

NEW JERSEY Outdoors

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Winter 1995



Gazing at Stars in the Winter Sky • Harvesting Ice at Howell Farm
Selecting a Live Tree for Christmas • Photographing Wildlife — Ethically
Tying Fishing Flies • Reliving New Jersey's Revolutionary War Battles

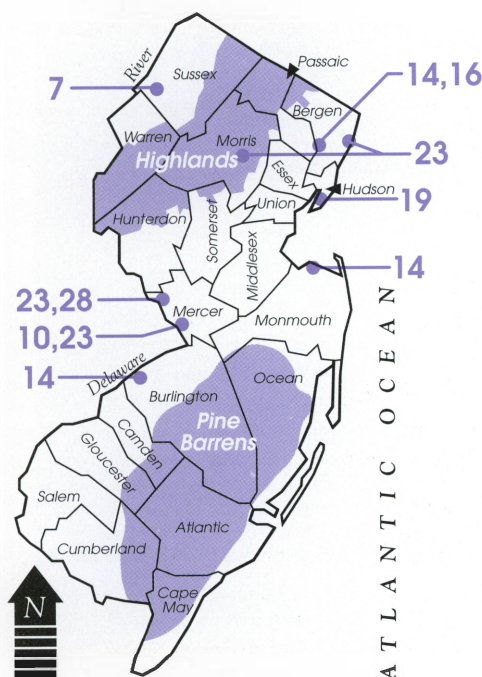


A lone tree stands against the elements at High Point State Park in Sussex County.

Table of Contents

Story Locator

(Page numbers indicated)



Departments

- 2 Editorials
- 3 Mailbox
- 4 Gardens
- 7 Inside DEP
- 10 Cityscape
- 12 Profile
- 14 Research
- 16 Outings
- 46 Marketplace
- 47 Volunteers
- 50 Bookshelf
- 56 Roundup
- 59 Events
- 62 Explorer
- 64 Wildlife in New Jersey

Covers

Front: Blocks of ice are stacked in the ice-house at Howell Farm in Titusville as part of an annual ice harvesting event. (See story on page 28.) Photo by Mary O'Connor
Back: Photo Courtesy of Collections, Historical Society of Princeton

Features

19 A Road Rally Turns Electric

by Judy Finman

Last spring, new breeds of electric and solar-powered vehicles invaded New Jersey. Learn more about schools and colleges in the Garden State that are on the cutting edge of this technology.

23 Six Weeks of Crisis in the American Revolution

by Pete McLain

New Jersey was a key staging ground in the early days of the American Revolution. Find out about the critical battles that were fought here and see the war through the eyes of the people who reenact these famous events.

28 New Jersey's Winter Crop: Harvesting Ice

by Kenneth Wajda

Ice was a crop for many farmers during the late 19th and early 20th centuries. Step back in time at Howell Farm to discover how ice harvesting was done in New Jersey.

36 The Ethics of Photographing Wildlife

by Leonard Lee Rue III

The Garden State is home to many native species. But before you venture out to capture wildlife on film, explore the ethics of this hobby and remember the photographer's Golden Rule: "Take only photographs and leave only footprints."

42 Fly Tying — The Angler's Art of Winter

by Ross Kushner

Winter can be a very productive season for anglers when they discover fly tying. Learn the basics of this practical hobby and prepare your tackle box for opening day.

51 Get Ready to Go . . . Star Gazing in the Winter Sky

by Larry Krumenaker

Lose yourself in the night sky with a journey through the planets, stars and constellations and discover the many myths they evoke.

The striped skunk is an abundant wildlife species in New Jersey. But before you snap pictures of this creature, learn more about the ethics of photographing wildlife, beginning on page 36.



LEN RUE JR.

Editorials



Christine Todd Whitman, Governor

Message from the Governor

New Jersey is part of a global community, and we can learn a great deal by looking at the environmental policies of other states and nations.

The Netherlands is one case in point. New Jersey recently sent a delegation of government, legislative and private environmental group leaders to learn more about efforts to improve both the environment and the economy in this small European country. What they found was a system that has made great strides in reducing air and water emissions and maintaining the quality of natural resources.

In 1989, the Dutch government developed a plan to reverse environmental degradation and achieve sustainable development. The plan aims to double the gross national product of the country and reduce water discharges by up to 90 percent by the year 2010.

The Netherlands has long-term, facility-wide permits with specific goals and effective inspection and enforcement. These voluntary covenants dramatically reduce emissions and discharges over a 15- to 20-year time frame.

These permits not only deal with air and water discharge control devices, but also focus on the total process. Industry likes the long-term predictability of the permitting process, particularly as it relates to capital planning.

The Netherlands also simplified its environmental laws in one document called the national environmental policy plan. The plan's goals are that pollution should be prevented in the most practical way, the best technology should be applied and non-treatable waste should be isolated, managed and controlled.

New Jersey has much to learn from the Netherlands and its national environmental policy plan. By working with businesses, environmentalists and citizens and by developing a state-wide environmental master plan based on our Geographic Information System (GIS), the Garden State too can enjoy both a vital economy and a healthy environment.



Robert C. Shinn, Jr., Commissioner

Message from the Commissioner

New Jersey can learn a lesson from the Netherlands and take a page from its environmental policies and procedures.

The Netherlands abandoned its "command and control" approach to environmental policy five years ago after it became too complicated and costly to implement for both the government and industry. Instead of setting environmental rules from the top down, with the help of industry and environmentalists, the Dutch developed a long-term plan and set goals to clean up the environment emphasizing pollution prevention.

New Jersey has taken the first step to develop an environmental master plan that will set a course of action for the environment in the future. As part of that process, the Geographic Information System, a complex computer mapping model, is being developed for the entire state to provide basic information, such as compiling a geographical inventory of the state's natural resources, locating contaminated sites and identifying biological monitoring stations.

This system can serve as a blueprint for environmental decisions made at the state, county and local levels. In addition, it will enable us to track the progress we have made.

We need to take a holistic approach that takes into account the cumulative effects of different sources of pollution. This approach recognizes that what goes into the air can come down in rain and end up in our streams. It isn't enough to address only one effect of any activity.

Armed with this information, we can set long-term goals for the environment. We can work with industries to find the best ways to reach those goals.

In the end, as in the Netherlands, we hope to provide a flexible, yet predictable, approach to environmental planning.

State of New Jersey
Christine Todd Whitman
Governor



Department of Environmental Protection

Robert C. Shinn, Jr.
Commissioner

Judy Rotholz
Director of Communications

Roger Shatzkin
Administrator, Office of Publications

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This publication is dedicated to promoting and encouraging the wise management and conservation of our natural, cultural and recreational resources by fostering a greater appreciation of those resources, and providing our residents with the information necessary to help the Department protect, preserve and enhance them.

Editor
Beth Kuhles
Art Director
Dilip Kane

Design and Production
Paul J. Kraml

Circulation
Sandra Pearson

Finance
Tonia Y. Brown

Administration
Dawn Blauth

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Mailbox

An Urban Wonderland

I have been a subscriber to *New Jersey Outdoors* since 1957, and I must say that the Cityscape article in the Fall '94 issue ("A Stroll Through an Urban Jungle: The Arthur Kill Greenways Project") highlighted the diverse ecosystems alive and working in New Jersey. Of particular interest in the article was the photograph of the water tower. The tower, and surrounding 35 acres of wetlands, is bordered by Route 22, the Garden State Parkway and Route 82.

Despite all the traffic, great blue herons, egrets, glossy ibis, double crested cormorants and numerous ducks and geese inhabit the area. For the past several years, I have been a volunteer with the Manomet Bird Observatory of Massachusetts as a wetlands watcher. I have been gathering data every week on the number of species of birds at the site.

The brochure available from the New Jersey Conservation Foundation is a must read for anyone interested in urban wildlife studies. I know I have found the diversity of flora and fauna a rewarding experience.

Keep up the good work and the timely articles on New Jersey's wildlife.

Frank Budney
Union

Editor's Note: The New Jersey Conservation Foundation brochure about the natural areas of the Arthur Kill watershed is available by writing to the NJCF, Mendham Road, Morristown, NJ 07960 or calling (201) 539-7540.

Keep New Jersey Green

I enjoy receiving and reading the *New Jersey Outdoors* magazine.

Having lived in several states in the past 12 years and being a native of New Jersey, I appreciate the efforts of the state government and the people of New Jersey to encourage habitat preservation and pollution control.

New Jersey does have unique ecosystems, such as the Shore, the Pine Barrens and other open areas.

I would encourage the state to continue tree plantings and wildflower plantings in order to cut down mowing costs along state roads.

I always enjoy visiting my home state, and I would enjoy living there again in the near future.

Please continue the efforts to preserve the state's quality outdoor environment for New Jersey certainly has areas worth preserving.

Paul M. Loch
Scott Air Force Base, Az.

A Litter-acy Campaign

I am writing this letter with great concern. My family takes two or three canoe trips a season. During our most recent trip on the West Branch of the Wading River, we came across terrible amounts of pollution. I cannot say that the problems that we found are something new. In fact, we have watched it get progressively worse. However, what we experienced on this last trip was devastating to me.

With each trip, we take extra plastic bags to pick up after others who don't think about the beauty that surrounds them. We usually fill a good size bag, feeling awful that people are so negligent, and dump the trash when we get home.

Unlike all the other trips we have been taking for years, the glass and can problems on this most recent trip were dreadful. As we approached any given beach, the sand glittered from the shattered glass. I leaned over at a shallow place on the river to get a handful of stones for my two-year-old to toss into the water, and I sliced my finger on glass. It is everywhere!

The pollution used to consist of whole bottles and cans, but now people go out of their way to shred cans and smash the bottles so that you cannot walk anywhere. My two-year-old even

got cut with his shoes on!

The Pine Barrens are so beautiful, and I hate for my children to see the destruction that is being done. What is the reason for ruining the environment and the enjoyment of others with such extreme pollution? This is a terrible tragedy that makes no sense. I wish that something could be done.

Paula Gormley
Southampton

Many animals are dying of pollution in this world. This has been happening because people have been careless with their garbage. For instance, the ring of the soda can has killed many ducks. The rings get caught on their beaks. That prevents them from eating.

Other dangerous forms of litter are plastic rings. Plastic rings have killed many birds when they get caught around the neck.

Also, the glass bottle has killed small animals. They get stuck inside the bottle, and then they die of starvation.

There are many more animals that have died and will die because of garbage. So anytime you litter, you may be killing an animal.

Yasmin Yaver, Age 11
Highland Park

A Positive View of NJ

I enjoy *New Jersey Outdoors* magazine very much. In the daily newspapers, so much that is negative is directed at New Jersey. It is good to have one publication which tell us of the good things that are going on all the time here in New Jersey.

Robert J. Radcliffe
Marlton

New Jersey Outdoors welcomes letters to the editor. Please include your name, address and daytime telephone number. Our address is NJO, NJDEP, CN 402, Trenton 08625-0402. We reserve the right to edit letters for length and clarity.

Starting a Well-Rooted Tradition With a Live Tree for Christmas



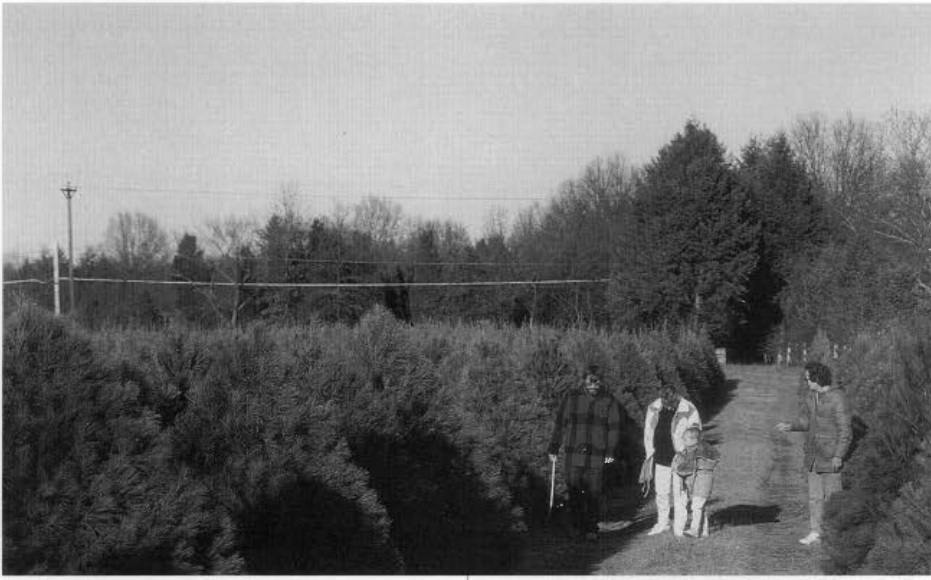
The Harpers purchased a live tree for Christmas last year. Not a cut tree, but one with a root ball that could be planted after the holidays. Its vibrant green foliage held promise for a long life after the transition from house to garden, but by early summer, this evergreen looked more like an “everbrown” as its needles began to sag and lose their rich green color. The tree was dead by midsummer, a mere skeleton of branches that advertised the Harpers as having black thumbs. What went wrong?

Increasing numbers of tree buyers are choosing live, dug-up evergreens for the holidays. Sadly, too many end up like the Harpers’ tree. Often the culprit is not poor stock, but rather a lack of practical information on how to acclimate and transplant trees.

The first step is choosing the right tree. You must select a suitable size and species and an appropriate planting site. In addition, you must take proper care of the tree before and after planting. Because each person’s needs are different, no single criterion can guide everyone when it comes to tree selection.

In the Northeast, the most common live Christmas trees include Douglas fir, blue spruce, white pine and Norway spruce. Just because they grow in *our* area doesn’t mean one will thrive on *your* property. Each species has its advantages and drawbacks, and these can be accentuated or diminished depending on the growing site you select.

Douglas fir, for example, is one of the most popular Christmas trees dug-up or



A family searches for the perfect Christmas tree at Wolgast Farm in Somerset. Many tree farms offer both cut and live Christmas trees.

cut, but is a poor candidate for wet areas that aren't well-drained. Conversely, blue spruce grows well on wet sites, but in areas with thin topsoil there is a greater chance of it blowing over in strong winds as it gets taller. Have a deer problem? White pine may require fencing or heavy doses of repellent to protect it from severe browsing. On the other hand, if deer aren't a concern, white pine grows comparatively fast and forms excellent wind breaks. Norway spruce also makes a good wind break and is somewhat more deer resistant, but it grows slower than white pine.

Many people make the mistake of choosing a tree that is too large for them to comfortably handle. Larger trees also lose a greater proportion of their roots when they are originally dug. With fewer roots to absorb water, a tree's chances of survival after planting are greatly reduced. Trees that are five feet or less have a more intact root system and are easier to handle.

How will the tree mature in your yard? Since all traditional Christmas tree species can reach heights of 60 to 80 feet or more, make certain your tree won't grow to block a window's view, unless that's your goal. If it is planted near your home, make sure it is far enough away so the branches won't

grow into the side of your house and break, leaving their sticky pitch behind.

Remember, you can always talk with a state forester, county extension specialist or local nursery owner for advice on the benefits and disadvantages of growing different trees in your specific situation.

Because live trees are just that — alive — proper care is as important as choosing the right tree. Moving a tree from one environmental extreme (outdoors) to another (your house) and back outside places the tree under significant stress. Acclimating your tree to these extremes is important to ensure its survival.

If night temperatures have been dropping below 20 degrees Fahrenheit at the time you bring your tree home, acclimation is essential, but it is worth the effort even if it has been warmer. Place the tree in an unheated area that is shielded from the wind. A garage, shed or enclosed porch is ideal, but wrapping the tree in a few layers of burlap and placing it in a protected corner outside the house also works. Set the tree in a large washtub or other watertight container with handles for easier maneuvering. Keep the tree in this location for a week to 10 days before you bring it inside.

Once inside, avoid putting the tree

near a radiator, heating duct or other direct source of heat. Turn the thermostat down a few degrees and even lower when leaving your home. The cooler, the better. The tree is dormant in winter and extended exposure to warm indoor temperatures of 68 degrees Fahrenheit or more can cause it to come out of dormancy and trigger bud growth, making it vulnerable to the relatively colder temperatures when it is later brought outside. For this reason, experts recommend leaving the tree indoors no longer than a week to 10 days. It is important to keep the tree's root ball moist at all times, but it should not be immersed in water. Wrapping it in plastic helps to prevent it from drying out.

When it is time to take the tree back outside, return your tree to the spot where you kept it before bringing it inside and leave it there for 10 to 12

Because live trees
are just that — alive
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Gardens

Smaller trees, like this Norway spruce, may be easier to transplant because more roots remain intact.

days. You may need to leave your tree in this spot a little longer if the weather is harsh, and your planting site is unprotected. Continue to water the tree and surround the root ball with wood chips or bags of leaves to keep it from freezing.

If you dig the hole before the holidays, store the soil where it won't freeze (a garage, shed or basement would be ideal), but first separate the topsoil from the poorer subsoil. Dig the hole 12 inches wider than the root ball, but no deeper than the root ball top. Protect the hole from freezing by filling it with wood chips or leaves. Cover the hole with a sturdy wooden board, so people and animals don't accidentally fall in.

When it is time to plant, remove the mulch material and position the root ball in the hole. Fill in with your reserved topsoil and pack it firmly by stamping. If your topsoil is of very poor quality, mix it with well-rotted leaf compost or humus. Undo the twine and burlap from the top and pull it back. Biodegradable material like twine and burlap can stay in the hole, but wire and synthetics should be removed. Nothing should be permitted to stick out of the ground. Fill the hole with water and let it drain, so the soil can settle around the roots, and then fill in with more soil where needed, packing it to make contact with the roots. Use the remaining soil to create a slight basin around the tree and fill it with a chunky mulch that allows air and water to reach the soil.

Fertilizing should be avoided the first



CATHY BLUMIG

year because it can cause burning of the tree's newly developing roots. Watering is usually the determining factor for the tree's survival from early spring through fall. Water the tree often and check the soil frequently to be sure it is moist but not water-logged.

Using a live tree for Christmas and helping it survive the transitory stages takes planning, a bit of know-how and some work. But the effort is well worth it. For many people, selecting a live Christmas tree that they can plant in their yard has become a well-rooted family tradition that serves as an ever-green reminder of holidays past.

For more information on where to find live Christmas trees for sale in New Jersey, write to the New Jersey Christmas Tree Growers' Association, 802 Brookside Drive, Toms River, NJ 08753. Or you can pick up a guide to growers at the state's travel and tourism centers in Deepwater, Knowlton, Montville, Jersey City, Flemington, Cape May and Atlantic City.

by Cathy Blumig, a freelance writer and tree farmer who lives and grows trees in Somerset

Inside DEP

Breathing New Life into Swartswood Lake

Swartswood Lake has long been known as a great place for fishing, boating and swimming. Just ask the 250,000 visitors to Swartswood State Park each year and the residents of nearby Stillwater and Hampton townships. But in the past several years, concern for water quality in the lake has clouded everyone's enjoyment.

The 510-acre glacier lake, located in Swartswood State Park — but surrounded by seasonal and year-round residences — began to show signs of water quality deterioration. The excessive growth of nuisance aquatic plants and algae greatly reduced the lake's recreational value, making swimming, sailing and fishing difficult for visitors to Swartswood.

Fearing the loss of the once abundant trout fishery, members of the local Paradise Fishing Club decided it was time to take action and stop the deterioration of the lake. Now, almost a decade later, a \$250,000 restoration effort by government agencies and strong citizen involvement have both anglers and park visitors once again enjoying the lake and its bountiful riches.

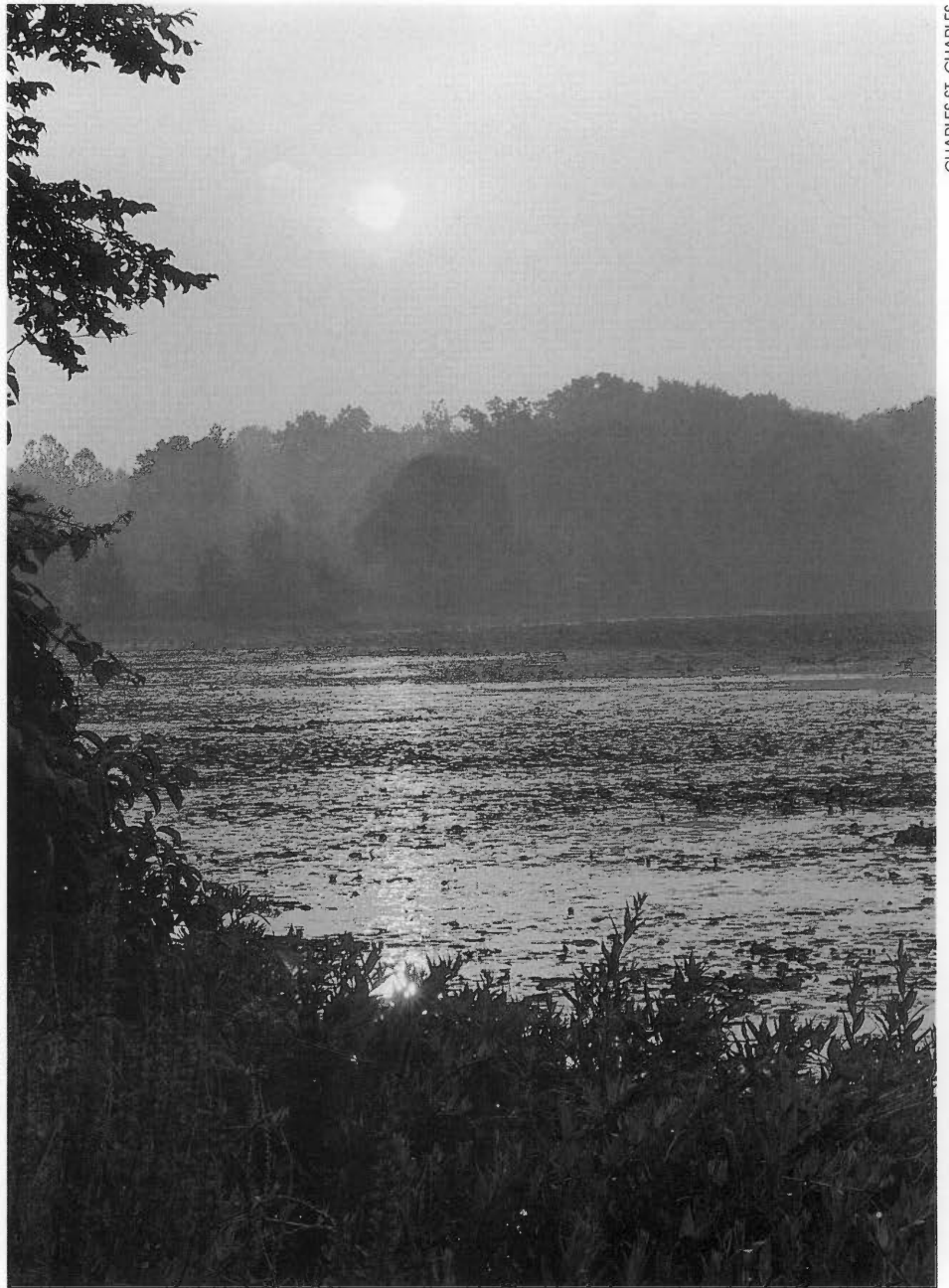
Declining Water Quality

Studies of Swartswood Lake and the surrounding watershed during the 1980s showed that there had been an increase in the concentrations of phosphorous and nitrogen entering the lake from various sources, creating a nutrient-rich environment. The increase of nutrients caused a decline in the dissolved oxygen in the fish habitat layers of the lake, threatening trout survival.

As a result of these findings, the Para-

dise Fishing Club, in concert with the County of Sussex, the mayors of Stillwater and Hampton townships, and the Department of Environmental Protection's (DEP's) Division of Parks and Forestry, formed the Swartswood Lake Restoration Committee. The restoration committee worked closely with state, county and local governments to ensure that the \$250,000 Clean Lakes Grant from the federal Environmental Protection Agency was put into action.

Aquatic vegetation can be seen on the surface of Swartswood Lake at sunrise.



CHARLES ST. CHARLES

STEPHEN ELLIS, SWARTSWOOD STATE PARK



Excessive aquatic growth at Swartwood (left) made fishing, swimming and boating on the lake difficult.

This harvesting machine (below) works like a giant lawn mower to cut aquatic plants in pre-selected areas.



STEPHEN ELLIS, SWARTSWOOD STATE PARK

Once the grant was awarded, a three-fold plan was developed. This plan aimed to increase the amount of oxygen in the lake with an aeration system, to control aquatic plants through mechanical harvesting and to reduce nutrients through better management of septic systems and storm water runoff sources.

The five-unit aeration system, which re-introduces dissolved oxygen into the water, was installed last year. Two of the larger units pull cold water from the bottom of the lake, re-oxygenate it, then redistribute it to the mid-depth layers of the lake that serve as fish habitat. This provides a cool water, high oxygen habitat for brown trout. Three "bubblers" located at various points in the lake help to distribute the oxygen-rich water. Other species of fish, such as rainbow trout, bass, sunfish, catfish, perch and walleye, also benefit from the overall improved water quality.

A land-based compressor system, constructed and maintained by the DEP's State Park Service, powers the two aeration devices and three bubblers that make up the entire system. Because the aeration system provides for a layer of "oxygenated water" which keeps nutrients in check, algae growth is controlled, and the lake water becomes clearer.

Controlling Aquatic Plants and Runoff

Aquatic plant harvesting controls the presence of lake bottom vegetation. The harvesting machine works like a giant lawn mower, cutting vegetation without harming the endangered or beneficial plants. Only pre-selected areas are cut, leaving intact the plant communities that are used by fish for shelter, spawning or feeding. For the best results, plants need to be harvested at least twice a year, more often if growth is rapid.

Harvesting has been found to be a more effective method of control than chemical use, due to the higher cost of chemicals and their indiscriminate effect on plant life. Plant harvesting also is an important safety measure, keeping swimmers from becoming entangled and preventing boats with electric motors — the only motorized boats permitted on the lake — from getting caught in the plants.

Septic and storm water management tackles the problem of poor water quality at its source — malfunctioning septic systems and uncontrolled pollutant runoff. The runoff carries the phosphorus and nitrogen that spur algae growth. A plan is being developed for routine maintenance,

Since the project began, a total of 3,774 volunteer hours have been logged, and the \$250,000 federal grant has been put to good use.

nance, inspection and education for nearby homeowners to achieve long-term improvement at the lake.

The success of the lake restoration would not have been possible without the persistence of the Paradise Fishing Club, which began a letter-writing campaign to local, state and federal officials during the early 1980s. Lynn Halliday, former director of environmental programs for the Sussex County Planning Department, offered technical support, and Dr. Stephen Souza of Coastal Envi-

ronmental Services, Inc. conducted the water quality study.

As a result of the overwhelming amount of citizen participation, the 100-member Swartswood Lake Association was formed. Since the project began, a total of 3,774 volunteer hours have been logged, and the \$250,000 federal grant has been put to good use.

"When you have this many people involved, you just can't be ignored," says Ed Szabo, a member of the Paradise Fishing Club.

The money provided for the installation of the aeration unit, harvesting for one year, ongoing public education, a septic management program and ongoing maintenance and operation for the next three years. In 1995, funding is being sought to continue the harvesting effort to cut another 160 acres of the lake and to continue other various lake restoration projects, many that may be supplied through the DEP with state and federal funds.

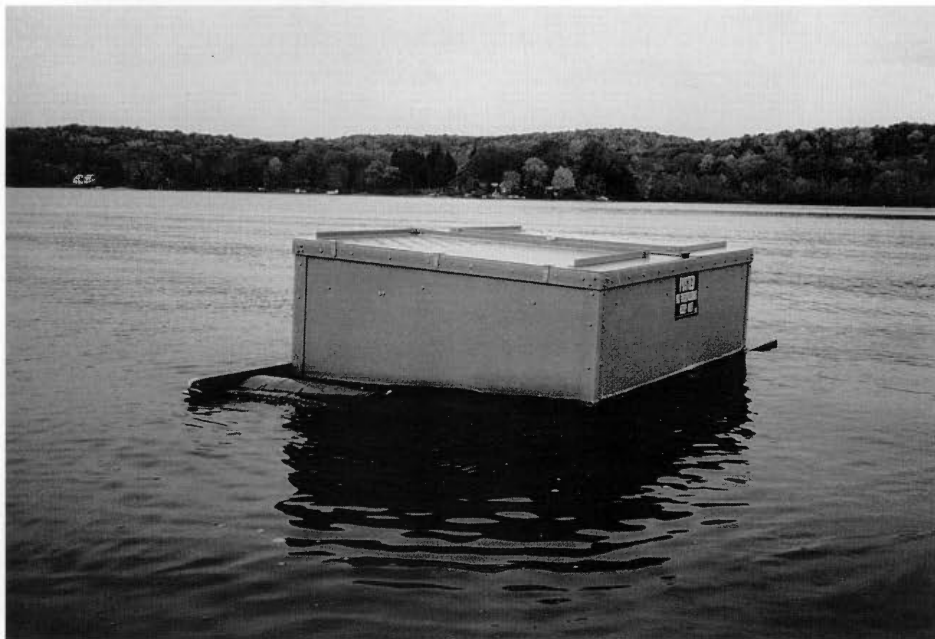
So far, all the time and effort put into the program seems to be paying off. "We see trout fishing getting bigger and better," says Szabo of the improvements. "Water clarity has been excellent, and people find the lake much more desirable."

With the return of oxygen to the water and the decrease in nutrients, the trout are coming back, and more trout means better fishing. In fact, water quality has been so good that the Division of Fish, Game and Wildlife has once again stocked the lake with hardy brown trout. In the future, Swartswood may even become prime fishing ground for trophy trout. And this has Szabo and the Paradise Fishing Club once again confidently casting their lines into Swartswood Lake.

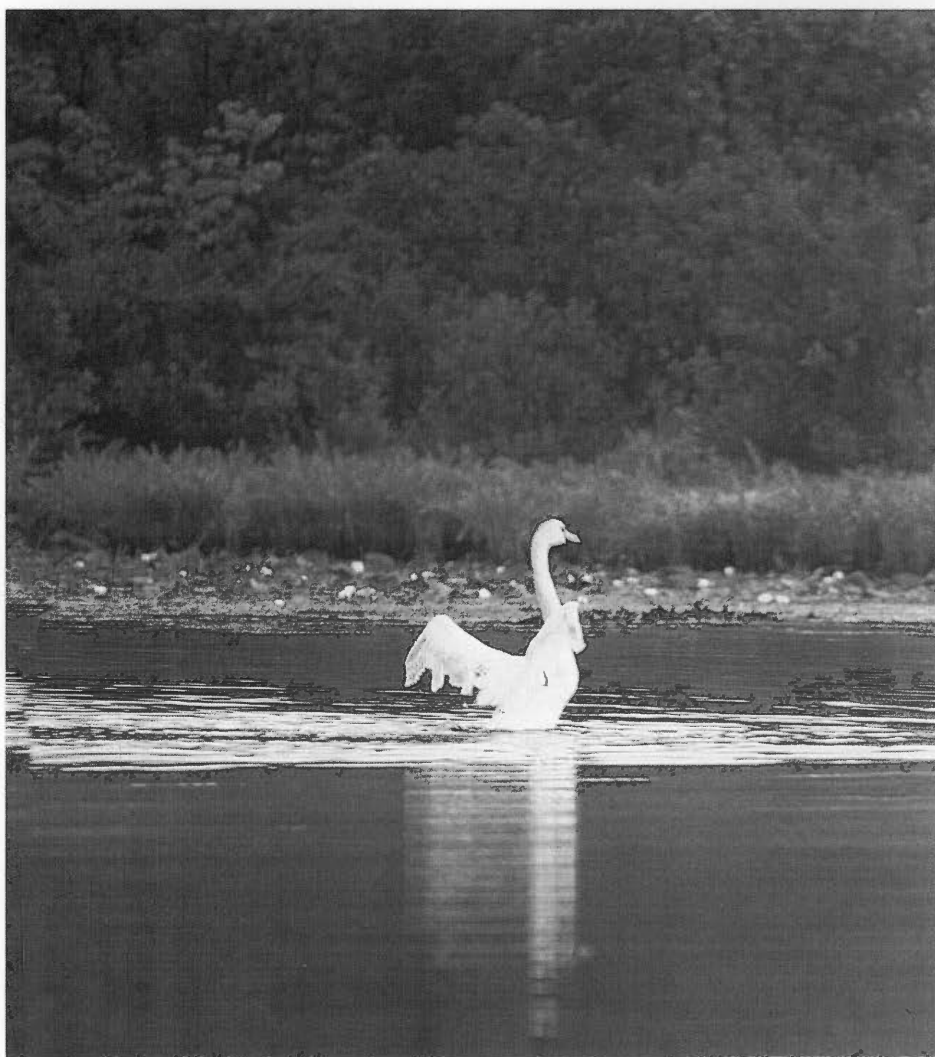
by Jenn Coldren, a communications assistant for the DEP's Division of Parks and Forestry

This aeration unit (top) is capable of processing 30 million gallons of water per day.

A swan (bottom) is one of many species of wildlife that can be found on Swartswood Lake.



STEPHEN ELLIS, SWARTSWOOD STATE PARK



CHARLES ST. CHARLES



On the Canal Banks: An Urban Park Renewal

If George Washington, perched high atop the stately Battle Monument in Trenton, could look down and slightly to his right, he would see the little North 25 Park.

Here in one struggling neighborhood, residents have spoken, and planners have listened. In the summer, bulldozers demolished this impassive park of concrete and steel located near the intersection of Pennington Avenue and North Warren Street. By winter, it is expected to be reborn as a gentler version — one with grass, trees, park benches, playground equipment and a walkway along a historic canal.

The renovated park is the first part of an ambitious plan called the Canal Banks Project, a “unique” approach to building parkland in New Jersey, says Allan Mallach, the economic development director for Trenton. This project, which will extend through much of downtown Trenton, plans to utilize the Delaware and Raritan Canal that runs through the city to link sites for recreation, commerce, housing and tourism.

“It’s an effort to rebuild the fabric of society with the canal as a common thread,” says Mallach.

And the city plans to use neighbor-

hood input to get the job done.

John Watson, supervisor of the Department of Environmental Protection’s (DEP’s) Green Trust Management, calls the city’s approach “very progressive.

“It is fairly unique that they are really implementing a campaign to get the neighborhood involved,” he says.

An Orphan Park

The new North 25 Park is the first phase of the Canal Banks project. Tearing down and rebuilding this park will cost less than one-tenth of the \$1.6 million price tag to build the multi-tiered concrete and metal structure in 1980.

“Everyone agreed on why that didn’t work. First of all, it created hidden areas where people could do drugs. That’s kind of a ’70s design; it’s inhumane to have a park that’s completely concrete with metal jungle gyms,” says Frank Weeden, a local businessman.

Doretta A. Wright-Simmons remembers being excited in 1979 at the prospect of the new North 25 Park, named for a nearby senior citizen housing project.

“It sort of turned into a drug haven,” says Wright-Simmons, who has lived in the neighborhood most of her life.

Before planning the new park, the first order of business for Alan Goodheart, a landscape architect and city consultant, was to identify the neighbors. He attended many of the local meetings, but found it difficult to identify the “community” because of the surrounding businesses and empty houses.

Goodheart says he has received more input from residents while working on other Trenton parks, but the North 25 Park is a special case.

“It’s a little bit of an orphan,” Goodheart says. “Hopefully, it will be the center of a new community. The city has to take a lead on this.”

City Councilman Albert “Bo” Robinson, who has lived in the vicinity of the park his entire life, remembers the manufacturers and retailers that once thrived around the monument. One of his many jobs years ago

was helping unload bananas for a produce dealer for 25 cents per trailer.

But Mallach says the days of numerous stores around the monument are gone, and there are not enough customers to bring them back.

"... You look at what can work," he says. In the case of North 25 Park, that may be an enclave of housing around the monument that resembles a Victorian square, with a grocery store nearby on one of the few large vacant lots left downtown. In other neighborhoods of the Canal Banks area, vacant lots may be turned into new homes, and existing homes will be restored.

"You just keep trying," Mallach says. "You've got to have a long-term view, and a lot of people get impatient because you don't see results overnight."

For the neighbors of North 25 Park, the immediate concern is security. Goodheart's design addresses that issue. The park will be almost flat, and it will have an unbroken lawn, with benches and a play area on the border. An imitation wrought iron fence will surround the entire park, except the canal-side walk, and it will be locked at night, Goodheart says.

If the money is raised to finance the whole project, an interpretive center would be added to the North 25 Park,

explaining the use of the canal during the 19th century to carry coal and lumber from the Pennsylvania coal fields via the Lehigh and Delaware rivers to New York City. The center would also be surrounded by outdoor exhibits that link other recreation areas through walking trails along the water.

Nearby, a state parking lot would be dug up so the canal could be widened to recreate a turning basin once used by barges.

There are ongoing efforts to link North 25 Park with other sites along the canal.

The Canal Banks Project

Just across the street from the park is a recently restored three-mile section of bicycle path. This canal area, owned by the DEP's Division of Parks and Forestry, was beautified this year using state and federal funds. In addition, there are plans to convert a nearby abandoned railroad right of way into a pleasant walkway.

Liz Johnson, city recreation director, says improvements to the area may encourage more native species to live in the waterway.

"We are focusing on the canal as an important natural resource that exists in the city," she says.

When completed, the Canal Banks Project will stretch across a large portion of downtown Trenton. So far, a plan has been drawn up for the entire project, and money

is available to construct North 25 Park and the railroad right-of-way conversion. In addition, several pockets of deteriorated housing will be bought and/or rehabilitated in the area, says Bill Valocchi, project coordinator for the city.

To date, \$5 million has been spent on this first phase of Canal Banks, roughly one-third to one-fourth of the amount needed to realize the entire plan, says Valocchi. The money came from the Capital City Redevelopment Corporation (CCRC) and the state's refinancing of the Richard J. Hughes Justice Center.

Valocchi says the support from the CCRC, created by the state Legislature to improve Trenton, was helpful, but those funds are dwindling. The city will have to turn to the state and federal government, as well as non-profit groups and corporations, for help in completing Canal Banks.

But already the plan is attempting to reshape Trenton — one neighborhood at a time.

"The feeling of ownership will help keep (North 25 Park) up," says DEP's Watson.

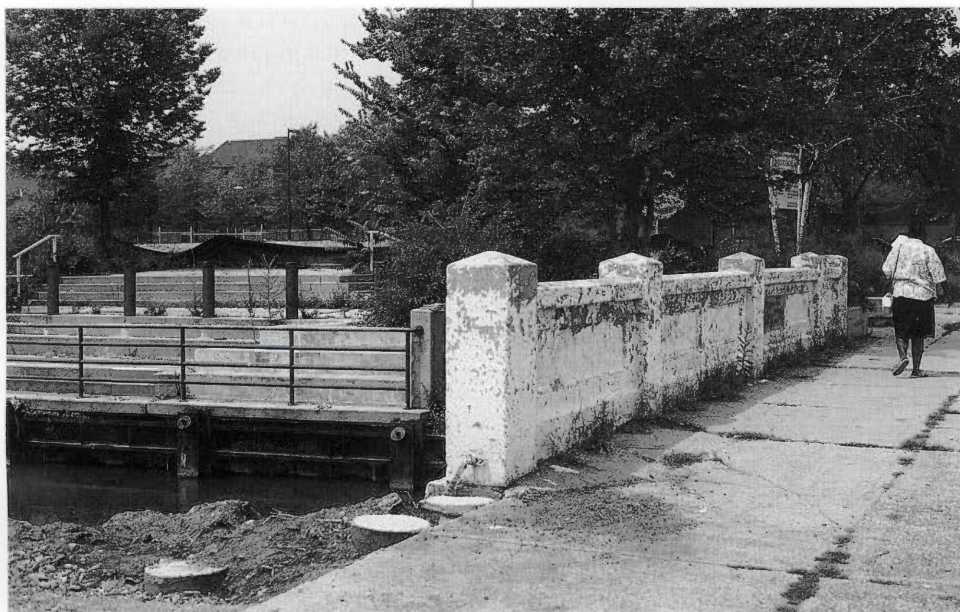
In addition to his state post, Watson is a member of Trenton's Open Space Advisory Board and a trustee of Isles, Inc., a Trenton-based housing and community gardening group that may perform rehabilitations for the Canal Banks Project.

"The more people who come to the redesigned park, the safer it will be," Watson says.

And that is just what the neighbors like Weeden, Wright-Simmons and Robinson asked for.

by Ellen Dean Wilson, a freelance writer from Trenton

The Battle Monument overlooks North 25 Park in Trenton (opposite page). The Delaware and Raritan Canal (left), which was used to transport lumber and coal in the 19th century, will be the common thread linking recreation, commerce, housing and tourism in downtown Trenton.





Walter Anderson performs a traditional dance.

Today's Dance of the Delawares

As his hand-beaded moccasins retrace the intricate dance steps of his Native American ancestors, Walter Anderson focuses on the steady beat of the drums. Cow bells jangle around his ankles, keeping his step in time with the rhythm.

Nearby, 50 fifth-grade students sit entranced. After the sound of the last drum beat fades, Anderson — a descendant of the Delaware Indian Nation, also known as the Lenape — scans his young audience for questions.

Slowly, a few scattered hands are raised. "Do you drive a car?" one student asks. "Do you live in a house?" another inquires.

Dressed in his traditional regalia with a headpiece made of deer tail and porcupine hair and a bustle resplendent with eagle and hawk feathers, Anderson appears to many children to be a figure from a chapter in their history books. For several years, he has visited schools throughout New Jersey teaching, performing ancient dances and sharing his Native American heritage.

Born in Burlington County, Anderson traces his Indian roots through his father and grandfather, both descendants of the Delaware Indian Nation. Although neither his father or grandfather were ac-

tively involved in the Native American community while Anderson was growing up, he recalls always being consciously aware and proud of his heritage as a child.

"My father and grandfather's generations didn't have the opportunity that we do today to express their Indian identity," says Anderson. "Powwows and other Native American events now offer tribes from all across the country a place to dance, express their culture and unite."

During the past 20 years, powwows have grown increasingly popular, becoming meeting grounds for Indians from many diverse backgrounds. On average, 10 powwows are held in New Jersey each year. According to the 1990 census, more than 15,000 Native Americans from 30 different tribes reside in New Jersey, and 1,300 are Lenape, New Jersey's only indigenous residents.

The phrase "pau wau" originally referred to a spiritual leader or medicine man, but Europeans who observed the medicine men's ritual dances thought the phrase described the whole event. Over the past hundred years, powwows have evolved from an ancient Plains Indian tradition into a vibrant celebration where Native Americans, donned in colorful, hand-made regalia, participate in dance competitions, pay tribute to their war veterans and revive and honor their traditions. In fact, attending a powwow was what first inspired Anderson to take an active role in his heritage.

Anderson has been dancing at powwows for more than a decade, traveling as far as Oklahoma and Canada. Because of his experience and knowledge of traditional dances that were once part of spiritual ceremonies, preparations for war or celebrations of victory, Anderson has been honored at local powwows with titles such as "Head Dancer," a revered position where he leads the male dancers out onto the floor.

Anderson credits James Lone Bear Revey, head of the New Jersey Indian Office and a Lenape whose ancestors were among the few to have remained in

New Jersey, with being one of his greatest influences and a role model in his quest to learn about his forebears. "Lone Bear has taught me spiritual meanings and traditions, parts of the Lenape language, as well as the importance of many of their crafts and artifacts," says Anderson.

Anderson first met Revey at the New Jersey Indian Office, a private organization that educates the public about Native Americans in the Garden State and assists people in uncovering their Indian roots.

"The public needs to see what Indians are really like," says Revey. "Hopefully, people like Walter who reach out to children in school programs will show them face to face that we are ordinary people who are proud of our heritage, so that the stereotypes from books and TV will begin to disappear."

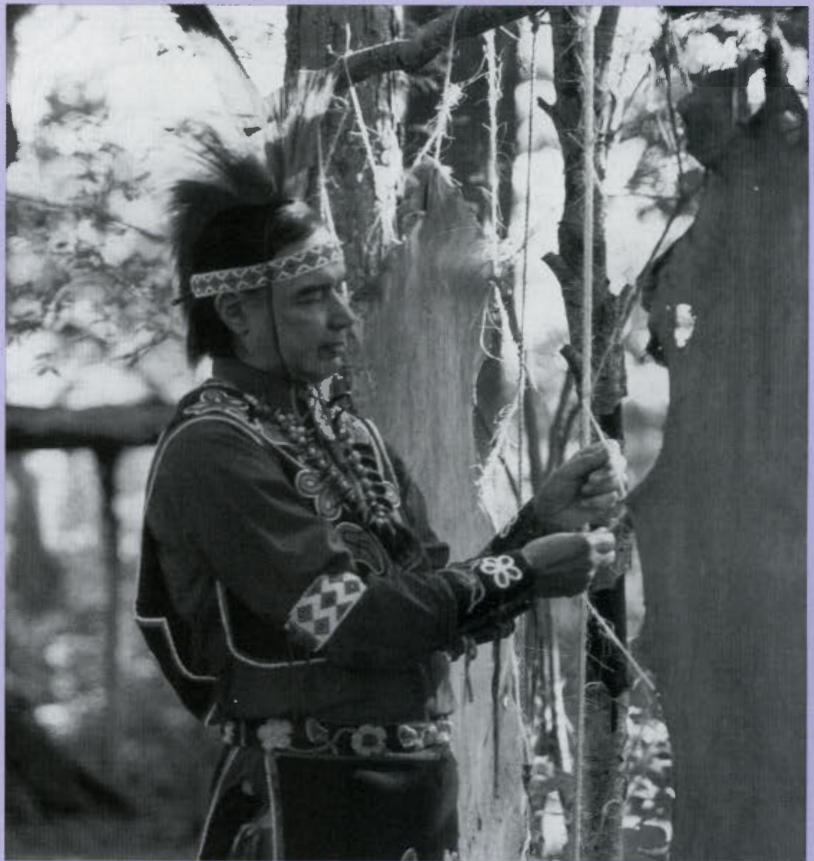
One of the most common stereotypes about Indians is that they were "threatening" or "violent savages," says Anderson. "The Lenape were just the opposite," he says. "They were very peaceful, spiritual people."

For the past two years, Anderson has been participating in Kaleidoscope Kids, an after-school and summer educational program for children ages six to 12 that is sponsored by the New Jersey State Museum. He shows the children Native American art, such as hand-carved peace pipes and articles of clothing, which sometimes require hundreds of hours of work to weave brilliant bead patterns into leather or other materials. Anderson also shares the spiritual beliefs and practices of the Lenape culture.

"My heritage has brought harmony into my life," says Anderson. "My goal is to not necessarily make people aware that I am an Indian, but to help them understand who Indians really are."

Anderson learned about bead working, like many other traditions, from friends and family as he was growing up. Today, he spends time — especially during the winter months — creating new crafts and attire, which he uses or sells at powwows or other Native American events.

Anderson was recently selected by



WALTER CHOROSZEWSKI

James Lone Bear Revey, head of the New Jersey Indian Office in East Orange, visits the Lenape exhibit at Waterloo Village in Stanhope.

Linda Poolaw of Oklahoma, the presiding Grand Chief of the Delaware Nation Grand Council of North America, to be the East Coast financial development representative for a Native American monument on Ellis Island. The council, which was formed three years ago to help unite Delaware Indians in the United States and Canada, is raising money for the monument while the National Park Service is donating the land and maintenance of the site.

The idea for the monument originated in the late 1980s, when the bones of a Lenape man, woman and child were found during the construction of another monument on Ellis Island. The bones are expected to be reburied during a ceremony at the original site in November, and a monument, designed by Delaware Indian Bonnie McKenzie, is expected to be erected by the spring of 1995 based on the availability of funds.

Anderson is also working with other Native Americans in the state to establish the New Jersey Commission on Native American Affairs to recognize the

state's American Indian population. A bill to establish this office was passed by the Assembly in May and is pending before the Senate.

This office will help keep alive Native American traditions in the Garden State. From late prehistoric times, New Jersey was the homeland of the Delaware Indians or the Lenape, which means "common" or "ordinary" people. Today, with the help of those like Walter Anderson, the culture and traditions of these indigenous people will not only continue to be a significant part of New Jersey's history, but an important part of its future.

The New Jersey Indian Office is located at 300 Main Street in East Orange and can be reached by phone at (201) 675-0694. For more information on the Native American monument on Ellis Island, contact Kent Tuscarawas Campus, 330 University Drive, Northeast New Philadelphia, Ohio 44663, (216) 339-3391.

by Amy Cradic, a consultant with the Department of Environmental Protection's Division of Parks and Forestry

Mining Gold from Garbage

"In order to meet New Jersey's dual goals of self-sufficiency and the proper closure of several hundred old landfills, we must seriously investigate every option to create additional disposal capacity and ensure the proper environmental closure of existing facilities. I am pleased various municipalities have shown an interest in participating in landfill mining pilot programs."

Robert C. Shinn, Jr., Commissioner
Department of Environmental Protection (DEP)



A landfill reclamation operation in Collier County, Florida.

PHOTOS COURTESY OF NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY

Landfill mining, a concept that seems to come right out of the 21st century, may soon be a routine operation in New Jersey. In fact, pilot projects are already being considered for the near future for sites in Bergen, Burlington, Camden, Hudson and Monmouth counties.

But landfill mining, which extracts various resources from old landfills for recycling, energy or reduction of a facility's overall size, is not a new concept. One of the best known examples involved a huge, unregulated open dump in London, which was used by the public to deposit waste over the course of several centuries.

In 1815, an operation for mining dust was established. The recovered dust was sold to Russia to manufacture bricks to help rebuild Moscow after Napoleon's

attempted invasion. By 1926, there was enough dust recovered from the London landfill to supply 41 brick-making facilities.

Landfill mining is being introduced in New Jersey as a way to recycle old landfills and incorporate the state's current solid waste management strategy in older landfills. Proponents say the benefits of landfill mining range from reducing the size of old landfills to recovering buried recyclable resources to remediating contaminated facilities.

Reducing the size of former landfills (or older portions of existing landfills) can be beneficial. First and foremost, the removal of buried materials creates space that can be used as future disposal sites, thus reducing the demand for new landfills elsewhere. In addition, a landfill that does not meet current state design stan-

dards could be brought up to code, which requires current technology, such as liners to protect against ground and surface contamination, before it is reopened.

The newly recovered land could also have other uses, such as for construction projects, wetlands mitigation, recreation or wildlife habitat.

Cutting the size of a landfill would also reduce the overall closure costs, which can range from \$55,000 to \$340,000 per acre. Closing a landfill requires capping it with dirt or clay, revegetating the site, installing groundwater collection and testing devices and monitoring methane gas production. Reducing the size of the landfill, therefore, could significantly reduce the overall expense, resulting in substantial savings to local governments.

Tires are recycled for their rubber as part of a landfill mining project (below) in Edinburg, New York.

Extracting Recyclables

Another aspect of landfill mining is the recovery of buried resources, including materials such as paper and plastic, which can be used as a "refuse-derived fuel" for generating electricity. Buried trash can represent an immense quantity of energy.

In fact, a landfill mining operation in Lancaster County, Pa., found that the facility could sell burnable fuel, made mostly from paper, for use in energy-producing plants. On average, for every 0.586 cubic yards of waste that was mined, the facility could get 0.2 tons of processed fuel, generating a revenue of \$3.60 per cubic yard of materials.

Methane, a gas produced from deteriorating materials, has been commonly recovered from old landfills for years. Methane can be used to generate electricity, upgraded for commercial distribution or converted to methanol fuel. In fact, methods have been developed to accelerate methane production in an environmentally-safe manner to help stabilize landfills faster.

Lancaster County also found that approximately 39 percent of the material mined from an old landfill could be used as landfill cover during closures, saving the cost of purchasing that material elsewhere.

A Metal Marketplace

Metals can also be another source of revenue from old landfills, generating as much as 60 cents for every cubic yard that is mined. But the process used for mining may affect the quantity and quality of metals that can be recovered.

Despite these advantages, some critics cite potential environmental and health impacts related to landfill mining. These include such issues as water and soil contamination, dust, noise, odors, the unearthing of chemical wastes, radioactive materials, biological hazards and asbestos, as well as the potential for explosions, gas releases and other problems.

The DEP has considered these issues and is examining ways to address them.

There are several ways to make cur-

rent landfills better fit for mining in the future. Chief among these is the development of facilities to accept hazardous waste from homes and other small generators. The first permanent collection facility in the state began operation earlier this year in Burlington County, and it has been a tremendous success.

In addition, the DEP is promoting several key elements for successful landfill mining operations including detailed health and safety plans, training for personnel, well-defined standard operating procedures, effective site controls, decontamination plans, environmental monitoring and emergency medical procedures.

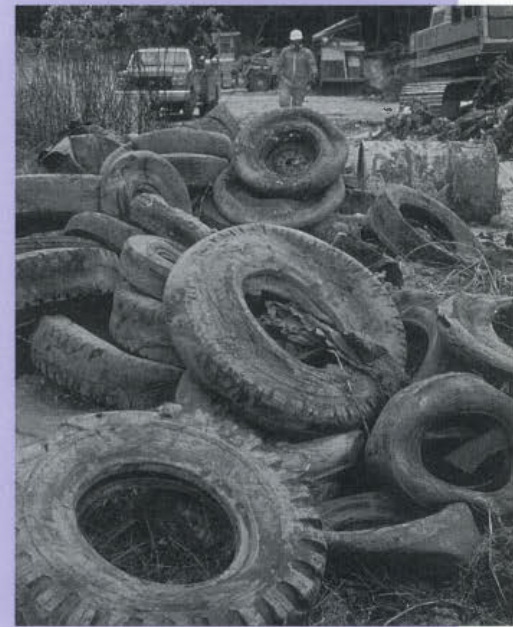
Several counties have offered to host pilot projects in landfill mining. Camden County has proposed mining burnable materials from the Pennsauken Landfill to supplement fuel for the county incinerator during periods of low production. Monmouth County is seeking to mine a closed landfill for a wetlands mitigation site as part of a new ferry launch proposal.

In addition, the Hackensack Meadowlands near Giants Stadium along the New Jersey Turnpike could be a source of large quantities of fuel for two large energy-generating incinerators located in Essex and Union counties, as well as an opportunity to reclaim landfill capacity for the future.

The implementation of pilot landfill mining projects in New Jersey recently received a significant boost from the state Legislature, which enacted a bill that directs the DEP to allocate \$250,000 from the existing Sanitary Landfill Contingency Fund to support mining demonstration projects. The legislation allows any municipality, county or local authority which owns or operates a sanitary landfill to apply to the DEP for grants for landfill mining demonstration projects. Interested local governments must submit a "mining plan" which the DEP is currently in the process of defining for prospective applicants.

This seed money will hopefully make landfill mining a reality in the very near

Landfill mining is a concept that seems to come right out of the 21st century.



future in the Garden State.

Landfill mining operations already exist in many states, including New York, Pennsylvania and Florida, where this form of solid waste management was initially pioneered. These states report great success in implementing recovery operations as well as impressive increases in revenues.

Thus, it may be time to explore new approaches to solid waste management in New Jersey. Landfill mining could prove to be a gold mine both for the environment and taxpayers' pocketbooks.

by Richard D.L. Fulton, a resource interpretive specialist, and Mike Winka, an executive assistant with the DEP's Division of Solid Waste Management

A Phoenix Rises from the Debris

It is believed to be the first — and only — museum in the nation that is chock full of garbage and built adjacent to a landfill.

Not only does a trash museum really exist, but you don't have to hold your nose when visiting because there isn't any garbage smell. The museum, opened in Lyndhurst in 1989 by the Hackensack Meadowlands Development Commission (HDMC), is just part of the commission's efforts to transform a portion of the Hackensack Meadowlands from a dumping ground into a teeming wildlife habitat and passive recreation area.

The museum is part of a modern environmental center which also boasts an impressive visitor's center and museum store, plus a lovely observation deck overlooking the Manhattan skyline, the Meadowlands and the Hackensack River. It is all contained within a 110-acre oasis known as Richard W. DeKorte Park that lies within six miles of New York City and features several interconnected, barrier-free trails.

While listening to the sounds of birds, you'll soon forget about the constant drone of traffic on the New Jersey Turnpike in the distance. Besides, you'll be too busy dodging dozens of curious Canada geese as they waddle alongside the path. Find out more about an urban salt marsh and its inhabitants inside the center through a diorama featuring a 1,000-gallon, brackish creek exhibit filled with live animals common to the area.

After, enter what locals and some staff members fondly refer to as the "Trash Museum," although its official name is the Hackensack Meadowlands Development Commission Environment Center Museum. As you roam the exhibit rooms, you'll learn about the role solid waste plays in our lives and how you can do more to save the earth.



ARLINE ZATZ

According to the latest federal Environmental Protection Agency statistics, we each throw out approximately four pounds of garbage daily, which amounts to more than 534,000 tons of garbage nationwide per day. Did you know that Americans toss away 29,000 tons of glass each day, enough to fill a highway stretching from New York to California? Or that Americans discard 580,000 tires daily, which if stacked would reach 10 times higher than Mount Everest?

Several displays, utilizing a series of peepholes, point out our wasteful 20th century habits, including the one-time use of aluminum foil and plastic cups. Helpful suggestions are incorporated on how to buy and use products more wisely. In addition, displays provide a wide array of recycling tips from composting leaves and yard waste to safely disposing of car batteries. In

pointing out these helpful tips in our daily living, these messages enforce what our responsibilities are in helping to save our natural heritage.

See what the inside of a landfill looks like — without the horrible odor — in the Garbage Sculpture Room. Although the room may appear to contain only old junk, this collage was built of choice pieces of garbage — ranging from old steel wool pads, tires and fans to old car radiators, fenders, chicken wire and other tossed-out items. This amazing array was collected on numerous late-night forays through the streets of northern New Jersey by Newark artist Robert Richardson.

When you're ready for the outdoors, ask for a self-guiding trail booklet and allow enough time to leisurely explore the interconnecting trails. With more than 200 species of birds visiting annually, this is a bird watcher's paradise.

The Hackensack Meadowlands Development Commission Environment Center was built in the Meadowlands adjacent to a landfill (below).



ARLINE ZATZ

Along the Kingsland Overlook Trail, a six-acre side slope of a 200-acre sanitary landfill, meander past various native plant communities, including a wildflower and butterfly meadow, grassland meadow, and deciduous and evergreen forest. At the top, enjoy Manhattan's skyline and what remains of Kingsland Creek, which is partially buried beneath the landfill. About 40,000 recycled soda bottles were bonded into a liner in the landfill to prevent the soil from slipping away before plants could take root.

During autumn and early winter, black ducks, northern pintails, and northern shoveller ducks migrate here for food because the salty tidal water does not freeze completely. During other months, a variety of shorebirds can be seen, including dowitchers, semipalmated plovers, least sandpipers and the lesser yellowlegs.

The Marsh Discovery Trail is a one-half mile boardwalk connecting a series of dredge spoil islands that trace the route of an extinct creek. The boardwalk, built of modular plastic decking and floats, minimizes environmental disturbance to the marsh because it doesn't require pilings. This trail features an outdoor classroom, nature observation blinds, photography blinds and a promenade deck. It also traverses an area which is the only known nesting site of the ruddy duck in New Jersey.

The Transco Trail, an "island" roadbed more than a half-mile long, was built in 1950 to provide access to a natural gas pipeline. Commission staff, with permission from Transco, has transformed it into distinct habitats at four peninsulas originally designed as places for trucks to turn around. Overlooks include an elevated salt marsh and upland plant communities as well as two

Did you know that
Americans toss away
29,000 tons of glass
each day, enough to
fill a highway
stretching from New
York to California?

The Trash Museum is filled with examples of what is thrown away every day (opposite page).



DOTY WAXMAN

sand beaches, an observation dock and benches for visitors.

Lyndhurst Nature Reserve, a 3.5 acre landfill reclamation, incorporates wetland and upland habitats. More than 52 species of woody and herbaceous plants can be observed here, with a noticeable change in vegetation along the gradient from a tidal mud flat to a freshwater pond. Animals and birds depend on this area during winter months, especially for food from plants such as bayberry, dogwood and chokeberry. There are also five seating areas, a bird blind and view scopes that focus on prominent features along the horizon, such as the Empire State Building and the World Trade Center. The pole and platform on the far peninsula were put there to entice an osprey to nest and to use the area as its hunting grounds.

"Environmental responsibility is DeKorte Park's very essence," officials at

the HMDC proudly declare. "It has risen like a Phoenix from the ashes of our culture's debris." A visit to the Trash Museum not only awakens the senses, but also helps to promote a cleaner, healthier environment through recycling, reducing and re-using waste.

The HMDC Environment Center Museum is located at 2 DeKorte Park Plaza in Lyndhurst and can be reached by phone at (201) 460-8300. The use of the trails is free during daylight hours, weather permitting. Admission to the environment center museum, which is open 9 a.m. to 5 p.m. weekdays and 10 a.m. to 3 p.m. Saturdays, is \$2 for adults and free for children under 12 years old.

by Arline Zatz, a freelance writer, photographer and author from Metuchen

A visit to the Trash Museum not only awakens the senses, but also helps to promote a cleaner, healthier environment through recycling, reducing and re-using waste.

A dock outside the HMDC Environment Center (above) is a great place to view the area's wildlife.

A Road Rally TURNS ELECTRIC

Story by Judy Finman / Photographs by Cameron Johnson

With names like "Lightning Volt," "Eclectic Taxi" and "Genesis," they might be the latest wave of rock bands. But their wild colors and bizarre shapes suggest other life forms. Did they land in New Jersey from another planet?

No, they are the new breeds of electric vehicles that ran in the spring in the Tour de Sol car rally, a race that tests the energy efficiency and reliability of electric or solar-powered vehicles. For the first time, New Jersey, New York and Pennsylvania hosted the event, which drew more than 60 vehicles, the largest field in the six-year history of the competition.

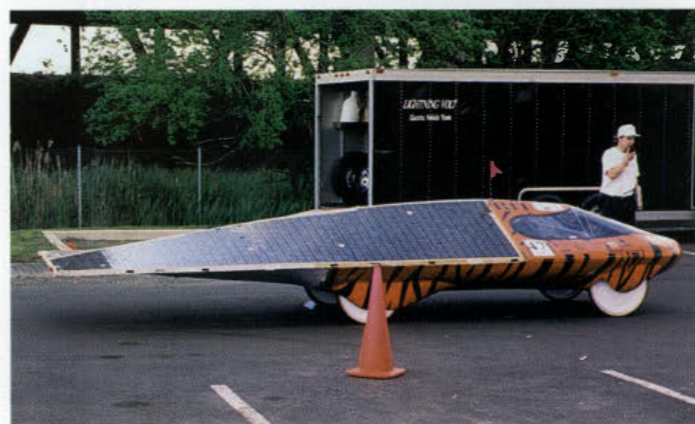
After opening ceremonies in New York City and a trip through the Holland Tunnel, the cars began the race at Liberty Science Center at Liberty State Park in Jersey City. Those that could traveled about 60 miles each day, navigating the hills and back roads of New Jersey and Pennsylvania to the finish line at the Liberty Bell in Philadelphia.

Vehicles from two New Jersey colleges successfully completed the trek, finishing within minutes of each other. Engineering students from Trenton State College drove a converted Ford Festiva, and automotive technology students at Brookdale Community College entered a retrofitted General Motors pickup truck with equipment supplied by Jersey Central Power & Light (JCP&L). Each day a fresh pair of students — one at the wheel, the other navigating from the passenger's side — took over their school's vehicle during the seven-day competition.

The two colleges ran in the commuter category for two- to four-person electric and/or solar-assisted vehicles that travel at normal road speeds, carry two people at all times and are allowed to recharge from solar panels and portable electric stations each night.

"The purpose of the event is to promote the development

The Tour de Sol featured many unique solar and/or electric-powered vehicles including (top to bottom) a car from the Massachusetts Institute of Technology Solar EV Club, an entry from Mankato State University (Minnesota), Sunpacer from Cato-Meridian High School of Technology in Cato, N.Y. and the spiRIT IV from the Rochester (N.Y.) Institute of Technology.





Trenton State College's Potential Difference (above) is powered by batteries and solar panels. The Sungo from New Hampshire Technical Institute and a solar-powered mini-motorcycle from Randolph High School's (NJ) Technology Department are today's alternative vehicles (opposite page, top photos), while the Boyertown Museum of Historic Vehicles in Pennsylvania shows electric vehicles from yesteryear (opposite page, bottom photos.)

and use of practical electric vehicles — in other words, getting electric vehicles on the road,” says race director Nancy Hazard of the Northeast Sustainable Energy Association in Greenfield, Ma. This race is held in real-world driving conditions with traffic, posted speeds and traffic lights.

Each day of the Tour de Sol, all the cars were timed as they traveled a specified distance between two communities. For each mile the team failed to complete, it was penalized 10 hours and 20 minutes. At the finish line each day, entrants were encouraged to drive extra laps — for each additional mile, they received a one-minute time credit. The winner of each category was the vehicle with the lowest adjusted time.

The winner of the race, which completed the course in two hours and 53 minutes, was the Solectria Force RS-2 seat, which has both solar and electric components. The cars from Brookdale Community College and Trenton State College came in 15th and 16th respectively, with adjusted times of 22 hours and four minutes and 22 hours and eight minutes.

Trenton State College's "Potential Difference"

To talk to Dr. Norman Asper of Trenton State College, you might think there was nothing unusual about the bright yellow Ford Festiva named "Potential Difference."

"It's just an everyday car, very comfortable to drive; anyone can drive it," says the engineering science professor. "We use it



This H-Power bus runs on fuel cells and may use waste energy to heat and air-condition the vehicle.

Building a Better Bus

It is the bus that runs on air and cleaner fuel, and it was developed right here in New Jersey.

A bus powered by fuel cells made its debut at Liberty Science Center during the Tour de Sol, but it did not run the race. The 30-foot, 25-seat electric bus is the first of three prototypes that H-Power Corporation of Belleville is de-

veloping under contract to the U.S. Departments of Energy and Transportation and California's South Coast Air Quality Management District.

The company claims the low-emission vehicle meets or exceeds transit industry standards as well as the requirements of the Americans with Disabilities Act. It features a wheelchair lift and accommodations for two wheelchairs.

Fuel cell technology may eventually bring together the advantages of using electricity with generation from renewable resources. Fuel cells generate electricity on board the vehicle and can run on methane or methanol pro-

duced from renewable materials. Rather than burn fuels and release carbon dioxide, fuel cells use hydrogen from the fuel and combine it with oxygen from the air.

In the H-Power bus, the fuel cell's energy comes from methanol, which is reformed to provide hydrogen. The bus holds 140 gallons of mixed methanol and water, enough for about 150 to 200 miles. A larger fuel tank could be installed for a longer run.

But methanol is not without controversy. Methanol and some of its by-products are toxic, and there are concerns over its health effects. In addition, most methanol is derived from non-renewable sources of fuel such as coal and

every day (on campus) to go out and buy materials and supplies.”

With a maximum speed of 55 miles per hour, the car has achieved a driving range of 87 miles on one electric charge. It is solar powered as well as electric. Photovoltaic panels on the roof and a portable array carried in the storage space behind the seats convert sunlight to electricity. A power tracker/computer in the glove compartment gathers data and determines whether to store electricity in the battery or to send it to the motor.

Every night, the car joined others at a portable charging station sponsored by several utility companies. The station, the size of a soda machine with 40 to 50 heavy duty electrical outlets, provided 208 to 220 volts of power by tapping directly into utility poles at the site. The cars were charged over four to five hours, using the equivalent of 10, 100-watt light bulbs burning for 10 hours.

Despite the recharging, Potential Difference was one of four cars that shut down in Clinton the morning after recharging at the same panel.

“They hadn’t been charged,” says Asper. Potential Difference was towed back to campus for the charge, incurring a major penalty. Another day, the car was towed to Allentown, Pa., after an old connection came apart. With tools donated by other teams, the students fashioned a new cable and rejoined the race.

natural gas.

However, this bus is a model of energy efficiency. Waste heat from the fuel cell provides passenger heating; in future versions it will also furnish all air conditioning. A nickel-cadmium battery pack that supplies the peak power needed for acceleration and climbing also stores energy recovered from braking, reducing methanol consumption and extending brake life.

H-Power’s president, Arthur Kaufman, touts the benefits of fuel-cell technology: “There are virtually zero polluting emissions compared to diesel buses. It is very quiet. It uses a domestically produced fuel — methanol. It uses less energy per mile (and)

costs less per mile than a diesel bus.

“This is a practical system for actual commercial use on a bus . . . once we bring the cost down to make it affordable,” Kaufman says. “We need the government to participate from R&D (research and development) to the first stage of commercialization.”

The bus was expected to get its first real-life test in an urban environment in the fall when it joined the Georgetown University campus transit system in Washington, D.C. The second prototype bus, which has not yet been completed, will be dispatched to Los Angeles.





Brookdale Community College's entry was a pickup converted to electric power in one semester.

Asper has been building alternative fuel cars at Trenton State for years, starting with a propane-fueled, 1972 Toyota Corolla with a Ford engine. Asper and his students built their first electric car in 1978 — a fiberglass sports model in a Volkswagen chassis.

Their first solar race was in 1992. "We were really outclassed in that vehicle," says Asper. "It was good bicycle technology. We had fun, we were competitive, (but) we didn't do very well."

Experts told Asper he needed a \$300,000 budget to develop a suitable car. Instead, he and the students found sponsors to underwrite the project. Freehold Ford donated the 1988 Ford Festiva, chosen because it was the last year the model had a four speed transmission. The retrofitted car ran in the 1993 Tour de Sol and again this year with the addition of the data acquisition system.

"Our intention was to build a convenient, safe, affordable commuter vehicle. . . . It worked just fine. It (did) exactly what it should have done," says Asper.

Brookdale's Electric Pickup

In only one semester, Brookdale Community College students converted the General Motors S-15 pickup truck with 50,000 miles from gasoline power to electric power.

"We started working on it in February," says Assistant Professor Paul E. Tucker, who teaches automotive technology. "Others had years to do this."

After stripping out all the gasoline-related components, the team used a conversion kit consisting of 20 batteries, wiring, an electric motor and controller to create this electric-powered vehicle. It can reach a speed of 70 miles per hour and travels between 50 and 70 miles on one charge.

Besides the truck, JCP&L also supplied \$6,000 worth of parts for the conversion and a trailer which towed the truck twice during the race — first when the vehicle lost power on the hills between Jersey City and Morristown, and once in Pennsylvania when it didn't get a good charge the night

before. "Many of the vehicles had to be towed at some point," Tucker says. Now that the race is over, the converted truck has been returned to the electric company's fleet.

"The best part of the race was the cooperation and teamwork," says Tucker. "That we could pull something like this off with volunteer labor (was) the most remarkable part. Students came in after hours on their own time." He worked every day except Sunday for the semester. Brookdale employees pitched in during the race, shuttling the student team members between the race sites and their homes.

The Electric Debate

But electric vehicles are not without controversy. Opponents point out these vehicles rely on electricity produced by utility plants, which use fossil fuels to generate energy and thus pollute the air. Critics also point out the high cost and short driving range of electric vehicles and believe the pace of development is too slow to make them a practical alternative.

In fact, Solectria, the largest maker of electric vehicles in the country and winner of the Tour de Sol's commuter class, offers sedans for \$35,000, and a three-year lease of an electric Ford Escort costs \$100,000. But the cost of operating these vehicles is low — only a few cents per mile. However, batteries are heavy, expensive and must be replaced every several thousand miles.

Proponents of electric vehicles say their primary advantage is reducing pollutants where they are used. Emissions from electric vehicles are a small fraction of those given off by gasoline-powered cars. And supporters point out that controlling pollutants from large power plants is easier than controlling emissions from each individual vehicle, where good maintenance is critical and often neglected.

With New Jersey and its neighboring states struggling to lessen air pollution and comply with federal clean air regulations, the Tour de Sol offers a proving ground for alternatives to smog-producing, gasoline-powered motor vehicles. Hazard points out three advantages of electric cars:

"They don't pollute at the vehicle. Even with recharging there's an environmental advantage. Secondly, there's energy independence from foreign oil, which has a national security benefit. And there's an economic advantage: our ultimate goal is electric vehicles with energy produced by renewable resources, such as wind, solar (and) hydro."

And, as the Tour de Sol showed so colorfully, some of these vehicles of the future are here today.

Judy Finman is a freelance writer who lives in Princeton.

Cameron Johnson is with the Division of Energy Planning and Conservation at the Board of Public Utilities.

Six Weeks of Crisis in the American Revolution

JOHN K. MILLS, PRINCETON BATTLEFIELD



By Pete McLain

Six weeks in New Jersey history helped turn the tide of the American Revolution.

From Nov. 20, 1776, to Jan. 8, 1777, New Jersey was a key staging ground in the war that freed the United States from British rule. During this period, General George Washington, with his poorly trained and equipped Colonial troops, eventually outwitted and out-maneuvered the highly-trained, professional soldiers of General Charles Cornwallis' British forces, representing an epic moment in our nation's history.

Washington Comes to N.J.

In 1776, George Washington took command of the American armies, a disorganized group of citizens lacking both military training and adequate equipment. In August 1776, Washington moved his troops to the Long Island-New York City area and attempted to stave off a massive British invasion of New York City and New Jersey. But the British quickly outmaneuvered Washington's small army and captured New York City.

Washington retreated and ordered 5,000 men led by General Charles Lee to Westchester County in New York to block a possible invasion of southern New England via the Hudson River.



COURTESY OF PRINCETON BATTLEFIELD

Capt. Greshom Mott's American unit moves its artillery into place during a reenactment of the Battle of Princeton (above).

General Hugh Mercer of the Continental army (inset) was bayoneted at the Battle of Princeton and later died from his injuries.

George Washington and his troops (below) cross the Delaware during the annual Christmas Day reenactment of this event.

Meanwhile, Washington took 2,000 to 3,000 troops to Hackensack. The colonial army retained control of two forts along the Hudson River in New York and Fort Lee that were used to close off the waterway to British naval traffic.

One of the major American calamities of the Revolutionary War was the fall of Fort Mifflin in New York on Nov. 16, 1776. Several thousand Continental soldiers surrendered and were taken prisoner.

But while the British may have won the battle, they did not win the war.

Fort Lee's Empty Fort

Cornwallis' army launched another attack on Nov. 20, 1776. The British troops landed at Lower Cloaster Dock and, within three hours, 6,000 men had scaled the 400-foot high Palisades and were marching up the peninsula toward Fort Lee. (While remnants of the fort can still be seen, it is marked primarily by the Bergen County town that bears its name.) But when the British forces arrived, they found warm food in the kettles and tents in place, but no army.

Washington, hearing of the impending invasion, led 1,000 troops to the only route of escape — the peninsula between the Hackensack and Hudson rivers. As Washington's army retreated, his troops removed the planks from a small wooden bridge by the Steuben House in River Edge to delay

the advancing British army.

Washington continued his retreat south across New Jersey, repeatedly contacting Lee in New York for reinforcements, but none were immediately dispatched.

On Dec. 8, Washington's army crossed the Delaware River just north of Trenton to the Pennsylvania side, acquiring or destroying any boats the British might use to cross the river. He set up several defensive positions along the Delaware from Lambertville to Bristol to prevent an attack on Philadelphia.

Washington's principal fortification was at Trenton Ferry, several miles north of Trenton. By this time, Lee began moving his troops to Washington's aid, although Lee himself was captured in Basking Ridge.

A Tactical Mistake

The British troops continued to pursue Washington's army in New Jersey, advancing to the shore of the Delaware River by late December 1776. It was here that Cornwallis made a serious tactical mistake. Since it was mid-winter and Washington did not appear to be a serious threat to the large concentration of British troops, Cornwallis deployed his men into four major garrisons located in Burlington, Trenton, Princeton and New Brunswick.

George Washington seized this opportunity to plan an attack on the divided British forces. Many of Washington's troops were nearing the end of their enlistments and were anxious to return home.

On Christmas night 1776, using every boat they could find, Washington's 2,500 troops, cannons and supplies crossed the raging Delaware River from Pennsylvania to New Jersey, fighting their way through floating ice, freezing rain and an approaching storm.

When the troops landed, they immediately marched south toward Trenton, determined to strike the British garrison eight miles away.

The Trenton Battle

The 1,400-man Hessian garrison (mercenaries in the British Army) under Colonel Johann Rall had been celebrating Christmas in the Trenton Barracks and private homes. Washington surprised the Hessian troops at 7:30 a.m. on Dec. 26 while many were still in bed. Washington captured and took command of the regimental flag after a short and disorganized resistance.

Rall was killed in this engagement, and a total of 918 British soldiers were killed, wounded or captured during this two-hour battle. Only two officers and two enlisted men in the Colonial army were wounded in battle. This British defeat was a major military blow to the pride of the British and the top command.

At this time, Cornwallis was in New York City preparing to leave for a vacation in England, thinking his garrisons in New Jersey had Washington well in hand. The British frequently referred to the Continental army as "a bunch of farmers with guns."



JOHN K. MILLS, PRINCETON BATTLEFIELD

Revolutionary War reenactors don the customary gear and weaponry of the common soldier (top). Durham boats are used to shuttle soldiers on the New Jersey side of the Delaware River (bottom) during a reenactment.

Learning of the military defeat in Trenton, Cornwallis quickly dispatched a large army of reinforcements to Trenton on Jan. 1, 1777. Washington had taken his prisoners to the Pennsylvania side of the river and returned his forces to Trenton, taking a position on high ground south of Assunpink Creek.

On Jan. 2, Cornwallis ordered an attack on a bridge which was the only access over the Assunpink Creek for Washington's forces. But the bridge was well protected by Continental army cannons, and when Cornwallis sent his Hessian troops to take the bridge, they were defeated in four attacks.

Cornwallis decided to wait until daylight the following day to attack the bridge with a larger force, but Washington slipped his 5,000 troops out shortly after midnight, leaving only a rear guard to stoke the camp fires and make it appear that Washington's army was encamped for the night. The Continental forces, using burlap bags on the wheels of the artillery and supply wagons, quietly moved the troops and supplies around the flank of the sleeping British troops and marched toward the British garrison in Princeton.

The Fox Chase

On Jan. 3, Washington's advance guards saw British troops coming south to reinforce Cornwallis in Trenton. The British encountered the Colonial army at Stoney Brook near Princeton. General Hugh Mercer, who was leading the Continental troops, was bayoneted, and his troops began to retreat in panic. It appeared the American line would break.

At this point, General Washington, riding a white horse, personally entered the battle and led the Continental army's attack. His troops immediately rallied, and observers feared Washington would be killed. As the fighting raged, the British troops began to break ranks and retreat. Washington was quoted as saying, "It was a fine day for a fox chase, my boys." This major battle lasted about 15 minutes.

Washington quickly pursued the British army for an hour to Nassau Hall in Princeton, which was then the center of the College of New Jersey (later Princeton University). The building was surrounded by the Continental army and, as cannon fire was directed at the building, the British garrison surrendered.

This was Washington's second capture of a British garrison in a few days.

At this time, Washington hoped to march on and attack the large British garrison in New Brunswick, where there was a major depot for ammunition, food and supplies. Unfortunately, Washington's army was starved, sick and weary from almost continual marching and battle and was not in any condition to continue fighting. In addition, the British were in fast pursuit of the Colonial army.

On Jan. 6, 1777, the Colonial army marched for three days to the Morristown Barracks, where they spent the winter before renewing their struggle.



LES RUDNICK



LES RUDNICK



JOHN K. MILLS, PRINCETON BATTLEFIELD

While the Revolutionary War lasted another six year before a peace treaty was signed in Paris, the six weeks in New Jersey signaled a turning point in the war.

As the British swept across New Jersey, they had claimed to the world they had taken the Garden State and re-established the royal government. They proudly took credit for taking back the first of the 13 rebellious colonies. They proclaimed this news to the colonies' British loyalists, and those waiting to see how the war progressed before announcing their allegiance to the British crown.

But as a result of these six weeks of crisis, American forces and the 12 other revolutionary colonies took heart in Washington's success and the recent New Jersey victories and realized that the American Revolution could be won.

Pete McLain is an outdoors writer who lives in Toms River.

Continental troops prepare their weapons at Washington Crossing before a march on Trenton.

Steps in History

You may wish to retrace the six week crisis of the American Revolution in New Jersey, starting with General George Washington's retreat from Fort Lee on Nov. 20, 1776 to his winter encampment in Morristown. Here are several key locations that are open to the public and the activities that are provided:

■ Fort Lee Historical Park

Hudson Terrace
Fort Lee, N.J.
(201) 461-1776

Visitor's center, fort reproductions, exhibits and brochures

■ Steuben House

1209 Main St.
River Edge, N.J.
(201) 487-1739

Historic building, exhibits, guided tours and special events

■ Washington Crossing Historic Park

1112 River Road
Washington Crossing, Pa.
(215) 493-4076

Restored buildings, visitor's center, exhibits, a library, narrated and guided tours, and brochures
Reenactment: Dec. 25
(Dress rehearsal, Dec. 11)

■ Washington Crossing State Park

255 Washington Crossing/
Pennington Road
Titusville, N.J.
(609) 737-0623
(609) 737-9304

Historic buildings, visitor's center, exhibits, audio-visual program and brochures
Reenactment: Dec. 25 (Dress rehearsal, Dec. 11)

■ Old Barracks State Museum

Barracks Street
Trenton, N.J.
(609) 396-1776

Historic buildings, museum, programs, exhibits, guided tours, living history and special events.

■ Princeton Battlefield/Clarke House

500 Mercer Road
Princeton, N.J.
(609) 921-0074

Historic buildings, guided tours, a brochure and special events.

Reenactment: Dec. 10

■ Morristown National Historical Park

Washington Place
Morristown, N.J.
(201) 539-2085

Library, interpretative program, exhibits, guided tours, special events and a brochure.

Today's Battle Brigades

Each year, hundreds of men and women don the customary gear of our forebearers to reenact the events of these great New Jersey battles. They provide a personal view of life during the Revolutionary War.

"Most people do it because they are interested in history," says John Mills, curator of the Princeton Battlefield, who has participated in reenactments since 1973. "You get to experience what the soldiers experienced — the equipment, living in tents, marching for miles. But what you can't experience is the deprivation, the emotions of being under fire or worrying about your farm at home."

For 20 years, Robert Snyder has depicted an oarsman on the large boat used to transport troops across the Delaware River during the annual reenactment of this Christmas Day event. He provides an account of what it was like that day.

"It took about 20 minutes, if all went well, to cross the river," Snyder says. "I could hear the troops complaining of the cold, their lack of adequate clothing, their hunger. Many were close to retirement on Jan. 1st, and they feared this was their last battle. Other men had not heard from their loved ones at home for months. It was not a happy group, but they were determined."

"As soon as we unloaded one group of soldiers, we

returned to the Pennsylvania side of the river and loaded another. Our only rest from dusk Christmas evening to 3 o'clock the next morning was when the troops were loading and unloading."

The troops landed and marched on Trenton, where they met the Hessian garrison. Here is how the battle lines were drawn and the fight through the eyes of one reenactor.

"As our troops entered Trenton, we were divided into two columns," says Larry Schmidt, a curator of history and interpretation with the Old Barracks Museum in Trenton, who was a soldier in a reenactment of the event. "One set up the artillery on the

high ground, known as 'Five Points,' which later became the Battle Monument overlooking downtown Trenton. The second column, of which I was a member, marched into Trenton and attacked the Hessian garrison at about 8 o'clock in the morning.

"I recall the Hessian troops forming battle ranks in the street and awaiting orders from Col. Johann Gottlieb Rall and his officers. Orders were slow in arriving, and the Continental troops took advantage of the cover of the local buildings and fences to fire on the exposed enemy forces who were described as 'sitting ducks.'"

Several days later, on Jan. 3, Continental and

British troops clashed again in Stoney Brook, where General George Washington took personal command of his army.

"The general immediately formed a left flank and personally attacked the British right flank," says Mills. "My unit in the reenactment, the Pennsylvania Riflemen, attacked their left flank. We surrounded the British and engaged them in a fierce bayonet battle until they retreated from the battlefield."

Hessian soldiers drill outside the Clarke House at a reenactment of the Battle of Princeton.



JOHN K. MILLS, PRINCETON BATTLEFIELD

A Belgian horse pulls an ice plow at Howell Farm during a re-creation of early 20th century ice harvesting. The ice saw in the foreground is used to cut blocks of ice from the pond by hand.





New Jersey's Winter Crop: Harvesting Ice

Story by Kenneth Wajda / Photographs by Mary O'Connor

It's a good thing ice floats.

This simple fact of natural engineering produced a valuable crop from New Jersey's ponds and lakes during the cold winter months for more than 100 years. And that crop — ice — was part of a multi-million dollar industry nationwide by the late 19th century.

Before refrigeration, there were few ways to keep meat and dairy products from spoiling. So people kept their perishables in cellars and spring houses, and they dried, smoked, salted and pickled whatever they could. Then a new technological option — an icebox — had made its appearance. The icebox was an insulated chest with a compartment for ice. The ice was supplied by Mother Nature — with a little help from humans and animals.

Ice harvesting began in parts of the northwest as a community event. Every year, usually in January or February, residents of rural communities would get together on the town pond or lake. There, they would measure, mark, score and cut the ice and fill storage buildings, called icehouses, for all the farmers in town. The task would be completed in a few weeks, and the ice would last until the following year. Nobody got paid for his or her work; the only reward was the ice itself.

A Step Back in Time

Today, that tradition is being kept alive at Howell Farm in Titusville, a "living history" museum depicting life at the turn of the 20th century. For the last 10 years, the farm has attempted to harvest ice.

"We succeeded seven times," says Pete Watson, the farm administrator. "When there was nothing to cut, we bought it from commercial icehouses, in much the same way that earlier farmers did when there was no natural ice."

Here, the ice is used as it was in times past — to cool iceboxes and to help make ice cream, which is served every summer at Howell Farm's ice cream social.

Ice harvesting at Howell is a very public event. Visitors can witness the process as well as try their hands at marking it, cutting it or hauling it up a chute via a pulley to the icehouse for storage.

The process begins by measuring the ice with a ruled stick to determine if it is thick enough. Last year, the ice at Howell Farm was 16 inches thick when it was cut. Typically, a farmer wanted the ice between 10 and 12 inches deep, but would settle for thinner ice if the winter had been unexpectedly warm.

At Howell, a cut in the ice is made with plows pulled by horses or ice saws worked by people. The first cuts create a channel, where ice is floated from the "ice field" to a wooden



chute at the shallow end of the pond. Ice is hauled up the chute and stored in an icehouse.

After the channel is completed, the ice field is marked out in rectangular patterns before being cut and sent to the chute for storage.

In small operations, like farm ponds, ice was cut into individual cakes using an ice saw. A cake typically measured 22 inches by 32 inches, but the size did vary.

The cake, now free from the ice mass in the pond, was floated through the channel with the help of a pike, a long wooden pole with a point and hook at its end. The point was used to push the ice, and the hook was used to pull it onto the end of the chute. There tongs were attached, and it was towed by horses up to the icehouse for storage. The ice was layered in the icehouse and covered with sawdust, which acted as an insulator. The process was repeated until the icehouse was full.

The icehouse at Howell Farm holds 25 tons. Since this is probably more than a farm family would need for its icebox, as well as for shipping products to market, it is probable that the surplus ice was sold.

Therefore, ice was thought of as a crop. If the weather was too warm, and there was no ice, the farmer would be forced to get it commercially for his needs, and there would be no income from the ice surplus.

At today's dollar amounts, at a rate of \$24 for a 300-pound cake of ice, it would cost \$4,000

The ice is scored into rectangular sections with an ice marker.



to fill the farm's icehouse. In 1900, it would have cost \$250, a sizable sum of money then.

"If the pond started to fill in with silt and got too shallow, and you were getting good money for your crop of ice, you'd have to drain and dredge the pond or else you'd lose your harvest site," Watson explains.

Ice maintenance — removing snow and animal droppings from the top of the pond — was also part of the game, Watson adds.

"Ice wasn't used in drinks, but rather in iceboxes to keep perishables cooler. But still the quality of the ice was important," he says. "The value of the ice was related to its purity. The clearest ice brought the highest price.

The design of the icehouse was critical. If the ice was properly stored, one could expect a loss of only 30 percent of the ice volume by melting in a one-year period.

Icehouses were constructed to retain the cold. Many structures had insulation of saw dust, cinder or straw between the interior and exterior walls. In addition, many icehouses were built with the slants of the roof facing east and west to avoid New Jersey's intense southern exposure to the sun.

The icehouse at Howell Farm is a wooden structure on top of a stone foundation that extends 10 feet underground. The original icehouse deteriorated and fell out of use in the early 1900s and, by the time the property was acquired by Mercer County in 1974, the site had become a garbage pit.

Saws are used to cut the ice by hand, and blocks are separated using an ice breaker, which resembles a flat rake.





Ice wasn't
used in drinks,
but rather in
iceboxes to
keep perishables
cooler.

Ice blocks are floated through a channel using a pike (opposite page) and placed on a wooden chute to be hauled up to the icehouse.

Ice is stored in the icehouse (left) and covered with sawdust, which acts as a natural insulator.



Ice is taken from the icehouse in summer to be used for Howell Farm's annual ice cream social.

Before the icehouse was reconstructed in 1990, plans were presented to the New Jersey Office of Historic Preservation to assure that they met all of the requirements for restoring state and federal historic sites. The icehouse was rebuilt with lumber from trees that had fallen or had to be taken down in county parks. The wood was collected over a period of six months, and the building was constructed by volunteers.

"We constructed the wooden part based on what little archaeological evidence we found in the pit and on an oral description given to us by a man from Pennington," Watson says. "He remembers sitting on the lawn here and watching as they took ice from the building to make ice cream. He had been invited to a birthday party for some little girl who lived in this house (at the Howell Farm) in 1906."

Commercial Harvesting

While ice harvesting evolved into a business for some farmers, it was a commercial enterprise at some of the state's larger lakes, such as Lake Hopatcong in Morris County and Greenwood Lake in Passaic County.

Mountain Ice Company was one of the largest commercial icehouses in Lake Hopatcong. It had as many as 1,000 employees in the busy ice-cutting season, and it filled orders through the summer in Newark and Jersey City. It ceased operation in 1934.



An old-fashioned Gibson icebox (left) from the early 1900s. Blocks of ice were put in the upper left chamber, while the other chambers were used for food. Two drip pans at the bottom caught the melted ice water.

Ice cream is made by hand at Howell Farm using crushed ice from the pond to cool the bucket of ingredients (above).

Many commercial ice houses would use motorized conveyer belts with “hold bars” to transport blocks of ice up the chute. They often ran cakes through a planer to cut the ice uniformly, so that everything fit perfectly. The average icehouse employed 100 people and stored as much as 25,000 tons of ice.

There were also occasional casualties in the industry as people, tools and horses would sometimes fall into the freezing water. But there would typically be equipment on hand to fish them out.

Ice harvesting all but died with the advent of the “Domestic Electric Refrigerator,” marketed in Chicago in 1913, and models by Kelvinator and Frigidaire that soon followed. Today, “living history” farms and other novelty ice harvesting operations are all that remains of this once great industry.

“Ice harvesting was something out of a different time, when people looked at things differently than they do now,” Watson comments. “People back then weren’t as concerned if their butter was a little rancid or their milk started to curdle. That’s just the way it was.”

Ice harvesting will be demonstrated at Howell Farm on Feb. 4. Admission is free. Howell Farm is located on Valley Road in Titusville, just off Route 29 two miles south of Lambertville. The farm can be reached by phone at (609) 737-3299.

Kenneth Wajda is a freelance writer and screenwriter who lives in Lambertville.

Mary O'Connor is a freelance photographer who also lives in Lambertville.



The Ethics of Photographing Wildlife

by Leonard Lee Rue III

I have seen several thousand caribou migrate in Alaska. I've witnessed hundreds of thousands of wildebeest on the move in Africa. I've observed hillsides covered with nesting penguins in Antarctica. And I have seen tens of thousands of shore birds stopping at the Delaware Bay to feast upon the eggs laid by horseshoe crabs.

I consider this annual New Jersey shore bird migration to rank right up there with the best wildlife spectacles of the world.

But in my 49 years as an outdoors photographer, I have seen

wildlife in all forms beset with adversity — with everything from human population growth to construction to insecticides to pesticides to pollution. The comic strip Pogo, which featured animals as human-like characters, said it best, "I have seen the enemy, and it is us."

As a professional wildlife photographer, I believe we have a moral responsibility not to cause harm or to allow harm to befall any creature we are shooting with our cameras. Therefore, there is a need for ethics when capturing nature on film.

According to the *American Heritage Dictionary*, ethics is the study of the general nature of morals and of the specific moral choices to be made by the individual in his relationship to others.

To put it in simple language, ethics is doing what you inherently know is right.

The Division of Fish, Game and Wildlife in the Department of Environmental Protection recently held a series of seminars for photographers and bird watchers on the ethics of photographing wildlife. The division was concerned about the impact of increased interest by bird watchers, wildlife photographers and the general public on the interaction between the shore bird migration and the horseshoe crabs in Delaware Bay.

Each May, with precise timing, semi-palmated sandpipers, dunlins, red knots, ruddy turnstones and sanderlings arrive at Delaware Bay in the week of the full moon. This coincides with the arrival of the horseshoe crabs, by the untold hundreds of thousands, that crawl up on the beach to lay their eggs at the mid-tide line.

The birds fly, non-stop, from South America to Delaware Bay. There they stop to rest and to gorge themselves on the fat-producing eggs. With their body reserves depleted, the birds feed voraciously, rapaciously, upon the crab eggs for about 10 days, doubling their weight, which will allow them to complete the journey to their Arctic nesting grounds.

In the three days that I spent at the Delaware Bay, I am happy to report that I saw no harassment of birds by wildlife photographers. However, several members of the public created minor disturbances, such as trying to throw back stranded crabs, thus interfering with the shore birds' feeding.

Photography Tips

For photographers, there are a few basics to successful shooting while respecting the lives of your wild subjects.

Use the longest lens possible on sandy beaches so you can stand at a distance. No lens shorter than 200 millimeters should ever be considered, and then it should be used with a 1.4 or 1.6 teleconverter to magnify your subjects. Remember sand reflects the sun and, therefore, light is always high, even on overcast days, so be sure to adjust your exposure.

Almost all wildlife has a "flight or fight" distance that varies greatly from species to species. Birds and animals in our state and national parks have become extremely tolerant of humans and their activities because wildlife is protected and encounters people in droves. Wildlife in our state and national refuges is less tolerant of man because hunting is allowed in parts of the refuges.

In state and national parks, you will find that most wildlife will tolerate your approach up to a certain distance and will then move on or fly off. You can usually tell when you are approaching this distance by "reading" the wildlife's behavior and body language.

All waterfowl, for instance, will turn into the wind when approached because that is how they take flight. Small birds sound their alarm notes. Grazing animals stop their feeding and may flick or raise their tails. If you continue your approach, all these species will be gone.

As you work with wildlife, you not only will be able to read their behavior, you actually get a "feel" for their next move. I have dealt with these creatures for so long that I can "feel" what they are going to do.



ADAM TUROW

A mallard duck in flight (above).

The Rue Ultimate Blind (opposite page), designed by the author, can be used to photograph wildlife without detection.

At the first sign of alarm, stop; don't go any closer. Let the wildlife settle down, and you can take your photographs.

When we think of being cornered, we think of being encompassed by walls or barriers from which we cannot escape. Wildlife can be "cornered" in open fields. If you should surprise a creature, and it thinks that you can catch it before it can escape, it feels cornered and may attack. Therefore, as a photographer, it is best to remember that a sharp offensive action could be a good defensive action when dealing with unpredictable wildlife.

Wildlife is Not Huggable

The early Walt Disney movies were the catalyst that spurred the tremendous interest in native wildlife. Some of the later movies and television shows did a disservice by portraying wildlife, including a huge black bear, as being "huggable." I constantly stress that all wildlife should be treated with respect and from a distance — the wild in wildlife means just that.

Blinds, which help to hide you from view, are a must when photographing birds. If you are out of sight, birds will have no reason to fear you and will soon resume their normal activities.

If you are granted permission to photograph on private lands, blinds can be made out of natural materials, such as reeds, cornstalks or brush. Or you can drape camouflage material over a framework of poles. When shooting in New Jersey state parks, forests or recreation areas, a special permit must be obtained from park superintendents to photograph wildlife, and blinds are allowed only with special permission. There is a fee for commercial photography.

Using a blind, you will be able to work at distances of six to 10 feet from birds or their nests. Have someone accompany you to the blind. After you are inside, have your companion depart. Small birds can't count, and they will perceive you have both left and that the danger is gone.

I do not like to photograph birds on their nests while they are incubating their eggs. If the birds are disturbed right after the eggs are laid, the nest may be abandoned. Every day a bird incubates the eggs, the bond becomes stronger. After the eggs



LEONARD LEE RUE III

To put it in simple language,
ethics is doing what you
inherently know is right.



ADAM TUROW

An eastern chipmunk (above) peers over a log.

A woodchuck (opposite page) takes a stand.

A whitetail deer (right) hides in the bushes.



CHARLES ST. CHARLES



LEONARD LEE RUE III

Almost all wildlife has a “flight or fight” distance that varies greatly from species to species.

A raccoon peeks out of its tree den.



have hatched, the bond is strongest and weakens just before the young are fledged.

Most birds' nests are well hidden so they cannot be found by predators. Do not cut the intervening branches that hide the nest. Tie them back and then untie them when you are finished. You will probably need a flash in order to get light into the dark area.

Do not keep parent birds away from their eggs or young. The eggs can become either chilled or overheated depending on the outside temperature.

About 40 percent of all birds' nests are destroyed before the young are fledged; do nothing to push that percentage higher.

Photographing Small Animals

Blinds can also be helpful in photographing small animals. Most squirrels, chipmunks and marmots will escape to dens or burrows when threatened, so if you keep your blind far enough away, they will soon come back out.

With larger mammals, such as white-tailed deer, it is difficult to locate their young. When you do, the mother will not be nearby, so never assume that the fawns are orphans. The mother purposely stays away from her resting young so as not to attract predators with her body odor.

Never touch the young. Although biological research has shown that 90 percent of all does will accept their young even with a human odor, don't be the cause of that 10 percent rejection rate. Do not approach any closer than you absolutely have to. Take your picture and get out of the area. If you approach the fawns too closely, predatory animals may discover them by following your tracks.



Be wary of raccoons, skunks or opossums that wander during daylight hours. They should be avoided because they may be sick with rabies. Report any strange behavior to your local game warden or animal control officer. New Jersey is experiencing an epidemic of rabies, and the raccoon population is only now recovering.

Wildlife needs all the help it can get in a world beset with danger. Wildlife ethics is really nothing more than the Golden Rule put into practice. I don't remember who said it first, but it can't be said any better, "When in the out-of-doors, take only photographs and leave only footprints."

Leonard Lee Rue III is an author and wildlife photographer who lives in Blairstown.

A cottontail rabbit (above left) pauses in the snow.

A red fox (above right) in winter.

Fly Tying — The Angler's Art of Winter



Story and Photographs by Ross Kushner

Like the fish they pursue, most fly anglers settle into a dormant state in winter — a kind of semi-hibernation. After the rods, reels, boots and vests are cleaned and carefully stored away, there isn't much to do but wait for spring.

But for those who have learned the art of tying flies, winter can still be a very active season. Many depend on these colder months to get their tackle boxes filled. And there is no better way to pass a snowy winter afternoon than crafting a delicate mayfly from feathers and fur and picturing it adrift on sunlit summer waters.

Most fly anglers consider tying their own patterns at one time or another, but often hesitate to take the initial plunge. There are many good reasons to try. The most common is saving money, although the initial cost of tools and materials may offset any savings in the beginning.

Perhaps a better reason to tie your own flies is found in the flexibility and self-reliance it can provide. Since fly fishing presents a moving target for fish, resourceful anglers need to imitate nearly every type of fish food with flies. Streamers mimic bait fish; deer hair "bugs" are similar to frogs or mice; dry flies imitate mature insects from mayflies to ants; and wet flies (or nymphs)

Rooster saddle and neck feathers from chickens are often used to construct dry flies or streamers.



can be mistaken for immature insects or drowned adults.

Adjusting features to fit your needs is a great help in meeting varied fishing conditions and in boosting your confidence in making the "perfect fly."

Once you've mastered the tying of standard patterns, you can create your own. This is one craft likely to bring out the artist in every angler. Not all of your inventions may catch the big fish, but that's part of the fun. Like a lot of fly-tiers, I've gotten to a point where I no longer purchase flies at all, since catching a fish on a store-bought item feels too much like cheating. You'll find that luring a stream-wise trout with a fly you designed and tied is the ultimate ego-boost.

To get started in this new hobby, you'll need some basic tools and proper materials for the patterns you have in mind. Ready-made, fly-tying kits are available, but you can also put your own "kit" together.

The Tools

The central tool in fly tying is the fly vise, an elevated clamp that holds the hook while the pattern is being prepared. The vise jaws sit on a shaft with a weighted base or attach to the edge of a table with a clamp. The vise should be made of hardened steel jaws that can handle a variety of sizes — from 24 midsize patterns suited for finicky trout to huge streamers for pike or bluefish.

Next, you need a bobbin to dispense and hold your thread. The bobbin has two spring arms, which clip onto the thread spool, and a hollow tube for feeding the thread. A new breed of ceramic-tipped bobbins may cost more, but they are worth the extra expense because the tubes last longer and are less likely to abrade the thread.

Although you can form the knot that completes the head of the fly by hand, a whip finisher is faster, easier and more precise. The whip finisher is a device with a slim metal handle and a specially configured wire extension.

Hackle pliers are used to wind feathers around the hook in tying wet flies, dry flies and streamers. There are three basic types, including the metal-jawed English style, the rubber-jawed, "non-skid" type and the duplex with one rubber and one metal jaw. In my experience, the English style occasionally break feathers while the "non-skid" (despite its name) tends to slip loose. The duplex pliers, designed as a compro-



An assortment of fly-tying equipment, including feathers, fur, hair, a bobbin, a hook, scissors and a fly vise.



A mouse and an insect are two examples of fly tying. They are being held by two different types of fly vises — one with standard jaws and the other with fine jaws.

mise, are really just that, since they sometimes break feathers and sometimes let go. I favor the rubber jaws since I'd rather start wrapping over again than be faced with trying to finish a fly with half a feather.

A bobkin is nothing more than a large needle with a handle, and it's a handy gadget for roughing up bodies on nymph patterns and several other delicate tasks. But it is most useful for applying head cement to finished thread wraps so they do not unravel.

Scissors get a lot of use, and you're better off with the best you can afford. Choose a pair made from tempered steel with fine points and serrated blades. The serrated blades make dealing with slippery materials like deer hair and feathers much easier.

A good hair stacker, an open-ended tube that slides into a metal cylinder, is used to align hair for dry fly wings or tails. Drop the hair into the tube, tap the cylinder on your desk and slip the tube out with the hair now neatly aligned.

Hair packers, on the other hand, are smaller diameter tubes used to compact the deer hair bodies on bass bugs. I use the hollow plastic tube from a Bic pen, but regular commercial packers are available.

Finally, I recommend a material clip, which attaches to your vise and acts as a third hand to hold materials out of your way.

Materials

Once you've rounded up the necessary tools, the next thing to consider is a selection of materials. Every standard fly pattern includes a list of the materials needed and brief instructions on tying, similar to a recipe. Read up on the particular flies you want to construct. The following materials are often used as basics in the recipe, but once you get started, let your imagination be your guide.

The hook, of course, is the essential ingredient for any pattern. The tying instructions for each fly will normally list a particular style of hook, and you should follow that recommendation. Barbless hooks are not only good for the fish, they're good for the fly-tier too. A barbless fly will last much longer than a barbed pattern and both the fish and the fly are less likely to be damaged when they are removed after the catch.

Thread is most often used to fasten all the other materials to the hook. It comes in three common sizes: 3/0, 6/0 and 8/0.



8/0 has the finest diameter and is superior for tying flies size 18 and under that are most often used in trout fishing. The strength of heavy 3/0 thread is useful for tying deer hair bugs and streamers for large fish such as bass, bluefish, pike and striped bass. I use 6/0 for everything else.

For fly-tying purposes, the term hackle refers primarily to plumage from domestic chickens. Feathers from the neck and the saddle, or back, of roosters are of major importance. Neck feathers wrapped around standard dry flies are essentially what makes them float. Neck feathers from roosters are graded on a variety of factors including feather length, count and stiffness. Saddle hackle is used mostly in constructing streamers, although a really good saddle hackle yields feathers suitable for larger flies.

The hair from deer, elk, moose and caribou is a main ingredient in many fly patterns. It comes in an incredible range of types, colors and lengths. A good flying-tying manual or the advice of an experienced friend will help you to learn the difference between such disparate items as cow elk and Texas whitetail.

Calf hair is a much easier to identify — the body hair is short and straight while the calf's tail is longer and wavy. These are used primarily for winging dry flies.

Dubbing refers to any material twisted onto thread and wrapped around the hook. Both natural furs and synthetics, such as antron, are used. In general, dry flies call for fine materials to resist water absorption. A host of different types are available.

Yarn, floss, chenille and tinsel can be wrapped around the hook shank to form the bodies of many patterns. In addition, red wool yarn is utilized as tailing material for some streamers, and tinsel is called for as ribbing material over other types of bodies.

In the past, few birds escaped use as an ingredient for a fly pattern. Today, of course, the feathers are taken from the more



common species. Sections of the larger flight feathers from duck, turkey and geese, along with the flank feathers from mallard and wood ducks, are used as wings on dry flies, wet flies and streamers and as wing cases for nymphs.

Pheasant, partridge and grouse have plumage perfect for wet fly hackle as well as legs and tails on nymphs and wet flies because they are softer and provide more movement. The soft downy "marabou" feathers from domestic turkey add life to old favorites like wooly buggers and marabou muddlers.

More and more modern fly patterns are making use of a variety of synthetics. Closed cell foam, similar to foam rubber, makes durable ant, beetle and hopper patterns. Several different synthetic wing materials for both dry flies and streamers are now widely available. This is an area that is sure to expand in the years to come.

As you can see, there is an extensive array of materials available, and this short list barely scratches the surface. Start with the ones you need and let your supplies grow along with your tying.

Learning to use your new acquisitions will be enjoyable if you approach it the right way. A friend with some skill (and some patience) is your best source, since nothing compares to watching an experienced fly tier at work. If you don't have anyone to help you get started, there are other avenues.

Trout Unlimited hosts some inexpensive flying tying classes throughout the state. In addition, the Division of Fish, Game and Wildlife holds one-day courses at Pequest State Fish and Natural Resource Education Center in Oxford where you can sample this hobby easily, since tools and materials are provided. The New Jersey School of Conservation in Branchville also hosts seminars on fly tying.

If you prefer the self-taught approach, a book or an instruction video is a necessity. A good tying manual is a helpful reference for any fly tier.

No matter how you approach it, you're in for a treat. Tying flies is an addictive pastime offering almost as much challenge and reward as fishing with them. I know that when the first lunker brown trout rises to a fly that you've tied, you'll be hooked just as surely as he is.

Ross Kushner, who lives in Kinnelon, is the conservation director of the East Jersey Chapter of Trout Unlimited.

Learn to Tie Flies

Following is a list of organizations, books and videos that provide fly tying instruction.

Instruction

■ Pequest State Fish and Natural Resource Education Center

Pequest Road, RR 1, Box 389
Oxford, NJ 07863-9737
(609) 637-4125

■ New Jersey School of Conservation

1 Wapalanne Road
Branchville, NJ 07826
(201) 948-4646

■ Trout Unlimited — East Jersey Chapter

Box 366
Hohokus, NJ 07423
(201) 445-3902

■ Trout Unlimited — Hacklebarney Chapter

4 Grove Street
Madison, NJ 07940
(201) 377-0225 (Ed Barry)

■ Trout Unlimited — North Jersey Chapter

P.O. Box 671
Sparta, NJ 07871

■ Trout Unlimited — Central Jersey Chapter

P.O. Box 4343
Dunellen, NJ 08812
(908) 469-8212
(Andy Babchak)

■ Trout Unlimited — Toms River Chapter
915 Brooks Road
Point Pleasant, NJ 08742

Books

■ **Tying Dry Flies**, by Randall Kaufmann, published by Western Fisherman's Press. Available from Western Fisherman's Press at (503) 639-4848.

■ **The Fly Tier's Primer**, by Dick Talleur, published by Lyons and Burford Publishers. Available from Lyons and Burford Publishers at (212) 620-9580.

■ **Fly Tying Made Clear and Simple**, by Skip Morris, published by Frank Amato Publications. Available from Frank Amato Publications at (800) 541-9498.

Videos

■ **Fly Tying Basics**, produced by Jack Dennis, distributed by Snake River Books. Available from Snake River Books at (800) 937-7309.

■ **Fly Tying Made Clear and Simple**, produced by Skip Morris, distributed by Frank Amato Publications. Available from Frank Amato Publications at (800) 541-9498.

Marketplace



H. Poster featuring fall leaves. 2' x 3'.

NJO Marketplace Order Form (Winter '95)	Adult Sizes/Quantity					Total Quantity	Total Price
	S	M	L	XL	XXL		
A. Sweat Shirt (\$24.95)							
B. Endangered Species T-shirt (\$12.95)							
C. Fin Whale T-shirt (\$12.95)							
D. Canvas Carry-all (\$9.95)	Product sales help support NJO						
E. Hat (\$10.95)							
F. Ceramic Mug (\$4.95)							
G. Magazine Holder (Special \$5.95)							
H. Poster (\$3)							
Merchandise Subtotal							
Shipping (see chart below)							
TOTAL AMOUNT DUE							

Name _____	
Address _____	
City _____	
State _____	Zip _____
Phone (____) _____	

Send order form with check or money order payable to: New Jersey Outdoors, DEP Bureau of Revenue, CN 417, Trenton, NJ 08625-0417. (Allow 3-4 weeks for delivery)

Orders up to \$10.00	Add \$3.50
\$10.01-\$15.00	Add \$3.95
\$15.01-\$25.00	Add \$4.95
\$25.01-\$35.00	Add \$5.75
\$35.01-\$50.00	Add \$6.75
Orders over \$50.00	Add \$7.50



PHOTOS BY GREGORY M. MCDERMOTT

The Ground Pounders: The Science of Search and Rescue

Pasha leads a hasty team on a search through Washington Valley Park in Somerset County.

Caroline Hebard has no idea why, at 4 a.m. one March morning, she suddenly awoke and switched on the television news.

But what she saw made her wonder about fate. The top story that morning was that 200 residents of an apartment complex in Edison were missing following a gas explosion.

The Bernardsville resident immediately set wheels in motion, contacting associates and waiting for the call she knew would come. The plea for help arrived

three hours later.

Hebard set out to the scene of the disaster with a specially-trained team of volunteers and dogs. Volunteer searchers scoured the ruins for visual clues, while the dogs used their noses to locate missing residents. But not once did the dogs give the distinctive bark that signaled a human find.

The next day, the teams returned to the site, but the result was the same. There were no casualties.

"Finally, at the end of the day, we re-

grouped and discussed," recalls Hebard.

"Then I went to the command center and told them, 'I am 90 percent sure there are no human remains in the debris.'"

And despite the magnitude of that explosion — which leveled whole buildings in the Durham Woods apartment complex — she was right. No one died in the blast (although one woman expired from a heart attack), and all the missing were later accounted for.



Alisa Jones, a Somerset County Parks naturalist and NASAR-trained volunteer, measures footprints with a stick.

Disaster Volunteers

Hebard, one of the most experienced searchers in New Jersey, is no stranger to disaster. As a specialist in using dogs to locate people, she has traveled the world under the auspices of the U.S. State Department on humanitarian missions following natural disasters in such places as Mexico City, San Salvador and the former Soviet Armenia.

Hebard, however, is far from alone. Across New Jersey, volunteers train for searches and are ready to go wherever they may be called.

Hebard says there are several dozen dog handlers with varying levels of search and rescue training in New Jersey at any given time, although no official records are kept of their actions. But canine units are only one component of the search and rescue function. An infantry of human volunteers make up the heart and soul of missions with their expertise in tracking and clue detection.

"We call ourselves 'Ground Pounders,'" explains Jane Butts, a volunteer searcher who works as the administrator of park rangers for the Somerset County Park System. "Actually, I hold two certifications,

one in straight search and rescue and the other in managing the search function."

Much of the search function is becoming a science, one taught by instructors across the country that are certified by the National Association for Search and Rescue (NASAR) in Fairfax, Va. Fundamental to this new approach is the mathematics of probability. Just as in the childhood game of hide-and-seek, many of those commonly lost have established predictable patterns in their wanderings.

Although hikers can become lost in New Jersey's vast areas of open space, more often the missing person is a child or an adult with Alzheimer's disease, a neurological disorder marked by progressive dementia.

People with Alzheimer's tend to travel in a circle, often doubling back, making traditional search methods more difficult. Children tire quickly, and many hunker down to sleep under logs or bushes, out of sight and undetected.

"There was one instance . . . where a state trooper's son had wandered off," Hebard recalls. "Dozens of searchers had walked right by this child because he had crawled under a bunch of thick rhododen-

dron bushes and gone to sleep. He was only an eighth of a mile from his home."

Many traditional outdoorsmen and women — such as hikers, hunters, berry pickers, mushroom hunters and wildlife photographers — have also developed their own unique patterns based on data compiled from cases across the country. If these individuals should become lost or injured, the search cannot necessarily focus on known trails because many will wander off the path in search of their hobby.

Based on these profiles, expert searchers can concentrate activities while remaining alert for other telltale signs. This is where the expertise of different searchers can come in handy.

"As a naturalist, I tend to see things that police wouldn't see," says Alisa Jones, a Somerset County park naturalist and a trained volunteer. "Since I'm out daily looking at animal tracks and people tracks, I'm often able to identify something that is out of place."

Butts says volunteers who are park rangers or naturalists will often look for clues in nature. These could include such things as the "shining" of grass, the glean left on high grass after someone has walked through, or the smell of a broken spice bush, which may indicate someone has passed through the area.

In addition, many of the volunteers are trained in first aid, allowing them to assist victims if they are injured when found.

Butts says search and rescue teams are always in need of the "local guide," who could be a hunter or local resident familiar with the area. Even if the local guide cannot physically join the search, he or she can provide valuable information on potential areas of danger.

Search and Rescue

Searches may combine the best elements of both people and dogs. During a typical search, some dogs run free so they can cover more ground than their two-legged companions. A dog's sense of smell is, by one estimate, 5,000 times more accurate than that of a human, and



Volunteers Jane Butts, Chris Carpenter and Norm Cetuk study terrain maps, the first stage of a search and rescue.

it can detect lingering human scents.

For canine ground runners, this serious business is a game. Training stresses fun, and it is founded on progressively more complex variations of "hide and seek." Often the game is bolstered by rewards from the handler in the form of praise or a pet treat.

During a recent demonstration at Washington Valley Park in Somerset County, a "hasty team" (those available on short notice) was put through its paces.

Hebard had brought along Pascha, an eager German Shepherd and her latest assistant in woodland and water searches. Other team members included Butts, Jones, Somerset County rangers Kristen Gigon and Chris Fox and Nick Inportico, a captain in the Somerset County Prosecutor's Office.

All are NASAR certified, and most had worked before with Hebard during drills and actual searches. All also are volunteers, with full support from Somerset County and its Parks Commission whenever urgent calls come during regular working hours.

"Our bosses recognize we're a resource not only to the parks, but to the community

at large," says Butts. "I think that's kind of a sign of the times, employers allowing committed persons more support as volunteers."

If this had been a real rescue, search managers would first study terrain maps, which are carried as part of their basic kits. The deployment of teams would be strategic and based upon physical geography and the probability of success.

With Pascha as lead, the hasty team follows an overgrown path along a woodland water course. Beside Hebard, another team member keeps careful tabs on Pascha's behavior. "This way," says Hebard, "if I lose my footing and have to look down, someone else can notice if he picks up something."

The other four team members act as flankers, dividing themselves evenly on open ground and working deliberately to avoid missing any clues. There might be an abandoned garment or, more often, footprints. These can be measured to determine foot size and stride, and they can also provide clues to a person's physical or mental condition.

But many clues are often hampered by those trying to help.

"Large numbers of people destroy the

scene for a K-9 unit that might be brought, as well as any clues that are out there," says Butts. "The whole point of searching is you don't look for the subject, you look for clues."

Professional Volunteers

Trained search volunteers can be available within minutes to police and fire officials throughout the state. These volunteers often will remain on duty for days if necessary.

Last December, the Clinton Township police called NASAR-trained volunteers to search for a woman reported missing at Round Valley Recreation Area in Lebanon. Police had found her car in the parking lot.

"We don't have enough resources to do a prolonged search ourselves," says Lt. Stephen Clancy of the Clinton Police. "That's why we had the dogs out first."

Although the woman was never found (police speculate that she may have hitched a ride with someone in the parking lot), this incident helps to demonstrate the need to build closer links between certified search managers and dog handlers.

"These dogs are to be respected," says Lynn Leahy, training and program director for NASAR. "We want to make the handler more a part of the search function."

For volunteers like Butts, her training has brought acceptance — and satisfaction.

"Jurisdictions are important, but we're finding that increasingly we're able to work as professionals alongside other professionals," The only difference is, we're not being paid," says Butts. "I can't tell you how good (being treated as a professional) feels. After all, we're all there not because of who pays us, but for the person who is lost."

For more information on NASAR, call (703) 352-1349. For more information about New Jersey search and rescue teams, call Jane Butts at (908) 722-1200 x 223.

by Daniel C. Church, a freelance writer who lives in Bethlehem, Pa.

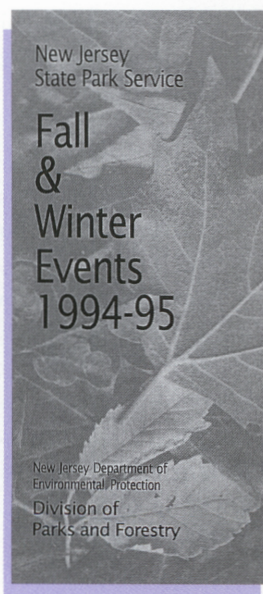
Bookshelf

Canoeing the Jersey Pine Barrens, by Robert Parnes, published by the Globe Pequot Press Inc., provides detailed descriptions of New Jersey's best canoeing rivers, as well as historical information about the regions through which they flow. There are also a few useful tips for canoeists everywhere. *The cost is \$11.95. Available in bookstores or from Globe Pequot Press at (800) 243-0495.*

Delaware Water Gap National Recreation Area Hiking Guide, by Nick Miskowski, published by the New York-New Jersey Trail Conference, contains all the information hikers need to enjoy the scenic areas of popular hiking trails on the New Jersey and Pennsylvania sides of the river. This revised version of Michael Steele's 1991 book features historical information, photographs and maps of the area. *The cost is \$7.95. Available from the NY-NJ Trail Conference, 232 Madison Avenue, New York, NY 10016 or by calling (212) 685-9699.*

Fall & Winter

Events, published by the New Jersey Department of Environmental Protection's (DEP's) Division of Parks and Forestry, is a guide to events occurring in state parks, forests and recreation areas throughout the fall and winter. It also contains information on state parks, forests, recreational areas, historic sites, interpretive programs and marinas. *The booklet is free. Available from the DEP's Division of Parks and Forestry at (800) 843-6420 or (609) 292-2797.*



How I Photograph Wildlife and Nature, by Dr. Leonard Lee Rue III, published by arrangement with World Almanac Publications, is a book on the mechanics of wildlife photography — from how to find animals to get photograph to how to compose the picture to get the best effects. *The cost is \$35. Available from Leonard Rue Enterprises at (908) 362-6616.*

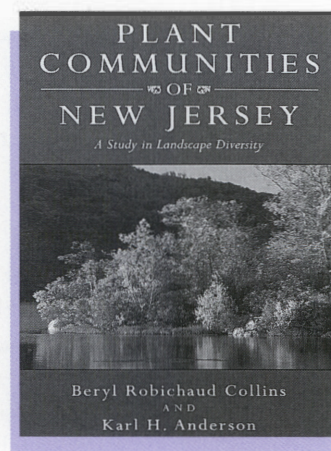
Known Contaminated Sites in New Jersey, published by the New Jersey Department of Environmental Protection, provides a listing of approximately 6,000 known sites in the state where contamination of soil or groundwater has been confirmed and where cleanup efforts have either begun or are pending. Each site record includes information on the site and location and the bureau within DEP where information can be obtained about the nature and extent of contamination, health risks and environmental damages. *The cost is \$15. Available in hard copy or on disk from the DEP's Maps and Publications Sales Office at (609) 777-1038.*

The Nature Directory: A Guide to Environmental Organizations, by Susan D. Lanier-Graham, published by Walker Publishing Company, provides information to help concerned citizens get involved in the environmental movement. This guide to more 130 major environmental groups, national and regional, also has detailed information about some of the most pressing environmental concerns facing society today. *The costs are \$12.95 for paperback and \$22.95 for clothbound volume. Available in bookstores and from Walker Publishing at (212) 265-3632.*

Old Burial Grounds of New Jersey, by Janice Kohl Sarapin, published by Rutgers University Press, is an illustrated guidebook to old graveyards in the Garden State. This book includes the history and lure of old burial

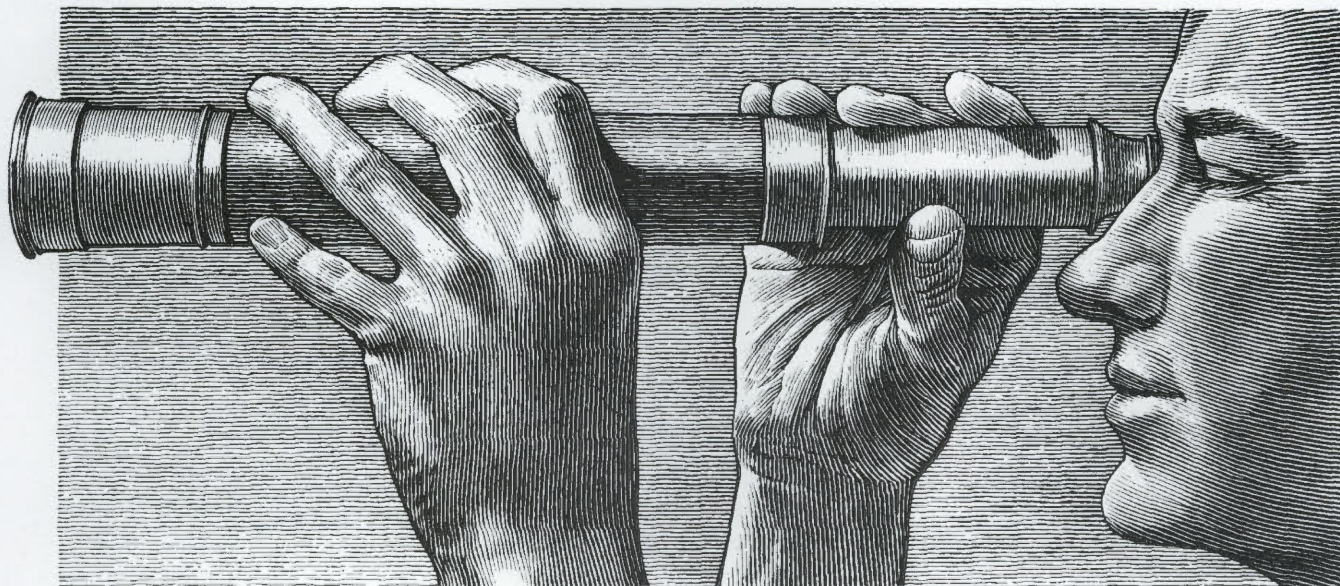
grounds as well as a how-to guide on reading epitaphs, dating gravestones by style, restoring abandoned graveyards and discovering the histories of people buried there. *The cost is \$14.95 for paperback and \$35 for hardcover. Available from bookstores or Rutgers University Press at (908) 932-7037.*

Plant Communities of New Jersey: A Study in Landscape Diversity, by Beryl Robichaud Collins and Karl H. Anderson, published by Rutgers University Press, is a study of the 12 types of plant communities distinguished in New Jersey. From the ridgetops of the north to the Pinelands of the south, this book examines the ecosystem of the Garden State through its vegetation. *The cost is \$17. Available at bookstores or from Rutgers University Press at (908) 932-7037.*



Standards for Safe Drinking Water in New Jersey, published by the Department of Environmental Protection, is a brochure for the general public on drinking water quality standards that is written in a question and answer format. This pamphlet also contains tables of the federal and state primary drinking water standards. *This brochure is free. Available from the DEP's Bureau of Safe Drinking Water at (609) 292-5550.*

Get Ready to Go . . .



Star Gazing in the Winter Sky

Standing around in the winter snow and cold may not strike you as the smartest way to go star gazing. Yet winter has four distinct advantages over summer — it gets darker earlier so you can observe at more convenient hours, the winter skies are often more transparent than summer's hazy nights, the brightest stars and many of the most interesting objects are visible only in winter, and there are no mosquitos, gnats or skunks to ruin your night.

Then again, winter observing requires more preparation. Shorts and a T-shirt won't keep you warm on those chilly winter evenings. And you need to find an observing site far from bright lights. Finally, since the sky isn't labeled, some kind of guide to the heavens is helpful.

First, dress for your winter star watching as if you were actually going into the cold of outer space. Cover everything and dress in layers. Be sure to protect your hands and feet and wear a hat and insulated boots.

You will need thin ski gloves or woolen

gloves for your hands, but they need to be flexible enough to hold binoculars, flip a chart page or focus an eyepiece.

Since most of the Garden State is aglow with the yellow lights of high intensity sodium vapor lamps, you will need to find a dark location to observe stars at their brightest. Voorhees State Park near High Bridge and Jenny Jump State Forest near Hope offer regular astronomy programs, and other state parks hold periodic star gazing events.

Bring a lounge chair with blankets or an unzipped sleeping bag. It's easier to tour the sky lying back, cocooned, than standing and craning one's neck. A pair of binoculars with six to eight times magnification is useful.

You may also want to bring along a thermos of something warm to drink. Hot cider-type drinks are best. Coffee and chocolate have caffeine, which restricts blood circulation at the extremities. Alcohol makes you lose heat, and it can cause your vision of Jupiter to wave like a fun house mirror.

A Tour of the Winter Sky

The night sky is the view screen of Mother Nature's time machine. As you'll discover, it displays two motions

— the Earth's rotation and its revolution around the sun.

We'll set our clock to 9 p.m. on Dec. 1. Lie back in your lounge chair and bundle up.

Start at the zenith or overhead point. Not far away, on the north side of the zenith, is a bright straggling "M-" or "W-" shaped group of stars. This is the constellation Cassiopeia, the Queen. Constellations rarely resemble the objects or people for which they are named. But in this position, Cassiopeia looks like a crown, though more like Burger King's than Queen Elizabeth's.

In Greek mythology, Cassiopeia was the world's vainest woman. Her ego nearly caused her to tie her daughter, Andromeda (a dim string of stars nearby), to the

The night sky
is the view screen
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Get Ready to Go . . .

rocks of the shore to serve as lunch for a sea monster. Cassiopeia's punishment was to be placed in the sky, never again to touch ground and rest.

Once you have found Cassiopeia, you can get a fix on other directions. Cassiopeia is always in the north. Facing that direction would put south at your back, west at your left and east at your right. The sunset in winter occurs near the southwest point.

Glance over to the northwest horizon. There you will see a large cross of stars with a bright white beacon on top. This constellation is Cygnus the Swan, but oftentimes it's called the Northwest Cross. Cygnus, the wayward swan, has been linked with a bird in various cultures far back into history. Greeks associated Cygnus with Leda, a friend of Jupiter and mother of the Gemini twins. The star at the foot of the cross, Albireo, is a fine yellow and blue double star when seen through binoculars.

If you sit and watch the sky for a few hours, you will notice things change. The stars shift locations with time. Cygnus gets lower; Cassiopeia moves in a counterclockwise arc. Actually, what you are witnessing is the Earth's rotation that moves you around to face a different part of the universe.

Simultaneously, the Earth is also orbiting the Sun. Every night, the line from the Sun to the Earth points to a different part of the universe as well. If you stay up two extra hours, the sky you will see is equivalent to the sky one month later. So the sky at 11 p.m. on Dec. 1 is similar to the sky at 9 p.m. on New Year's Day. Watching the stars move over the hours is like a fast forward on the seasonal star show.

On New Year's Day, in the southeast section of the sky, Orion the Hunter climbs up the sky on an angle. If you watch Orion for two hours, or come back on the first of February, he will have moved into a prominent view, standing upright in the south.

Orion, a superman in many cultures, has been a warrior, wanderer or hero

STAR PHOTOS BY RICHARD PEERY, NJ STATE MUSEUM PLANETARIUM



throughout time. The Greek Orion was an immortal human because his mother dunked him up to the heel in the river Styx. Unfortunately for him, he was later stung by Scorpius the Scorpion, but the gods honored his bravery by placing him in the stars.

Orion is easily pinpointed by his belt — three close, equally-bright stars in a row. Above and left of the belt is Betelgeuse, a star tinged pink. Below and right of the belt is arc-blue Rigel. (The color differences show temperature — blue is hot, and red is relatively cool.) Betelgeuse, whose name in Arabic describes its location in Orion as the “armpit of the central one,” marks a shoulder. Rigel, whose name similarly means “left leg of the giant,” is Orion’s foot. Two other stars,

along with Betelgeuse and Rigel, complete a great rectangle that surrounds the belt.

Use the belt to locate other constellations. Moving up and to the right leads to a star that resembles a dimmer Betelgeuse. It lies on the lower tip of a V-shaped group of stars. The star is Aldebaran, the group is a star cluster called the Hyades, and the whole constellation is Taurus the Bull. The V-shape is the bull’s face, and Aldebaran is its eye.

Greeks believed Taurus was an animal that swam away with Europa, its feet stamping the earth creating the Straits of Dardenelles; other cultures say Taurus was the bull tamed by Jason of the Argonauts. Despite all this, Taurus appears to have a grudge against Orion, eternally charging into this innocent bystander.

If you continue the line beyond Orion, you end up at a tiny clump of stars resembling a dipper, or a tiny shopping cart. This is the Pleiades, the Seven Sisters star cluster. In Japan, this group is called Subaru. The bull is apparently running away from the car!

The Pleiades are the seven daughters of Atlas, the man who held up the world, who were rescued from harassment by Orion by being put in the sky. Unfortunately, spending forever on the back of a charging bull doesn't seem like much of a rescue. Ancient astronomers believed Hyades indicated the beginning of the rainy season when it rose with the sun.

Retreating back to Orion's belt and moving downward and to the left, we find the larger of Orion's two hunting dogs, spotlighted by the shiniest dog tag in the sky. The Dog Star, Sirius, which means "sparkling" or "escorting," is a near neighbor to the Sun. The light that arrives now left during the last visit of Halley's Comet to our neighborhood in 1986. Orion's other pooch, Canis Major, has been owned by various gods and heroes, but this dog now spends his nights begging for food from Orion.

Orion and his neighbors are a tableau of all we know about the long lives of the stars. The start of the process is found just below Orion's belt in a vertical chain of three stars. This is Orion's thrice-jeweled sword. Look closely at the middle star — it doesn't look quite right. That's because it's not a star at all. It's fuzzy because it is a stellar nursery, a factory of stars called the Orion Nebula. Take a look at it with your binoculars and see a swirling cloud of light in which many stars are embedded.

This nebula is cosmically very young. A caveman some 20,000 years ago would have drawn Orion as we see him today, but

with a sword having but two jewels. Over time, the nebula will transform itself into a star cluster, like the Pleiades or Hyades.

These families of stars do not last forever. As they travel the Milky Way, they tend, like most families, to disperse. Our Sun, and many of the single stars of the winter sky, were once in clusters.

Betelgeuse and Aldebaran are example of stars that are dying. They are red giants — red because they are a cool 3,000 degrees Fahrenheit (compared to Rigel's 100,000 degrees).

They are giants because, in the process of running out of hydrogen, their outer gaseous edges are pushed far away

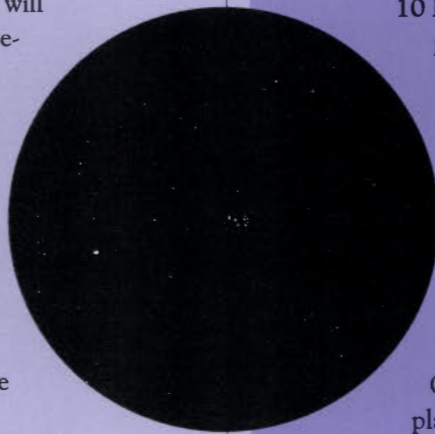
from their cores. Indeed, if one were to bring Betelgeuse to our solar system, the sun would be a mere hot spot in its center, and the star's edge would be near the orbit of Jupiter.

One day, these stars will lose their red outer envelopes and shrink down to the size of planet Earth. Such a star, a white dwarf, is found orbiting close to the Dog Star.

This is only one snapshot in the ever evolving showcase of the night sky. There are 83 constellations, uncountable double stars, nebulae, clusters and galaxies yet to discover. We leave the rest up to you. Suit up and enjoy the beauty and timelessness of New Jersey's winter skies.

by Larry Krumenaker, a freelance writer who lives in Westwood.

The constellation Orion (opposite page) and the star clusters Hyades (top) and Pleiades (bottom.)



A Trip Through Endless Time

One doesn't need a star chart to find objects in the sky. All you need is literally right at your fingertips. Just follow the Moon on its journey around the heavens using this simple method.

Use the following calendar to find planets, constellations and star clusters during the winter months. One degree equals approximately the width of your thumb.

Happy star gazing.

December

8 The Lion's Heart Star, Regulus, is the dominant star in the east late at night. The planet Mars lies two degrees from Regulus. The lonely bright "star" near the Moon is Saturn. On the other side of the Moon is the Y-shaped water jar of the constellation Aquarius.

10 Near sunset, the Moon, just passed its quarter stage, is in the south. The dim circlet of stars to the north of the Moon is one of the two fish that make up the constellation Pisces. Near sunrise, the brilliant star in the east isn't the Christmas star, it's the planet Venus.

13 A bright but tiny boomerang-shaped group of stars above the Moon is the constellation Aries, the Ram.

15 The gibbous Moon (which is more than half, but less than full) lies between two star clusters, the Pleiades and the Hyades, which make up much of the constellation Taurus the Bull.

Get Ready to Go . . .

The Hyades looks like a "V," and the Pleiades resembles a little shopping cart.

20 Need a challenge? Look low in the west-southwest a half hour or so after sunset. The planet Mercury will be the pinprick of light in the glow.

29 The planet Venus is the bright object three degrees from the morning crescent Moon, which lies between Venus and the planet Jupiter (lower and left). Tomorrow Jupiter will lie much closer to the Moon, only a degree away.

January

5 The evening crescent Moon lies north of the planet Saturn. Viewed even in a small telescope, the edge of the rings ought to be visible. Use a telescope with between 50 and 100 magnification to see the edges of the rings. Higher powers will blur the image and lower powers just don't show it clearly.

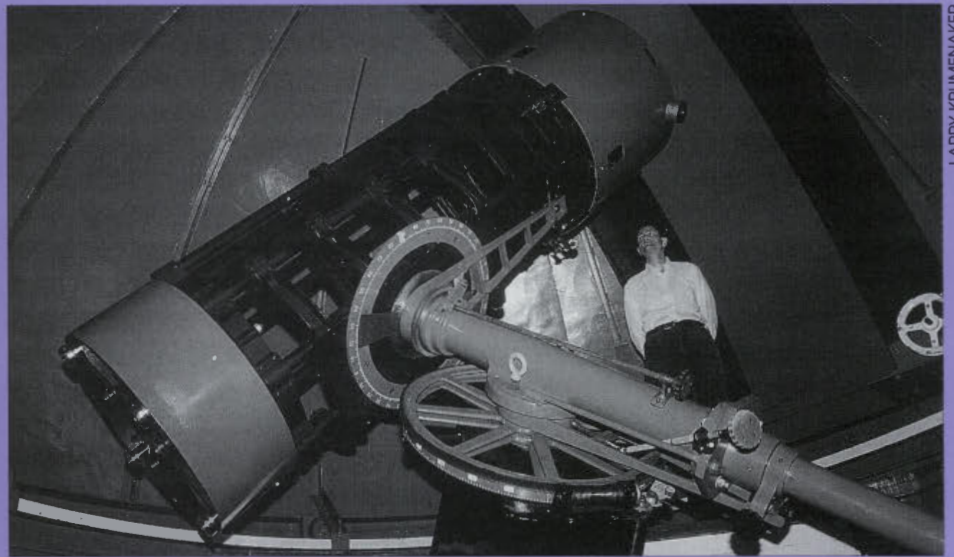
6 The Moon lies just off the edge of the circlet of the constellation Pisces.

11 The Moon wanders by a star cluster, the Pleiades, lying on the back of the constellation Taurus the Bull. Pleiades, in Japanese, is Subaru. Next time you see this make of car, check the logo.

12 That bright star near the Moon is Aldebaran, the eye of the Bull. The V-shaped group of stars, a star cluster called the Hyades, marks the Bull's face. Aldebaran is one point of the "V," the Moon is on top of the other point.

13 The nearly full Moon stands right over the head of the constellation Orion as he climbs upwards on an angle over the eastern horizon.

14-15 The diamond-bright planet Venus passes close to the planet Jupiter



LARRY KRUMENAKER

The telescope in the New Jersey Astronomical Association Observatory in Glen Gardner.

and the double star Antares in the east at the start of dawn. All will fit in the field of view of a pair of binoculars.

18 Missed the planet Mars last month? Tonight the Moon is next to Mars and the double star Regulus. In fact, they are all in a nearly straight line, with Regulus in the middle.

23 The Moon passes in front of the bright blue spring star, Spica, before dawn. This "eclipse" by the Moon of a star is called an occultation. Watch Spica wink out as it gets covered up.

26 Those two bright objects near the Moon are the planet Jupiter (the brighter one) and the double star Antares (the reddish one).

27 The crescent Moon is very close to the planet Venus, which also appears as a fat crescent shape in a telescope because of its orbital position.

29 The planet Mars crosses the star cluster Sickle, otherwise known as the head of the constellation Leo, the Lion. The Sickle looks like a backwards question mark.

February

1 The Moon passes the planet Saturn for the last time in evening until autumn, although both are very close to setting at this time.

7 The Moon moves past the Pleiades star cluster tonight and the star Aldebaran tomorrow night.

11 The planet Mars rises at sunset, a time called "opposition." The Earth lies right smack between Sun and Mars at this time. Mars, nearly as bright as the brightest star Sirius, remains up all night.

14 Find the red heart in the sky on St. Valentine's Day. It is disguised as the planet Mars and is located near the Moon.

19 The Moon is near Spica, the bright star of Virgo.

The Moon passes three planets in succession — Jupiter on Feb. 23rd, Venus on Feb. 26th and Mercury on Feb. 27th — all in the dawn skies.

The Astronomy Club

There are many places in New Jersey to learn more about the night sky. Following is a list of planetariums, observatories and state parks and forests in New Jersey that offer star gazing events for the public.

North

■ **Dreyfuss Planetarium**
Newark Museum
49 Washington Street
Newark, NJ
(201) 596-6611

■ **Jenny Jump State Forest**
Astronomy Center
Hope, NJ
(908) 459-4366

■ **NJ Astronomical Assoc. Observatory**
Voorhees State Park
High Bridge, NJ
(908) 638-8500

Central

■ **New Jersey State Museum Planetarium**
205 West State Street
Trenton, NJ
(609) 292-6333

■ **Princeton University Observatory**
Peyton Hall
Princeton, NJ
(609) 258-3800

■ **Robert Novins Planetarium**
Ocean County College
Toms River, NJ
(908) 255-0343

■ **Raritan Valley Community College**
Planetarium
Route 28 and Lamington Road
North Branch, NJ
(908) 231-8805

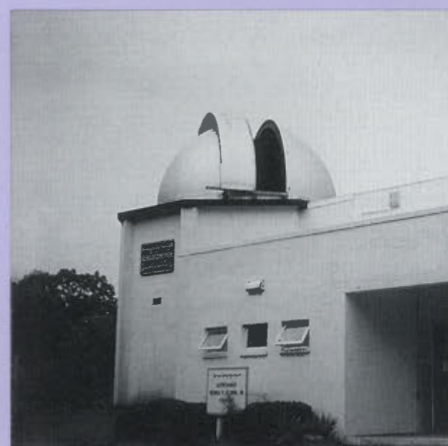
■ **Sperry Observatory**
Union County College
Springfield Avenue
Cranford, NJ
(908) 276-STAR

■ **Trailside Planetarium**
Trailside Nature and Science Center
Coles Avenue and Providence Road
Mountainside, NJ
(908) 789-3670

■ **Washington Crossing State Park**
Titusville, NJ
(609) 737-0623

South

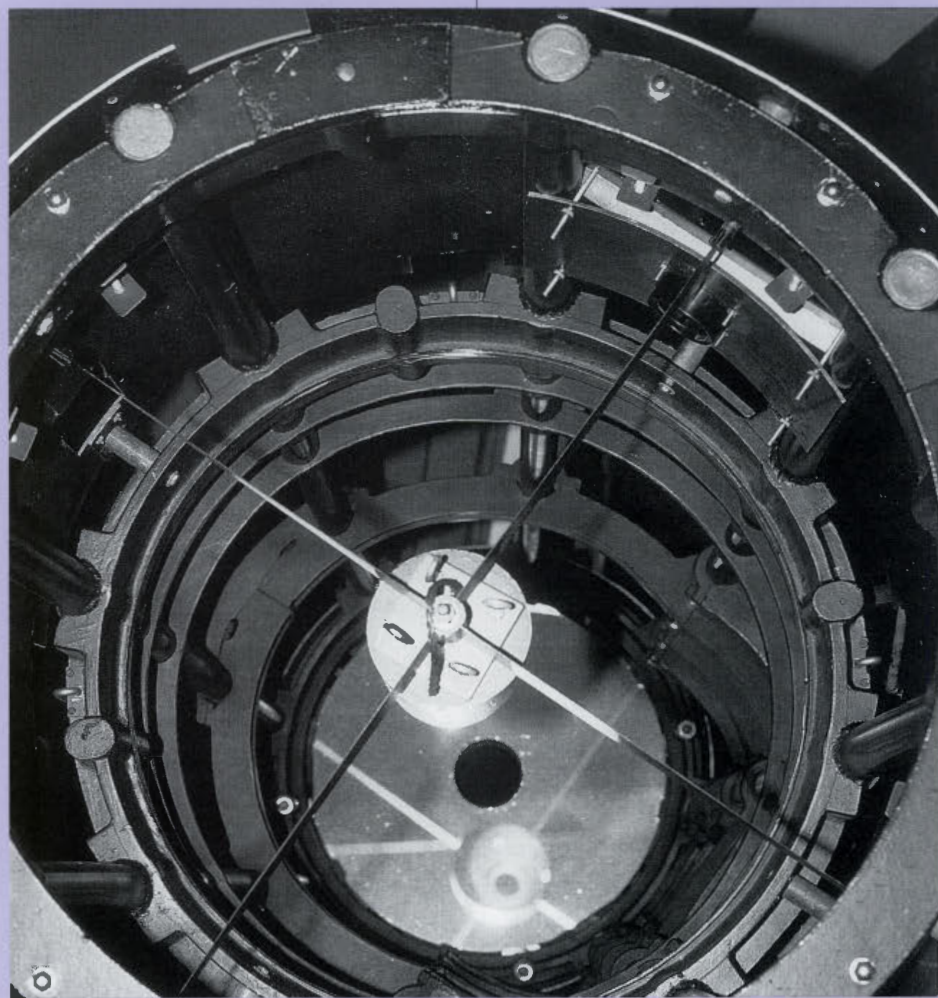
■ **Lebanon State Forest**
New Lisbon, NJ
(609) 726-1191



LARRY KRUMENAKER

The New Jersey Astronomical Association Observatory (above) is located in Voorhees State Park. See the inside of this telescope with a 26-inch mirror (below) at the observatory.

See star gazing events in the Calendar of Events beginning on page 59.



LARRY KRUMENAKER

Adopt-a-Wreck: Give Fish a Good Home

During the past few years, there have been opportunities to adopt highways, whales, beaches and more in New Jersey. Now you can adopt a ship and make a contribution to marine life habitat that will live on for many years.

The Division of Fish, Game and Wildlife (DFG&W) has begun an Adopt-A-Wreck program, which will be used to sink and maintain old vessels and tanks as part of the state's artificial reef program. These vessels provide a home for a variety of aquatic species, as well as a recreational opportunity for thou-

sands of anglers and divers.

Sponsors can raise or contribute a portion of the funds — all tax deductible — that are necessary to prepare, tow and sink a vessel for New Jersey's 14 artificial reefs. Prior to sinking, floatable debris must be removed; oil must be cleaned from the engine, tanks and bilge; watertight compartments must be vented; all doors and hatches must be removed; and the vessel must be towed a long distance to the reef site.

Adoptive "parents," which have included diving and fishing clubs and marine and shipping businesses, get to dedicate and name the vessel. Those names will be reflected in future news releases, charts and publications produced by the

DFG&W and the Artificial Reef Association. Sponsors will receive a brass plaque and photo of their named ship.

There are currently several vessels available for adoption. These include:

- **Oil Tanker** — This 325' x 67' will be the second largest vessel sunk on a New Jersey reef. Cost: \$10,000.
- **Tug** — A 97' large ocean tug. Cost: \$4,500.
- **YSR 17** — A barge with a large deck house, deck machinery and tanks, which looks like "Noah's Ark." Cost: \$3,500.
- **YSR 23** — A barge with deck house, deck machinery and tanks. Cost: \$3,500.
- **YON 15** — A 130' x 35' oil barge with 100 tons of tire units on deck. Cost: \$2,500.
- **YON 265** — A 180' x 35' fuel barge with a small deck house and loaded with 750 tons of concrete-ballasted tire units. Cost: \$2,500.
- **Gravel Barge** — A 130' x 35' open hopper barge. Cost: \$2,500.
- **Army Tanks** — M-48 and M-60 surplus military tanks, some from the Korean conflict. Cost: \$500 each.

For an application form and more information about adopting a wreck, call (609) 748-2020.



DEP Presents Green Awards

Seven individual, group, civic and corporate greening efforts recently received the 1994 Green Community Achievement Awards from the Department of Environmental Protection's State Forestry Service. The awards recognize individuals or organizations who plant and care for trees to enhance the beauty of New Jersey's cities and towns or who heighten residents' awareness of the value of community trees and forests. The 1994 winners were:

Anna Panayiotou for her initiative and fund-raising efforts in developing *Bayonne 2000: Cleaner and Greener*, a project designed to make this Hudson County community a model urban forest by the year 2000.

Elizabeth Johnson for her dedication to open space improvement and urban reforestation in Trenton in Mercer County and for her role in establishing the city's professional community forestry program.

The Atlantic City Urban Beautification Committee, a nonprofit volunteer organization in Atlantic County, for its civic improvements, urban beautification projects and revitalization of several city parks and streets.

Merck & Co., Inc. for preserving the surrounding natural environment during the construction of the Merck world headquarters in Readington in Hunterdon County. The building and internal roads occupy only 10 percent of the site's 459 acres. More than 1,300 mature trees, located in the path of construction, were moved to an on-site nursery and later replanted.

Point Road School in Little Silver for its tree-planting project for young children, which emphasized the importance of trees as a renewable resource while providing shade and enhancing the beauty of the community. The children helped replace the trees that were used for lumber in the construction of a school playground.

The Secaucus Shade Tree Commission in Hudson County for establishing a community forestry program and implementing a tree conservation ordinance.

The Stafford Township Environmental Commission in Ocean County for incorporating the use of trees and other natural vegetation to mitigate nonpoint source pollution in the township's storm water management plan.

Tracking Biodiversity in America

The New Jersey Natural Heritage Program is part of a nationally-recognized network that collects and tracks biological diversity throughout North and South America.

The Biological and Conservation Data (BCD) system, developed by The Nature Conservancy for the Natural Heritage Network, recently garnered a prestigious Computerworld Smithsonian Award for its computerized data system that catalogs facts about plants, animals and ecological communities in the United States, the Navajo Nation, five Canadian provinces and 14 Latin American and Caribbean countries. New Jersey's Natural Heritage Program in the Office of Natural Lands Management in the Department of Environmental Protection's Division of Parks and Forestry is part of this network.

The BCD system currently tracks the status of some 17,000 plants, 10,000 animals and 3,500 natural community types in the United States alone. Of these, New Jersey's program tracks 929 plants, 1,022 animals and 61 natural communities.

The information collected in the New Jersey data base, which was developed by the Natural Heritage Program in cooperation with the DEP Division of Fish, Game and Wildlife's Endangered and Nongame Species Program and The Nature Conservancy, will contribute to the development of an environmental master plan for the state. This plan, which will provide a map of New Jersey's natural resources as well as locate contaminated sites, will allow government, business and others to make better decisions to protect the state's natural resources.

For more information on the BCD network, call the New Jersey Natural Heritage Program at (609) 984-1339.



Locating Contaminated Sites

Prospective homeowners concerned about contaminated sites in their neighborhoods can get the information they need thanks to a Department of Environmental Protection (DEP) public service program.

For those interested in buying or selling a home, or businesses which would like more information about known contaminated sites in the area, the DEP operates the Site Information Program, a public service to help gather critical information in their decision-making processes. The program, available through the DEP's Bureau of Community Relations, provides information for prospective home buyers or sellers, real estate agents, legal professionals, lending institutions and government agencies concerned about contaminated sites at or near properties of interest.

The program also helps the public get in touch with other DEP divisions, as well as outside agencies, for further site information or other related issues, such as radon or testing drinking water. The Bureau of Community Relations coordinators also discuss general information about the effects of known contaminated sites and the progress of cleaning up those sites.

The program uses the recently published *Known Contaminated Sites in New Jersey* report to help identify sites such as leaking underground storage tanks, former landfills and contaminated industrial sites. (See Bookshelf on page 50 for availability of this report.) The program is working with the Geographic Information System (GIS), a sophisticated computer mapping program, to develop a means of pinpointing known sites more efficiently.

A list of each municipality's known contaminated sites is available from the municipal clerk. Statewide lists are available at college, county and major local libraries. Prospective homeowners can also check with realtors for information on specific homes.

The Bureau of Community Relations also provides fact sheets and conducts public hearing in many areas, especially where the major Superfund sites undergo multi-year cleanups, to keep residents and local officials apprised of the situation, and the progress made in site remediation.

For additional information on contaminated sites in New Jersey, contact: The Site Information Program, Bureau of Community Relations, New Jersey Department of Environmental Protection, CN 413, Trenton, NJ 08625-0413 or call (609) 633-2325 or (609) 984-3081.

New Jersey Firefighters Battle Blazes Out West

In the first nine months of 1994, 3.7 million acres of forest burned in 64,470 fires across the country. And on the front line of many western blazes were crew members and support staff from New Jersey.

The New Jersey Forest Fire Service sent six, 20-person crews during the summer months to battle blazes in Washington, Montana, Utah, Idaho and Oregon during the height of the forest fire season in the western states. Fires in California, Colorado, Montana, New Mexico and Washington claimed the lives of 27 firefighters this year. The crews from New Jersey battled fierce blazes — working 14 to 16 hours days, with some shifts extending to 20 hours at a time — for two to three weeks before returning home.

Under an interagency agreement between the New Jersey Forest Fire Service and the U.S. Forest Service established in 1985, New Jersey has sent crew members or support personnel to battle blazes in the West for nine of the last 10 years, including huge fires in Yellowstone National Park in Wyoming in 1988. In return, crews from other parts of the country are available to assist in our state from March to mid-May during New Jersey's forest fire season.

"We are pleased to provide assistance during the fire emergency in the western part of the country and proud of the New Jerseyans who are dedicated to forest fire prevention and control," says Commissioner Robert C. Shinn Jr. of the Department of Environmental Protection.



Alder flycatcher

CORNELL LAB. OF ORNITHOLOGY

A Partner in Flight

New Jersey may not be famous like San Juan Capistrano for its annual return of the swallows, but it is one of eight states in the country taking a lead role in conserving this and other neotropical migrating bird species.

New Jersey has agreed to act as a "model state" under the National Fish and Wildlife Foundation's Partners in Flight program, which is helping to protect the neotropical birds that winter in Central and South America. Many of these species can be found in the Garden State in the spring and summer, including barn swallows, tree swallows, purple martins, gray catbirds and chimney swifts. Rarer species, such as the scarlet tanager, the golden-winged warbler and the grasshopper sparrow, are on the decline because of the loss of habitat.

More than 100 organizations, including state/provincial fish and wildlife agencies, universities, foundations and private companies representing the forest products industry, will assist in developing the first initiatives for research, monitoring species and managing habitat for the conservation of these birds.

Loss of habitat is a key reason for the decline of these colorful songbirds, particularly species that breed in the Northeast. As a model state — and the only one to date from the Northeast — New Jersey has begun to develop a master plan for the comprehensive conservation and management of declining neotropical bird species and their habitats throughout the Garden State.

Other states that are models in the Partners in Flight program are Arizona, Arkansas, Colorado, Georgia, Illinois, Missouri and Tennessee.

Roundup by Denise Mikics of the DEP Office of Communications and Paulette McKay, an intern from Yale University.

Events

December

1 DANGERS OF THE DEEP (Through Dec. 31) Learn about the virtual arsenal some sea animals have at their disposal — including poisons, toxins, teeth, barbs and electricity — at this special exhibit. **Hours:** 10 a.m. to 5 p.m. (Wednesdays through Sundays) **Admission:** Adults, \$9; children 2-11, \$6; students with ID cards and seniors, \$7.50 **Phone:** (609) 365-3300 **Location:** Thomas H. Kean New Jersey State Aquarium, Riverside Drive, Camden

1 ON THE NATURE OF THINGS: THE SCIENTIFIC PHOTOGRAPHY OF FRITZ W. GORO (Through Jan. 29) This photographic exhibit reveals science as you've never seen it before with images ranging from the inside of a salamander's capillary to the moment after the first atomic blast. Accompanied by commentary from top scientists. **Hours:** 9:30 a.m. to 5:30 p.m. (Tuesdays through Sundays) **Admission:** Adults, \$9; students and seniors, \$8; children 2-12, \$6; children under 2, free **Phone:** (201) 200-1000 **Location:** Liberty Science Center, Phillip Street, Jersey City

1-4 'Twas the Night Before Christmas at Kuser Farm Mansion (Also Dec. 7-11) See what a turn of the century Christmas would look like during a walk through the Queen Anne "Country Home" of Fred Kuser and his family. **Hours:** 6 to 9 p.m. (Sundays through Fridays); 1 to 5 p.m. (Saturdays) **Admission:** Free **Phone:** (609) 890-3630 **Location:** Kuser Farm Mansion, Newkirk Avenue and Kuser Road, Hamilton

3 OWLS OF NEW JERSEY Join Giselle Smisko for a slide presentation and discussion about the owls that live in New Jersey and meet Katie the saw-whet owl. **Hours:** 2 p.m. **Admission:** Free **Phone:** (201) 635-6629 **Location:** Great Swamp Outdoor Education Center, Southern Boulevard, Chatham

3 STARGAZING See the wonders of the night sky in this event led by the United Astronomy Clubs of New Jersey, Inc. **Hours:** 8 to 10 p.m. **Admission:** Call for information **Phone:** (908) 459-4366 **Location:** Jenny Jump State Forest, Hope

3-4 ANNUAL CHRISTMAS EXPRESS (Also Dec. 10-11 and 17-18) Santa rides the

steam-powered train at Allaire State Park. **Hours:** Noon to 3 p.m. **Admission:** \$2.50 **Phone:** (908) 938-2253 **Location:** Allaire State Park, Route 524, Farmingdale

3-4 MORE THAN MEETS THE EYE (Also Dec. 10-11, 17-18 and 27-30) Discover objects in the night sky that are visible with the naked eye, binoculars, small and large telescopes and spacecraft cameras. **Hours:** 2 p.m. (1 p.m., Dec. 27-30) **Admission:** \$1 **Phone:** (609) 292-6333 **Location:** New Jersey State Museum Planetarium, W. State Street, Trenton

3-4 REMEMBER THE ANIMALS WEEKEND Visit your favorite animals at Paws Farm and don't forget to bring them special treats such as apples, dog chow and bird seed. **Hours:** 10 a.m. to 4 p.m. **Admission:** Free **Phone:** (609) 778-8795 **Location:** Paws Farm Nature Center, Hainesport-Mt. Laurel Road, Mt. Laurel

3-4 ROAMING THROUGH THE FALL SKIES (Also Dec. 10-11, 17-18 and 27-30) See the prominent constellations, bright stars and planets of the autumn sky at the New Jersey State Museum Planetarium. **Hours:** 1 and 3 p.m. (noon and 2 p.m. Dec. 27-30). **Admission:** \$1 **Phone:** (609) 292-6333 **Location:** New Jersey State Museum Planetarium, W. State Street, Trenton

3-4 VICTORIAN CHRISTMAS The Ringwood Manor is decorated in the Victorian style for Christmas. **Hours:** Noon to 6 p.m. **Admission:** Call for information **Phone:** (201) 962-7031 **Location:** Ringwood Manor House, Ringwood State Park, Ringwood

4 HOLIDAY HAPPENING This festive family day features workshops to make bird feeders and wreaths, cross-country skiing demonstrations, wagon rides, wacky races for children, free entertainment, an arts and crafts sale, visits with Santa, caroling and more. **Hours:** 11 a.m. to 5 p.m. **Admission:** Free **Phone:** (908) 842-4000 **Location:** Thompson Park, Newman Springs Road, Lincroft

4 SIERRA CLUB HIKE THROUGH THE AEROFLEX PROPERTY AND SUSSEX BRANCH Hike the new Kittatinny Trail and the area around the Aeroflex airport and explore the Sussex

Branch railroad right-of-way. **Hours:** 10 a.m. **Admission:** Free **Phone:** (908) 852-0597 **Location:** Sussex Branch Parking Lot, Route 206, Andover

4 SIERRA CLUB SINGLES HIKE AT JOCKEY HOLLOW Enjoy this easy five-mile hike through Morristown National Historic Park. **Hours:** 10:30 a.m. **Admission:** Free **Phone:** (908) 469-8925 **Location:** Jockey Hollow Visitors' Center, Morristown

4 SIERRA CLUB SOUTH MOUNTAIN RESERVATION HIKE Join this moderate 8.5 mile hike beginning at the Tulip Springs Picnic Area. **Hours:** 9 a.m. **Admission:** Free **Phone:** (201) 427-6863 or (201) 956-0587 **Location:** Tulip Springs Picnic Area, South Mountain

4 SUNDAY FAMILY DAY: HOLIDAY CELEBRATIONS IN N.J. Choose from various workshops at the New Jersey State Museum, including making a bird feeder, making holiday symbols or ornaments from woods, fields and the shore or investigate where animals go in winter. **Hours:** Various times **Admission:** Call for information **Phone:** (609) 292-6308 **Location:** New Jersey State Museum, W. State Street, Trenton

5 CHRISTMAS IN GREENWICH Visit historic Greenwich on the Cohansy River during this holiday celebration featuring history, crafts, songs and more. **Hours:** Noon to 5 p.m. **Admission:** Free **Phone:** (609) 455-4055 **Location:** Ye Great Street, Greenwich

7 CORN HUSK ANGEL ORNAMENT WORKSHOP Learn how to make a real country classic for your Christmas tree, complete with corn silk hair, halo and hanger. **Hours:** 7:30 to 8:30 p.m. **Admission:** \$5 **Phone:** (908) 506-9090 **Location:** Program Room, Ocean County Parks Administration Office, Toms River

7 RARE BIRDS Discover hawks, eagles, shorebirds and warblers during this event for beginners and experienced bird watchers alike. **Hours:** 8:30 a.m. to 5:30 p.m. **Admission:** \$22 **Phone:** (908) 842-4000 **Location:** Thompson Park, Newman Spring Road, Lincroft

7 SPECIAL SENIOR HIKE Take a bus to Princeton for this hike for seasoned walkers to Princeton and Drumthwacket. **Hours:** 8:30 a.m. to 3:30 p.m. **Admission:**

Events

\$12 (Pre-registration required) **Phone:** (908) 842-4000 **Location:** Thompson Park, Newman Spring Road, Lincroft

9 CHRISTMAS CANDLELIGHT TOUR See Whitesbog Village, decorated in the holiday tradition, by candlelight. **Hours:** 7 to 10 p.m. **Admission:** Free **Phone:** (609) 893-4646 **Location:** Whitesbog Village, Route 530, Whitesbog

9 FESTIVAL OF TREES (Through Dec. 18) Live music will highlight this indoor display of 50 trees decorated in different holiday traditions. **Hours:** Call for hours **Admission:** Adults, \$2; children and senior citizens, \$1 **Phone:** (908) 766-2489 **Location:** Somerset County Park Commission Environmental Education Center, Lord Stirling Road, Basking Ridge

9 WHEATON VILLAGE VAN TOURS Take a bus trip to tour this historic glass-making village. **Hours:** 8 a.m. **Admission:** \$8 plus \$4.50 admission to Wheaton Village (reservations required) **Phone:** (609) 971-3085 **Location:** Various locations, Ocean County

10 FORT HANCOCK CHRISTMAS IN THE 1940s (Also Dec. 14) Celebrate Christmas at Fort Hancock on Sandy Hook as it was 50 years ago with the sights, sounds and scents of the 1940s. **Hours:** 6 to 8 p.m. **Admission:** Free **Phone:** (908) 872-0115 **Location:** History House, Sandy Hook

10 HOLIDAY MAGIC AT THE NEW JERSEY STATE AQUARIUM See magicians of all kinds in an extravaganza to kick off the holidays. **Hours:** 10 a.m. to 5 p.m. (Wednesdays through Sundays) **Admission:** Adults, \$9; children 2-11, \$6; students with ID cards and seniors, \$7.50 **Phone:** (609) 365-3300 **Location:** Thomas H. Kean New Jersey State Aquarium, Riverside Drive, Camden

10 KALEIDOSCOPE KIDS SATURDAY WORKSHOPS Learn to make natural wind chimes, candles, and historic tree ornaments plus discover the colors of Christmas through prisms. **Hours:** Various times **Admission:** Call for information **Phone:** (609) 292-6308 **Location:** New Jersey State Museum, W. State Street, Trenton

10 REENACTMENT OF THE BATTLE OF PRINCETON Relive history with this

reenactment of a famous Revolutionary War battle. **Hours:** 11 a.m. to 3 p.m. **Admission:** Call for information **Phone:** (609) 921-0074 **Location:** Clarke House, Princeton Battlefield State Park, Princeton

10 YULETIDE TOUR OF HISTORIC SALEM Tour 18th and 19th century homes, churches and public buildings; witness Revolutionary and Civil War re-enactments; and enjoy Father Christmas, carolers, a handbell choir and horse and buggy rides. **Hours:** 2 to 8 p.m. **Admission:** \$8 **Phone:** (609) 935-1415 **Location:** Market Street, Salem

17 KALEIDOSCOPE KIDS SATURDAY WORKSHOPS Learn to make natural historic tree ornaments and wrapping paper and listen to holiday musical instruments; also discover the world of lizards. **Hours:** Various times **Admission:** Call for information **Phone:** (609) 292-6308 **Location:** New Jersey State Museum, W. State Street, Trenton

17 MOONLIGHT HIKE Enjoy the spectacle of Lebanon State Forest in winter by moonlight. **Hours:** 7 to 9 p.m. **Admission:** Free **Phone:** (609) 893-4646 **Location:** Whitesbog Village, Route 530, Whitesbog

17 SENIOR HIKERS These hikes are for the seasoned walker. **Hours:** 9 a.m. **Admission:** \$11 (pre-registration required) **Phone:** (908) 842-4000 **Location:** Thompson Park, Newman Spring Road, Lincroft

17 SIERRA CLUB RAMAPO CIRCULAR HIKE Hike nine miles through the Ramapo Mountains to experience beautiful views and an American Indian rock shelter. **Hours:** 9 a.m. **Admission:** Free **Phone:** (201) 427-6863 or (201) 956-0587 **Location:** Ramapo Mountain State Forest, Skyline Drive, Oakland

17 STAR SEARCH (Also Jan. 28, Feb. 25 and March 25) Explore the night sky in this event led by the New Jersey Astronomical Association. **Hours:** 8:30 to 11:30 p.m. **Admission:** Call for information **Phone:** (908) 638-8500 **Location:** Voorhees State Park, Route 513, Glen Gardner

19 HANDMADE CHRISTMAS CARDS Make your own paper and turn it into a unique greeting card. For children 12 and up. **Hours:** 4 to 5:30 p.m. **Admission:** \$5 **Phone:** (908) 506-9090 **Location:** Pro-

gram Room, Ocean County Parks Administration Office, Toms River

25 WASHINGTON CROSSING THE DELAWARE Come join the Washington Crossing Foundation of Pennsylvania as they re-enact this Christmas Day event of the Revolutionary War. **Hours:** 1 to 3 p.m. **Admission:** Free **Phone:** (215) 493-4076 **Location:** Washington Crossing State Park, Route 29, Titusville

25 SIERRA CLUB CHRISTMAS DAY HIKE AND HISTORIC OUTING IN WASHINGTON'S CROSSING STATE PARK (PA AND NJ) This easy three-mile hike concludes with watching the re-enactment of Washington crossing the Delaware River. **Hours:** 9:30 a.m. **Admission:** Free **Phone:** (908) 603-9511 **Location:** River Road Parking Area, Titusville

31 NEW YEAR'S SPLASH Ring in the New Year with the splashiest party in town. **Hours:** 10 a.m. to 5 p.m. **Admission:** Adults, \$9; children 2-11, \$6; students with ID cards and seniors, \$7.50 **Phone:** (609) 365-3300 **Location:** Thomas H. Kean New Jersey State Aquarium, Riverside Drive, Camden

January

1 NEW YEAR'S DAY HIKE Enjoy the sights of New Jersey in winter at the 10th annual New Year's Day hike through the Paulinskill Valley Trail. **Hours:** 10 a.m. **Admission:** Free **Phone:** (908) 852-0597 **Location:** Footbridge Park, Blairstown

7-8 SUPER SCIENCE WEEKEND This two-day extravaganza features hands-on activities, demonstrations and exhibits that make learning about science fun. **Hours:** 9 a.m. to 4:45 p.m. (Dec. 7); noon to 5 p.m. (Dec. 8) **Admission:** Free **Phone:** (609) 292-6308 **Location:** New Jersey State Museum, W. State Street, Trenton

14 DIVE EXPO See the latest diving equipment, meet the experts and hear trade stories. **Hours:** 10 a.m. to 5 p.m. (Wednesdays through Sundays) **Admission:** Adults, \$9; children 2-11, \$6; students with ID cards and seniors, \$7.50 **Phone:** (609) 365-3300 **Location:** Thomas H. Kean New Jersey State Aquarium, Riverside Drive, Camden

21 BEGINNER CROSS COUNTRY SKI CLINIC (Also Jan. 22, Feb. 4-5) The 2 1/2 hour clinic includes a lecture, hand-outs, demonstration, practice and evaluation. **Hours:** 9:30 to noon; 1:30 to 4 p.m. **Admission:** \$19 ; \$10 with your own skis; \$5 if held inside because of lack of snow (Pre-registration required) **Phone:** (201) 835-2160 **Location:** Weis Ecology Center, Snake Den Road, Ringwood

21 100TH ANNIVERSARY EXHIBITION (Through Dec. 31) See this one-year exhibition commemorating the 100th anniversary of the New Jersey State Museum with photographs and examples of the collection. **Hours:** 9 a.m. to 4:45 p.m. (Tuesdays through Saturdays); noon to 5 p.m. (Sundays) **Admission:** Free **Phone:** (609) 292-6308 **Location:** New Jersey State Museum, W. State Street, Trenton

29 THE WORLD OF MINI MANIA This winter expo features hand-crafted and miniature dolls as well as dolls for the collector. **Hours:** 10 a.m. to 4:30 p.m. **Admission:** Adults, \$5; children, \$2.50; senior citizens, \$4.50 **Phone:** (908) 382-2135 **Location:** Holiday Inn Jetport, Newark Airport

February

2 EAT AND LEARN (Also Feb. 9, 16, 23 and March 2, 9, 16, 23 and 30) Bring a lunch and learn about the environment in this series of informative lectures, workshops and demonstrations at the Wetlands Institute. **Hours:** Noon **Admission:** \$2 **Phone:** (609) 368-1211 **Location:** Wetlands Institute, Stone Harbor Boulevard, Stone Harbor

4 WILD SAFARI AT THE HMDC Learn about predators from wildlife expert Andrew Simmons in this discussion of how animals such as Siberian tigers, cougars, leopards and black bear live and hunt. **Hours:** 11 a.m. **Admission:** \$4.50 (Pre-registration required) **Phone:** (201) 460-8300 Ext. 39 **Location:** Hackensack Meadowlands Development Commission Environment Center, DeKorte Park Plaza, Lyndhurst

4-5 GUIDED NATURE WALKS (Also Feb. 11-12 and 25-26) Enjoy cedar swamps, salt marshes, fields and upland forests during a hike through Cattus Island Park.

Hours: 2 p.m. **Admission:** Free **Phone:** (908) 270-6960 **Location:** Cattus Island Park, Cattus Island Boulevard, Toms River

4-5 TOMS RIVER WILDFOWL ART & DECOY SHOW More than 125 artists and carvers from Vermont through the Carolinas will feature songbirds and decoys, wilderness artwork, life size and miniature art, prints, photography, paintings, decoys and carved birds and fish. **Hours:** 9 a.m. to 6 p.m. (Feb. 4); 10 a.m. to 4 p.m. (Feb. 5) **Admission:** Adults, \$3; children, free **Phone:** (908) 341-9622 **Location:** Toms River Intermediate School East, Hooper Avenue, Toms River

5 FAMILY DAY: 100 YEARS OF NEW JERSEY'S AFRICAN-AMERICAN HISTORY The New Jersey State Museum presents a series of workshops and activities for children and their families for Black History Month. **Hours:** Noon to 5 p.m. **Admission:** Free **Phone:** (609) 292-6308 **Location:** New Jersey State Museum, W. State Street, Trenton

11 HIKE THE HILLS (Also Feb. 19) Enjoy the great outdoors as you hike throughout the hills of Matarazzo Farms and top off the day with a hot luncheon, wine tasting and wine cellar tours. **Hours:** 1 to 4 p.m. **Admission:** \$20 **Phone:** (908) 475-3671 **Location:** Four Sisters Winery at Matarazzo Farms, Route 519, Belvidere

11 JAZZIN' THE DEEP A splashy jazz celebration for the whole family. **Hours:** 10 a.m. to 5 p.m. **Admission:** Adults, \$9; children 2-11, \$6; students with ID cards and seniors, \$7.50 **Phone:** (609) 365-3300 **Location:** Thomas H. Kean New Jersey State Aquarium, Riverside Drive, Camden

11 NATURE AND RAPTOR WALK Take a walk outside the Environment Center in search of birds of prey, including red-tail hawks, harriers, rough-legged hawks and more, and learn about their adaptations, migration patterns and the importance of the Meadowlands ecosystem. **Hours:** 8:30 a.m. **Admission:** Pre-registration, \$2; at door, \$3 **Phone:** (201) 460-8300 **Location:** Hackensack Meadowlands Development Commission Environment Center, DeKorte Park Plaza, Lyndhurst

19-20 LIVING HISTORY DAY This

popular event at Monmouth Battlefield features "soldiers" from the Revolutionary War and the Civil War, as well as figures in black history. **Hours:** 10 a.m. to 4 p.m. **Admission:** Free **Phone:** (908) 577-8816 **Location:** Monmouth Battlefield State Park, Monmouth

25 BASEBALL IN NEW JERSEY (Through the winter and spring) Celebrate the 150th anniversary of the game of baseball at this exhibit at the New Jersey State Museum. **Hours:** 9 a.m. to 4:45 p.m. (Tuesdays through Saturdays); noon to 5 p.m. (Sundays) **Admission:** Free **Phone:** (609) 292-6308 **Location:** New Jersey State Museum, W. State Street, Trenton

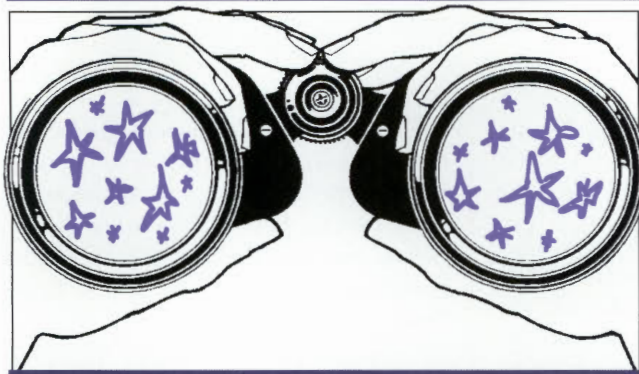
25-26 ANNIVERSARY SEAL-ABRICATION Celebrate the New Jersey State Aquarium's third birthday with this celebration of seals. **Hours:** 10 a.m. to 5 p.m. **Admission:** Adults, \$9; children 2-11, \$6; students with ID cards and seniors, \$7.50 **Phone:** (609) 365-3300 **Location:** Thomas H. Kean New Jersey State Aquarium, Riverside Drive, Camden

March

4 NATIVE AMERICANS THEN AND NOW Learn how the American Indians lived, hunted and dressed. **Hours:** 10 a.m. **Admission:** \$3.50 **Phone:** (201) 460-8300 **Location:** Hackensack Meadowlands Development Commission Environment Center, DeKorte Park Plaza, Lyndhurst

4 PINELANDS SHORT COURSE Learn about the science, history and folklore of the New Jersey Pine Barrens through 19 different workshops. Choose from courses on wildflowers, canoeing, Whitesbog Village, topographic maps and pirates. **Hours:** 8 a.m. to 3:30 p.m. **Admission:** Call for information **Phone:** (609) 894-9342 **Location:** Rutgers University, Cook-Douglass Campus, Hickman Hall, New Brunswick

18 FISHING EXPO See the latest fishing equipment and learn more about lures and lores. **Hours:** 10 a.m. to 5 p.m. **Admission:** Adults, \$9; children 2-11, \$6; students with ID cards and seniors, \$7.50 **Phone:** (609) 365-3300 **Location:** Thomas H. Kean New Jersey State Aquarium, Riverside Drive, Camden



Explorer

Hey, Explorer!

Stars and Stories

Did you know that most stars are older than the earth itself and that they may exist for millions or even billions of years? As the earth was shaped, the stars watched. As plants, animals and people populated the world, the stars watched. And thousands of years ago, people began to watch the stars.

Every civilization used the stars and planets to determine direction and such elements of time as days, months, seasons and years. Many religious and cultural traditions, as well as music, art and poetry from around the world, refer to the stars in some way. Babylonians, Egyptians, Eskimos, Norsemen, Chinese, Aztecs, Greeks and Romans all marveled at the stars, closely followed their motions and made up myths inspired by the stars and their patterns. Many of those myths remain today.

Astronomers are not really sure who

first imagined the shape of people or animals in the stars, creating the constellations, the "oldest living picture book." These imaginative pictures drawn upon the stars continue to capture people's interest today.

To learn more about six constellations in the winter sky, see the story on "Get Ready to Go . . . Star Gazing in the Winter Sky" beginning on page 51. To discover more about how constellations are formed or how we see the stars from earth, try the following exercises.

Get the Picture?

The constellation Cassiopeia is best known for its W or M shape (depending on its tilt), and it is formed by five fairly bright stars. Because of the earth's rotation and tilt, this constellation seems to rotate around the North Star and is visible in New Jersey year-round.

In ancient China, this constellation was viewed as a chariot. In early Arabia, this same set of stars represented a hand that aided in warding off evil. Perhaps best known is the Greek "picture" of these stars as Cassiopeia the Queen. The W shape represents her crown or a woman seated on a throne. The following myth contains related Greek characters that are also constellations, including Cepheus, Andromeda, Cetus and Perseus.

King Cepheus and Queen Cassiopeia lived happily with their daughter Andromeda until the queen offended the sea nymphs, who then sent a sea monster named Cetus to ravage the coast. The monster would depart only if Andromeda were sacrificed. Andromeda was chained to a rock to await her death. Just as Cetus appeared, so did Perseus, the son of Jupiter. The king promised Perseus Andromeda's hand if he would save her, and Perseus killed the sea monster. Andromeda and Perseus were married and lived happily ever after. But as punishment, Cassiopeia was bound to her throne and cast into the sky, where she continues to spin around the North Star.

■ **Diagram 1** is a picture of the five stars of Cassiopeia as they appear in the sky.

■ **Diagram 2** uses the five stars to draw a picture of Cassiopeia. (However, the "picture" cannot be seen in the sky.)

■ **Diagram 3** shows the five stars of Cassiopeia connected with lines. This suggests a definite shape for the constellation, and it is used today in most star charts to depict the constellation.

Diagram 1



Diagram 2



Diagram 3

The Light in the Night

Each star in the night sky is very far away, and some stars are farther from the earth than others. Groups of stars are called constellations, and these constellations form imaginary pictures in the sky.

But these constellations, or "pictures," can only be seen from our universe. If you were to visit another universe, you'd see different constellations because the stars are at different distances and positions in the sky. To better understand how stars appear to be at the same place in the sky even though they are at different distances from the earth, try the following experiment with an adult.

Go outside on a clear, windless night and find a long stretch of sidewalk or parking lot that is not near any street lamps, houses or other sources of light. Bring a flashlight, two candles, two candlesticks and matches. Turn around and close your eyes. Have the adult place the lit flashlight and candles at varying distances of 50 to 100 feet away from you. As you turn around, can you tell which light is the flashlight? Or which light is closest to you? Or farthest away? Why might this task be difficult to do?

Distance and space can be deceiving when you are viewing objects without the benefit of being able to judge distances. From earth, star gazers can see many individual stars, clusters of stars, planets and galaxies. Sometimes a very large but distant galaxy will look smaller than an individual star closer to earth. As a result, astronomers today must use math, science, computer and mapping skills along with complex instruments to observe the sky and conduct research.

by Tanya Oznowich of the Department of Environmental Protection's Environmental Education Unit



Find a Constellation — Make a Myth

So you're home at night with nothing to do. Grab paper and a pencil and stare at the random selection of stars above. Use your imagination to create two or three of your own constellations. Use the methods in Diagrams 2 and 3 (on the previous page) to identify and draw your constellations. Next, write your own story about them. How did they get there? Who or what are they? Why are they there?

Remember, the sky's the limit!

You can share your stories with us. Just write to Explorer, *New Jersey Outdoors*, New Jersey Department of Environmental Protection, CN 402, Trenton, New Jersey 08625-0402.

Wildlife in New Jersey

The Bobcat

Although the bobcat is on the state's list of endangered species, this rare and elusive wild cat can still be found roaming the hardwood ridges and swamps of northern New Jersey.

The once abundant bobcat was reported to be near extinction in the Garden State by the turn of the 20th century. Currently, bobcats appear to be found only in the northern one-third of the state, primarily in Morris, Passaic, Sussex and Warren counties.

The Division of Fish, Game and Wildlife in the Department of Environmental Protection initiated a restoration program in 1978 with the release of bobcats captured from the wild in Maine. Between 1978 and 1982, a total of 24 bobcats (12 males and 12 females) were placed at two suitable locations in Passaic and Sussex counties. Following these efforts, information on bobcat sightings, distribution and survival rates has been monitored through reports from reliable observers, and the collection and examination of individuals killed by vehicles.

There are about 10 to 15 reliable sightings and one or two dead bobcats reported annually. Current information indicates that although the bobcat continues to survive in North Jersey, they have not moved to other parts of the state. And increased development in the north may threaten its continued existence in New Jersey.

The Endangered and Nongame Species Program (ENSP) is expected to undertake a systematic study of the bobcat in 1995 to determine its numbers and distribution in New Jersey. That study will use scent-post stations, where a food odor is used to attract animals to an area that is equipped with freshly-raked soil or smoked glass. The footprints that are left behind will allow biologists to identify the species that live in the area.

In addition, the state's new Geo-

graphic Information System (GIS), a computerized model of the state, will allow the ENSP to delineate critical habitats for the bobcat.

The bobcat is a medium-sized, short-tailed cat. Its short, thick fur is usually brownish to grayish in color, and it has a white underbelly with black spots. The back of the ears are black with a central white or gray spot and are tipped with black ear tufts. The tail has a black tip with a white underside followed by three to four black bars.

Bobcats range in size from 28 to 47 inches long and can weigh from 15 to 35 pounds. Males are somewhat larger than females, and some exceptional animals can weigh 45 pounds or more.

Humans and dogs have been the bobcats' primary predators. However, the relatively recent expansion of the coyote in the Northeast may affect the bobcat. The coyotes create an increased disturbance, compete for the same food sources and may even prey on the bobcat. But the actual impact of coyotes on resident bobcats has yet to be determined.

Though the bobcat is known to live in a wide variety of habitats, its continued presence in areas of high population seems to correlate with the availability of vast areas of rocky outcropping and ledges. These areas, which provide both escape cover and denning sites, are typically found along the Kittatinny Ridge in Sussex and Warren counties, the Bearfort

Mountains in Passaic County and the Ramapo Mountains in Bergen County.

Bobcats are solitary, elusive hunters which are rarely observed even in areas where they are abundant. Those privileged enough to catch a glimpse of one in New Jersey should consider themselves very fortunate. They typically prey upon small mammals such as rabbits, mice, squirrels, porcupines, moles and shrews, but they have been known to hunt animals as large as a white-tailed deer, especially during the winter.

If large prey such as deer are taken, the bobcat will usually cover the remains with brush, grass and other debris and return to the carcass later for another meal. Though some vegetation may be consumed, the bobcat is essentially carnivorous.

The range of a bobcat, which may be as large as several square miles, varies depending on the availability of food. During the breeding season, bobcats may also travel extensively in search of a mate.

Female bobcats are sexually mature at one year of age; however, males do not reach maturity until they are two. The breeding season occurs in February and March. Following a 62-day gestation period, one to four kittens (although it is usually two) are born blind and spotted. The kittens are weaned at about 70 days and may remain with the mother well into the fall. Males take no part in the rearing of the young and, except for a female with kittens, bobcats live solitary lives.

The bobcat is a rare and interesting inhabitant of areas in New Jersey that are less accessible and populated. Like the black bear, it represents an earlier time in our history, when open space was not at such a premium, and when people were perhaps more tolerant of their non-human neighbors. The continued presence of these species will largely depend on human tolerance and our desire to preserve what remains of New Jersey's "remnant wilderness."

by Robert Lund, a research scientist with the DEP's Division of Fish, Game and Wildlife

Bobcats appear to be
found only in the
northern one-third of
the state, primarily in
Morris, Passaic, Sussex
and Warren counties.





The Princeton Preparatory School baseball team photographed in the late 19th or early 20th century.
See how the game evolved in the Garden State in *New Jersey Outdoors*' spring issue.

In Next Season's Issue

Celebrate 25 Years of Environmental Protection

Explore New Careers in the Environment

Learn About New Jersey's Newest State Park

Kayak the Atlantic Ocean

Take a Guided Fishing Tour

Soar with New Jersey's Eagles