BELL

uranium-bearing granite, gneiss and marble —some of the oldest rocks in the State. Like Maine and Pennsylvania, added Bell, New Jersey is vulnerable to radon gas because of the high uranium content found in bedrock, present throughout much of the State. It could be said that many communities north of Trenton have a "potential" radon problem, explained Bell, adding that in many cases it can be corrected.

Although it is quite common and as old as time, radon was first discovered at very high levels inside a house in the Reading Prong area by accident nearly two years ago. That's when Stanley Watras, an engineer at a nuclear plant in eastern Pennsylvania, set off radiation alarms when reporting to work. Scientists called in to investigate the incident soon learned that Watras's home contained very high levels of radon. This caused experts throughout the United States to shift their attention away from underground mines, where high levels of uranium have been monitored for years, to private residences.

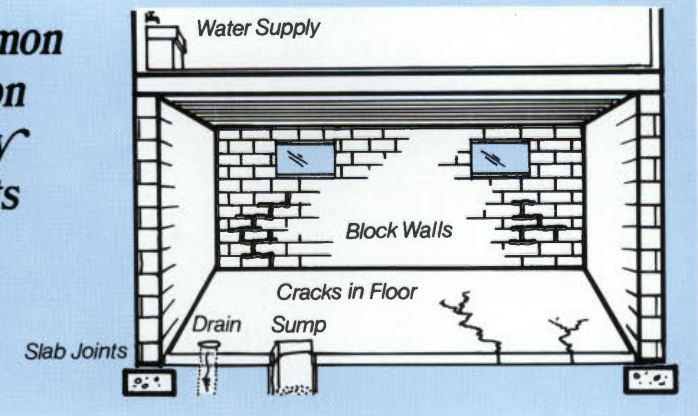
In truth, early humans as long ago as prehistoric times, when they first moved into caves, have unwittingly been exposed to radon. What happens is the gas, when allowed to roam freely outdoors, mixes with the air and disperses. But when trapped inside a house—insulated to keep cool and heated air from escaping—the radioactive gas emitted from the ground cannot blow away and instead accumulates. The newly recognized concern over radon in homes, however, is accentuated because, with no way of getting out, the gas and its radioactive by-products can attach themselves to dust particles. If inhaled, they cling to the lungs, where they could damage cells and lead to cancer.

Although weatherproofing may have aggravated the radon problem by reducing ventilation, which helps to push the gas out of homes, it has not increased radon levels to any significant degree. What has been determined, however, is that the problem is related to differences in air pressure between the inside of the house and the underlying soil. If the indoor pressure is lower—caused by major appliances using large quantities of air—radon gas is sucked up from the ground more easily. This, coupled with inadequate ventilation, causes the carcinogenic gas to collect. Still, radon levels in homes can vary, depending on building type, local geology, climate and the lifestyle of residents, explained Dr. Nicholls, adding that it can be thousands of times greater in one building than another.

Dr. Eileen Hotte, acting chief of the Bureau of Environmental Radiation, said four conditions must be present before a radon problem occurs. They are: (1) uranium or radium is in the soil or bedrock beneath the house; (2) the soil or rock is permeable, and the gas can move through it to the surface; (3) the building has cracks or openings such as fissures in the concrete foundation, allowing the gas to enter the house; and (4) negative or low air pressure exists within the home. "Aside from digging up the entire State, we can never totally rid ourselves of radon," said Dr. Hotte. "But we can control it."

Nonetheless, the possible health risk associated with indoor radon is mounting. Over the past four decades scientists have studied the effects that radon exposure has had on uranium miners who breathed the gas eight hours a day for years while working deep within the mines. From the data collected, scientists determined that many of the miners did, in fact, develop lung cancer. In turn, scientists today estimate that from 5,000 to 20,000 lung cancer deaths a year in the United States may be caused by radon. The possible link between indoor radon exposure and the disease, though strong, remains the subject of great debate in the scientific community. Some questions yet to be answered are: At

Common Radon Entry Points



Toll-Free Radon Hotline

If you are a concerned resident who would like to discuss radon with a qualified radiation physicist at the DEQ's Bureau of Radiation Protection, or if you want to receive a radon information kit, you may call

1-800-648-0394

between 8:00 a.m. and 5:00 p.m. weekdays. You may also reach the Hotline by dialing (609) 530-4000.

what level of radon exposure is cancer a probable risk? How many homes contain dangerously high radon levels? When should corrective steps be taken? Despite the questions, it is believed that the risk does increase as the radon level and length of exposure increase.

What is Acceptable

According to Elaine Makatura, community relations manager at the Division of Environmental Quality, New Jersey has been using 4 picocuries per liter of air—established by the federal Environmental Protection Agency—as an acceptable level. On average, houses contain one picocurie per liter, added Dr. Hotte, explaining that a picocuried is one-trillionth of a curie and represents the decay of two radon atoms per minute. In the now famous Watras house, the concentration of radon gas reached 2,700 picocuries per liter, carrying with it the equivalent risk of smoking 135 packs of cigarettes per day.

The radon issue is also unique from environmental concerns society has faced in the past because it is a natural phenomenon. Its evolution begins with uranium, a precursor of radon. The uranium goes through a series of transformations into other elements. One of the elements along this decay chain is radon gas. This transformation happens over a very long period of time, said Dr. Hotte, describing the time sequence in terms of "half-lives." The time it takes for half the atoms of uranium to decay is 4.5 billion years. Though the half-life of radon is 3.8 days, she added, it is constantly being replenished. However, during this short span of time, Dr. Nicholls explained, radon decays into other atoms that emit alpha particles—which transfer their energy to nearby atoms. It is the radon decay products, he said, that are responsible for almost all the harm associated with radon exposure. An individual exposed to radon during an entire lifetime—at 4 picocuries per liter average—has about one chance in 100 of developing lung cancer.

Because the culprit is not a corporation or industry spewing radioactive gas into the environment, radon defies the traditional governmental regulatory processes. Some states, however, are tackling the problem head-on, and due to its efforts New Jersey has emerged as a leader. At present, two bills have been signed into law appropriating a total of $4.3 million to study and address the issue, said Makatura. As a result, the Departments of Health and Environmental Protection have designed a plan calling for officials at DEP to survey the state for areas containing uranium, helping to identify where and to what degree radon exists. No simple task. Maps of uranium concentration, said Bell, are not foolproof guides to radon because other factors such as permeability and moisture content affect the distribution and mobility of radon. Also, officials are testing radon levels in homes, and the DEP plans to sample 6,000 dwellings to determine locations and housing types most at risk.

Concurrently, Department of Health officials will study the relationship of indoor radon exposure to lung cancer data to see if there is a link between them. Janet Schoenberg, chief of the Cancer and Epidemiology Program, said her department is tracking down past and present residential information on some 2,000 people who live in New Jersey to try to determine the probable radon exposure of the people who developed lung cancer. They will be compared with a group who does not have the disease, in the hope of discerning a pattern. The result of the study is not expected to be available for at least one to two years.

Tests at Home

Meanwhile, homeowners can test radon levels with commercially available kits or by engaging a radon-testing firm. Though the industry is currently independent, the State is moving to regulate it. Nevertheless, officials suggest contacting State environmental agencies for guidance, or calling its radon information telephone number (1-800-648-0394). Brochures and pamphlets are also available. It is also likely that changes will be made in the State's building codes and construction practices. "There's absolutely no question, these things will become a reality," said William M. Connolly, deputy director of the Division of Housing. "It's just a matter of when."

As for existing structures in which radon is found, the solutions can be either costly or inexpensive. They range from structural repairs and improvements, such as putting in underground radon removal pipelines in areas of high radon levels, to sealing cracks and openings and installing fans for those homes with low readings. Many real estate agents, said Susan Covais, government affairs analyst for the New Jersey Realtors Association, are including voluntary clauses for radon testing in contracts.

Senator John Dorsey (R-Morris County), a prime mover behind much of the State's recent radon legislation, said New Jerseyans are "not panicking over radon," but they "are genuinely concerned" with how to correct the problem. "There is no sign of a mass exodus from the Garden State," Senator Dorsey concluded. NJO

Rachelle DePalma Gabarine is a professional writer whose works have appeared in several newspapers. This is Rachelle's first entry in New Jersey Outdoors.

The immature head of King Frederick II

PHOTOGRAPH BY SUSAN CONNELL, HARRAH'S MARINA CASINO AND HOTEL

PHOTOGRAPH BY FISH, GAME AND WILDLIFE

The Eagle Flies

BY STEVEN K. BRUSH AND BRUCE J. THIEL

Action on the polo field

A clear September sky warmed Mattix Run Equestrian Center where polo fans awaited the beginning of the Tricorne International Cup. The contesting teams, the British Combined Services and the host Harrah's, followed the British Color Guard and bagpipe band onto the playing field. Shortly thereafter, the referee tossed out the willow-wood polo ball which was pursued by the mounted, mallet-swinging players. Harrah's team, led by David P. Hanlon, President of Harrah's East, displayed the winning form that had given it a two-year winning streak.

Harrah's team often plays in benefits for causes such as the Cancer Foundation and the March of Dimes. This match, sponsored by Tricorne Limousine Service, was played to benefit the New Jersey Bald Eagle Restoration Project. It was the brainchild of Tricorne's Betty de Guevara to dedicate the proceeds of the event to this worthy cause. Contributions resulting from the event totaled $7000. This money was donated to the Bald Eagle Restoration Project within the Department of Environmental Protection's Endangered and Nongame Species Program.

The Tricorne International Cup was not the only exciting spectacle on that September Saturday. The spectators were also treated to a close-up view of King Frederick II, a three-year-old bald eagle from Montana. He was brought to the match by his handlers, Bill and Stephanie Streeter. The Streeters direct the Natural Science Raptor Center in Milford, Pennsylvania, where they rehabilitate injured birds of prey. Their presence with King Frederick II at the polo match was part of the Center's ongoing public education program on the need for raptor protection. This bald eagle was a striking example of the powerful beauty as well as the frailty of this singular American symbol. King Frederick II became a victim of lead poisoning, the Streeters explained, when he ingested toxic levels of leadshot while feeding on wounded waterfowl. This resulted in permanent damage to his central nervous system so that he could not survive on his own. The Streeters did not need to point out the drooping wing and balancing difficulties

King Frederick II with Bill Streeter, Director of the National Science Raptor Center

PHOTOGRAPH BY FISH, GAME AND WILDLIFE

caused by the poisonous lead. The damage was clearly evident to the spectators who were enthralled with this first-hand encounter with a bald eagle.

After seeing that magnificent bird and understanding the cause of his suffering, it was impossible not to realize the importance of New Jersey's Bald Eagle Restoration project. While man has had destructive impacts on species like the bald eagle, he can also take measures to restore and protect the ecosystem. This has been a key principle of the Bald Eagle Project and the Endangered and Nongame Species Program as a whole.

The Long Road Back

Poison in the form of the pesticide DDT severely decimated the bald eagle population of New Jersey as it did throughout much of the country. In 1959, ten eagle nests were observed in the southern part of the state. Yet by 1975, only one nesting pair of eagles remained in New Jersey. That pair produced only a single eaglet from 1975 to 1979. The lingering effects of the DDT interfered with eagle reproduction, causing the eggshell to be so thin that it would break during incubation.

In an early attempt to reverse the trend, the Nongame and Endangered Species Program attempted to place a captive-born eaglet in New Jersey's lone nest in 1979. This effort at "fostering" failed as natural predators caused the abandonment of the nest by the adult eagles the night before the transfer. The young bird was then returned to captivity. The first successful fostering of an eaglet to the nest was accomplished in 1982. This eaglet, named Faith (and later, Checkoff) had been born in captivity at the Patuxent Wildlife Research Center in Maryland, a federal facility. New Jersey's pair of bald eagles readily adopted Faith and raised her until she fledged, or left the nest. [See "A Little 'Faith' is Followed by 'Stars' and 'Stripes'" by James W. Carpenter and John A. Stegeman in *NJO*, Jan./Feb. 1984 issue.]

As satisfying as the first success was to the Project, it was realized that it was only a single step in the process of restoring the bald eagle as a viable species in New Jersey. The raptor's own traits and elements within its environment created considerable obstacles to the Project.

In order to reach its long-term goal of 8-10 nests in the state, the Bald Eagle Restoration Project had to deal with several problems. For one, bald eagles are monogamous and mate for life. Studies of eagles and experience with captive birds have shown them to be extremely selective in the choice of a mate. Therefore, numerous immature eagles must come into contact with each other for pairing off to take place. Even after successfully fledging from the nest, these eagles do not reach sexual maturity until four to five years of age. During the intervening years, the eagles may wander long distances in search of suitable habitat. Thus, an eagle that has been released in New Jersey may find its mate and locate its nest in another state.

Both natural and human predators are also a constant threat to the survival of eagles. Eagle eggs in inland nests are often eaten by raccoons. Despite laws to the contrary, the primary killer of adult eagles is gunshot. The second greatest cause of eagle mortality is electrocution from contact with power lines. As in the case of King Frederick II, lead poisoning from eating leadshot-laden waterfowl also takes a deadly toll.

Confronted with these realities, the Endangered and Nongame Species Program greatly expanded the scope of the Bald Eagle Restoration Project in 1983. The technique of introducing captive-hatched eaglets into the nest of the single pair of adult bald eagles was continued. Yet it was through another technique, called "hacking," that many more eagles were introduced to the wild.

Previously, the Endangered and Nongame Species Program had utilized hacking to successfully restore the peregrine falcon to New Jersey. New York State's hacking program had resulted in the establishment of two new bald eagle nests. In cooperation with the Natural Lands Trust—Philadelphia Conservationist, a "hack tower" was erected in the Fortescue Glades in Cumberland County. The hack tower is an elevated platform topped by six cages. In the hacking process, eight-week-old eaglets are placed in the cages, normally in late May, and carefully fed until they are 12-14 weeks of age. At that time, the young eagles have developed flight feathers and are ready to fledge. In the case of wild eagles, when the young have fledged, or left the nest, they remain solely dependent upon the parents for 40-60 days. For this reason, New Jersey's fledglings are still fed at the tower for that length of time. At the end of this period, the immature eagles have developed the flying and hunting skills necessary for survival in the wild.

As with any other species, the bald eagle's permanent reestablishment requires an adequate breeding pool. It is critical for a monogamous species like the eagle that a large number of birds in the same age groups be introduced simultaneously to allow for sufficient opportunities for pairing off. Larry Niles, Leader of the Bald Eagle Restoration Project,

estimates that they need to introduce 50-60 birds in order to establish the first five new nesting pairs. (This is assuming that all of the hacked birds survive and remain in New Jersey.) At that point, which Niles feels may occur before 1990, there should be no further need for hacking. As fledglings from previous years mature, more nests are likely to be established. To date, the Bald Eagle Restoration Project has successfully introduced 44 birds. Five years of fostering eaglets into the one existing nest has produced eight fledged birds. Hacking, begun in 1983, has introduced 36 eagles to New Jersey habitat.

Positive Developments

In recent years, the Endangered and Nongame Species Program has begun to see positive developments in the Bald Eagle Restoration Project. In 1986, up to 15 immature eagles visited the Fortescue Glades hacking tower to feed along with the nine eaglets of the year's fledgling group. Particularly encouraging to Project personnel was the observation of two four-year-old eagles, a female and a male, engaged in the preliminary stages of pairing off. Project Leader Niles is looking for this pair to nest in South Jersey this year. In terms of numbers of wintering bald eagles, the most recent available census (with data from January, 1986) recorded 25-30 eagles in the entire state. Up to 15 of these avians winter in the vast marshes and forest along Delaware Bay.

The effort to restore the bald eagle is far from over. Large groups of eagles must be hacked for each of the next several years if a viable breeding population is to be assured. Hacking and fostering are both labor-intensive operations. Success depends upon many variables. For example, the pine tree holding the eagle nest has died and lost its foliage, thus rendering the nest more exposed to the elements and the tree vulnerable to windstorms and rot. It was no longer safe for Bald Eagle Project personnel to climb the tree to continue the fostering operation. Accordingly, a similar, healthy tree nearby was selected last fall and a new nest was built by the Project. There is reason to believe that the pair will utilize the new nest, as they were observed returning to the tree in December.

New Jersey's Endangered and Nongame Species Program is constantly refining hacking and fostering techniques to improve the survival chances of the bald eagles. New sources of eaglets are also being sought. One idea under consideration would be to swap New Jersey peregrine falcons for eagles from surplus southern states with an abundance of bald eagles.

With the bald eagle returning to its former habitats, it is being sighted by New Jersey birdwatchers with increasing frequency. Bald eagles may be identified by using a few distinguishing characteristics. By their size alone—up to 3½ feet long with a wingspread of 7-8 feet—they stand out from most other birds. Bald Eagles soar on flattened wings as opposed to the smaller osprey's arched wings and the turkey vulture's up-curved or V-shaped silhouette. The sharply-hooked beak is prominent as it is nearly the length of the head. It should also be remembered that the immature eagles have gray to black head and tail feathers which become white only at maturity.

Prospects for sighting bald eagles in New Jersey are good along the Delaware Bay shore and in the southern coastal region. They have been frequently sighted at Higbee Beach and Dennis Creek Wildlife Management Areas in Cape May County and Forsythe National Wildlife Refuge-Brigantine Unit in Atlantic County. The open waters around Trenton Marsh, Mercer County, have also attracted eagles in their search for food.

Fall Migration Best Time to See Eagles

The broad wingspan of the bald eagle allows it to soar easily for great distances between feeding grounds. Southern eagles sometimes migrate north, while northern eagles come south after the breeding season. Eagles from both areas may be found in New Jersey during the fall migration. The eagle varies its diet according to the seasonal availability of prey species, according to Project Leader Larry Niles. The bald eagle feeds mostly on fish during the summer. As fall turns to winter, it takes wounded waterfowl and muskrat as well as fish. In the late winter and early spring, these food sources are less plentiful and the eagle scavenges animals and dead fish.

It is through efforts such as the Tricorne International Cup that the work of the Bald Eagle Restoration Project can continue. While the Project has been funded primarily through the Income Tax Check-off, it is becoming increasingly dependent upon individual contributions and fundraising efforts.

You also can support the Bald Eagle Project. To contribute $2, $5, $10 or more, check off line 39B of your 1986 New Jersey Income Tax Return or make a direct contribution. For more information on how you can support the Bald Eagle Restoration Project, write: Endangered and Nongame Species Program, Division of Fish, Game and Wildlife, CN 400, Trenton 08625.

Steven K. Brush and **Bruce J. Thiel** are freelance writers. Steve has had articles published in NJO in the past. This is Bruce's first contribution.

1986 Black and White Contest Photos

In past issues we have published winning photographs and articles from the New Jersey Outdoors 1986 Writers and Photographers Contest.

Left

Title: **In Repair**
By: *John Miller*
Ringwood, NJ
Rank: *2nd Place Published Photographer*

Below

Title: **White Water**
By: *James B. Currie*
Mercerville, NJ
Rank: *1st Place Unpublished Photographer*

Invest in New Jersey's wildlife and

The Endangered and Nongame Species Program depends on
your contribution on line 39B of the sta

atch your interest soar!

our tax deductible donation. Check-off
income tax form.

Raptors have long been a source of fascination to people. Their keen vision, sharp, powerful talons and hooked beaks make them among the most efficient predators of the avian world.

Sixteen species of diurnal raptors regularly occur throughout the Garden State. Of these, nine species are considered true soaring birds, gliding effortlessly on air currents and thermals.

Ospreys—This large fish-eating raptor is found worldwide and is represented by a single species. These birds are seldom found far from water except during migration. In New Jersey the osprey can be seen nesting along the Atlantic and Delaware Bay coastlines. Ospreys are currently listed as threatened in the Garden State.

Eagles—Both North American eagles can be found in New Jersey's skies. The bald eagle is the Garden State's most critically endangered species with just a single nesting pair remaining. The golden eagle is typically a western species, however a small number do nest throughout eastern Canada and northeastern United States. Winter is the best time to observe these majestic birds in New Jersey. Wintering "hot spots" include the upper Delaware River, the Delaware Bay drainages and the Forsythe National Wildlife Refuge.

Buteos—Members of this group have robust bodies, long, rounded wings and short fan-shaped tails. They are often seen soaring overhead in wide, lazy circles or conspicuously perched along our roadways. This group includes the broad-winged, red-shouldered, red-tailed and rough-legged hawks. All but the rough-legged hawk breed in the Garden State. The red-shouldered hawk is listed as threatened in New Jersey.

Vultures—These birds are undoubtedly the most commonly seen birds of prey in New Jersey. Two species, the turkey and black vulture can be found throughout the state. The vultures are the master soarers of the raptor world and can often be seen in large groups. While they are considered birds of prey they rarely kill their own prey, preferring to feed on carrion.

For more information on New Jersey's endangered and nongame wildlife write:

N.J. Division of Fish, Game & Wildlife
Endangered and Nongame Species Program
CN 400
Trenton, N.J. 08625

It's Check-Off time again

By Julie Arberger

Part I

When buying a home in New Jersey, some say, be careful about open fields. In a few years, you may have a few hundred neighbors and a shopping mall nearby.

But what if you were an animal or a plant. There's a good chance that field was your home. The birds, the beasts and the flowers can have it tough in New Jersey. Without a place to live and raise their young, about 34 kinds of animals in New Jersey have begun to disappear. Those close to extinction are called "endangered species"; those bravely hanging on are called "threatened."

What's being done for them?

Quite a bit. For one thing, there is a State office looking after them—the Endangered and Nongame Species Program in the DEP's Division of Fish, Game and Wildlife. Nongame animals have never had the protection game animals have. Game animals are kept thriving because hunters want them, pay for licenses and have votes. But now dedicated professionals at the Nongame Program are working hard to protect and restore our troubled wildlife. There are new laws, new programs, real action. On your own tax return, you may have "checked off" $2 or more dollars, designating them to State programs designed to help our endangered and nongame animals. That means you gave the animals money that otherwise would have been refunded to you. In 1986, individual taxpayers gave nearly a half million dollars.

The result: some species are now recovering; others at least hang on. I made an informal, strictly unscientific survey talking to biologists, herpetologists—that's snake specialists—bureaucrats and birders to find out more.

In Trenton, I saw Jo Ann Frier-Murza, the Chief of the Endangered and Nongame Species Program (ENSP). Her tiny office is cluttered with file cabinets, stuffed birds, pictures of birds and a real live frog. She is a soft-spoken women, but determined.

"The Endangered Species Program had some successes in 1986," Mrs. Frier-Murza said.

"The osprey population had shrunk from 500 pairs in the state during the 1950's to 50 pairs by 1974." (Ospreys are fish-eating hawks.) "It is now making a healthy comeback. In the '60's, osprey eggs in New Jersey were not hatching; DDT had made their shells too thin, and the eggs broke. So we imported eggs from other states where egg hatchings had been successful, and put them into New Jersey nests. Earlier we had built artificial nesting platforms where the birds could safely build nests. These platforms are stormproof, and being on protected property, safe from development. And the eggs hatched.

"We now have 127 nesting pairs in New Jersey, and the bird was taken off the State Endangered List in 1985." (It is still "threatened.")

Where could I take my kids to see an osprey? I asked.

"South Jersey—Higbee Beach Wildlife Management Area. It's an Endangered Species Reserve as well," she responded.

So one mild Sunday late in fall, we drove to Higbee on the Cape May peninsula. The entire place is designed to accommodate our endangered and threatened species. The state has built not only nesting platforms for the osprey, but snake hibernacula (snake dens) and a tiger salamander management pond as well. (Money from the Checkoff Program is used to manage the land.) The marsh, the fields, dunes and beach of Higbee are a natural stopping off spot for thousands of migrating birds.

As we sat on the sunny beach, some small sand-colored birds scurried up and down the sand: semipalmated plovers. Their cousins, the piping plover, are endangered; their tiny nests are nearly invisible in the sand and are inadvertently trampled by people and dogs. Fencing people out did not help—gulls, rats, cats and foxes got the eggs. But the ENSP now plans to protect nesting spots even better for piping plovers by controlling predators as well

Young peregrine falcons in hacking tower

PHOTOGRAPH BY PETE MCLAIN

as people using their habitat.

We hiked the trail through the dunes to a field where some tall man-made platforms have been built for osprey. Would we see one? It was rather late in the season. Most of the birds were gone for the winter (to face new and different dangers along tropical shores). We hiked past a snake hibernaculum (just a big pile of gravel, no signs of life), and came to a shallow pond. Suddenly a huge bird flew up in front of us. Yes, it was an osprey, a large fish-hawk. He hung in the air like a kite, and seemed rather interested in my little boy who wore camouflage colors. He circled once, his huge glider-like wings holding him aloft without flapping. He allowed us one long close look at him, then slowly moved on.

The osprey is doing better each year because the original shell-thinning effect of DDT is slowly decreasing now that the substance is banned. This year nearly 3500 osprey sightings were reported in New Jersey, an increase of over 500 birds alone in one year. That's a record.

The peregrine falcon is another New Jersey success. Nationally the bird is endangered, but not here. Our birds come not only from the Arctic and Greenland as migrants, where the falcon population has recovered, but as breeding birds from "released populations"—captive-bred peregrines set free by the Division of Fish, Game and Wildlife and The Peregrine Fund. Towers and nesting trays have been built throughout the State as well.

Besides, this bird has learned a lesson and done something few living creatures do. It has changed its habits: originally a cliff dweller, the peregrine now also lives on towers built on salt marshes.

Over 600 peregrine falcon sightings were reported in New Jersey in 1986; that's about 100 more than the year before.

"Funny," Mrs. Frier-Murza says with a smile, "The peregrine falcon has been one bird to prosper even with all the construction in our State. It likes high places and sometimes builds nests on top of buildings and in high bridges. We started with no birds in 1975 and we now have 14 nesting pairs."

The most popular bird on the Endangered List is, of course, the bald eagle. There is still only one nesting pair in the State's breeding population, (down from 22 pairs in 1960's), but 51 eagles were observed moving through Cape May this year, and on the upper Delaware the eagles have increased steadily. There are more than 20 eagles wintering on the upper river now, and that's a record.

This record is no doubt due to the New Jersey's "hacking," which Mrs. Frier-Murza explained.

"We bring eaglets from Canada and raise them in hacking towers in the tidal marshes down south in Cumberland County. When they are old enough they are released. We provide food on special feeding poles located in the marshes, which keep the birds around the area for a longer time.

"For the past three years we have saturated the area, releasing a total of 36 bald eagles. It's too early to predict whether those birds will nest in New Jersey or elsewhere."

In 1982, the State began still another effort to counteract the harmful effects DDT had on the bird's hatching success. To keep the eagle eggs from breaking in the nest, they were taken from their nest and plaster replicas slipped in. The real eggs were incubated at the U.S. Fish and Wildlife Research Center in Maryland, then hatched, and when the eaglets were about two and a half weeks old, they were brought back to the nest. Their parents accepted them! By 1986, eight eagle chicks had made their first flights from the New Jersey nest.

Habitat is Important

"But their problems may have just begun," Mrs. Frier-Murza told me. "Bald eagles have a 70 per cent mortality rate. They lose their habitat; they sometimes can't find enough food; they run into an electrical wire and get zapped. I'm happy to say shooting has not been a problem in New Jersey."

In spite of the dangers, conservationists believe that given enough habitat, places to nest, places to feed, places to be safe, the bald eagle will reestablish itself in our state.

Where could you find a bald eagle in New Jersey? Last winter we had gone to the Delaware Water Gap National Recreation Area, a hugh parcel of uninhabited fields, forest and mountains bounded by the river. A Park Ranger said that a few weeks earlier, two Bald Eagles had been spotted near a certain abandoned house, not far from the river. The dirt road to the house was treacherous, narrow and icy. Our eyes were on the road when a huge shadow suddenly slid over our car. It was him—the 747 of birds—

"A BALD EAGLE!" my daughter shouted.

Right on time, as if he had been sent to rendezvous! He then perched in a small tree on the edge of a field. We got out of the car for a better look. He was a young bird, dusky head and tail, but immense, nonetheless. For minutes he sat posed in the tree, scanning the field for food, and, I think, feeling unfriendly

Rattlesnake run over by a vehicle while sunning itself on a warm sandy road

Rattlesnake undergoing surgery

about us. Then he flew. We felt privileged to have seen him so long and so well.

Skipping around the list of our endangered fellow-creatures, we come to the reptiles and amphibians: the timber rattlesnake, the corn snake, the bog turtle, the Pine Barrens treefrog, just to name a few.

"People like birds," Jo Ann Frier-Murza told me, "But most people could live without snakes." Well, two men who can't—and won't—are herpetologists Otto Heck and Bob Zappalorti. These men have been working on check-off funded programs for reptiles and amphibians for years. They know a lot of their animals in person. In 1986, they spotted 32 corn snakes.

"And that's not too many snakes," Heck says frowning. "Fifteen of those were "returns" that is, we had spotted the same individual in previous years. That's always a good sign. However, the corn snake is still highly endangered because of illegal collecting," he says.

The corn snake gets collected because of its gorgeous colors—Indian corn, burnished gold, and oranges. Besides being beautiful, it is also gentle—a real collector's item, nice to have around.

Heck took me into the snake house—on top of the biology department at Trenton State College—where he keeps the corn snakes used in his Captive Breeding Program. As he held a magnificent four-foot-long beast by its tail, its front end kept trying to slither into his pocket. It was that time of year—snakes like to crawl into narrow places for the winter and keep warm. Heck explained the program to me;

"We keep some adults in cages to breed. They mate and lay eggs and we release the young hatchlings when two weeks old."

This year nine eggs were laid, six hatched; six baby snakes went new into the woods.

"What is especially harming the corn snake and other endangered reptiles and amphibians are all those all-terrain vehicles, the three-wheelers and dirt-bikes. They kill lots of them. Snakes like soft sand. So do the Evil Knievels."

And what about the timber rattlesnake? How is it doing, and does anybody care?

"Snakes need all the friends they can get," Bob Zappalorti said firmly, "and I'm one of them."

Zappalorti says in 1986 the timber rattler held its own in New Jersey.

"The biggest problem the timber rattler faces, of course, is development. It chips away at the Pinelands." He stopped a moment and thought.

"And the Pinelands themselves have become a major recreation area attracting more people

PHOTOGRAPH BY ROBERT T. ZAPPALORTI

PHOTOGRAPH BY ROBERT T. ZAPPALORTI

and more cars on the sandy backroads. Gravid rattlesnakes—that is, pregnant ones—like to sun themselves in open areas, usually roads or railroad embankments. They need the sun for their developing embryo. And with all the increasing traffic, they are getting run over."

Zappalorti had just suggested to one township that it close some sand roads next summer in an area where the rattler was being heavily hit by cars and motorcycles.

The law now also protects rattlesnakes. In New Jersey, developers who intend to build more than 25 houses in an area that contains endangered wildlife habitat must provide living space for those animals.

Bob Zappalorti told me about a large land developer who planned to build on a 600 acre wetlands in South Jersey. The area had many corn snakes, rattlesnakes and Pine Barren treefrogs—all three are endangered species. After extensive mitigation with the state—a sort of give-and-take between the two parties—the developer agreed to set aside 206 acres for endangered wildlife. He also agreed to clear four fields for the snakes and build a large hibernaculum, that man-made snake den. Seventy-five per cent of the original animal population was saved.

"Development cannot go ahead without some kind of mitigation," Zappalorti says confidently. "Buffer zones between houses and wildlife habitat are created, hibernacula sometimes built, culverts installed so that animals can pass safely under a road. We look at adjacent properties with an eye to establishing wildlife corridors, connecting areas to give the animals a greater range of habitat."

But the problem still remains: nobody likes rattlesnakes.

"If someone sees a rattlesnake," says Zappalorti, "he kills it. When actually a rattler is not an aggressive snake unless it's provoked or molested. I've never been bitten by a rattlesnake and I've even stepped on one."

We had only a few minutes left to discuss the remainder of wildlife on the endangered list—the Pine Barrens treefrog, some of the salamanders and turtles: Zappalorti commented briefly on the host of problems facing these endangered species: amphibians are being affected by de-icing chemicals used on roads, fertilizers from farm fields and acid rain. The turtles and salamanders are losing their habitat. But the herpetologist believes if we keep preserving our wetlands, this wildlife will survive.

And why must we care about rattlesnakes and corn snakes, bog turtles and osprey?

Jo Ann Frier-Murza summed it up for me:

"First, because the law says we must."

"Second, because what happens to wildlife will eventually affect man," she said firmly, "And third, because it's there."

Part II

PHOTOGRAPH BY JOSEPH SCHMELTZ

Wildlife Rehabilitation Center at Mercer County Corrections Facility

Any idea what a nature trail in the landfills and an exercise cage in a corrections facility have in common? Both were helped by New Jersey's Endangered and Nongame Species program.

Small matching Wildlife Checkoff Conservation grants program—less than $1000 each for local organizations interested in wildlife—is a new feature of the Check-off Program.

One such grant was given to the Hackensack Meadowlands Environmental Center, in Lyndhurst, to help them find out what plants would best grow on a landfill—alias garbage dump—after it is closed.

I followed the garbage trucks past the Meadowlands Sports Complex, through some industrial parks, past some corporate centers to the Headquarters of the Hackensack Meadowlands Development Commission. It is perched over a marsh in the Hackensack River Estuary. Right behind it is the Bergen County Landfill. The area contains more than 250 species of birds and 36 species of fish and mountains and mountains of garbage; a couple of thousand truckloads of garbage are dumped there every week.

Katie Weidel is "Senior Landscape Architect" for the Commission and in charge of experimenting with different grasses, trees and wildflowers. Her assistant, Audrey Benda, a student intern, worked with her on the grant project. The grant money bought the seeds and the seedlings; the two women did the work.

To get to their garden plots, we crossed a ditch full of poisonous-looking liquid and climbed the steep side of the landfill. We walked on rotted garbage, oily and mushy, with debris sticking up everywhere: an old shoe, tin cans, hunks of rubber. The sweet sickly smell of methane gas blew through the marsh. (It is generated by the stuff as it rots.) The plots had already bloomed, and now just seedheads remained. The grasses would weather through the winter. I had missed seeing the wildflower garden in bloom; the black-eyed suzies, the cosmos and snapdragons, and lots more, but somehow I can imagine that tiny bit of colorful life sitting in the middle of this mess, a sign of a better future.

"It was tough to get anything to grow," says Audrey Benda. "There is little topsoil on landfill and what exists is either very wet or very dry. The wind blows unmercifully up here and beats the seedlings to bits. Then came the rabbits, then the raccoons, then the kids on dirt bikes. To get anything to grow was a constant battle, but we succeeded."

The women expect the wildflower garden to reseed itself next year. That's what it is all about—to determine which plants can survive by themselves without fertilizers or soil improvement. The women also experimented with tree seedlings on level ground closer to the marsh. The first crop failed because of the harsh micro-climate of that barren garbage desert. They tried again the second season, this time with older trees. Those are dormant now, but alive like the wildflowers and the grasses, braving the elements of the Hackensack Estuary. The practical application of this project in New Jersey is obviously important.

Another Endangered Non-game Species Program Conservation Grant was given to the Mercer County Wildlife Rehabilitation Center.

What's that? It is a wild animal hospital located at the Mercer County Corrections Facility, a prison near Lambertville. High fences with barbed-wire tops surround it, and officers inside carry guns. It seems an unlikely place for a wildlife hospital, but the prison grounds have plenty of space for the facility's huts and cages, and inmates, carefully selected, help care for the patients.

Naturalist Joe Schmeltz, who is in charge, showed me around: various small cages held a sick crow, an amputee duck and a couple of doves. Three orphaned possums were heaped together asleep in the corner of one hut. The birds and animals looked well-tended, the cages clean, the food abundant. Schmeltz and his assistant Jon Holmes and four inmates patch the wounded animals up and care for them as they recuperate.

With great pride, Schmeltz and Holmes showed me the new flight cage, their pride and joy—10 feet high, 48 feet long and 16 feet wide. The Conservation Grant had been given to the Wildlife Center to buy materials for that raptor flight cage.

"That grant paid for the cinder block, the wood and the wire," said Schmeltz, "but the inmates built the cage."

"It's a wonderful addition which gives large recuperating raptors enough space to fly and exercise," says the naturalist. I thought of a patient taking his first walk in the corridor of a hospital—how important it can be to have such a place.

Just goes to show you—a little money can go a long ways.

Keep checking! NJ

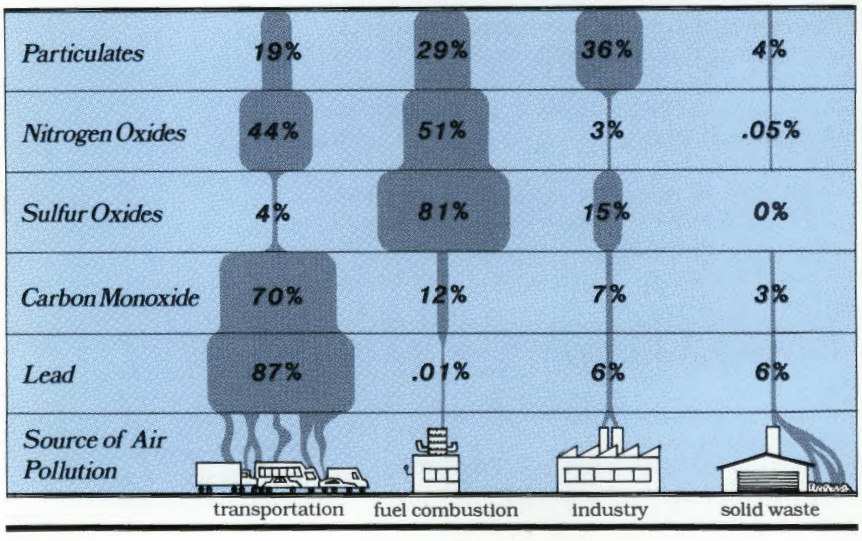
If you or your organization would like more information on this program, please contact:

Endangered and Nongame Species Program
Division of Fish, Game and Wildlife
CN 400, Trenton, NJ 08625
609-292-9101

Julie Arberger is a professional writer whose works have appeared in several newspapers.

New Jersey

This chart shows the percentage of emissions caused by a particular activity, for each pollutant. Total percentages for each pollutant are less than 100%, due to existence of minor activities not shown on this chart. (Source: *National Air Quality and Emissions Trends Report, 1984. USEPA.)*



A recent poll by the Eagleton Survey of Rutgers University showed that one out of four New Jerseyans is concerned about the quality of air in the State. The perception of New Jersey as a "heavily polluted" state is constantly reenforced by comedians everywhere and by travelers on the New Jersey Turnpike who pass miles of petrochemical plants emitting odorous substances.

What is the quality of the air in New Jersey? Let's take a look at where the State's air pollution comes from and what is being done to control it. You may be surprised to learn that we can't blame it all on the turnpike refineries. In fact, our personal lifestyles contribute significantly to air pollution levels.

New Jersey has a unique set of circumstances which results in a high amount of pollution when compared with many other states. The State is heavily industralized, has over four million registered cars, more miles of highway per square mile and more cars per mile of highway than any other state, the densest population in the country and is home to some of the major petrochemical firms in the world.

Each of these factors contribute to air pollution: Many of our day to day activities in the modern world are the culprits. The very first air pollutant came from the fires made by cavemen. As society evolved and became more complex, so did the sources of pollution. From cave fires to firepits in medieval castles to central heating to huge power plants, the air quality grew worse as man's comfort level increased. The industrial revolution brought not only advanced technology but also advanced pollution. The rate of advance is rapidly increasing: since 1950 the population of the United States has increased 60 per cent, while use of electrical energy has increased 600 per cent and total energy consumption has increased by 250 per cent.

In addition to the major pollutants, there are many more that are known to have adverse effects. For example, the Environmental Protection Agency (EPA) has estimated that approximately 2,000 toxic air pollutants that are potentially cancer causing or otherwise toxic to human beings are likely to get into the air because of their general use. It is estimated that over 62 million pounds of these contaminants are emitted each year.

Is anything being done to control these substances? Yes, in fact, of the many accomplishments in the field of environmental protection, none have been more dramatic than the improvement in ambient air quality that has occurred in this country over the past two decades. Urban areas, one plagued with unhealthy levels of sulfur dioxides, carbon

Cares *about* Clean Air

BY CINDY GORDON

monoxide and particulates, now enjoy marked reductions in these pollutants.

It is difficult for us to believe that air quality was once so poor that hundreds of lives were lost because of ambient sulfur dioxide during air pollution episodes in this country and abroad. These tragedies, coupled with an increasing knowledge of the effects of air pollutants on human health, provided the impetus for the strong mandates of the Clean Air Act amendments of 1977. Under the provisions of this federal statute, the U.S. EPA established a regulatory framework upon which the individual states constructed their control programs. States have implemented tough control measures necessary to accomplish national air quality standards in most areas. However, in New Jersey and other high density areas of the country, some pollutants such as ozone continue to resist even the most stringent control requirements, while other new pollution issues such as air toxins and acid deposition now pose a more substantial and complex challenge for the future. Disasters such as the Bhopal, India, toxic chemical release have prompted agencies to take a closer look at these substances and devise appropriate control strategies.

New Jersey First

New Jersey was the first state in the country to pass air pollution control legislation. That was in 1954, and since then the State has maintained its reputation as having one of the country's finest air programs. The air program, part of the State Department of Environmental Protection (DEP), has shown some significant results. Recognizing the serious problem of pollution from motor vehicles, New Jersey implemented an annual mandatory emission inspection/maintenance system in 1972—the first in the country. Since that system was put in place, carbon monoxide levels have been reduced significantly.

New Jersey now must face new problems posed by contemporary air pollution issues such as acid deposition and risks to public health and welfare that could result from an accidental release of chemicals.

DEP is also expanding regulations for toxic materials in the air, and future initiatives may focus on indoor air quality.

DEP and EPA, together, devote more than $10 million each year to fund these programs. They do this because the basic philosophy of the Clean Air Act and New Jersey air pollution control laws is to protect public health and welfare. Air quality can seriously affect each of us.

Poor air quality can affect your health, damage plants and animals, deteriorate materials and lower your quality of life. Air quality has often been implicated in causing and exacerbating lung disease (coughing, chest discomfort, colds, respiratory problems), heart disease and lung cancer. Other physical problems including burning eyes, headaches, allergies, asthma, bronchitis and emphysema have been linked to certain air conditions.

Air Quality and Agriculture

Crops and ornamental plants have suffered from exposure to contaminants in the air. In New Jersey, soybeans, the biggest cash crop in the State, are now being carefully studied by agricultural scientists to determine if the crop has been damaged by air pollution. Leafy vegetables, such as spinach and Swiss chard, are particularly susceptible to ozone. It is widely believed that certain species of trees, such as the red maple, have been stunted following exposure to air contaminants. Acid rain, a particular kind of air pollution that is transported from other regions, is believed to have killed all the newborn rainbow trout in van Campens Brook in New Jersey's Kittatinny Ridge in 1984.

Air pollutants can damage property and materials, soil clothing, discolor paint and even corrode stone, marble and metal. Corroded bridges, cracked rubber and eroded monuments have been attributed to air pollution. In fact, a recent study by Bell Laboratories confirmed that the Statue of Liberty had suffered serious damage and much of the restoration was needed to repair damage done by years of exposure to airborne contaminants.

One of the most precious values of good, clean air is hard to measure. The beauty of a clear spring day, the ability to gaze across a vista without a trace of smog, our entire enjoyment of the outdoors in all seasons, in any location, is dependent on good air quality.

If you want to have some control over air quality, consider what you can do:

- support local, state and national initiatives to keep the air clean.
- conserve energy use.
- use public transportation, take a bike or walk to work.
- maintain your car properly, particularly its emission controls.
- always use unleaded gas if your car requires it.

Don't forget that you can choose not to drink the water, but the air you breathe has no substitute. NJO

PHOTOGRAPH BY MARLENA GLOFF-STRAW

Cindy Gordon is the Chief of the Bureau of Policy and Administrative Planning in the DEP Division of Environmental Quality.

Canoeing the Passaic River . . .

By Lynn T. Combs

The Passaic River is more often viewed as an adversary than a friend; more often ignored than considered a source of beauty or enjoyment. To experience its story, a group of us decided to travel this River from its source to the mouth with the hope of experiencing its quiet beauty, its powerful drama and its abused conditions.

On a gray and cool April day nine eager neighbors in five canoes set out from the Old Mill Inn on Route 202 in Bernardsville, which was as close to the source as we could get. We had planned the first day with the thought that it would be relatively easy, thus breaking us all in to the rigors of a full day on the River. Almost immediately our easy expectations turned ardurous as the small stream dissipated into a marsh. Paddling was no longer possible so we had to get out of the canoes and push, pull or haul the boats over and under trees, grass hummocks and emerging skunk cabbage. Soon the marshland became a thick underbrush of shrubs and briars. A trail was bushwacked through this maze so that the rest of us would have a route to follow. After two hours of such work we hit the open water of Osborne Pond next to the AT&T building in Basking Ridge.

Below the pond dam the River is a meandering stream that runs along the border of the Great Swamp National Wildlife Refuge. There are many tree obstacles and generally a slow-moving current. By the time we reached Passaic Township, our home waters, we were three hours behind schedule. With eagerness we approached the Millington Gorge, one of the most beautiful stretches of this River. The Gorge was filled with trout fishermen but even their activity could not detract from the almost pristine beauty of this area. The steep slopes on both sides of the water are dense with hemlocks giving an ethereal look to the scene. The swifter moving water makes for an exciting but almost too fleeting passage through the Gorge.

After a quick stop for lunch we continued on feeling renewed after hot tea and dry socks. If we were to arrive at our nighttime destination we would have to work at our paddling as we traversed the River between Passaic and Warren Townships. Just as night was approaching we reached our campsite in Chatham Township, where we were officially met by two members of the Township Committee. It was an uplifting way to end the first day.

By 8:30 am we were on our way. The River through New Providence and Summit is a lovely stretch of the glacier moraine. There are many rocks and some interesting canoeing. The spillway in Summit at Stanley Park cannot be run with full boats so we hauled our canoes around the easterly side. Through Chatham Borough the water was active as we passed under the supports for the trolley that once ran between Summit and Chatham. The Chatham Dam added an element of excitement. After we passed the Shepard Kollack Park, where a personalized sign encouraged us onward, the River returned to its slow movement. An osprey glided overhead as we passed close to the Short Hills Mall and the Commonwealth Water Company reservoirs.

The stretch between Passaic Avenue and South Orange Avenue seemed long. We encountered what would be our last tree obstacle, which offered the additional problems of deep, slippery mud and dense poison ivy. We lunched just before the South Orange Avenue bridge. The River continued its slow pace behind the Florham Park Business Park and on

The author (second from left) ready to begin the expedition

CONTEST WINNER

. . . All of it

under Route 10. The railroad trestle in East Hanover was blocked by a log jam thick with branches, boards and other debris. It took some delicate maneuvering to prepare a path for us.

We had planned to spend the night of the second day at the Essex County Park called Charm Acres on Eagle Rock Avenue. However, we arrived there at 3 pm, and knowing that the next day would be particularly long and hard, we decided to continue on for another hour. Thus we left Eagle Rock Avenue and headed into the Hatfield Swamp. This area is open and seemingly unspoiled from the River's vantage point. As we left Route 280 we were alone and removed from civilization except for the sounds of planes. After we passed under the first of the four Route 80 bridges that cross the River we began to look for a campsite. Now we were in Montville. We found a site that was dominated with the sounds of Route 80.

On the River by 7:30 am, we spent the better part of the morning canoeing through Great Piece Meadows. This vast and inaccessible open space seems an enigma in the most densely populated State in the Union. The Passaic River turns on itself several times during its journey through the meadow. The slow course casts a calming effect that seems to match the tranquility of the current. We were entertained by many waterfowl and were struck by the remoteness of the area.

Rounding the bend into Fairfield we reentered settled banks of the River. At Two Bridges are the bridges, one crossing the Passaic and the other the Pompton River. At this convergence the channel becomes very wide and imposing and the River becomes more urban. Crossing under Route 80 again and then Route 46, the River is lined with homes and businesses on both banks. When we approached the island in Little Falls we knew we were nearing the falls. This would be our first major portage. Through earlier scouting and communications we had planned our carrying route and received permission from Passaic Valley Water Commission to cross their property. The portage itself was only a quarter of a mile walk, but getting back to the River meant lowering the canoes and gear down a very steep embankment and then across a rock-strewn river bed to reach the water channel. It took us two hours of steady work before we were ready to paddle again.

The 40 minute trip to Paterson was easy and swift. The River entrance into the City of Paterson is handsome and well kept. The lush green city parks were well populated with children. As we turned into Pennington Park just under the pedestrian bridge to begin our next portage, we were greeted by interested children who helped us carry some of our gear. The carry through Paterson was up a steep slope in the park, down Front Street and then up and through the Paterson Falls Park.

We spent the night on the north side of the River below the Falls. The powerful sound of the majestic Paterson Falls was a dramatic backdrop to the nightfall.

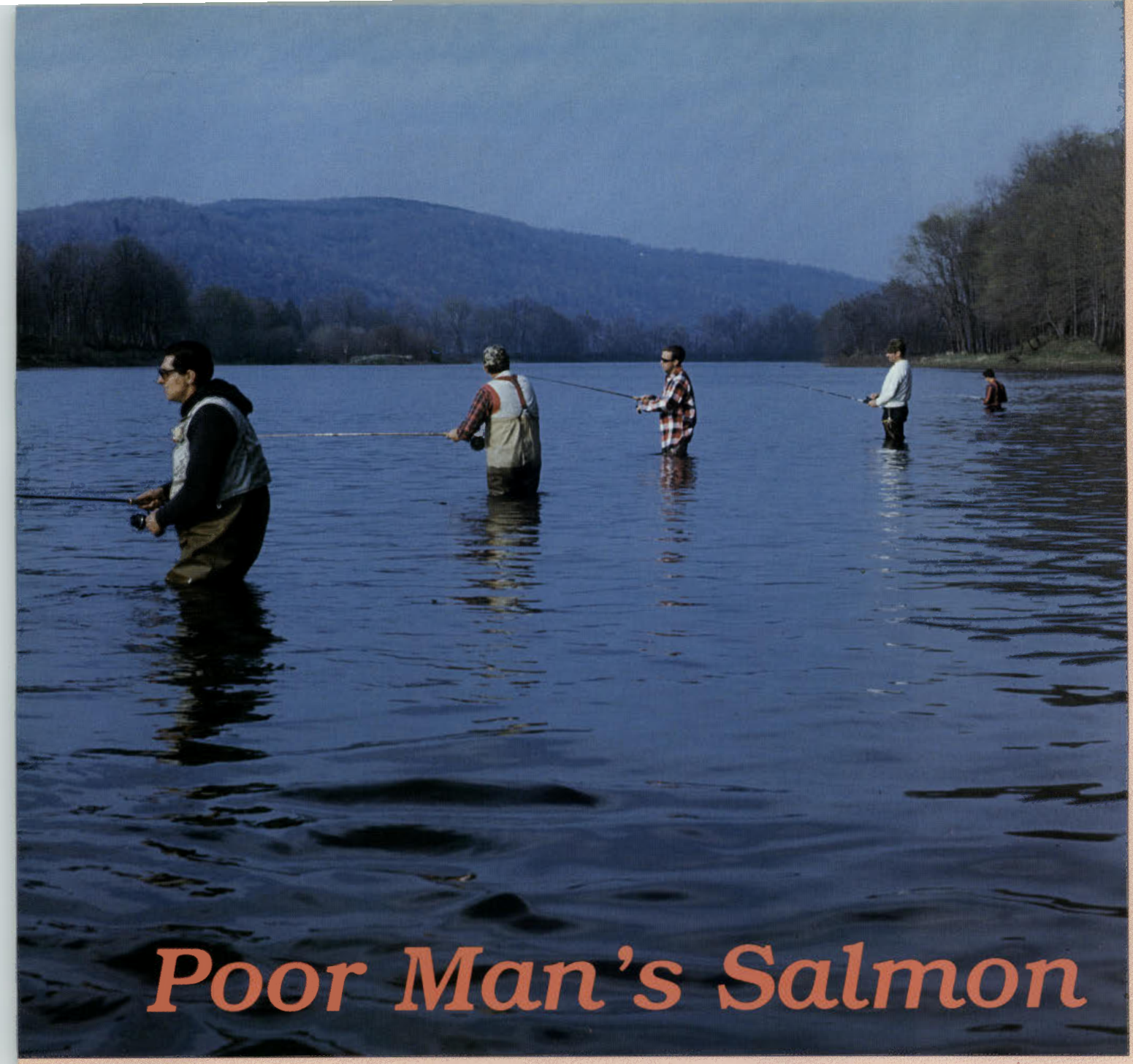
Without so planning we were all up early and on the River before 8 am. This part of the River is the closest to white water canoeing on its entire journey. The gradient of the River as it courses through Paterson is greater than we'd yet encountered, and the water moves very fast through the narrow confines of downtown Paterson. Soon afterwards the River returned to its slow pace and we began to anticipate the Garfield Spillway. We spotted it just as fishermen shouted their warnings. We had to haul our gear over this dam and back down the steep concrete structure to be able to reenter the water. We passed by the Riverside Parks in North Arlington soon after we canoed under Route 3. There was much activity on the shoreline and we were frequently waving to others. We now began to notice the signs of tidal water. The tide was going out and we had trouble finding a picnic spot because of the mud flats. Finally we tied up next to a river piling and climbed out onto a wooded knoll.

As we traveled through Kearney we had an unusual experience. The high school crew teams of Belleville, Nutley and Kearney were involved in their competition. The motoring officials quickly spotted us and asked us to hug the left bank so as not to interfere with the boats. So, as we traveled through Kearney we were entertained by the excitement of a crew race from an ideal viewpoint.

Now we were aware of the change in tide water. The paddling became more work. We crossed under the Old Erie Lackawanna bridge. In the distance stood high-rise buildings of Newark. Just as we approached the Jackson Street Bridge, the Empire State Building of New York City appeared on the horizon and the planes bound for Newark Airport glided overhead. The end was in sight.

New Jersey looks different from the River's point of view. At times the River is remote and natural. More often the River is squeezed and neglected. It is a unique way to experience New Jersey and is representative of the diversity, the success and the failure of our State. One last experience capsulized some of our feelings. While waiting for the van to meet us at the Riverside Park in Newark, one local baseball player asked my husband, "Hey, mister, are you a pioneer?" It was a good feeling to be a pioneer in New Jersey. NJO

Lynne T. Combs is a published author and was the Mayor of Passaic Township, Morris County. The article was selected as the second place winner of the 1986 NJO Editorial Board Writing Contest.



Poor Man's Salmon

To find good shad fishing areas, look for the anglers. When the shad are running, the anglers will be fishing.

By Pete McLain

When the shad bush flowers in late April and May along the banks of the upper Delaware River, the Atlantic shad are making their way upstream on their annual spawning run to the Delaware's tributaries in New York and Pennsylvania. When shad pass the Mercer County Generating Station near Trenton, dedicated shad fishermen start to take their toll of one of the sportiest of game fish. Like the aristocratic Atlantic salmon, the shad don't feed on their spawning run, but they do strike lures, make hard drag sizzling runs, and perform aerial acrobatics similar to the prestigious salmon.

One of the best parts of Delaware shad fishing is that it can be as simple or as complicated as you care to make it. You can drive almost to the river bank, stand on the grassy edge and cast out into the current. Or you can load your tent or camper, tow a boat with a small outboard and spend a week camping at a local private or state campground. One of the best is the state-owned Worthington State Forest in Warren County. Here you can pitch a tent or locate your camper within casting distance of the best shad fishing area on the Delaware. Stokes State Forest in Sussex County is only a short drive to one of the best fishing spots on the River.

The trout season is open when the shad are running, and the famous Big and Little Flatbrook are only a few miles from the Delaware at Layton in Sussex County. It's easy to fish for shad and trout on one delightful spring outing on two of Jersey's most spectacular natural areas.

When and where to fish for shad? The start of the annual shad run on the Delaware River

A happy angler with a six pound roe shad

A pair of roe shad taken from the Delaware River near Dingman's Bridge. The best shad fishing is usually late April through May.

is probably determined by water temperature. Some anglers feel that shad bite best when the water temperature is over 52 degrees Fahrenheit. If the winter has been mild, without too much snow in the spring, the shad may arrive at Trenton in late March. However, a late spring and high or cold river water may delay the migration a week or so. Generally, the peak of the shad fishing in the Dingman's Bridge area of the upper Delaware is late April through May. Most years the shad fishing will last well into June.

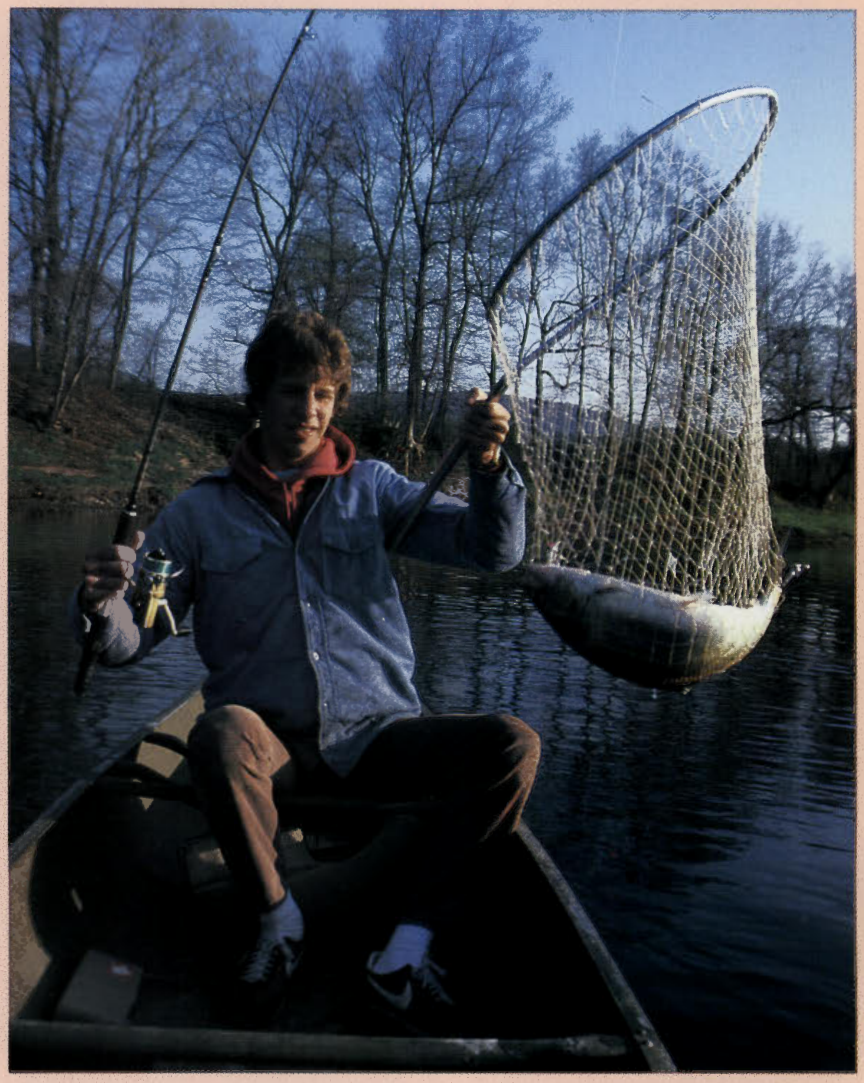
From Trenton to the Water Gap

Shad do not strike lures until they reach the Trenton area. The first shad are usually taken at the warm water discharge of the Mercer County Generating Station at Trenton, then at Scudders Falls, Lambertville, Bulls Island at Stockton, Reigelsville, Easton, Martin's Creek, Portland, and the Delaware Water Gap and above. One of the most popular shad fishing areas in the state is between the Delaware Water Gap and the New York State line at Matamoras. This part of the river is accessible from both New Jersey and Pennsylvania. There are a number of good boat launching sites on the Delaware River, one at the town of Milford. The federally owned Tocks Island National Recreation Area has several good ramps a few miles south of Dingman's Bridge on the Pennsylvania side of the river. There is a site at Columbia, and between Phillipsburg and Easton, at Reigelsville, the Kingwood Access site, Bulls Island near Stockton, the Lambertville ramp, and the Scudders Falls ramp near Yardley, Pennsylvania. The Mercer County Parks Department maintain a good ramp in Trenton. There are a number of other small boat access sites between Trenton and the New York State line.

To locate the best shad fishing spots, look for the fishermen. As the shad move up the river, they tend to follow currents and deeper sides. They will rest or lay over in certain pools or bottom areas. It doesn't take the anglers long to find these hot spots by trial and error fishing. Where there is a well-beaten foot path along the river's bank, you'll find a good shad fishing area.

Bank casting and boat fishing are the most popular fishing methods. Some anglers prefer to wade, but the river water is still cold in May. Overall, the bank fishermen probably catch more shad, because they are spread out the length of the river. Trolling is done mostly in the upper reaches.

Most shad fishing boats are trailered 12 to 15 foot aluminum skiffs or john boats with 6



to 25 hp engines. Some anglers like a square stern canoe with a 4 hp outboard engine. It's important to have an outboard that will troll about as fast as a man slowly walks. A boat that moves too fast seldom catches shad because the lures are not running near the bottom.

Here is one of the major secrets of shad fishing. Make certain that your lures, whatever type they may be, are trolled or retrieved along the bottom or less than a foot above it. It's been truly said that if you don't hook bottom now and then, you are not fishing deep enough.

Lures, weights and fishing line are extremely important. For lures, most anglers prefer the "shad dart" which is a small lead jig with a wisp of bucktail tied on a gold-colored hook. The dart can be any color, but generally red and white or yellow and red are the standards. The weight of the jig depends on the river current, water clarity, and how you are fishing. When there is a strong current, a 1/3 or 1/4 ounce jig may be required, but usually a 1/16 to 1/8 ounce will do the trick. Most boat anglers will add a few split shot weights a foot ahead of the dart to be certain that the lure gets down to the bottom. The bank caster may prefer the heavier darts to allow greater casting distance, and also so the darts will sink faster in a strong current.

Most shad fishermen prefer the medium-action spinning rods of 6 to 7 foot length with a light tip action and a heavy butt section to provide the authority for handling a balky shad. The light tip allows easy casting of the relatively light shad darts.

Shad darts are the most popular lures, but some anglers prefer the small gold-colored willow leaf spinners, small spoons and other flashing lures. Shad do not feed on their spawning run, and you seldom find anything in the fish's stomach. They probably strike at lures that pass their nose as a reflex action, rather than for feeding. Therefore, almost any small lure that comes near the business end of a shad can be a good one.

The fly rod fishermen are in the minority on the upper Delaware, but they have their place if they have the proper tackle and know how to use it. A No. 8 flyrod system with a sinking line or tip and an assortment of small, brightly colored streamers or special shad flies will catch shad, if fished across the currents and retrieved along the bottom.

The boat fishermen usually troll against the current, moving slowly upstream so their lures bounce along the bottom or ride just over it. Some boat fishermen may anchor up current of a good shad-producing area. They then cast lures back into the river current and with just a little rod tip action, wait for the shad to find the bottom-bouncing darts.

Freshwater Fishery Biologist Arthur Lupine, in charge of the Division of Fish, Game and Wildlife's shad research program, reports that in 1986 an estimated 600,000 shad came up the Delaware River to spawn. This was the largest number of shad tallied since the inception of the shad research in 1974.

Two Rules To Follow

Two of the cardinal rules of shad fishing are: First, you don't try to "horse" or force-land a hooked shad. They have a paper-thin mouth and too much pressure will usually cause the hook to pull free. The secret to landing a shad is to keep a steady and even rod pressure on the fish, and allow the reel's drag and the flex of the rod to tire the fish. The second rule is to always use a landing net to boat a fish. Without a net, you'll lose most of your fish at the side of the boat. Bank fishermen can usually lead the fish into the shallows, where they are easy to grab by hand.

The best times of the day for shad fishing are early morning and late evening as the sun is going down. Cloudy overcast days are better than sunny ones. But at the peak of the shad run, they can be caught all day long.

The female shad is preferred by the anglers, as it provides the shad roe which is considered a delicacy. The flesh of the shad is tasty, but the fish is well endowed with large and many small bones, which are hard to remove. With a little practice, an angler can learn to "bone" a shad, which removes most of the annoying small bones. Many anglers prefer to smoke their shad. They are excellent smoked.

A New Jersey fishing license is required for shad fishing on the Jersey side of the Delaware, and a Pennsylvania license when angling on the Pennsylvania side. If you are a boat fisherman you can fish the river with either state's license, but bank fish only on the side of the river for which you have a license. Pennsylvania has a six-fish limit; New Jersey has no daily limit.

Boat anglers should pay strict attention to the state boating safety regulations, and have the required equipment on board. Life vests are a must, a good anchor and line, a pair of oars in the event of an engine failure and extra clothing if you get wet.

Spring and shad fishing in New Jersey are synonymous. Spending a few days on the upper Delaware River trolling or bank fishing for shad will be a fishing experience you'll look forward to every year. NJ

ALL PHOTOGRAPHS BY AUTHOR

Pete McLain is known to many as the former (retired) Assistant Director of the Division of Fish, Game and Wildlife. He is a regular contributor of NJO.

CALENDAR OF EVENTS

March

Saturdays & Sundays	PEQUEST TROUT HATCHERY AND NATURAL RESOURCE EDUCATION CENTER open for tours. Oxford. 201-637-4125
8	SURVIVAL SHELTER BUILDING, Washington Crossing State Park, Nature Center. Titusville. 609-737-0609
12	EASTER EGG HUNT, Allaire State Park, Farmingdale. 201-938-2371
14	PASADENA AND GOOSE POND HIKE sponsored by the West Jersey Group of the Sierra Club. 609-267-7052
15, 22	MAPLE SUGARING, Washington Crossing State Park, Nature Center. Titusville. 609-737-0609
27-29	OPEN HOUSE at Pequest Trout Hatchery and Natural Resource Education Center. Oxford. 201-637-4125
28, 29	THIRD ANNUAL ART AND DECOY SHOW. Toms River Area YMCA. Toms River. 201-349-5104

April

4	OPENING DAY of Trout Season.
4	BUS TOURS OF HISTORIC TRENTON sponsored by the Contemporary Club of Trenton. 609-392-9727
11-17	SOAP MAKING WEEK, Allaire State Park, Farmingdale. 201-938-2371
12	EASTER EGG HUNT, Allaire State Park, Farmingdale. 201-938-2371
18-24	CANDLE DIPPING WEEK, Allaire State Park, Farmingdale. 201-938-2371
19	EASTER PARADE ON THE HISTORIC BRIDGETON RIVERFRONT. 609-451-4802
25	JUNIOR FISHING CONTEST, Allaire State Park, Farmingdale. 201-938-2371
25-26	FIRELOCK SHOOT, Monmouth Battlefield State Park, Freehold. 201-462-9616

May

2	HIKE HISTORIC WHITESBOG, sponsored by the West Jersey Group of the Sierra Club. 609-267-7052

March 1987

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April 1987

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The Brook Trout

A New Jersey Native

BY ROBERT H. SOLDWEDEL

Few fish have been praised as highly as the brook trout. Perhaps the most eloquent description of the "brookie" can be credited to the Rev. Myron W. Reed, a noted gentleman and angler of his day, who described it as "... the gold-sprinkled living arrow of the white water; able to zig-zag up the cataract; able to loiter in the rapids; whose dainty meat is the glancing butterfly."

If a fish could truly be termed "beautiful" that adjective would have to apply to the brook trout both in color and form. It would be impossible to give a single description of the color of a brook trout as it varies immensely. The classic "wild" variety is that "gold-sprinkled arrow" with the bright orange belly, stunning red pectoral, ventral and anal fins framed in pure white and deep blue green back mottled in gold. This fish bears little resemblance to the brook trout fresh out of the Pequest Trout Hatchery and Natural Resource Education Center. The brook trout at Pequest are silvery blue and one must look very closely at them to detect the characteristic coloration. This is a good example of why one should not identify fish on the basis of coloration alone but should also rely on features such as its square tail and the arrangement of its teeth.

The fact that the brookie is a char and not really a trout is mentioned here only because every other writer on the subject brings it up, which makes its noting more or less obligatory. The original error in taxonomy can be traced back to the Pilgrims who mistook it for the same trout which they were familiar with in England. The Pilgrims must have done their fish identification on the basis of color too.

Brook trout are generally described as opportunistic feeders. This means they will try to eat anything they can get their mouth around. This is a very happy circumstance for trout fishermen as it makes the brookie one of the more easily caught trout. Among the more common items on the brookie's menu are plankton, crustaceans, aquatic insect larvae, nymphs and adults (primarily mayfly, caddisfly, midge and blackfly), terrestrial insects, snails, worms, leeches and a wide variety of fish.

Brook trout have relatively high water quality standard requirements. They are among the most sensitive of fishes to changes in environmental conditions which, among other things, makes them a very good indicator of environmental quality. In addition, the earlier stages of its life cycle (egg, fry, etc.) are even more intolerant than the adult stage.

The physical condition of the stream is as important as its water quality. The ideal stream for brook trout has relatively stable water flow, an even mixture of pools and riffles, a silt free gravel bottom, abundant in-stream cover such as boulders, and undisturbed vegetated stream banks. Cover is extremely important in holding trout in a stream, and the number of trout in the stream can usually be increased dramatically by improving the amount of cover available.

Even more important for the natural reproduction of brook trout is the requirement for a silt-free stream bottom. Development or agriculture in the watershed, if not properly conducted, will turn the streams to mud after every rainfall. This is particularly critical during the breeding season (mid September through November in New Jersey) for as the silt load in the stream settles out it smothers the eggs and embryos in the brook trout's gravel redd (nest). The year's reproduction of brookies is at great risk from siltation until the larvae, which is buried in the gravel, absorbs its yolk sac (3-7 days) and becomes free swimming. Even after this critical period is passed, silt is still a major problem as it may wipe out the aquatic invertebrates which are the trout's major food source.

The New Jersey Fish and Game Commission (which eventually came to be known as the Fish and Game Council, which oversees the activities of the Division of Fish, Game and Wildlife) adopted a catchable trout stocking program in 1914 following the commencement of trout production at the Hackettstown Fish Hatchery in 1911. Brook trout were a mainstay of this program until 1970 when disease problems became so severe that it was no longer cost efficient to continue rearing them. Fortunately brook trout were available from the federal (U.S. Fish and Wildlife Service) fish hatchery system and the Division was able to continue its stocking program in those waters in the southern half of the State which were suitable only for this species. When the Pequest Trout Hatchery came "on line" in 1983, it was once again possible to raise brook trout. The annual production of brook trout at Pequest ranges from 200,000 to 230,000, with nearly an eleven-inch average size.

The return of brook trout to the Division's stocking program created an immediate and dramatic improvement in early season trout fishing. Brook trout are more willing to bite than either browns or rainbows, especially during the colder weather which is characteristic of the first few weeks of the trout season. This has been repeatedly documented in tagging studies. There has been no logical scientific explanation for this behavior other than for the fact that they are more active at colder temperatures than browns and rainbows.

Fishermen and fisheries managers alike could not find a better candidate for a "put and take" stocking program, as the brookies are relatively easy to catch and few end up wasted when, along about June, the marginal trout stocked waters become unfit for trout survival and whatever hasn't been caught dies.

"Against All Odds" would be a good title for a documentary on New Jersey's native brook trout populations. Despite their stringent habitat requirements and the fact that the native fish are no more selective than their hatchery counterparts when it comes to being fooled by a fisherman, they continue to survive, often in surprising proximity to urban development.

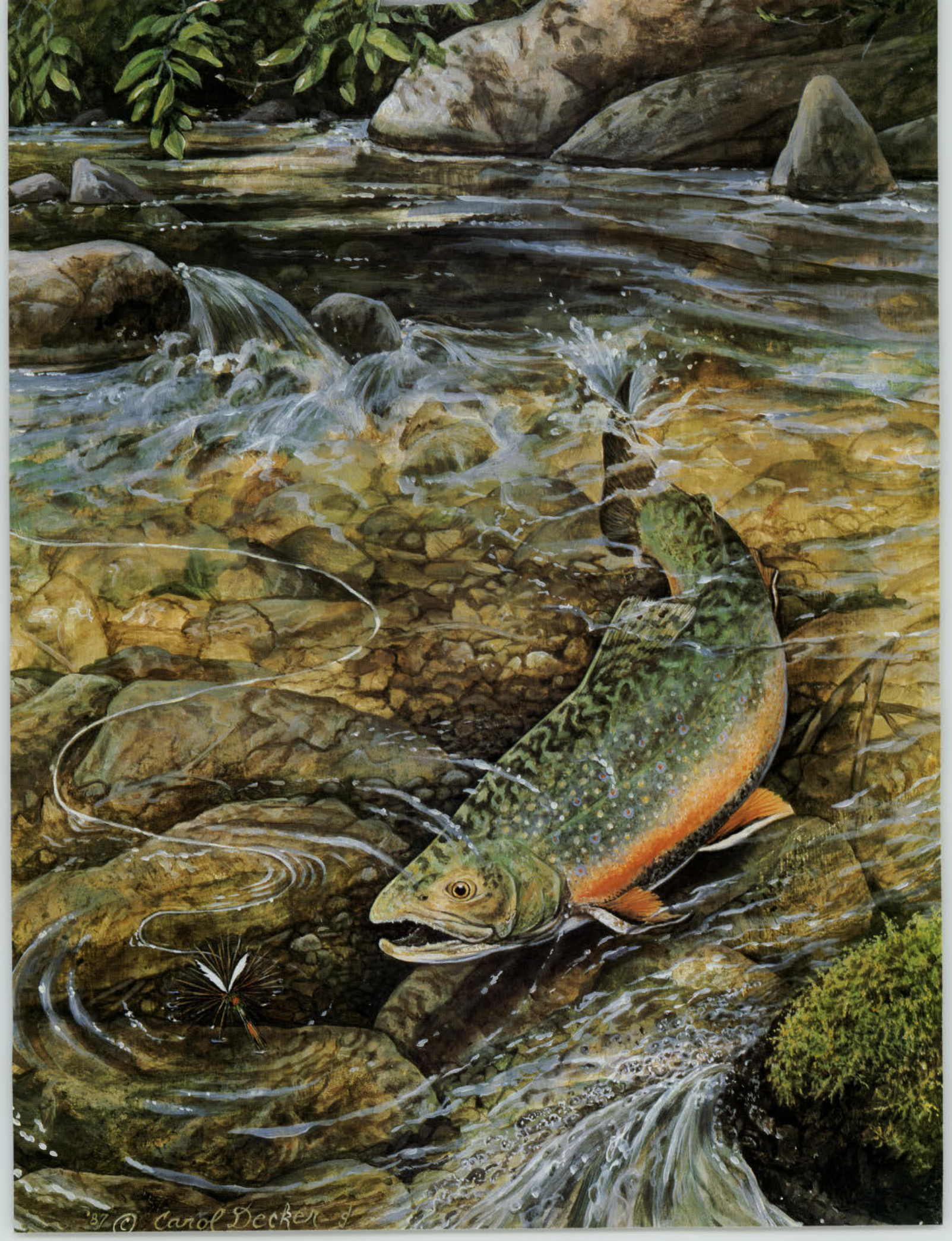
Just how long they can continue to do so is subject to debate. If their habitat can be maintained, a wild brook trout population can be perpetuated indefinitely through the use of "catch and release" regulations or variations thereof, such as those in place at the Van Campen Brook Natural Trout Fishing Area. Habitat protection is by far the biggest challenge. Although significant legislation is now on the books which enables some degree of control over development within the stream and its floodplain and although trout streams receive special consideration in the surface water quality standards criteria, in the opinion of most fisheries managers we are still falling short in providing adequate protection to our trout streams.

Thankfully, the threats to the trout and their habitat have been recognized and wide ranging support exists for the protection of the resource. People now realize that by protecting the brook trout, they are in turn protecting their own quality of life. Looking back through the ancient archives of the Bureau of Freshwater Fisheries it is interesting and encouraging to note that the streams which supported wild brook trout populations in the 1920's are, for the most part, still supporting them today. Despite all their problems, that generation was able to pass on the brook trout to us. Hopefully, the next generation will be able to credit us with doing likewise. NJ

FRONT COVER Nesting pair of osprey in Cape May County. Photograph by William Robichaud.

INSIDE BACK COVER Brook Trout. Illustration by Carol Decker.

BACK COVER "We care about clean air" is the theme of National Wildlife Week, March 14 to 21.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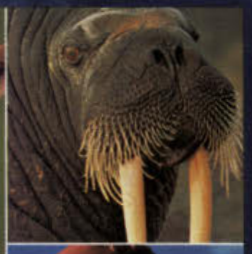

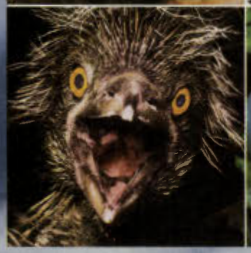

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