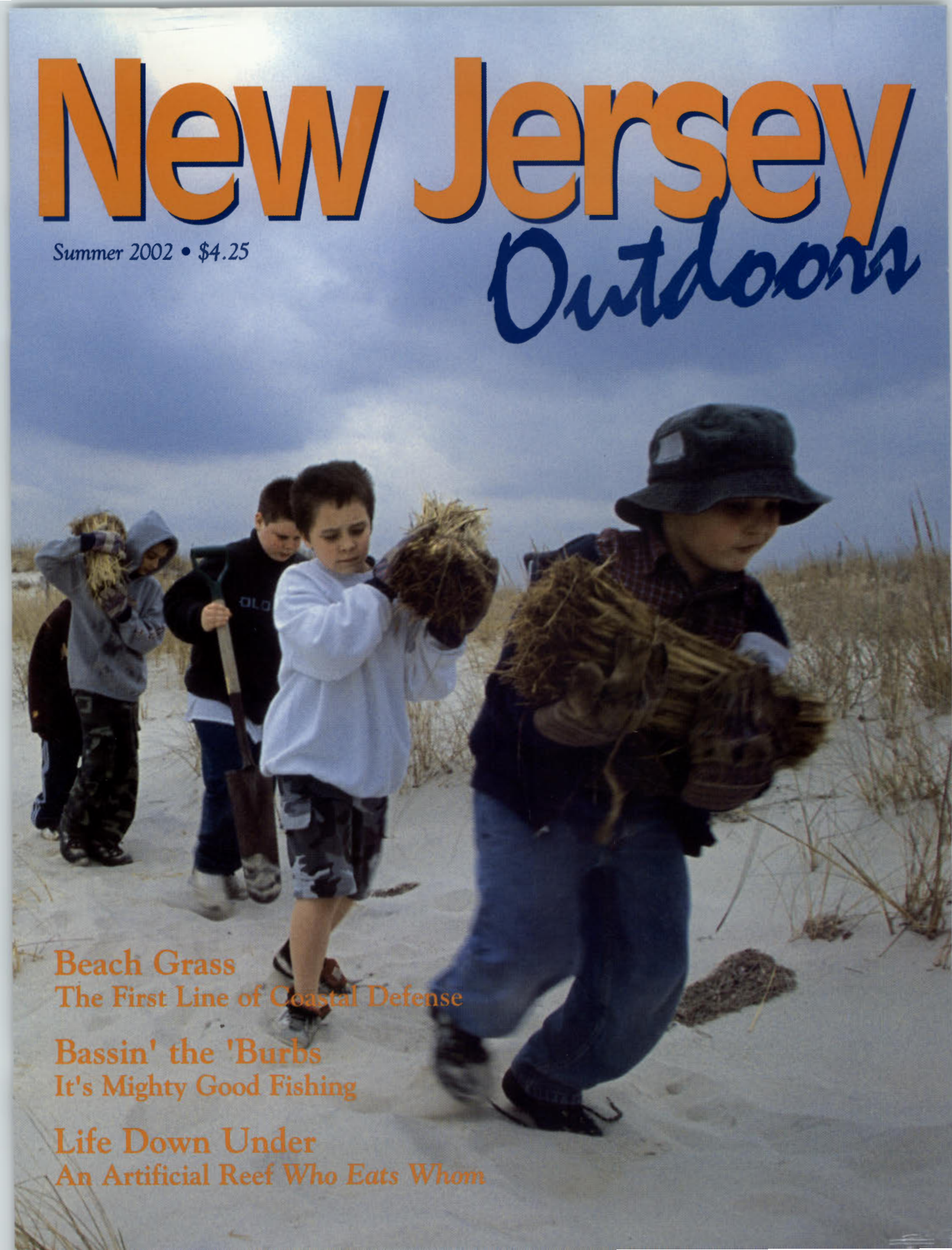
New Jersey Outdoors

Summer 2002 • $4.25



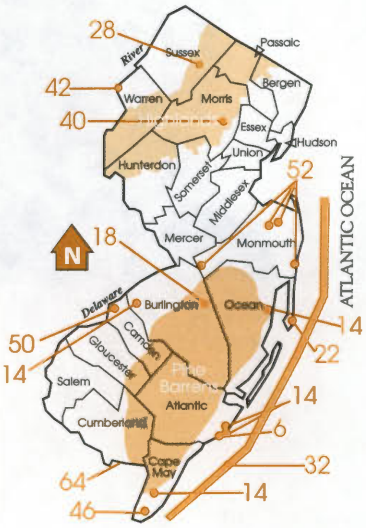
Beach Grass
The First Line of Coastal Defense

Bassin' the 'Burbs
It's Mighty Good Fishing

Life Down Under
An Artificial Reef Who Eats Whom

Table of Contents

Story Locator
Page numbers indicated



Departments

Front/Back Cover
Hi-ho, hi-ho, it's off to plant beach grass we go! Volunteers of all ages are helping to save Island Beach State Park's primary dunes. (See page 22.) *© Steve Greer*

Inside Front Cover
Blueberries such as these helped put Whitesbog on the map. Today, the historic village also serves as a doorway to the Pine Barrens. (See page 18.) *© Stephan Thompson*

Inside Back Cover
The Eastern oyster is the subject of the **Wildlife in New Jersey** profile on page 64. *© 2002 Kathy Johnston*

From Governor James E. McGreevey

James E. McGreevey
Governor

Thank you to all of you who joined us when we kicked off New Jersey's trout season at the Pequest Trout Hatchery and Natural Resource Education Center in Oxford, Warren County. In addition to congratulating the winners of our fishing art and writing contests, the event provided an opportunity to announce two key initiatives that will expand the state's fishing resources.

One initiative will expand access to fishing waters for New Jersey's anglers. We will use open space acquisition funds from Green Acres bond issues—approved overwhelmingly by New Jersey's voters—to finance this initiative. Easements for fishing access rights will be purchased in key areas of the state. These permanent easements will allow the public to wade and walk along the streambed and banks of productive fishing streams for the sole purpose of fishing.

Our second initiative focuses on expanding fishing programs to additional areas. This will afford more children throughout the state the opportunity to experience, enjoy and appreciate this great natural resource.

Fishing can be relaxing or challenging; it can offer solitude or foster cooperation. Whether your catch sustains you or you release it, fishing is always great. In fact, there is an article in this issue—*Bassin' the 'Burbs*—that testifies to the many benefits fishing affords.

New Jersey's vast waterways are a valuable treasure that a million New Jersey anglers utilize almost all year round. Our administration recognizes the importance of the fishing community in New Jersey. We are committed to increasing recreational opportunities in our rivers and streams.

Once again, thank you and enjoy the fishing. May you and your family be blessed with a healthy summer season.

James E. McGreevey

From Commissioner Bradley M. Campbell

Bradley M. Campbell
Commissioner

New Jersey has the distinction of being able to offer vacation and recreational opportunities for just about everyone. And the Department of Environmental Protection is the steward of many of the natural and historic resources that support those opportunities for the citizens of this state and our many visitors.

Whether it's the roar of the surf, a mountainous trail, or a glimpse of the past that beckons you, why not discover the treasures of New Jersey before seeking out more distant venues. From the Highlands of North Jersey to the ecologically unique Pine Barrens of the southern counties, you can hike our parks and forests, discovering stunning views and regional flora and fauna, then picnic, swim, bask in the sun, or cool down under a leafy canopy. From the Atlantic Ocean to the Delaware River, you can visit our interpretive centers, tour our historic sites, fish our lakes and streams, visit the past in our living history villages, relax on our sandy beaches, and climb a lighthouse or two.

New Jersey is small enough to make almost any destination perfect as a day trip, as well as a weekend getaway or a longer vacation. Several excellent choices—Whitesbog, Sterling Hill Mine, Island Beach State Park, and the Delaware Water Gap—are featured in this issue of *New Jersey Outdoors*.

Visit. Enjoy. See why we consider safeguarding these natural and historic treasures for future generations to be so important. And then consider how you can help.

Bradley M. Campbell

NJO News & Notes

Be Bear-y Smart

Now that warm weather has arrived, New Jersey's black bears have become more active. Residents of bear country—North Jersey—should follow the tips listed below to reduce the problems associated with bears. Whether you live there or are planning to visit, please:

- Use common sense in an encounter with a bear. Remain calm and never approach the animal. Make the bear aware of your presence by talking or clapping, and always give it an escape route.
- **Never feed a black bear.** Bears that are fed either intentionally or unintentionally can become aggressive and dangerous, and may have to be destroyed.
- Report aggressive bears immediately to the Division of Fish and Wildlife's Wildlife Services Unit at 908.735.8793. Nuisance or damage problems caused by bears should also be reported to the same number.

To bear-proof your surroundings:

- Store garbage in airtight containers in a secure area such as a basement or against the inside wall of a garage.
- Feed outdoor pets during daylight hours only and remove all food scraps and food bowls immediately after feeding.
- Hang bird feeders at least 10 feet off the ground from a free-hanging wire.
- Protect beehives and livestock. Electric fencing is sometimes effective in preventing black bear damage.

To learn more about New Jersey's black bears, visit **www.njfishandwildlife.com** or call 908.637.4125. Programs for schools and civic organizations are available free of charge, as are brochures and other materials on living in bear country.

Preliminary 2001-02 Deer Harvest Estimate

Based upon preliminary deer harvest data, the Division of Fish and Wildlife is characterizing the 2001-02 deer hunting season as one of the most successful to date for deer management efforts and for deer hunters. An estimated 68,669 deer—the third highest number on record—were harvested during the six deer seasons.

Shotgun hunters continued to harvest the most deer (32,947, or 47 percent of the total); bow hunters accounted for 34 percent of the total harvest (23,516 deer); and muzzleloader hunters took the remaining18 percent (12,206 deer).

An informative table detailing the deer harvest by seasons and zones is available online. For a link to that document (in PDF format), please go to **www.njfishandwildlife.com/news/2002/drhrvest.htm** and scroll to the end.

2002 Mid-Winter Waterfowl Survey Results

The Department of Environmental Protection's Division of Fish and Wildlife recently completed New Jersey's portion of the U.S. Fish and Wildlife Service's (USFWS) Atlantic Flyway Mid-Winter Waterfowl Survey. This survey, designed to track long-term trends of waterfowl species wintering along the Atlantic coast, has been conducted each January since 1955.

The survey is conducted simultaneously in all Atlantic Flyway states to measure the abundance and distribution of wintering waterfowl in the region. The survey figures are taken from flights conducted over key wintering areas and are not an absolute count of the entire waterfowl population.

The survey count for black ducks was the highest ever recorded in the state, while counts for mallards and pintails were the second highest ever recorded for those species. The second highest state count for Canada geese was also recorded. Counts were particularly high in areas where migrant, sub-arctic breeding Canada geese are known to spend winter, providing further evidence of a strong recovery of this population. Scaup, canvasbacks, and tundra swans were the only major species below their respective 10-year average in 2002.

State of New Jersey
James E. McGreevey
Governor

Department of Environmental Protection
Bradley M. Campbell
Commissioner

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Communications and Legislative Affairs

Kathleen Bird
Director of Communications

New Jersey Outdoors

Summer 2002, Vol. 29, No. 3

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.

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2002 Mid-Winter Waterfowl Survey Results, continued

	The 2002 Survey Count in New Jersey	As Compared to the Latest 10-yr Average	NJ Count as a Percent of the Total
Atlantic Brant	124,590	+25%	65%
Black Ducks	115,280	+46%	35%
Snow Geese	122,450	+61%	30%
Canada Geese	241,328	+40%	25%
Bufflehead	18,600	+32%	25%
Mute Swans	1,648	+15%	20%
Mallards	39,010	+43%	18%
Scaup	47,155	-08%	10%

2001 Skillful Angler Winners

For nearly two decades, the New Jersey Division of Fish and Wildlife has been recognizing anglers who catch fish of not quite record, but nonetheless substantial, size. The Skillful Angler Program began in 1983 with 31 applicants; 129 applications, representing 21 different species, were officially processed for 2001. To date, 1,780 anglers have been awarded skillful angler status.

The two most popular species caught by skillful anglers in 2001 were brook trout and chain pickerel, with each accounting for 20 entries. No entries were received this year for American shad, northern pike, bluefish, cod, blue or white marlin, mako shark, pollock, or albacore, bluefin, yellowfin, and tuna (other) categories.

Congratulations to the following winners:

Freshwater Species	Weight	Angler	Hometown	Where	When	Length	Girth
Largemouth Bass	7 lb., 7 oz.	**Dave Hughes**	Turnersville	Bells Lake	9/6	25"	17.5"
Smallmouth Bass	5 lb., 3 oz.	**Paul Joyce**	Jackson	Manasquan Reservoir	8/18	20.75"	15.875"
Striped Bass Hybrid	11 lb., 6 oz.	**Mallory Smith**	Millville	Maurice River	4/16	30"	16.5"
Carp	50 lb.	**Steve Babilino**	Turnersville	Garrison Lake	5/31	46"	36"
Channel Catfish	12 lb., 13 oz.	**Stephen Miklandric**	Belle Mead	Lake Assunpink	9/8	30.25"	18.5"
Black Crappie	3 lb., 8 oz.	**Forrest Black**	Bound Brook	Spruce Run Reservoir	3/24	16"	17.5"
Muskellunge	28 lb., 4 oz.	**Steve Nemeth**	Phillipsburg	Delaware River	7/31	48"	21"
Chain Pickerel	7 lb.	**Ed Witkowski**	Middletown	Deal Lake	9/19	32"	11"
Brook Trout	8 lb., 6 oz.	**Mike Denniston**	Brielle	Spring Lake	4/7	20"	I.N.A.
Brown Trout	8 lb., 5 oz.	**Cletus Polk, Jr.**	Mahwah	Manasquan Reservoir	8/16	25"	14"
Lake Trout	26 lb.	**Walter Neumann**	Cliffwood Beach	Round Valley Reservoir	7/16	37"	23"
Rainbow Trout	8 lb.	**Cletus Polk, Jr.**	Mahwah	Monksville Reservoir	7/12	4.5"	16"
Walleye	6 lb., 15 oz	**William Pugsley**	Randolph	Lake Hopatcong		25.5"	I.N.A.

Saltwater Species	Weight	Angler	Hometown	Where	When	Length	Girth
Black Sea Bass	6 lb., 4 oz.	**David DiGiuseppe**	Sea Isle City	Over the wreck *Cleopatra*	8/12	24.5"	I.N.A.
Striped Bass	56 lb., 15 oz.	**Ron Faust**	Lansdale (PA)	Barnegat Light	10/31	48.5"	29"
Black Drum	78 lb.	**Phil Fors**	Brigantine	Brigantine North End	6/8	52"	I.N.A.
Winter Flounder	4 lb	**John Chan**	Edison	Belmar Jetty	12/8	20"	16.5"
Fluke	10 lb., 12 oz.	**Patrick Donnelly**	Brick	Off Seaside	8/25	29"	I.N.A.
Kingfish	2 lb., 4 oz.	**Barry White**	Little Egg Harbor	Barnegat Light	10/16	16.5"	9.25"
Tautog	13 lb., 4.8 oz.	**Greg Eastburn, Jr.**	Tuckerton	*Miss LBI*	4/11	25.75"	20"
Weakfish	10 lb., 12 oz.	**Stanley Klimek**	Sayreville	Delaware Bay	5/3	29"	I.N.A.

The Striped Bass Bonus Program

This program allows participating anglers to retain one additional striped bass beyond the normal daily possession limit of two from New Jersey's marine waters. In 2001 there were 105 party/charter boats and 13,900 individual participants; the preliminary estimate of the harvest is 4,526 striped bass (78,300 pounds).

All participants receive two non-transferable *fish possession cards*. Participants must punch month and day of harvest immediately upon taking and prior to transportation of bonus fish. The bonus fish must be taken to a registered check station (there are 55 throughout the state) or the card mailed to the NJ Division of Fish and Wildlife. Having a second card gives the angler the opportunity to harvest bonus fish on consecutive days, especially when fishing at night or when check stations are closed.

To receive your bonus fish possession cards, complete and mail the application form (below) as directed. Please note that if you are mailing applications for more than one person, a stamped envelope must be enclosed for each.

NEW JERSEY DIVISION OF FISH & WILDLIFE
Striped Bass Bonus Program
Individual Participant Application

Date_____

Name_____
Last First Middle Initial

Address_____
Number and Street

_____
City State Zip Code

County_____ *Social Security #_____

Daytime Telephone Number: (_____)_____
Area Code Number

**E-mail address: _____

MAIL COMPLETED FORM TO:
Division of Fish and Wildlife
Striped Bass Bonus Program
PO Box 418
Port Republic, NJ 08241

* Required for processing application.
** The division is developing a voluntary Bonus Program e-mail list for special notices, regulation updates, emergency closures, etc.

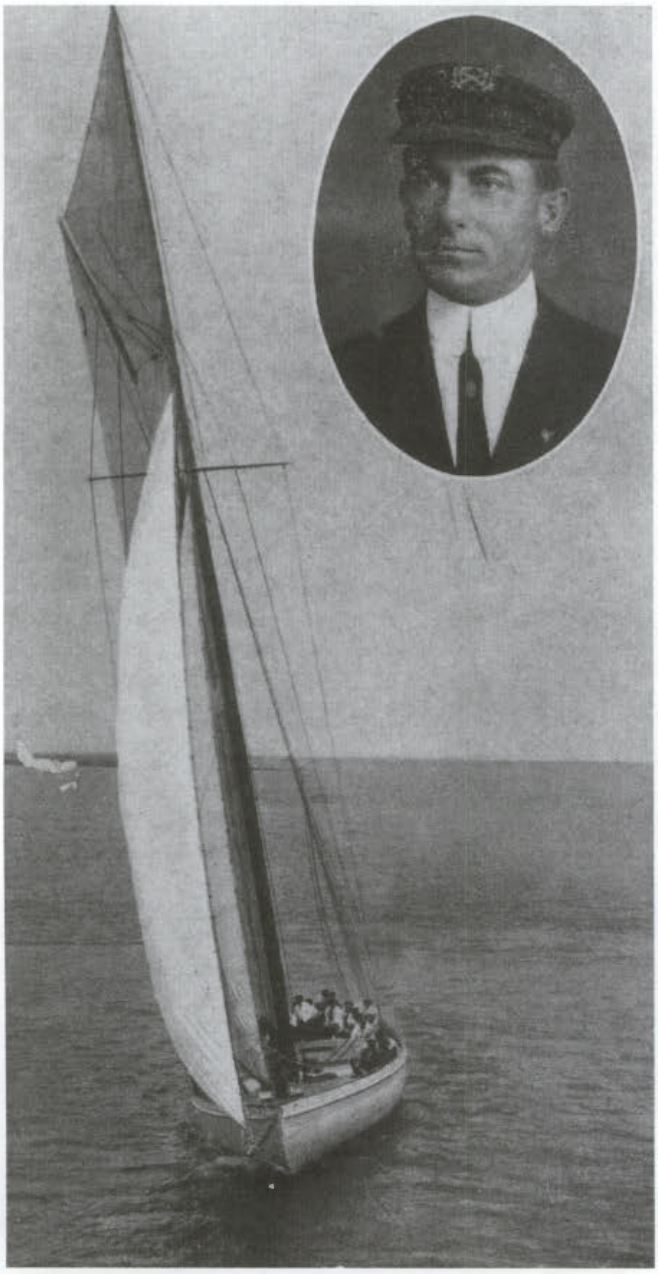
You must enclose a self-addressed, stamped, #10 business envelope for each applicant to receive two fish possession cards.

DIVISION OF FISH & WILDLIFE USE ONLY

Fish Possession Cards #s Issued_____ Duplicate Check_____

Date Mailed to Applicant_____ Initials_____

Wooden Boats & Men of Legend



by Gretchen F. Coyle

"Farley State Marina, Farley State Marina. This is the Moon Mist. Come in, please," calls the captain of a 42-foot Grand Banks trawler yacht.

"This is Farley State Marina," a crisp female voice responds. "Please switch to channel 6-5."

Now

The Inlet section of Atlantic City is busy with boats of all types, coming and going. Marinas, the Flying Cloud Restaurant at historic Gardner's Basin, clam boats, and numerous other commercial fishing boats take up the whole east side as one enters from either the Intracoastal Waterway or Atlantic City Inlet. Three early man-made lagoons provide shelter—Gardner's Basin, Snug Harbor, and Delta Basin.

The last three decades had seen the empty Starn's and Hackney restaurants, drug deals, and burned out shells of homes. But, thanks to New Jersey's Casino Reinvestment Development Authority, the Inlet area has been rebuilt and landscaped, completing the evolution from stately old seashore "cottages" where families gathered for the summer at the turn of the century to once again a safe shore for residents.

The biggest draw these days is the refurbished Farley State Marina, which sits in front of the Trump Marina Hotel Casino. With a capacity for 640 yachts, along with gas, diesel, a pump-out station, cable TV, electric, telephone service, and 24-hour security, this marina is a favorite for seasonal as well as daily visitors. Two casinos and a number of restaurants are within walking distance, and a quick taxi ride to the city's famed Boardwalk brings entertainment for all ages.

Then

In the latter half of the 19th century, Clam Creek, as the basin was called, lived up to its name as an area filled with clams, oysters, and fish. As the Atlantic City population exploded, fresh fish were

Opposite page: A young Captain George B. Gale (inset), probably in his U.S. Life Saving Service uniform, with his first *Princeton*, circa 1910.
Photo courtesy of Robert Ruffalo

Below: *Olive*, a catboat owned by the Gale family, loads passengers set for an afternoon sail in the Atlantic Ocean, circa 1940.
Photo courtesy of Robert Ruffalo

needed for the new hotels and restaurants. Men living off the sea worked hard 12 months a year, filling their large wooden sailboats with cod, menhaden, oysters, clams, or mackerel, depending on the season. Running the Inlet before it was dredged and a jetty was added was difficult.

Tom Hulme, of Atlantic City, is a noted authority on the area's old wooden gaff-rigged sloops and catboats. Years of studying and collecting are reflected in his fascinating scrapbooks; they depict a time long past on the water that today reflects neon signs and multi-story casinos.

"The early workboats did absolutely anything to make a buck," Hulme says. "They even changed their rigs periodically, depending on the boat's use and owner." This accounts for the fact that pictures exist of certain boats showing both cat and sloop rigs over the years. Most of the early workboats were built at the local Van Sant shipyard. A few came from Dorchester on the Delaware Bay.

In 1883, the Yachtsman's Association was founded at the end of Main Avenue near the Inlet on the property later to be occupied by Captain Starn's famous restaurant. The March 28, 1948, *Atlantic City Press* contained an old picture of the sea captains of the Yachtsmen's Association at the turn of the century. "They were a hardy lot," the caption read. "Most of the men learned the ropes from their fathers and were captains by the time they were eighteen." During the off-season the captains either lived off the sea to make ends meet or were part of the U.S. Life Saving Service (re-named the U.S. Coast Guard after 1915).

As the new century dawned, there were plenty of vacationers wanting to go for a sail. Boat captains had found a new catch—the tourist. "Think of it this way," Hulme says, "it was clean work in the summertime with a white shirt and tie. And they didn't have to get up two hours before daybreak."

Some boats began to be built strictly for sightseeing; others were built for commercial use, but their wide, shallow draft hulls made them suitable for either. Engines began to be installed at the old catboats. Some of the topmasts were cut off the older boats as the need for sail power became mainly for sightseeing passengers. Engines maneuvered the lagoons of the Inlet area. Pictures after the turn of the century begin to show some of the larger catboats with ridiculously short masts.

Robert Ruffalo, of Princeton Antiques and Books, deals in out-of-print books and has acquired an impressive collection of Atlantic City photo-

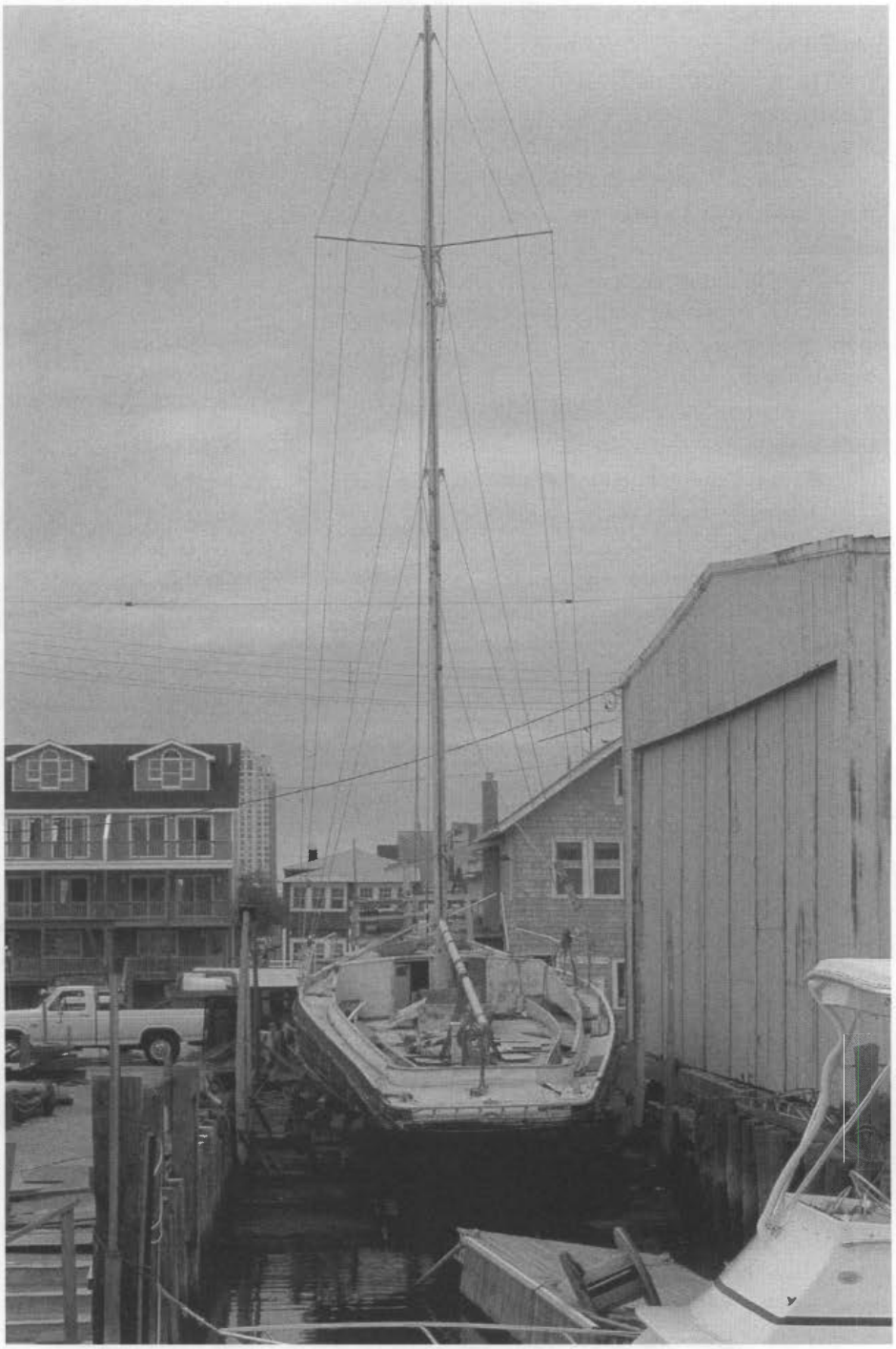
graphs. President of the Atlantic City Historical Society, he has one of the world's largest collections of Atlantic City photographs and memorabilia. Co-author of *Atlantic City, America's Playground*, Bob says with a smile, "The two-legged harvest became easier and more lucrative." Consequently, these workboats added plush seats to their cockpits, painted them, and took visitors for rides. Tom Hulme adds, "A lot of the old sea captains would make their own upholstery."

As many as 60 people could sit comfortably on each sailboat. "There weren't any rules," Tom laughs. "If you had a life belt for each passenger, you could take as many people as you could hold." An afternoon of sailing was a must for excursionists from crowded cities such as Philadelphia, New York, and Baltimore who had traveled to Atlantic City via the railroad. It was almost as exciting as a walk on the famed Boardwalk, a healthy swim in the ocean, or a box of salt-water taffy.

Before the Depression the cost of a sailboat ride was $1; during the Depression it sunk to 50 cents. By 1940, the price was up to between $2.50 and $3. Advertisements for these not-so-cheap rides bragged about "sailing along the oceanfront," but on rough days the trip was around the back bays. The usual sailing time was about two hours.

The Inlet area has changed from working and passenger sailboats to luxurious yachts tied up at floating docks. Visitors today may find it hard to imagine the scene of 50 to 150 years ago, but blue water trailing a wake of white bubbles off the stern of a passing vessel is the common denominator linking past and present.

Below: Although in deplorable condition, the *Helena G. Starn* can still be seen in the Inlet area.



Prolific freelance writer Gretchen Coyle divides her time between Beach Haven (NJ) and Useppa Island (FL), where she does most of her writing. Her contributions to **New Jersey Outdoors** *include: Mullica River Reflections (Spring 2001), The Opti: Sailboat of Choice for the Younger Set (Summer 2000), The Saga of Tucker's Island (Summer 1998), and Wind, Sand and Salt: Quirks of a Seashore Garden (Spring 1997).*

Legendary Captains and Vessels

Financier John E. Mehrer held a race at the end of each summer for the boat captains. Competition was stiff and the local skippers coveted the prize, usually a medal. Winners were able to fly the "J.E. Mehrer Champion" flag. Mehrer financed the building of many of the large sailboats belonging to the Gale family of boat captains.

Captains George B., Charles, Sam, and Ed Gale came from the industrious family of sea captains who owned and skippered some of the 50- to 60-foot catboats. Theirs were among the large number tied up along Clam Creek and its tributaries. Fancy docks such as the Inlet Pier, Inlet Sailing Center, Inlet Pavilion, and the Yachting Pier lured curious visitors. "T" and "L" docks were constructed so the boats could easily land under all wind conditions.

In a number of pictures George B. Gale, complete with the tie and captain's hat, sits at the helm of the *Princeton*, one of the most celebrated and photographed boats of all. Around him is always a well-dressed group of people posing for one of the cameramen who flocked to the Inlet area promising pictures as soon as the boat returned. Men wore coats and ties through the 1930s; Edwardian women wore long dresses, then shorter ones beginning in the 1920s. Children were similarly dressed. Long sleeves protected the sailors from the numerous flies, mosquitoes, and sun.

There were approximately six *Princetons* between 1906 and 1945. According to the *Registry of Merchant Vessels of the U.S.*, all were owned by the Gale family and were listed for either fishing or passenger service. Each weighed about 20 tons and carried a crew of three.

The year 1928 saw the launching of the popular *Harry Hackney*, first skippered by Captain Starn. Its design was created from a half-model. Entrepreneur Harry Hackney advertised his famous Hackney restaurant with its name on the mainsail, complete with large red lobster above. Soon Captain Starn opened a competing restaurant, Captain Starn's, nearby. Starn purchased Hackney's sailboat, using the same method of charging tourists for a sailboat ride while advertising his restaurant for all to see. It is under Starn's tutelage that a teenaged Tom Hulme became a mate and learned the ways of handling one of the large sailboats.

Today, the *Helena G. Starn* sags in many places, flaking with peeling paint. Her half-rotten mast is barely standing while lines weigh down the rotten wooden boom. Old wooden pulleys, a sturdy wheel, and an enormous cockpit tell the sad story. She is probably the only sailboat of her kind left. And she may not be around for long. The Westcoat Marina, where she perches on an equally decrepit old railway, is for sale. It will likely be developed soon, as waterfront property directly across from the Farley State Marina becomes more valuable.

—*Gretchen F. Coyle*

The Harry Hackney is launched (*Atlantic City, 1928*). Note the gentlemen wearing coats, ties, and hats.
Photo courtesy of Tom Hulme

Bushwhack

The Art of Almost Aimless Woods Wandering

Article & images by Michael Zeugin

It starts innocently enough.

You are hiking a snow-covered trail. A crisp coating of early season sleet crunches under your feet. Yours are the first human tracks in the well-traveled rut. Other creatures have passed here but they are not going your way. You look down at the twin sets of deer hoof prints that cross the trail, perpendicular to your path. Your eye follows them, wistfully at first. Then, as you stare off into the distance wondering why the deer went there, something primordial takes hold of your senses. Suddenly you see it; the natural corridor the deer have followed. Emboldened by the snow, knowing you can always Hansel and Gretel your way back along your own footprints, you take the first step.

You veer off the trail.

A sense of exhilaration sweeps over you. You are free. Free of the need to follow any prescribed route. It is why you come to the woods—to break away. The trail always seemed to ring untrue. It was someone else's course, decided and followed by others. As you move along the deer tracks you see the places where they have nuzzled under the snow for acorns, remnants of fungi or wild grapes. How do they do that with such precision?

You crouch below some overhanging branches and become the deer. A cold puff of wind blows across your neck and you turn. As you look back toward the trail where you left off, the image of a Lenape Indian flits through your mind. You turn again and follow the curved path of tracks draped across a rise, marveling at the ease of the uphill line. Then as you gaze into the arroyo below, you realize you will never be content to travel the marked human path again.

You have become a bushwhacker.

Winter is perhaps the best time to begin to understand bushwhacking. The forest is open, devoid of leaves. In northern forests, snow often provides a stark contrast to the trees and a blotter for game tracks. The long, unobstructed view allows the bushwhacker to follow the terrain. When the snow is deep (in Sussex County, at elevations above 1,000 feet, upwards of 100 inches of snow falls some winters), human traffic is almost completely cut off. Skis, snowshoes, and snowmobiles rule the easier trails, but many places become insulated from all human contact for as much as three months. In these places the woods are reclaimed by the animals—and you.

With the right tools—skis or snowshoes, or packboots in snow less deep—the snow makes for delightful bushwhacking. The cold can also lead to trouble. In December 1996, a cross-country skier got lost in Wawayanda State Park (Sussex County), while following a trail. He died of apparent hypothermia. His body was found three days later after a massive search effort. So, you need to be prepared (more on that later).

Before You Begin

Before bushwhacking, study topographic maps of the area. *Study* means *memorize*. Another warm-up is to hike all the marked trails in the area, to get a sense of the terrain. Those starting out might carry a map, although others might find that ruins the fun. If you lack a strong sense of direction you may want to carry a compass, but here we run into the danger of turning bushwhacking into orienteering. There is a difference.

Orienteering, a hobby for some, involves finding one's way around the wild using compass and map. We won't even mention the Global Positioning System (GPS), radios, and cell phones. A real bushwhack is just explorer, forest, and wits. But everyone needs to find his or her own comfort, safety level, and learning curve.

Once familiarized with the terrain, start out by playing *connect the trails*. Simply leave one trail and cut a line through the woods to another, using game trails to find the easy way through. Gradually increase the level of difficulty by lengthen-

Bear scat and deer droppings are signs of trail use by wildlife.

ing the distance traveling off-trail and selecting rougher terrain. Be especially mindful of swamps and cliffs—the topo maps will show these. Repeat explorations of the same area until you find yourself *feeling* your way through the woods.

What is feeling your way through the woods? This is difficult to explain because it is closely tied to intuition. The best analogy might be a moment from the original *Star Wars* film: Jedi master Obi-Wan Kenobi's voice enters Luke Skywalker's consciousness at the moment he is trying to target a weak point in an enemy craft on a strafing run. "Use the Force, Luke," his former mentor's voice urges. Luke does, relying purely on intuition to achieve success.

So it is when you are on the right path through the woods. The wrong path will leave you frustrated, perhaps even wishing you were back on the trail. The right path will seem almost effortless, or perhaps like you are stalking or slithering through the trees. The more you bushwhack, the more you'll feel it. The feelings need to be experienced repeatedly to be recognized and then reinforced.

Practice Makes Perfect

Such bushwhacking nirvana is only achieved with repetitive training. Every bushwhack is different. Each wander through the forest should lead to a find—a place, a thing, some new knowledge. Eventually as skills and experience converge, these *finds* happen with startling regularity: a deer carcass . . . an old mine shaft . . . cave openings in cliffs . . . the bleached jaw of a coyote. You won't see them often on a marked trail.

After you become accustomed to following natural paths, you become more sensitive to alterations in the terrain. Old grown-over logging or farm roads will reveal themselves. These can be fun to follow or ski. Look for old building foundations, mining pits, rock dumps.

The holy grail of bushwhacks is the game trail. In New Jersey, these are primarily used by deer. But in some places all sorts of animals—deer, bear, coyotes—converge on one natural path; mountain passes or ridges are good places to look. You'll know when you find one of these game superhighways. You'll likely find not only a well-worn trail, but also droppings from a variety of animals.

If you travel quietly and into the wind, you may find not just their droppings, but the animals themselves. It's not uncommon to surprise sleeping deer or a browsing bear while bushwhacking along a game trail. Pine forests, mountain laurel thickets, and swamp perimeters are just some of the places you might disturb animals who normally go there to hide from noisy trail hikers nearby.

An All-Season Adventure

So how do you find game trails when there isn't any snow? In open forest these trails are traveled heavily enough to be visible in some areas. The more the natural terrain features pinch the animals into a single place—a culvert, a gap in an old farm wall, a grassy grazing area—the easier it is to spot their paths. In autumn and spring, views through the forest are still unobstructed. The trick is to see both the natural corridor and the game path.

Fresh deer tracks are easiest to spot and follow after a night's rain. Deer disturb the leaves on the ground with each step, turning them up, which makes them differ visually from the surrounding

The author's daughter, Cassandra, hunkers down to search for a deer-tunnel.

forest floor. As the tops of leaves dry, deer hooves turn up the darker wet undersides of the leaves. Once the bushwhacker becomes adept at seeing this, following them is easy.

Deer "tunnels" are another form of game trail. The tunnel is formed by the deer traffic in and under thick brush. These are common in areas of mountain laurel found in northern New Jersey and areas of new growth or vines. To find deer tunnels more easily, hunker down to the height of a deer. Or just squat and look around. Children often have a bunch of fun finding these game trail tunnels, since they are the right height for access.

Summer bushwhacking can be more difficult but it brings its own rewards. Since vegetation is thickest in summer, some areas become almost impassable. To increase the fun, select your summer bushwhacks carefully. You'll need your topo map for this. Select higher rocky terrain—it's less likely to support dense vegetation. Look for broad north/northeast facing slopes. These get less light than other exposures, also limiting thick growth. If you combine dry, thin soil areas with a northern exposure you will find the best summer bushwhacking terrain.

Summer bushwhacking through varied terrain can have other advantages. Wild blueberries, blackberries, grapes, and raspberries are among the finds you'll make off the trail. I've discovered acres of plump wild blueberries thriving on a rocky mountaintop too arid to support other growth. From July through September, consider carrying an empty quart container in your pack for surprise harvests.

A Word to the Wise

Bushwhacking is, in many ways, the opposite of trail hiking, but there are some shared facets. Safety is one of them. It's a good idea to let someone know where you are going, or take a friend. For bushwhackers it is especially important to leave an accurate description of the area you intend to explore. Include an emergency overnight kit in a pack. For me, this includes waterproof matches, candles (to help start a fire in wet conditions), an emergency whistle, a reflective emergency blanket, extra clothing for sufficient warmth in nighttime temperatures, water, insect repellent, sunscreen, a water purification device, and some light snack foods.

Proper hiking shoes are a must. This means boots with full ankle coverage, not the low-top beefed-up sneakers that some manufacturers are now marketing as "day hikers." Bushwhacking means walking through rough terrain where ankle support and protection can be a good thing.

While we're thinking of ankles, be especially aware of snakes when bushwhacking. New Jersey is home to timber rattlesnakes and copperheads. I have encountered them both on and off the trail in New Jersey forests. In cooler times they are often sluggish, but on hotter summer days snakes can react quickly to intruders.

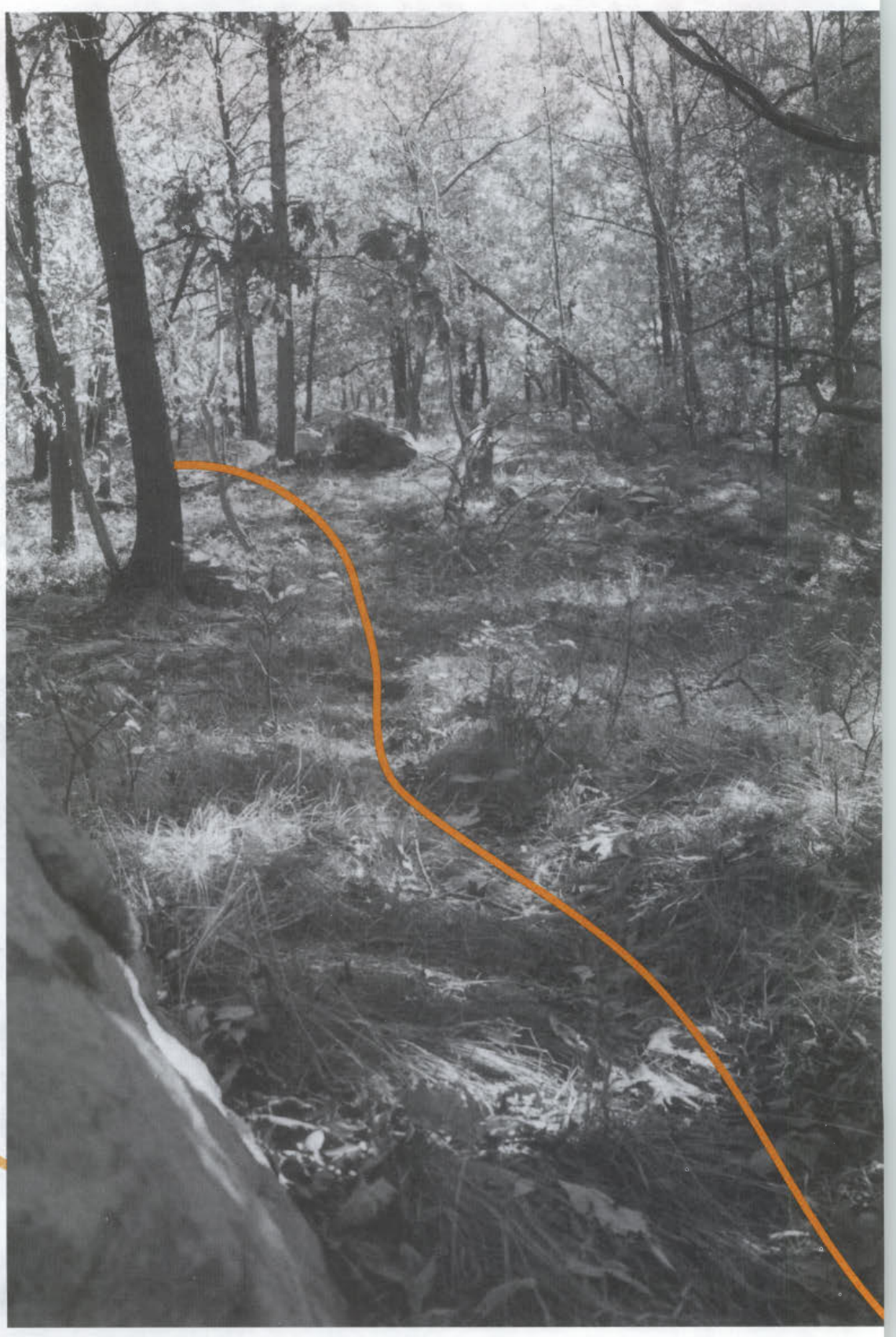
Another consideration in New Jersey is tick protection. Although I have yet to be bitten, something I attribute to luck and sensitive skin, I pick ticks off my clothing or body after almost every bushwhack. For trail hiking—and especially bushwhacking—read up on tick protection and avoidance techniques.

There are periods during fall and winter when you may want to avoid bushwhacking. Most hunters are cautious and bound by the ethics of taking only

clean shots at a clearly defined target. There are exceptions, so creeping along deer tunnels through dense mountain laurel is less advisable during the various deer seasons. Pick up a summary of hunting regulations at a hunting or tackle shop to check exact season dates. If you can't resist bushwhacking during hunting seasons, wear safety orange. Avoid earth tones and white gloves or hats.

Above all remember to bring your sense of exploration, adventure, and observation. These are all part of what makes bushwhacking so stimulating. And bring your camera. You will find off-trail moments that beg capturing.

Michael Zeugin has been known to wander aimlessly through forests on bushwhacks long enough to make companions refer to them as grueling. It is surprising he finds his way back to write stories and develop the photographs for **New Jersey Outdoors** *and other outdoor magazines. Zeugin's commute from the Skylands region to Rutgers University in Newark, where he teaches English, is spent daydreaming about past outdoor forays or cooking up ideas for new ones.*



Barely discernable to the untrained eye, this wildlife pathway is most evident to a seasoned bushwhacker.

Bassin' the 'Burbs

by Toni Stefano

My 13 year-old daughter KeriAnn's suggestion somehow filtered through the din of the honking horns as I made the near suicidal left turn off Tilton Road in Northfield into the parking lot of the dance supply store.

"Mom, Birch Grove Park is right down there (she was pointing). Can we go fishing after we get my shoes?"

We were on a late June mission. KeriAnn's annual recital was looming, and the only place to buy the shoes she needed just happened to be a half-mile or so up Tilton Road from the turn leading to Birch Grove Park. During the spring, we caught a couple of limits of trout from the ponds dotting the park, and I'm sure the memory of whatever snapped her line that day in May was still vivid in the colorful, and magnified, mind of a teenager.

Shoes purchased, and with a Wendy's burger 'n fries each under our belts, we split after tying our chosen lures. I chose a 3/8-ounce yellow/chartreuse spinnerbait. KeriAnn picked a 1/8-ounce bright orange Yo-Zuri Snap Bean.

A small bass, here. A little bigger bass, there.

"MOM!" resonated over the Birch Grove grounds, and I happened to catch the splash of the fish as it landed after the second jump. KeriAnn, armed with her ultra-light trout outfit, was locked in a more take-than-give with a largemouth that meant to make her pay.

I could only offer words of encouragement as she swept the rod right to left and then low to the water in an effort to keep the fish's head turned (as I taught her). The tiny reel's drag withstood the punishment, not without a screech or two, though. Twisted line and all, she lipped the bass and held it up for a photo.

"Mom", she said matter-of-factly, sweat highlighting her upper lip, "it's camera time."

That it was a pretty nice bass at a little over two pounds wasn't the only thing I was pleased about. What had me smiling to myself was the affirmation of my personal belief that that good bass fishing can be encountered close to home.

"Nice fish, Ker," I offered, after taking her photo.

"I've lost bigger here," she replied matter-of-factly, releasing the largemouth into the dark waters. "Let's hit the Absecon Pit on the way home. Bigger bass there."

"The Pit" is situated directly behind the town's municipal building off the Whitehorse Pike (Route 30). We read about it in an article in *The Fisherman* magazine a couple of years ago. Although it sits practically in the middle of a suburban residential area, the little—but deep—5-acre pond always has bass waiting. With darkness falling, and the mosquitoes and gnats multiplying, we called it quits after about a dozen largemouths between 10 and 15 inches hit our silver and black Rapala plugs. Although we didn't catch "The Big One," it was a lot of fun on the light and ultra-light rods.

"Ya know, Mom," Keriann observed later that evening, between coloring her nails for the umpteenth time and fielding phone calls, "we catch bass right around here and in the parks close by Aunt Tracey's house. How come whenever you read something about bass fishing it's always about on a big lake or going somewhere far away?"

I explained that when most people go bass fishing, they usually spend a full day at it. Chances are they either have a boat or rent one, and they like to read about faraway places. A "grass-is-always-greener" kind of thing.

Despite our hectic schedules, we still get to go fishing when a free morning or afternoon magically appears on the calendar. When we're on the road, which is often, I'll find out if there is a municipal or county park close to where our ultimate destination is. My sister Tracey lives in Garwood, in Union County,

Opposite page: KeriAnn caught this two-pound largemouth in Atlantic County's Birch Grove Park. There are six ponds in Birch Grove, and they're loaded with bass and pickerel.
© Toni Stefano

Below: Colonial Park in Somerset County is a bass hotspot. Each of its three ponds harbors largemouths like the one the author's holding
© Tom Pagliaroli

which happens to be within a 10-minute ride of a number of really good bass fishing waters. Nomahegan Park, Lenape Park, Echo Lake Park, and the Watchung Reservation all have ponds or lakes that are loaded with largemouths, and some pretty big ones at that.

I vividly remember watching a guy wrestle a bass that had to go five pounds from Lower Echo Lake. It was a Sunday morning in early May about four or five years ago. He was fishing at the lower end of the 100-yard paved section of shoreline, casting a tiny Mepps spinner for trout. We thought he hooked one of the giant trout stocked by a local club for a fishing derby, and when the bass jumped, I think everyone went into shock. Another fisherman put a tape measure to the bass, and it went past 21 inches! The bass was released, and the talk of the morning was how a bass survived to get that big in a county park pond.

Don Madson, who owns and operates the Sportsman's Outfitter in nearby Clark, shed some light on the matter. I had stopped in later that afternoon to buy a few Mepps spinners and, naturally, to pick his brain.

"After the Memorial Day weekend, fishing pressure on Echo drops off to almost nothing," he says. "Just about everyone who fishes Echo is after trout, and the largemouth bass are ignored. There's a lot of great bass food in Echo. Shiners, minnows, sunnies, crappies, goldfish, small carp, frogs, and crayfish. Nothing for a largemouth to do in there but get big and fat. Every once in a while, somebody catches one and the word gets out. But fishermen forget, and the bass just get longer and rounder."

If that was the case with Echo, I reasoned, why not other waters like it? Since that conversation, I've fished a lot of suburban park ponds and lakes throughout the state. Many are stocked with trout, and many not. No matter, since the bass fishing on the majority of them has been absolutely fantastic, either size- or numbers-wise. The bonus is that, except for a fishing companion, I hardly ever see anybody else casting for bass.

Where to Look

Some of the best suburban bass fishing spots are hidden in plain sight. Laurel Acres Park Pond in Mount Laurel (Burlington County) is a typical suburban bassin' situation. It's small—maybe three acres—and is stocked with trout. During April and May, it can get crowded, but by June, fishermen are scarce. From the summer through fall, the bass person can have the run of the place. Laurel's largemouths get pretty big—my personal best is about 2 1/2 pounds—and really like black plastic worms, spinnerbaits, and minnow-type floating plugs. You would think that with good bass potential, more people would fish there. It's very easy to get to, the parking is convenient, and you can cast from most of the shoreline. But a week or two after the last trout stocking in the middle of May, anglers seem to disappear.

The same with West Pond in Cape May Court House, directly off Route 9 and on the grounds of the always busy Cape May County Zoo. West Pond gets crowded during the trout-stocking season, but by late May, the weeds are up and the trout fishermen are gone. This is when the largemouths come out to play. I had all I could handle with the 4-pounder that came out from under the walkover bridge to grab my Boss Rat, and I caught another, about half that size, in the pond across Route 9.

And it doesn't have to be in a park, either. KeriAnn pointed to a patch of water tucked between some office buildings along Route 37 in Ocean County near Toms River. "Think there's a bass in there, Mom?" she asked. A quick jughandle at the next light and within a minute we were ready to find out. We checked for "No Trespassing" posters. There weren't any, so I assumed it was open to the public. A good dose of tick repellent, and we gave it a shot. We only had about 20 minutes to spare, so it had to be hit-and-run. We cast chartreuse spinnerbaits along the edges of the weeds, and KeriAnn caught a pair of foot-long largemouths on successive casts. We ended up with seven bass, the longest of which was only 15 inches. Still, it was fun, and seven bass in 20 minutes is pretty good fishing.

Like I said, hidden in plain sight.

Info Sources

There are several excellent sources of information to guide you to bass in the 'burbs.

The New Jersey Division of Fish & Wildlife offers *Places to Fish*, a guide that covers the ponds, lakes, reservoirs, rivers, and streams open to the public. These are listed by county, and include the species present, fishing quality, facilities

Below: Rodents rule! Surface rats and mouse lures resemble the real thing and are just the ticket for weedy suburban park waters.
© Toni Stefano

available, acreage (or length), access, and whether the water is owned by the state, county, or municipality. It even lists the nearest city or town. It's available free by sending a self-addressed, stamped ($0.55) business-size envelope to Places to Fish, Pequest Trout Hatchery, 605 Pequest Rd, Oxford, NJ 07863 or to Places to Fish, Bureau of Freshwater Fisheries, PO Box 394, Lebanon, NJ 08833. A modified version is provided on the division's Web site (www.njfishandwildlife.com/fishstrm.htm).

Also available from the division is a list of more than 50 New Jersey fishing sites that are accessible to people who have difficulty with mobility. Visit www.njfishandwildlife.com/pdf/handilst.pdf for the on-line version, which is in PDF format. The print version is available by sending a $0.34 stamped, self-addressed envelope to: ACCESS, Pequest Trout Hatchery, 605 Pequest Rd, Oxford, NJ 07863.

For a list of publicly owned access sites on the Delaware River, see the current edition of the freshwater fishing issue of the *NJ Fish & Wildlife Digest*, available free at all license agents and division offices.

Another helpful resource is the *Wild Places & Open Spaces Map*. Maps can be purchased at the division's Trenton office (501 East State Street, 3rd floor) or Pequest office (Route 46, Oxford) for $3. Or, send your request with a check made payable to NJ Div. of Fish & Wildlife for $4 per map (includes shipping and handling) to: Wild Places Map, Division of Fish and Wildlife, PO Box 400, Trenton, NJ 08625-0400.

A second source is the *New Jersey Lake Survey Fishing Maps Guide*. This publication has maps of many state, municipal and county-owned lakes. (It also includes the *Places to Fish* listings). The maps feature depths, bottom contours, and structure—the works. Fishing tips are offered for many of the lakes and ponds, and there are several articles about specific waters. The guide is available for $15.28 (which includes postage, handling, and NJ sales tax) from New Jersey Sportsmen's Guides, PO Box 100, Somerdale, NJ 08083 (856.783.1271).

A third source is the Internet. Clicking onto a county or city web site should lead you to a listing of its parks or park system. Any waters open to fishing within the park, or parks, will be listed.

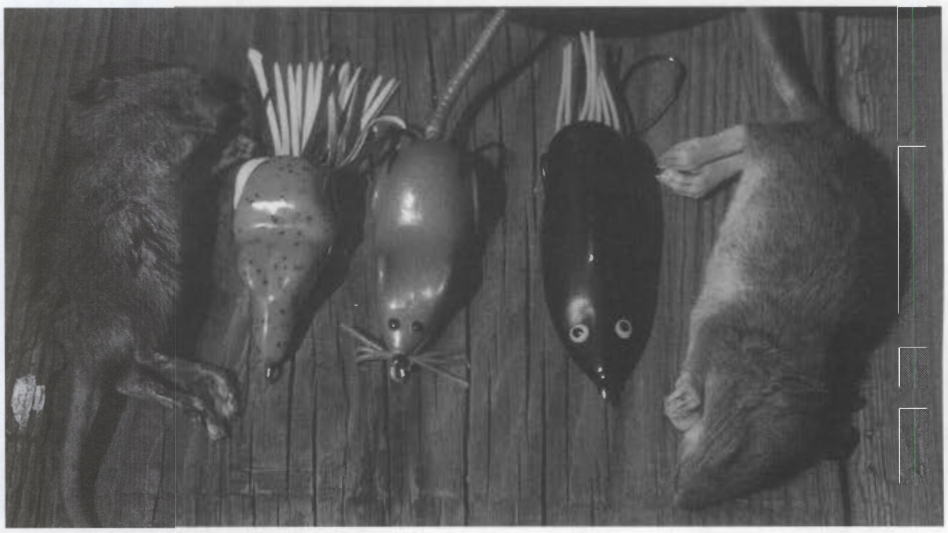
Yet another source is the local tackle shop. These can be hard to find, what with the *marts* and all, but find one and you're on track. These are stores of reliable, up-to-the-minute information on local fishing, and you can bet the guy behind the counter won't steer you wrong in pointing out where the best spots are. He wants your business, and if he puts you on bass, he hopes that you'll become a customer.

Great Baits

I'm a firm believer in the KISS (Keep It Simple, Stupid) principle when it comes to bassin' the 'burbs. A couple of spinnerbaits (1/8-ounce and 1/4-ounce/chartreuse or yellow skirt and a gold or copper blade), a half-dozen 6-inch plastic worms (black, red shad, or pumpkinseed; three 1/0 worm hooks and 1/4-ounce worm weights), two surface minnow-type plugs (silver/black or gold/black), a couple of Johnson Silver Minnows (1/4-ounce/silver and gold; a couple of 2-inch chartreuse grubs for trailers), and a pair of weedless topwater plastic rats (yellow, white, black, or gray) are all that's needed to bring bass to the bank.

These are what I use, and they all fit in two small plastic boxes that go in a fanny pack, along with a small point-and-shoot camera. A line clipper on a lanyard around my neck, and I'm good to go. I've seen guys carrying around tackle boxes the size of a mini-van, and I've noticed these same fishermen changing lures every few casts. My experience is that if you limit yourself to only a few options, you tend to fish each more thoroughly and catch more bass in the long run.

While spinnerbaits, plastic worms, weedless spoons, and plugs catch a lot of 'burb bass, one lure that really comes into its own on weed and lily pad covered park ponds and lakes is the weedless surface plastic rat. Rodents rule on these waters! The reason they catch so many bass is that you can cast them onto the heavy mats of weeds and pads and retrieve them without getting snagged. When a bass sees one of these things, body wiggling and tail wagging, moving



over the top cover, it looks too real to resist. When the fish sucks down the rat, it sounds and looks like the surface is being flushed down a toilet! It's really something you have to see, and feel, to believe! The PhatRat, Boss Rat, and Moss Mouse should be in every suburban largemouth angler's pack.

I prefer spinning tackle. My 5-foot, 9-inch medium-action Fenwick rod and Fin-Nor reel loaded with 10-lb. test line (I like clear/blue Stren for visibility) will handle the baddest of 'burb bass.

While I certainly anticipate and enjoy a bass fishing excursion to Lake Hopatcong, Budd Lake, Greenwood Lake, Big Swartswood Lake or Union Lake (I refer to these as New Jersey's *Great Lakes*), I don't feel deprived if I don't get to them over the summer. Those suburban waters are loaded with largemouths and are convenient when time (such as before work) is at a premium. Make a few casts in your local park pond. Bet you'll be surprised!

Toni Stefano is the membership director of the Recreational Fishing Alliance, a 501 (c)(4) nonprofit lobbying organization based in New Gretna, NJ and Washington, DC. She is an active fresh- and saltwater angler who especially enjoys largemouth bass, trout, fluke, and striper fishing.

Where to Go

While there are literally hundreds of suburban bass ponds and lakes that provide good to excellent bass fishing, I've found the following to be especially good waters. Maybe we'll meet there this summer! (If I've missed your favorite, let *New Jersey Outdoors* know.)

Atlantic County	Absecon Pit
	Birch Grove Park Ponds
	Hammonton Lake
	Maple Lake
	Lake Lenape
Burlington County	Laurel Acres Pond
	Medford Park Ponds
	Pemberton Lake
Camden County	Blackwood Lake
	Nash's Lake
	Oak Pond
Cape May County	Dennisville Lake
	West Pond (and the pond across Route 9)
Cumberland County	Davis Mill Pond
	Giampietro Park Pond
	Laurel Lake
	Sunset Lake
Essex County	Verona Park Lake
Gloucester County	Grenloch Lake
	Swedesboro Lake
Mercer County	Carnegie Lake
	Lake Mercer
	Gropps Lake
	Mountain Lake
Middlesex County	Davidson's Mill Pond
	East Brunswick Park Lake
	Farrington Lake
	Lake Manalapan
	Milltown Pond
	Roosevelt Park Lake
	Westons Mill Pond
Monmouth County	Deal Lake
	Poricy Pond
	Turkey Swamp Park Pond
Morris County	Burnham Park Pond
	Lake Ames
	Mount Hope Pond
	Speedwell Lake
Ocean County	Lake Shenandoah
	Manetta Lake
	Pohatcong Lake (in Tip Seaman Park)
Passaic County	Barbours Pond
	Weyble Pond
Salem County	Harrisonville Lake
	Maskells Mill Pond
	Rainbow Lake
	Riverview Beach Pond
	Salem Canal
Somerset County	Best Pond
	D&R Canal (Griggstown to Manville)
	Mefflers Pond
	Millstone River
	Powder Mill Pond
	Spooky Brook Lake
Union County	Lake Lenape Ponds
	Lower Echo Lake
	Milton Lake
	Nomahegan Pond
	Rahway Park Pond
	Surprise Lake
	Warinanco Park Pond

Whitesbog: Doorway to The Pines

by Karen Larsen
Images © Stephan Thompson

Route 70 flows in a stream of black pavement banked by the dense green and copper forest of the Pine Barrens. It is a flying run from Philadelphia to the shore through a landscape dry, empty, flat, lifeless, deserted and featureless.

"There's nothing there," they say, those people with a cottage rented for two weeks on Long Beach Island. "Just drive through as quickly as possible. And watch out for the deer." How much they have missed in their headlong rush to the beach.

This summer ignore advice, and try something different. Slow down. Turn off Route 70 and onto the sand roads winding between the trees. Get out of your car. Breathe. Walk.

What you will see is not dry; ponds and streams and reservoirs with gold sand beaches are behind that screen of green and copper forest. What is there is not featureless or barren or lifeless.

Hundreds of varieties of plants flourish in the shade and sunshine of a Pine Barrens summer, sheltering and nourishing thousands of creatures that swim, crawl, run, and fly in relative peace and silence. Join them for a day and you will see what others have missed.

The Pine Barrens can initially appear sealed and intimidating. The forest, when seen from behind the windscreen of a car, appears as tightly closed and guarded as the mossy plates sheathing the back of a snapping turtle. Many of the sand roads local people travel are unmarked on maps and lead to villages—now just clearings in the woods—that disappeared a century or more ago.

Where to start? How does one pull aside that thick green curtain to view what lies behind? One village remains intact and is an excellent entryway—and introduction—to the Barrens.

The Door Is Open

Whitesbog Village lies within Lebanon State Forest, just one mile west of the intersection of Routes 530 and 70, four miles east from the center of Browns Mills. On both the national and state Registers of Historic Places, Whitesbog is a cluster of cedar-shingled buildings, most constructed in the latter part of the 19th century and the beginning of the 20th century, when the village was the heart of a commercial cranberry and blueberry operation.

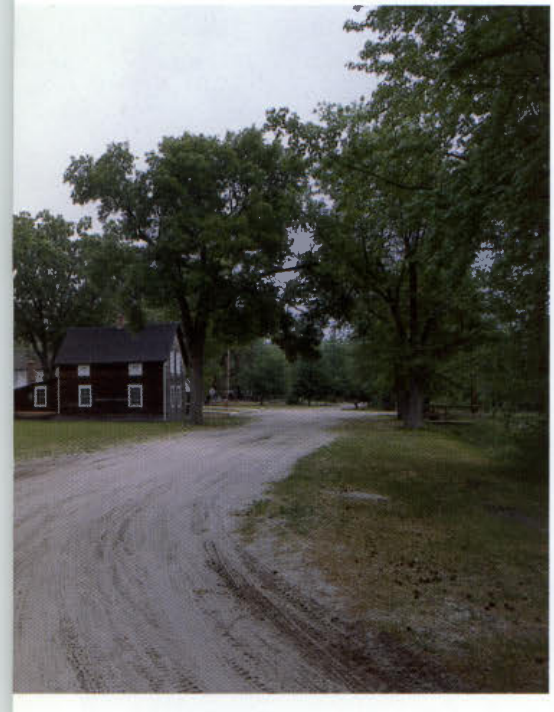
Nestled beneath tall pitch pine, black gum, and American holly trees, Whitesbog is a carefully preserved testament to a time when Italian and African-American laborers traveled by train from Philadelphia to hand-harvest fruit every autumn. It is the surrounding property however—the 3,000 acres of sand-road-laced forest, heirloom blueberry fields, and both abandoned and active cranberry bogs—that makes the site much more than a rare and special window into New Jersey's agricultural history.

Migratory and nesting birds find sustenance and shelter amongst the hundreds of varieties of aquatic and land plants that flourish in this part of the Barrens. Far from being a trackless wasteland, the Whitesbog Preserve is defined by ponds, streams, reservoirs, intimate glades, and open expanses of abandoned bogs that the forest has yet to reclaim. The general store in the vil-

Below: Workers' housing

Bottom left: Whitesbog Village is a great starting point for a Pine Barrens trek.

Bottom right: Indian pipe (*Monotropa uniflora*)



lage center, staffed by volunteer docents on the weekends, and where maps suggesting well-marked routes can be found at any time, is a good place to start your exploration.

Although you are welcome to bring your car as you travel well-maintained roads and paths—indeed, for those who contend with physical challenges this is one of the additional benefits of exploring the area around Whitesbog Village—consider leaving it in the parking lot. Put on a pair of running sneakers or walking shoes, feel the subtle cushion of packed sand roads and pine needle carpets, bring dogs and children, and breathe the scent-laden air that sweeps out from between stands of moss-blanketed trees and over the open spaces of water and bog.

You could begin your walk in early morning or in the late afternoon when the sun angles across the horizontal lines of open vistas. Then the deep metallic colors of the landscape come to fore—bronze in pine needles under your feet; pewter on the still or wind-swept reaches of ponds; and gold in the fractal light that streams through the outstretched boughs of white cedar, red maple, scrub oak, and pitch pine.

You could come in the blazing heat of a summer day when empty white beaches bordering warm, clean, sand-bottomed reservoirs invite picnicking beside the soft tea-colored water. You could come on a clear moonlit night when docents from the village lead guided walks through a landscape luminous in silver. Each season, each time of day, has its own unique beauty.

Flora and Fauna Abound

Your walk will be edged by hairgrass, bushy beardgrass, and switchgrass arching in dry counterpoint to the swaying rushes feathering the water in irrigation channels dug a century and more ago at roadside. Delicate pepperbush flowers lift pale spikes above thick serrated leaves. The forest rings everything—shades of deep green, blue, and black, a tapestry of coniferous and deciduous trees. Occasional isolated pitch pines and red maples lean over ponds, their outstretched branches reflecting in dark still water.

The heavy jasmine-tinged scent of white swamp azaleas fills the evening air in June and July while early summer offers showy displays of pink and white mountain laurel. Sluice gates and dams that once channeled the water for cranberry agriculture now form bridges and provide musical accompaniment for the walker or runner.

You will not be alone in your explorations, although most of your companions will have wings or webbed or hoofed feet. In the damp sand of early morning, deer leave sharp-edged impressions that trip lightly over the furrowed drag marking a musk turtle's crossing from one pond to another. The deer, coats gone reddish in the summer season, are sheltered and quiet, hidden in the forest, but the turtle is still in evidence.

Look for her. She sits with her brothers and sisters, sunning in silent fellowship, forming a line of wet black backs on a half-submerged cedar log a few yards from shore. White egrets and great blue herons with sword-blade beaks stalk hapless frogs in the shallows. They stand on graceful legs—the ballerinas of the bog—waiting, waiting, until an unwary amphibian glides by. A swift stab, an instant of motion breaks the stillness, and then all is quiet again.

Bring a fishing pole; large chain pickerel glide in shadows beneath the banks of the deeper bodies of water. People have been known to hook and release thirty or more large thrashing silver and green fish in a single afternoon. In some old flooded blueberry fields and shallow bogs, ducks—mallards, woods, blacks—quack and cackle while nesting;

sandpipers twitter and rush along the edges of reservoirs.

Farther from the water's edge cottontail rabbits shelter in dense thickets of greenbriar and huckleberry, while in the deeper woods gray foxes burrow through the shallow topsoil to den in the loose sand beneath. The pursuit—but not the killing—of these animals is a living tradition in The Barrens. Weekend mornings are filled with the distant sound of beagles and blue-tick hounds reverberating through the woods.

Above it all, the raptors and scavengers soar. Hawks, turkey vultures, and bald eagles scribe great wheeling circles above the bogs and forest looking for small creatures on the run or for those that have stopped running forever. Empty? Lifeless? Deserted? The Pine Barrens is anything but.

Preserved for the Future

Whitesbog Village, with the land that surrounds it, is a multi-use area managed by the Whitesbog Preservation Trust. The non-profit organization has a mission to "restore, protect, and enhance the land, sites, and buildings at Whitesbog and to provide educational and interpretative programs about the history, culture, and natural environment of Whitesbog."

Dog walkers, horseback riders, runners, sand road dog sled mushers, birders, orchid hunters, butterfly and insect aficionados, kayakers, canoeists, huckleberry pickers, and those with an interest in New Jersey's agricultural history all use the area in addition to foxhunters and fisherfolk. However, with careful management and recreational opportunities that are spread over thousands of acres, congestion or overuse of a particular area has never been a problem.

Whitesbog Village is an excellent access point for exploring a part of New Jersey all too often missed in the rush for the shore. Stop and see it this summer. Get out of your car. Breathe. Walk.

A Canadian by birth, Karen Larsen grew up in Massachusetts. She taught high school social studies and served two years in Bulgaria and Macedonia as a member of the Peace Corps before coming to New Jersey to pursue a graduate degree at Princeton University.

Below: Raccoon (*Procyon lotor*)

Bottom: A satisfied taster

Opposite page: Cedar swamp/cranberry reservoir

Activities and Events

◆**Monthly Moonlight Walks** Meet at 7pm at the general store for a docent-led 1- to 2- or 3- to 5-mile walk though the forest and bogs.

◆**The Annual Blueberry Run** is held in June. The 10K cross-country sand road race will start at Whitesbog Village.

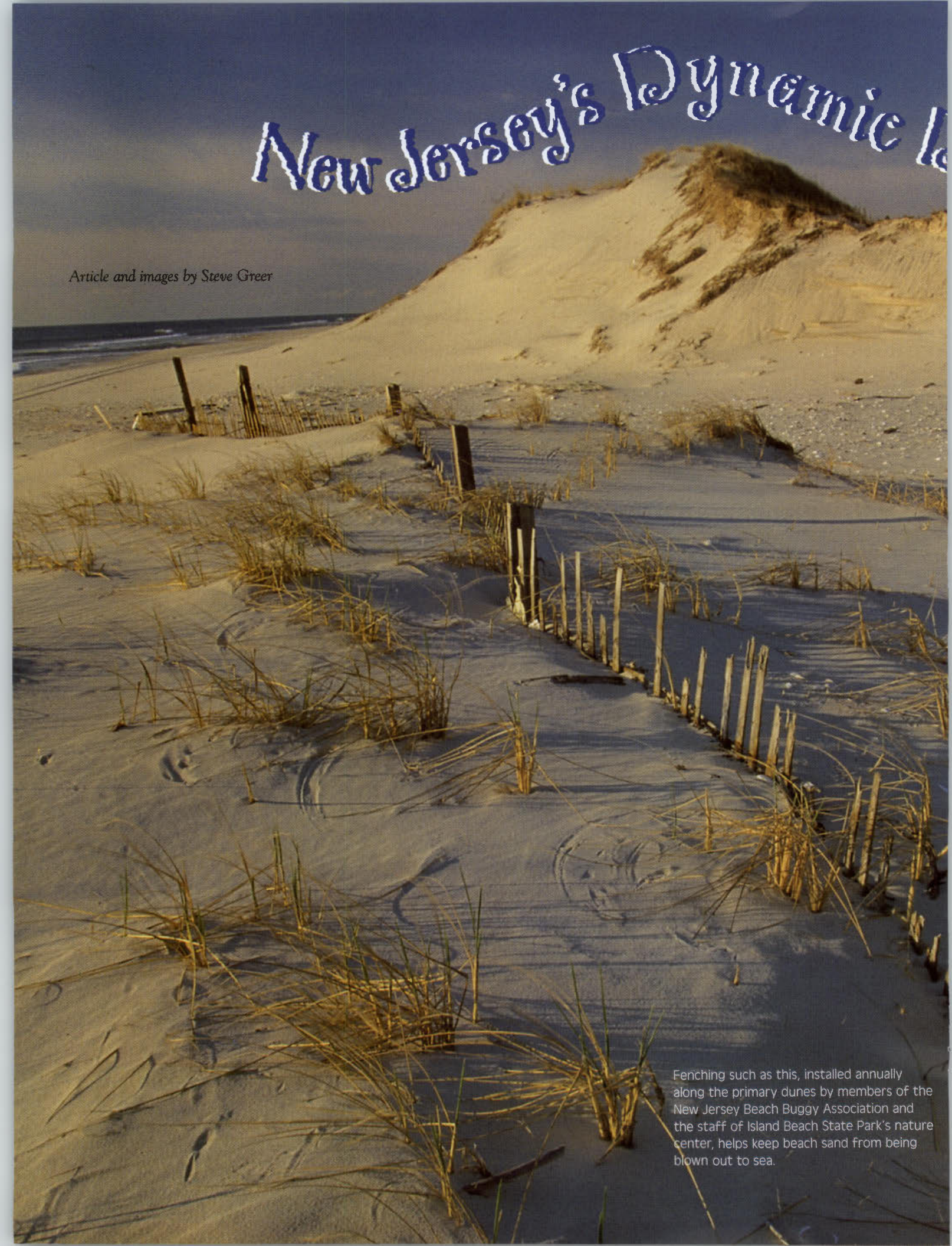
◆**The 19th Annual Blueberry Festival,** a daylong celebration of blueberry products featuring village tours, music, antique engine displays, and local artisans will be held on June 29. Call Steve Thompson at 609.893.4646 for details.

◆**The Old General Store** at the center of Whitesbog Village is open on weekends. A selection of local products, brochures, refreshments, and tours are available.

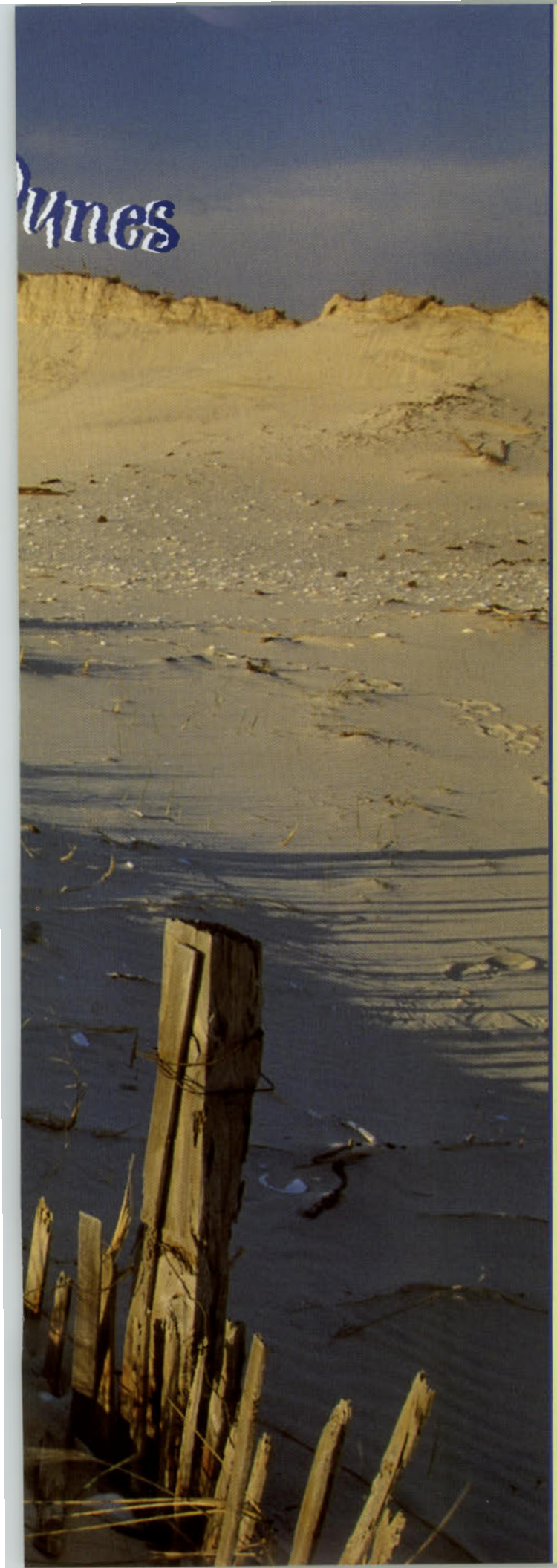
Visit **www.whitesbog.org** for detailed driving directions, activities, and updates.

New Jersey's Dynamic L

Article and images by Steve Greer



Fenching such as this, installed annually along the primary dunes by members of the New Jersey Beach Buggy Association and the staff of Island Beach State Park's nature center, helps keep beach sand from being blown out to sea.



"My classroom is 10 miles long." With arms outstretched like a fisherman describing the one that got away, Diane Bennett-Chase, a full time naturalist with Island Beach State Park, defines her working environment. Created by eons of geological forces, and molded by ocean currents and winds, the park is one of the last surviving examples of an undeveloped barrier island along the Atlantic coast. More than 3,000 acres of sand dunes, salt-sculpted trees, and green salt marshes make it an ideal outdoor classroom for studying an intact coastal ecosystem.

It is here, on a cool blustery morning, that Diane prepares for one of the most important environmental interpretations the park offers. Loading provisions into her truck, she explains that a local group of students will be arriving to learn the role of the American beach grass plant and its tremendous responsibility to the island.

As a retired elementary school teacher with a love for science, Diane volunteered to write interpretive programs at Island Beach. Before long, she was hired to guide the summer kayak tours. (See *Exploring the Tidal Marsh by Canoe*, Summer 1996.) Her involvement with the educational programs over the years then led to her becoming the park's full-time naturalist.

With the truck filled with equipment and supplies, we head for the beach. The fast-moving clouds and ominous sound of the waves give us a not so subtle indication that the Atlantic is anxious today. Driving through a beach access path, we see it. With winds coming directly off the ocean at 20 mph, the surf coils and jumps high onto the wet beach, precariously close to the primary dunes. It is both magnificent and a bit scary. In a landscape where sand and wind are the principal actors, we stand for a moment transfixed by the power and beauty of the rolling waves.

The Sand Cycle

The balancing act between the sand dunes and ocean can be a fine line at best. In a perfect world, sand from the dunes is blown out to sea during winter storms, creating steep shallow beaches and ocean sandbars. From spring to autumn, the ocean waves and tides return the sand to shore, establishing long and gradual sloping beaches once again.

The reality of this cycle is that sand can relocate to another beach, move far out to sea, or be deposited into the bay. The loss of this sand causes permanent changes in beach size and composition.

Convincing the blowing sand to stay on the island is a full time job for Diane and her dedicated staff of volunteers. Armed with hundreds of small orange flags, she looks for any chinks in the armor of the primary dunes—the first line of defense for the barrier island.

As we walk along the edge of the dunes, we come across a section that has a gaping 20-foot-wide hole carved through it. Literally tons of sand have been blown away, allowing us to see into the secondary dunes and thicket community. Created by the storm winds and ocean waves, this lack of sand along the primary dune is known as a depression.

Naturalist Diane Bennett-Chase examines a depression.

"See the angle and sharpness of this depression?" Diane points towards the upper section of remaining dune that is a sheer vertical cliff. Its face is heavily scoured with sharp, jagged lines. "This is known as a scarp and it has been carved and shaped by blowing storm winds. And now that this dune has been compromised, this area of barrier island is especially vulnerable to erosion from future storms—like leaving the front door of your house open during a driving rainstorm." It becomes evident to me that the wind and ocean make no distinction between their treatment of sand castles built by summer beach-goers, and the 20-foot high sand dunes standing tall next to them.

We walk through the depression and back into the secondary dunes to see the effects of a washover—a condition where the ocean has actually blown through the depression and flowed back and into the secondary dunes. Carrying sand and debris, the ocean has uprooted plants, rearranged vegetation, and literally changed the landscape overnight. "Some plants can tolerate the salt water, and are conditioned to sporadic flooding, but others simply die," says Diane.

Identifying a specific area at the base of the depression, where the beach grass will be the most beneficial, she begins dotting the base (or *swale* as it is called) with her flags. Soon, she has row after row of neatly planted flags waving in unison, signaling where the beach grass will help heal and re-establish the dune.

A Coastal Creation Story

To understand how the barrier island and the sand dunes were formed, we have to go back a few years. Well, several thousand years, in fact. More than 50,000 years ago, a massive glacier occupied what is known now as Canada and the northern part of the United States, including half of New Jersey. During the glacier's advancement from the north, it pushed rocks, trees, soil, and anything else in its path as it scoured and reshaped the land.

During the next 40,000 years, the earth began to warm, prompting the glacier to retreat. The glacial melt caused a rapid rise in sea level, and the land that was under the enormous weight of the glacier rose up, creating the coastal ecosystem that we recognize today.

New Jersey's barrier islands were formed about 6,000 to 7,000 years ago, thanks in part to a low-profile landscape and continued sediment buildup from moderate offshore currents and tides. Then, about 4,000 years ago, when sea-level rise slowed considerably, salt marshes were formed on the bay side of what is now Island Beach State Park.

During this time, sand dunes were forming along the leading edge of the ocean. Strong ocean winds moved large amounts of sand from the dry section of the beach further inland. Along the way, established maritime vegetation served as stumbling blocks, collecting the blowing sand around them. Over time, the mounds of sand grew and the beginnings of the primary dunes were formed.

Bottom: Volunteers plant culms of beach grass.

Top: Diamondback terrapin (*Malaclemys terrapin*)

Bottom: Least tern (*Sterna albifrons*)

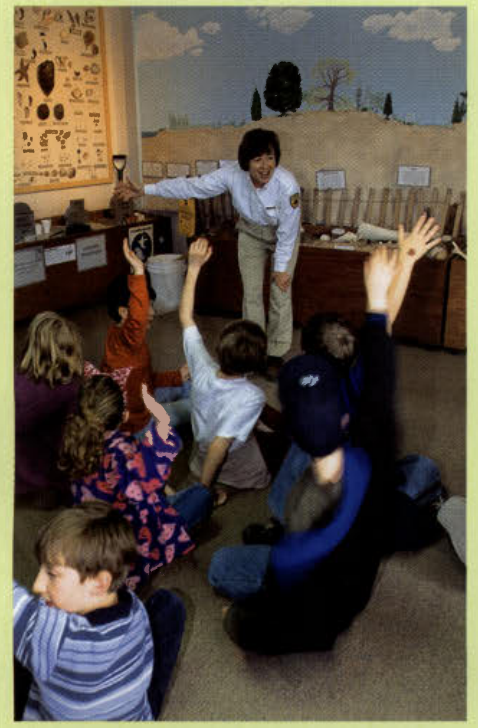
Bottom: Children are eager to participate in naturalist Diane Bennett-Chase's classes.

Preserving a Precious Diversity

With the flags in place, we begin to make our way back to the nature center. Walking the narrow width of the island we pass through the dunes, thicket, and forest communities. The change between habitats is abrupt, and in only a short distance we move from open shifting sands, devoid of vegetation, to a dense maritime forest of wild black cherry, red cedars, American holly, and willow oak. To date, there are 395 known plant species in the park, including the largest expanse of beach heather in New Jersey.

This remarkable diversity of habitats also supports 241 species of wildlife, including the largest colony of nesting ospreys in the state. Endangered species of piping plovers, least terns, and black skimmers complete this list. For park visitors, there are two observation blinds located near a tidal marsh and a fresh water pond, providing excellent opportunities for viewing the island's flora and fauna.

Back at the nature center, and between bites of her lunch, Diane is answering the phone, loading more beach grass into the truck, answering questions to park visitors, all just before responding to an impromptu meeting with a private company wanting to organize a volunteer day for its employees. She reappears in time to conduct the presentation on beach grass planting.



Today, Cub Scout Pack 92 and their families are getting a crash course in barrier island biology. Pointing to a mural of dune habitat, Diane asks, "Why do we plant beach grass?" All the hands in the room go up and there's a unified response of "to protect the island!" "That's right!" Holding up an unassuming, scraggly looking stalk of beach grass, she declares, "This plant is about to do something amazing—it's going to hold that huge pile of sand in place."

Learning Their Lesson

Diane explains that the American beach grass (*Ammophila breviligulata*) is a cool-weather plant. Most of its growth and root expansion happens in early spring, making March and April the best time to plant the individual stalks, called culms. The grass, which thrives in a condition of blowing wind and sand, is planted in the primary dunes. The interconnected root system, called rhizomes, begins to spread out and support the ever-shifting sands. The more movement and depositing of fresh sand, the more the plants are stimulated to grow. In turn, the growing plants and their roots stabilize the dunes, allowing more and more sand to be deposited. It's this amazing cycle that captivates everyone in the room.

American oystercatcher *(Haematopus palliates)*

With the delivery of an infomercial host and the credibility of a naturalist, Diane asks, "How many culms are we going to plant today?"

Shouts of "50!" and "100!" come from the young audience.

"More," Diane responds.

"300!" "More!"

"600!" "More!"

"1,000?"

"Yes! Today, we are going to plant 1,000 culms of American beach grass." After a demonstration of the proper planting techniques and a rally cry of "We have the grass! Do you have the power?" the kids head for the dunes.

This spring, Diane will teach 15 different groups the science and techniques used to protect the primary dunes.

"It's not just about getting the beach grass planted," says park superintendent Bill Vibbert. "It's about education. We are providing experiences for young people so they will understand the importance of preserving the dunes. They are integral in helping to protect the coast."

Managed by the New Jersey Department of Environmental Protection, the park offers many interpretive programs about beach ecology to students and other interested groups. Staff is available year-round to tailor programs and nature walks to meet specific needs and interests. With prior approval, schools and nonprofit organizations may reserve an area for independent field study.

"Environmental education is the key to protecting our natural coastal resources," says Diane. "People are interested in learning about the island and how they can make a hands-on contribution to protect it."

Because We Care

Meeting the kids at the beach is Frank Mulroony, a retired IBM executive who logged 550 volunteer hours in the park last year. Today he is assisting Diane in handing out gloves, shovels, and beach grass to the enthusiastic participants. When asked why he does this, he responds, "for a love of nature and for the park. I fish here a lot, and it's a way I can give back to the natural resources that offer me so much enjoyment." Frank's spirit of volunteerism is echoed by all who contribute to this extraordinary place. These people and their resources come in all shapes and sizes. (See *ORFO Folks*, Summer 2001.)

Wakefern Food Corporation, the distribution arm of ShopRite Supermarkets, donated the funds to purchase the 12,000 individual plants from a local nursery. "Participating in the beach grass program is a natural extension to the products and services provided from our family-run supermarkets," says Tim Vogel, Wakefern's project manager for environmental affairs. "It's a chance to show we care about the community in which we live and work."

The New Jersey Beach Buggy Association, founded at Island Beach, is also involved in protecting the park's coastal resources. "Each May, our members participate with the nature center staff to install fencing along the primary dunes," says Bob DeLeonard, the association's president. "Blowing sand from the beach hits the fencing and drops. In less than two years, an 8-foot-high fence can be completely covered with sand."

Like a modern-day Pied Piper, Diane leads her students, with shovels and bundles of grass in tow, up and into the dunes. Being careful to walk only in the designated planting area, they hike to the spot where she has placed her flags. As each orange flag is removed, a culm is planted in its place. Soon, the flowing curves of the dune are accentuated with long strings of beach grass. With the satisfaction of a job well done, everyone hikes back to the beach knowing that the new plants are already attracting the blowing sand. Before long, the efforts of these young naturalists will transform this landscape, making it hard to recognize when they return next spring.

Standing in stark contrast to the highly developed shore region, this resilient ribbon of white-sand beach and barrier island has much to offer. Within the diverse landscape of sand dunes, forest, freshwater wetlands, and tidal marshes is an array of plants and animals found nowhere else in New Jersey. To learn more about these habitats, including the geologic processes, animal life, and the rich cultural history, a visit to the park's Forked River Interpretive Center is a must. A highlight of the center is the Emily de Camp Herbarium, which supports an extensive collection of plant species available for hands-on study.

With activities like swimming, fishing, biking, horseback riding, birdwatch-

ing, picnicking, and canoeing, it's easy to see why Island Beach State Park is truly our greatest coastal treasure.

As a nature photographer, there is nothing Steve Greer enjoys more than being immersed in a natural landscape. While his images have been published in **NJO**, *this is the first time this "photographer who writes" has contributed an article.*

To Visit or Volunteer

Located in Ocean County, between the Atlantic Ocean and Barnegat Bay, Island Beach State Park can be reached by following Route 37 east to Seaside Heights. Once on the island, follow Route 35 south all the way to the main entrance. The park is open daily from 8 a.m. to dusk. On weekends and holidays during the summer season, the park opens at 7 a.m.

Through the Volunteers in Park (VIP) program, several different activities, including interpretation and education, are available to the public. Volunteers learn new skills, meet different people, and engage in a variety of environmental challenges. Not to mention, it's a lot of fun.

For more information on the many educational programs or contributing as a volunteer, contact Diane Bennett-Chase at 732.793.1698.

References and Resources

New Jersey Department of Environmental Protection **www.state.nj.us/dep**

Island Beach State Park **www.state.nj.us/dep/forestry/parks/island.htm**

Garden State Preservation Trust **www.state.nj.us/gspt**

U.S. Geological Survey **www.usgs.gov**

A Naturalist Along the Jersey Shore, by Joanna Burger, Rutgers University Press

Transformation of a dunescape

Mining Memories at Sterling Hill

Article & images by Cindy Ross

It is with a sense of urgency that we go off to the mineral dump of the Sterling Hill Mine, plastic bag for collecting samples in one hand, rock pick in the other, safety glasses on our eyes. We hurry, as if all the best specimens will be found by the rock hound just in front of us. We are anxious to see what treasures lie waiting to be claimed as our own. It's like a giant Easter egg hunt, only instead of eggs, we're searching for fluorescent minerals or any rock that looks cool.

The Sterling Hill Mine, located in the Highlands region of New Jersey, is one of the two mines that compose one of the world's most famous mining districts. (The other is the nearby Franklin Mine, located three miles north in Franklin Borough). Of the 3,400 minerals known to man, more than 10 percent—a world record—are found in the Franklin-Sterling area. Three of those minerals—zincite, franklinite and willemite—make up an ore body that is unique among mineral deposits in all the world. Zincite and franklinite were mined here and nowhere else, and although willemite is found elsewhere, it is only in limited quantities, usually as the alteration product of adjacent zinc sulfide mineralization.

An extraordinary number of fluorescent minerals—80, another world record—are also found in the Franklin-Sterling district, making it one of the great areas of mineralogical interest in the world.

The Sterling Mining Museum has been listed on the National Register of Historic Sites since 1991, shortly after underground mining ceased and the site was opened to the public as an educational facility. The museum continues today as a non-profit foundation. It is—along with Historic Speedwell, Oxford Furnace/ Shippen Manor, Waterloo Village, and the Hunterdon Historical Museum—part of a Highlands trail of historic sites that tell a remarkable story about industry and invention in northern New Jersey.

The mine was named for William Alexander—recognized as the Sixth Earl of Sterling, although he signed all legal documents as Lord Stirling—who owned the property from 1761 to 1776 and attempted to smelt, or refine, the local ores. It was not until the perfection of ore-dressing techniques in the early 1800s, though, that mining the deposits became economically feasible. The Sterling Hill ore was an aggregate of three zinc minerals and relatively pure calcitic marble that occurred in various proportions from place to place in the deposit. Taken as a whole—if not too much barren wallrock was included—the grade of the ore as mined in the latter years of production was slightly more than 20 percent zinc. However, in the years prior to 1961 the percentage of zinc metal in the ore mined ranged between 12 and 18 percent.

The other zinc deposits of the world are chiefly composed of the sulfide sphalerite in various concentrations in limestone. Although the grade of ore mined from those deposits is considerably less (as low as 3 percent zinc), it is much easier and less expensive to achieve a high-grade mineral concentrate for shipment to the smelter than was possible at either Franklin or Sterling Hill. For this reason the Franklin-Sterling ores, despite their high grade, were much more evenly competitive with other deposits than one would surmise from their high metal content.

Of the two ore bodies in the district, the one at Franklin was the larger by a factor of two. It also was more easily and economically mined as the ore was more compactly distributed in a simple geologic structure. At Sterling Hill the ore occurred in a complexly folded band and varied in thickness from less than 2 feet to as much as 150 feet. Furthermore, while the Franklin ore was fairly uniform in its physical properties, the Sterling Hill ore varied greatly in its magnetic charac-

Opposite page: Ron Mishkin examines Sierra's finds.

Right: Miners' dirty boots and clothes hang in the Zobel Exhibit Hall.

teristics. The problems of mining, milling, and extracting the metal from the ore were therefore much greater at Sterling Hill than at Franklin.

Although just about all of the Franklin ore body was recovered, the same was not possible at Sterling Hill as the ore body is bounded by a major brittle fault and overlain by a 1,200-foot-deep pocket of water-saturated mud. For a variety of reasons, both operational and political, the almost depleted ore body became too costly to mine and it was closed down and sealed in 1988. Nowadays, the three zinc minerals found in the Franklin and Sterling Hill mines are most famous as curiosities.

A Treasure Trove

Inexperienced rock hounds like my two children and me cannot tell with the naked eye which specimens fluoresce and which don't. When we find something interesting, we tote it over to Ron Mishkin, in his shiny white hard hat, to ask his opinion.

Bryce hands him a smooth pale white cylinder. "That's marble, or calcite, the mineral name. It's shaped that way because it came out of a drill core."

Ron worked underground in various mines for 11 years, doing drilling and roof bolting. Then he took his passion for rocks and returned to school to become an engineer, a geologist and a historian. Ron can tell a lot about these rocks just by looking.

What we're looking for are the famous rocks that fluoresce into electric red, orange, yellow, and green. Ron uses a portable ultraviolet light (shortwave) to see if it's fluorescent. Fluorescence is visible light emitted by a mineral or other substance in response to ultraviolet light. Phosphorescence is the glow you will see after the ultraviolet light is switched off. We'll see these minerals in all their glory at the end of our tour, when we're treated to the Thomas S. Warren Museum of Fluorescence. In the meantime, we're hoping to snag some specimens for our very own.

For $10 on the last Sunday of every month between March and November, you can hunt for minerals in the open mine mineral dump. We are sharing the dump with a crowd of eighth graders from William Annin Middle School in Basking Ridge. Their geology class comes to the SterlingHill Mine on three weekends a year with their teacher and chaperones to collect samples and learn about geology. A student brings a rock over and Ron tries to scratch it. Testing for hardness is one way to distinguish which kind of mineral it is. He shows us examples of the reddish zincite and the shiny black franklinite, and we run off to try to spot them. There are also pretty crystals, garnets, and shimmering mica to find in the heaped piles.

Once we've gotten a fair bag full, we carry them over to the weigh station, where Richard Hauck, president of Sterling Hill Mine, works the scale. It is not uncommon to leave with $100 worth of minerals for your $10.

The Zobel Exhibit Hall

This is the first stage of our tour, which includes the 4,200-square-foot Zobel Exhibit Hall, the underground mine, and the Museum of Fluorescence. Sterling Hill Mine specializes in school group tours and has an extensive field trip geared to earth science educators. They use it as an introduction to using our public lands as outdoor classrooms. They are also dedicated to the furtherance of mining preservation and scientific research. This is exactly the reason Richard and Robert Hauck were interested in purchasing the closed mine back in 1989. They approached the borough officials and asked if they could restore the site and create a historical museum, thus ensuring preservation of the famous Sterling Hill Zinc Mine. The brothers culminated their lifelong love for mining and mineralogy as custodians of one of the most unique geological sites in the world.

After paying a few dollars for our mineral treasures, we gather around George Chewey, our tour guide, and follow him into the Zobel Exhibit Hall. This building began as the dry house, or change house, for the miners, where they began and ended their workday. Hanging from the ceiling on chains and pulleys are 500 baskets containing rubber boots with dried mud on them. Dirty cotton flannel shirts and pants hang from the baskets, looking as though the miners pulled them up on the last shift. Miners waited days to wash their filthy clothing, until they "started walking on their own."

Rows of metal lockers create aisles directly beneath them. Along the far wall are showerheads where the miners rinsed the muck off themselves communally. Everything looks eerily as if the men just walked out—which helps the visitor begin to imagine life as a miner. The rest of the exhibit hall contains mining equipment, geological samples, and displays that we examine until it is time to head into the mine.

On our way to the shaft, George

The old 1860 mine entrance

points out the overhead conveyor belt that brought the pulverized crude ore down the mountain. An aerial passageway leads from the mill to the shipping tanks that tower above us. Here the ore was loaded into covered railroad hopper cars or, later, trucks bound for the company's smelter in Palmerton (PA), where it was reduced to zinc oxide and zinc metal for use throughout the country. While zinc was the chief product derived from the Franklin and Sterling Hill ores, a by-product, important to the steel industry, was an iron-manganese alloy—spiegeleisen—produced from those values that were also present in the ore. At the close of mining it was estimated that there were about 715,000 tons of rock containing about 185,000 tons of zinc metal scattered in permanent pillars throughout the mine. This would not be classed as ore since it would not, under any circumstances, be recoverable economically.

Inside the Mine

We pull on our sweaters as we approach the mine's adit door, for it is a comfortable cool 56 degrees underground. (An adit is a nearly horizontal tunnel giving access to a mine.) Our tour will stay on one horizontal level, and cover only a fraction of the thousands of feet of mine tunnels on 25 levels that once were accessible. And this tunnel will only take us 100 feet under the mountain, compared to the 2,700 feet of depth that the flooded mine once reached.

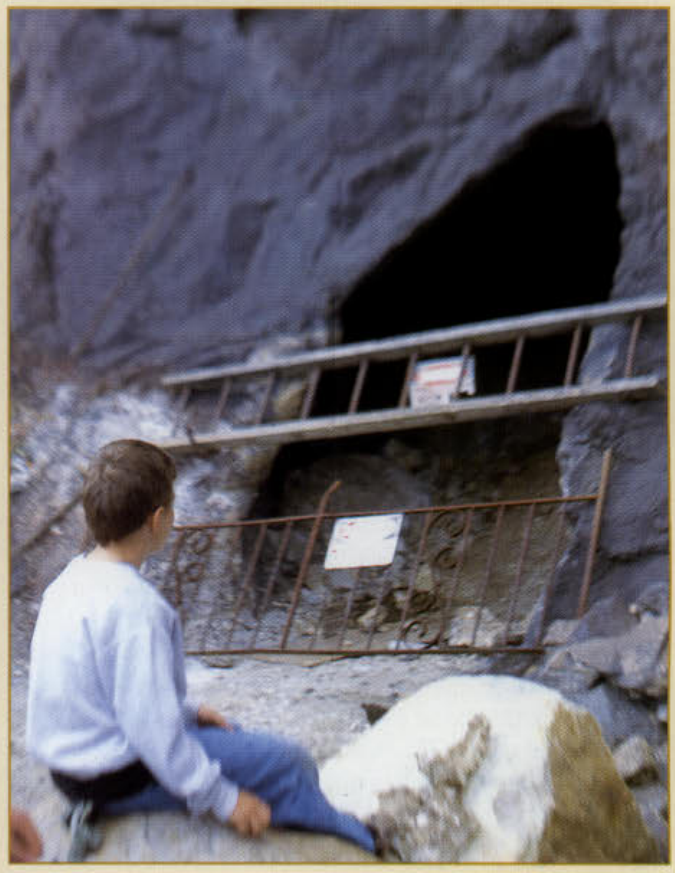
George demonstrates the heavy air doors that had to be closed in order to control the circulation of air through the mine. There were two-man compartments in the steeply sloping shaft that took 40 men down at a time on an open wooden-stepped flat car called a cage. A system of signal bells and hoist signals as well as two-way radio communication was used to communicate between the various mine level stations and the hoist operator in a building on the surface. Lining the tunnel walls are stored air and water hoses and the rock drills.

Around the corner is the lamp room, where racks of lamps with their battery packs are stored. They used to be carbide but the safer batteries emit a bright broad beam and a spotlight. The miners watched their battery level and recharged them nightly at the end of their shift.

Self-rescuers, which contain chemicals that change carbon monoxide to carbon dioxide, are also lined up on racks. Fires could start from electrical shorts, eating up all the life-giving oxygen and producing deadly carbon monoxide in short order. Seventy-five men at a time worked Sterling Hill Mine. Before the last shift was over, back in 1986, they were making a base wage of $13.50 an hour plus a bonus for production.

Out in the tunnel, George points to the ceiling where steel bolts were drilled into place on angles to bolster the solidity of the 15 to 20 tons of rock above our heads. He takes a rod and rams it into the rock sides to illustrate the different sounds of safe, solid rock and loose rock.

How the ore in a stope was mined is very interesting. The A three-boom "jumbo" drill made a pattern of 70 to 220 long holes into the face of the rock. These were loaded with explosives—a mixture of ammonium nitrate (common fertilizer) and fuel oil, primed with a stick of dynamite—in which an electric blasting cap was inserted as a detonator. The caps were wired into a common circuit that was set off from an electric firing box located a safe distance from the blast. The charges were calculated to go off at varying fractions of a second so that the rock would blast away from the face as opposed to collapsing onto itself. The tunnels, or "drifts," were advanced from as little as 6 or 7 feet to, rarely, 15 feet at a time using a single "jack-leg" drill or a single column-mounted drill.



There are life-size figures throughout the mine depicting miners loading ore cars, working machinery, and so on, to give visitors a sense of life underground. And George enhances that sense saying, "You think you know what dark is," as he flicks off the electrical switch. We cannot see our hand in front of our face. A scary thought if you were depending only on your cap lamp.

Once the lights come on, George points out a fault line crack in the wall. It is "inactive" however, and will not move, making the mine a very safe place for us to be.

The Rainbow Room

Our next stop is a favorite on tours—the Rainbow Room, a little prel-

ude to the breath-taking display in the museum, which is saved for the end. Here is part of an old stope, or tunnel where ore was actually mined. The incandescent lights are switched off and when the ultraviolet ones are switched on, the gray rock walls of the room suddenly glow with vibrant green, orange, red, blue, and purple. A vivid band of green fluorescent willemite arches in front of you in the shape of a rainbow. Another band of red fluorescent calcite runs below it. This is representative of the actual ore the miners were mining.

Mineral florescence was discovered around the turn of the century, when mines were electrified. Sparks from knife switches and the mine trolleys emitted ultraviolet light revealing the florescent quality of willemite and other minerals. Miners were known to bring home a few minerals in their empty lunch boxes and many older miners boast quite a home mineral collection of their own.

Before leaving the Rainbow Room, we're told to select a rock from the buckets to keep as a souvenir. Once again, the ultraviolet lights come on and we raise our treasures to the light, marveling at what it has suddenly transformed into. Powdery fragments rub off onto our hands and they glow like the rocks. "What fun, Momma!" my kids tell me.

The Warren Museum of Fluorescence

We go out into the daylight of the Passaic Pit where George shows us original ore outcrops and where they drilled and mined back in the 1800s. Once back inside, we turn down a tunnel to see lifelike figures loading ore from an overhead chute into a tramcar. Another is positioned by the slusher machine, showing how the buckets scraped up the broken rock. Yet another figure is loading a drift face with dynamite. These figures bring the whole mining process to life, especially for children.

Then we descend a slope for 350 feet to a part of the mine that was mined and abandoned in the early 1900s. The tunnel is deep, full of water, and ominous looking—quite a contrast to the bright sunlight waiting for us at the end of the mine tour.

I said the best is saved for last and we all want to linger in the new Thomas S. Warren Museum of Fluorescence. A special plastic sheeting is used to create viewing windows, behind which is one amazing mineral after the other, in almost every color of the spectrum. The plastic sheeting offers nearly perfect transmission of light throughout the visible range, combined with near total absorption of ultraviolet light. Fluorescence is explained in a little more detail so we can understand what we are seeing.

Fluorescence in minerals is a selective transformation of incoming ultraviolet energy, which is invisible to the human eye, into emitted visible light. Ultraviolet means "beyond violet," and is the name given to that region of the electromagnetic spectrum just shorter in wavelength (and higher in energy) than violet light. Mineral florescence takes place when the ultraviolet energy is absorbed by a mineral and immediately given off as visible light. Florescent colors are exceptionally vivid and present the viewer with an eerie glow of emitted, not reflected, light. The emission is often confined to a narrow band of light, thus yielding pure, intense color.

Phosphorescence, on the other hand, is luminescence that is caused by the absorption of radiation at one wavelength followed by delayed reradiation at a different wavelength. While fluorescent luminescence ceases almost as soon as the incident radiation stops, phosphorescence continues for a noticeable time.

The amazing thing about this museum is that there are more than 1,000 pieces on display, with specimens from every continent on the planet. There are household items, including clothing and toys where manufacturers include florescence to make things "whiter than white" and put vivid colors in their inks. The highlight is a 3,000-pound geode, one of the largest in the world. It came to its permanent resting-place via Disneyland. An open area reveals the fluorescence inside in the geode.

Mission Accomplished

Of course, a trip to the gift shop is in store after such a marvelous experience. We have a difficult time selecting which minerals not to buy, they are all so beautiful and interesting. What my children really want is a portable (short wave) ultraviolet light to make their newly acquired minerals come to life. It's enough to make rock hounds feel like they are in heaven and a newly converted one go hog wild wanting to get started on the best mineral collection ever. This is exactly the mission of the Sterling Hill Mining Museum and president Richard Hauck—to pass the love of geology and minerals to our youth. If our level of enthusiasm as we leave Sterling Hill, pockets stuffed, was any indication, I'd say he is doing a very successful job!

A sense of having "been there; done that" is always infused in frequent contributor Cindy Ross's articles, and that's especially true with regard to this one. When she was 21, she was one of only 12 women working with 800 men in Bethlehem Steel's Grace Mine, an underground iron ore mine in Joanna, PA.

George Chewey at the mine's adit door

Eat or Be Eaten

Survival of the Fittest on an Artificial Reef

A frilled anemone (*Metridium senile*), our largest and most common anemone

by William Figley
Images © Herb Segars

The classical, textbook version of a typical marine food chain is a link-by-link progression from plankton to sardine to mackerel to tuna. If only adult life stages are considered, then this straightforward illustration has merit. In actuality, however, predator-prey relationships in the ocean are very diverse and very complicated.

When it comes to food, most fish and other marine life are very opportunistic—they eat what is available at the time and suitable to their feeding approach (mouth size, teeth, etc.). Big things eat smaller things and, since almost all marine species begin life as microscopic larvae, few are spared the gauntlet of hungry adversaries that come in every form and size and must likewise eat to grow bigger. In nature, it's eat or be eaten.

The rate of attrition is horrific, almost complete. Only the rarest individual, through a combination of adaptation and luck—mostly luck—survives from larva to adult. For each survivor, countless others must perish, consumed.

The manmade reefs along the New Jersey coast, constructed of rock, concrete, ships, and other structures, are colonized by their own special, thriving marine life communities. The healthy biota concentrated on, in, around, and over these hard-substrate habitats have a healthy appetite, too—an appetite that we are only beginning to understand.

In the sea, plants using energy derived from sunlight convert carbon dioxide gas, water, and nutrients into living tissue. Plants are called producers since they make their own food. The rate at which they do this is called primary productivity. Producers comprise the basic building blocks of the marine food web. The ocean waters off New Jersey are nutrient-rich and very productive. The sea gets its deep-green color from countless millions of microscopic plants (phytoplankton) that thrive in the upper, lighted portion of the water column called the photic zone.

Phytoplankton provide food for zooplankton (microscopic drifting animals) and the larval forms of other marine animals, such as fish and crabs, that grow much larger as adults. Unlike plants, all animals must obtain their food through consumption and are thus called consumers. Animals feeding directly on plants are classified as primary consumers.

As this drifting, planktonic community of microscopic plants and animals is carried along by currents, it is also slowly sinking, eventually reaching the depths where reefs are found. At these depths—50 to 125 feet—not enough sunlight may penetrate the water column to support photosynthesis. Thus, few plants can live and grow there and, as a result, very little primary productivity occurs on New Jersey reefs. Instead, these deepwater environments are colonized by marine animals—consumers.

The Consumers

The initial input of energy (food) into the reef food web comes from two outside sources: phytoplankton drifting or carried by currents down from photic, surface waters and detritus, which is composed of fine particles of decayed plant and other organic matter that washes from land out to sea. These two sources of energy, both derived from the primary productivity of photosynthesis, are captured by primary consumers on the reef—the filter-feeding animals that live attached to the reef structures.

These animals are known as *fouling* or *encrusting* growth or, scientifically, as epibenthos; they include blue mussels, barnacles, bryozoans, and sponges. These animals siphon seawater through their gills or guts, straining out plankton and

Sea raven *(Hemitripterus americanus)*

microscopic food particles. They often carpet reef structures in dense colonies; for example, some surfaces support as many as 10,000 young mussels per square foot.

Other epibenthic organisms that also live attached to reef structures capture zooplankton and drifting larvae using small stinging cells. These animals are known as impingement feeders and include anemones, hydroids, and stony coral. Even the initial larval stages of higher forms of life, including fish, fall prey in vast numbers to the living, feeding carpet of epibenthos. Fouling organisms form the base of the reef food web, because they harness energy from the plankton in the water column, have a great collective biomass (weight of organisms), and become a source of food for higher level consumers.

Once a fouling community is established on a shipwreck or other reef structure, a host of mobile invertebrates crawls in to dine on mussels and barnacles, which are anchored in place, unable to escape, their shells providing their only defense. Predators use an array of techniques to overcome the protective shells. Starfish employ hundreds of suction feet and hydraulic arms to pry open mussel shells—water pressure never tires; muscle tissue does. Jonah crabs and lobsters use powerful claws to crush the shells. Tautog, cunner, and triggerfish have teeth designed for nipping off mussels, which are then swallowed whole.

Other sessile invertebrates are under attack as well. Sea urchins crawl slowly over the reef, methodically grazing on minute, invertebrate growth. Shrimp pick away at the soft, bulbous bodies of anemones. Animals that feed on primary consumers are termed secondary consumers. The carnage is so great that reef surfaces supporting dense colonies of mussels and barnacles in the spring are often cleaned bare by the fall. Only those fortunate enough to have settled in a tight crevice manage to survive. However, maintaining their status as the foundation of the reef food web, fouling organisms are prolific, and denuded reef surfaces are re-colonized annually.

Even waste products do not go to waste. The fecal matter expelled by the dense populations of the fouling community enriches the sea floor around the periphery of the reef. The fecal matter is reprocessed by filter- and deposit-feeding animals, called benthos, that live buried in the sand. These animals include tube worms, sand shrimp, nematodes, crabs, and sand dollars. Many of them thrive on the natural fertilizer shed by the reef community.

The Eaters Become the Eaten

Reef fish—black sea bass, tautog, cunner, scup and triggerfish—forage on and off the reef. Mobile, epibenthic invertebrates living on the reef and the surrounding sand bottom—crabs, shrimps, amphipods, isopods, worms, and snails—are prime food items for reef fish. For example, crabs account for about 85 percent of the diet of sea bass. Some are captured around the reef; others are rooted out of the sand. The fish feeding on crabs are considered tertiary consumers. Being opportunists, sea bass will also attack schools of bait, such as butterfish, anchovies, or squid, that congregate around or swim by reefs.

Young-of-year fish, only an inch or two in length, that live on the reef are also subject to predation from other reef fish, such as sea raven and conger eel. Secluded hiding places within the structures may improve these fragile youngsters' chances of survival.

Wherever communities of marine life are concentrated, larger ocean predators will also congregate in hopes of finding an easy lunch. These predators follow either of two routes to the reef, over the sandy sea floor or through the water column. Those on the sea floor, called demersal predators, rely on stealth and camouflage to ambush unsuspecting reef denizens. Fluke and monkfish, for exam-

Top: Tubularian hydroid (*Tubularia crocea*)

Center left: Blood sea star (*Henrica sanguinolenta*)

Center right: Common sea star: Forbes asterias (*Asterias forbesi*) eating a blue mussel

Bottom left: Gray triggerfish (*Balistes capriscus*)

Bottom right: Ivory barnacles (*Balanus eburneus*) with blue mussels (*Mytilus edulis*)

ple, are flattened fishes with skin that can alter its coloration to mimic the pebbles, shell fragments, and sand of the surrounding bottom, allowing these predators to practically disappear. They lie patiently in wait around the edges of reef structures and only strike when their unsuspecting victim approaches too closely for escape.

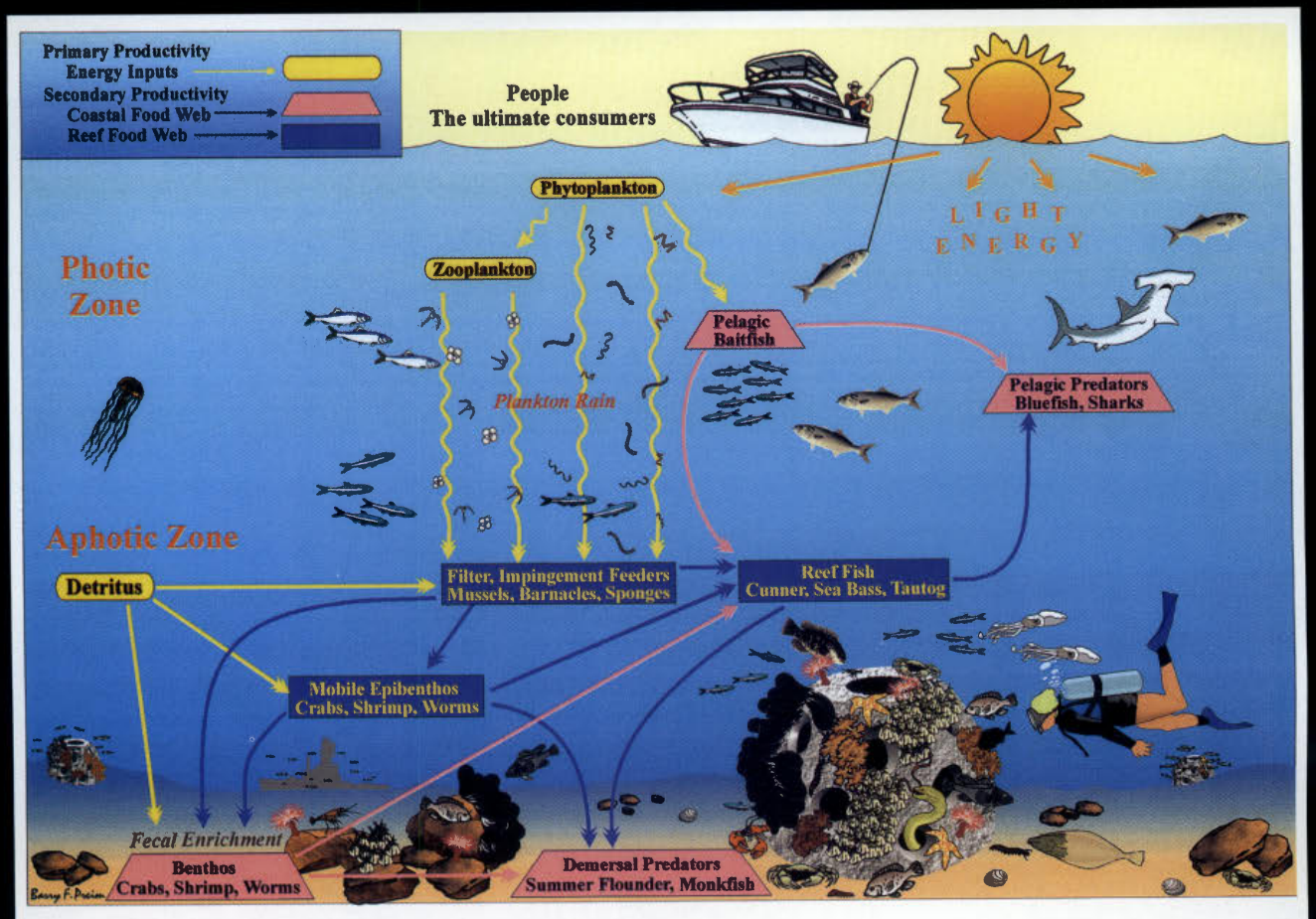
Those that visit from higher up in the water column are called pelagic predators. These constantly swimming predators, which include bluefish, striped bass, tuna, and sharks, rely on speed and agility to dart ahead and out-run their prey. The presence of reef structures makes this task a lot harder, and a relatively slow reef fish, which would otherwise be an easy target in the open water, becomes almost impossible to catch where reef hiding places abound. These off-reef marauders, when feeding on fish, represent fourth-level consumers.

Each link in the food chain is called a trophic level. The trophic level assigned an animal depends upon the trophic levels of the food items it eats. Plants (phytoplankton) occupy trophic level 1; all the higher levels consist of animals. In the marine food web, most species feed upon a variety of items and, consequently, may fit in more than one trophic level.

With rare exceptions, people are at the top of any food chain and the reef food web is no exception. In 2000, recreational anglers caught 4.8 million fish of 25 species on New Jersey reefs. Scuba divers harvested 17,000 lobsters and 32 tons of mussels. These diverse seafood choices put humans in trophic levels 3 through 7 in relation to the marine reef food web.

Bill Figley is a principal fisheries biologist with the New Jersey Division of Fish and Wildlife's Reef Program.

Illustration by Barry F. Preim

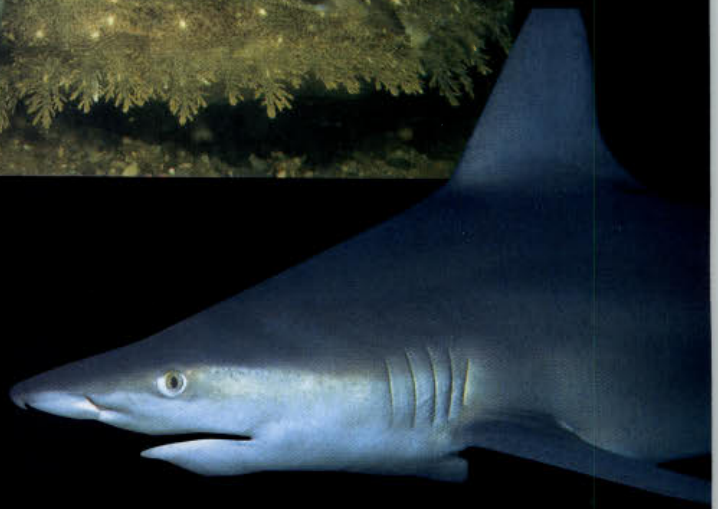


The basic components and pathways of energy transfer in a NJ reef food web.

Representative animals associated with a New Jersey Reef Food Web

Reef Fouling Community		Mobile Reef Benthos	Large, Reef Predators		Sand Bottom Benthos	Off-Reef Predators	
Filter Feeders	Impingement Feeders		Invertebrates	Fish		Demersal	Pelagic
Mussels Barnacles Slipper Shell Sponge Bryozoa Tube Worms Jingle Shells	Anemone Hydroids Stony Coral	Shrimp Crabs Isopods Amphipods Snails Sea Urchin Starfish	Lobster Jonah Crab Spider Crab Rock Crab	Sea Bass Tautog Cunner Triggerfish Scup Sea Raven Conger Eel Red Hake Cod (in winter)	Bloodworms Moon Snail Surf Clam Sand Worms Nematodes Sand Dollar Amphipods Razor Clam Lady Crab Rock Crab	Fluke Monkfish Dogfish Skates Sea Robin Sand Tiger Sharks Sandbar Sharks Sculpin Rays	Bluefish Bonito Jacks Tuna Sharks
2, 3	3	3, 4	3, 4, 5	3, 4, 5	2, 3	3, 4, 5, 6	3,4,5,6

Trophic Levels (above)



Above left: New England dog whelk (*Nassarius trivittatus*)

Above right: Goosefish (*Lophius americanus*) eating a black sea bass (*Centropristis striata*)

Right: Sandbar shark (*Charcharhinus plumbeus*)

The simulated brook and tiny pool are planted with moisture loving ornamentals.

A Growing Enthusiasm

by Ruby Weinberg
Images © Martin Weinberg

Tucked into the side of an Appalachian mountain ridge in Morris Plains is Helen and Frank Donn's private two-and-a-half-acre garden called Watnong. Meaning *place of the hills*, the name was given to the area by the Lenni Lenape, native Americans who once lived here. Located slightly east of Morristown, it is not too distant from Jockey Hollow where, in 1777, George Washington's troops suffered for survival in the open fields. Remarkably, Watnong Gardens enjoys a sheltered microclimate where moderate temperatures favor the growth of a great many ornamental plants.

These days, a growing number of New Jersey garden lovers, as well as travelers from other states and abroad, come to visit Watnong. Many old timers revisiting the place well remember its more recent history, the era between the 1960s and the mid '80s. The property, then called Watnong Nursery, was the home and business of Hazel and Don Smith. Don had spent the greater part of his life as a teacher, principal, and the superintendent of schools in Parsippany-Troy Hills. Upon retirement the couple purchased a house and an acre of land on Watnong Terrace and began to turn their casual horticultural interest into a compelling search for landscape plants.

What the Smiths observed throughout northern New Jersey, and elsewhere on the eastern seaboard, were houses being swallowed up by fast growing yews, junipers, and other rapacious landscape plants. The use of more refined dwarf and slow-growing species, which the Smiths advocated, was a problem. Where were these plants to be purchased?

To locate these uncommon treasures, they traveled all over New Jersey, to America's West Coast, and, eventually, to Europe. It was their goal to make the plants available, at a price, to knowledgeable New Jersey gardeners.

A single rare specimen is always in danger of being lost, so Don became proficient in propagating stock using seed, cuttings, or any other way he could devise. Painstaking and scholarly in his ways, his methods produced amazing results and, as early as 1977, Watnong's inventory numbered a remarkable 800 species. What started as a small business grew also—by leaps and bounds.

It's All in the Neighborhood

Next door to the Smiths lived Helen and Frank Donn. Although the couple watched all the busy nursery activities with interest, they were non-gardeners and remained a distant but respectful social distance from their neighbors. Many another family would have been disturbed by having a business on their very doorstep, but the Donns took it all in their stride. Eventually, they developed a warm friendship with the Smiths. To their surprise, they even began to enjoy the cultivation of a small part of their own one-and-a-half-acre property.

Just before their deaths in the early 1980s, Hazel and Don donated many of their special collections to botanical gardens, including the National Arboretum in Washington, D.C. And then they performed a remarkable act—they priced their property for sale so that their neighbors, the Donns, would be able to buy it and combine the adjoining properties. Helen and Frank were delighted with their new purchase.

As these neophyte gardeners retired from their full time employment, they too became enthusiastic collectors. It disturbed them that many of the Smith's prized introductions were now gone from the garden, and took it as a challenge to locate and return them to Watnong. With time and considerable amounts of research, Helen and Frank were able to obtain reproductions of some of the special dwarf hemlocks, chamaecyparis (cedars), spruces, daphnes (laurels), and other prized specimens that the Smiths had grown. Now, however, the somewhat disorderly collection of pots and cans and balled and burlapped specimens that had been the nursery no longer existed. The two lots were transformed into one well-designed garden.

Strolling the Gardens

Visitors get their first view of Watnong Gardens as they look down from the drive at a sunken area—a grassy space surrounded with beautiful plantings—retained mostly with rock walls. No one lingers here, however, because generous, well furnished beds, running longitudinally in back of the two houses, lie ahead. A series of paths, both paved and grassy, invite viewers to follow the beds stretched out before them. Here and there, they curve and broaden to fully expose special plant collections. A mass of at least 120 different kinds of hostas, their colorful scalloped leaves stretched out in undulations similar to waves of the ocean, is among these.

Garden benches are placed here and there, but most visitors saunter further up the path, their heads moving from side to side like the spectators at a tennis game. Ahead is an unexpected focal point—the stationary six-car child-size Watnong Choo-choo resting on 2 x 4 "tracks" in a bed of gravel. Designed and built with meticulous care by Frank Donn, each car is a realistically painted train replica. The cars are fitted with troughs in which are displayed miniature conifers and alpines. These plants will flourish only in this well drained mixture of good topsoil, sand, perlite, peat moss or com-

The Watnong Choo-choo in mid-summer

post, and a goodly amount of pea gravel.

To simulate a cloud of smoke, the stack rising above the locomotive is planted with a tufted blue grass called *Festuca glauca*. The various freight cars, including a planked gondola, hold such treasures as a yellow-leafed form of the wall campanula, a double flowered cranesbill, dianthus with silver foliage, and other delicate alpines. A tiny Japanese maple (*Acer japonica* 'Shishigashira') slowly grows here as well. In the end car, the little red caboose, is a special cultivar of the Japanese white pine, 'Yatsuda pygmea,' that pokes its little head above the other plants. All in all, Frank Donn's originality and fine craftsmanship, and Helen's selection of plants, are a wonder to all who look upon the Watnong Choo-choo.

From Tall to Tiny

In a far corner of the property grows an enormous conifer that is totally unexpected in an East Coast garden. It is a blue-gray needled form of the giant redwood, *Sequiodendron giganteum*. Called 'Hazel Smith,' it was selected by Don Smith from a batch of Pacific Coast seedlings. Surprisingly hardy in northern New Jersey, this conifer has now become available nationwide from select nurseries.

At the back of one bed, the visitor passes by a shed decorated with old gardening tools and marvels at the enormous number of dwarf conifers planted everywhere. At last count, there were more than 430 different species and cultivars, and the acquisition list is still growing. Those that the Donns prize above all others are the result of Smith's propagation, especially those taken from *witch's brooms*, the brushy, abnormal, closely clustered shoots that infrequently appear on conifers. Cuttings or grafts taken from this growth frequently result in dwarf plants. Smith introduced several of these plants, particularly those taken from full sized hemlocks, to the public.

Typical of the dwarf forms he grew is the Japanese Hinoki false cypress (*Chamaecyparis obtusa*) called 'Nana.' A specimen planted at Watnong in 1969 is still only 18 inches high and two feet wide. Even more typical, perhaps, is the Donn's white pine with the tiniest of leaves. Called 'Ontario,' it has developed into a plant only three feet tall in about 10 years. Home gardeners who grow only the Eastern forest white pine, which eventually can reach 100 feet, will be pleased to learn that even a small garden can support 'Ontario' and other slow growing species.

A Splash of Color

Taking an inventory of all of Watnong's holdings seems an impossible task, but almost every plant is carefully labeled. Besides conifers, the Donns display many fine azaleas, rhododendrons, and other flowering shrubs. Throughout the growing year, Watnong Gardens is a spectacle of diverse form and color.

Probably the best known of all the shrubs here is a variegated version of the burkwood daphne. Carol Mackie, for whom the shrub was named, gave it to the Smiths after she found it growing in her New Jersey garden. The edges of the green foliage look as though they were painted with pale, almost white, gold.

In the early days of his gardening efforts, Frank Donn cleared what was then a crowded woodlot, leaving the best of the native trees as a canopy for the shade lovers below. Constant pruning, mulching, and management have kept them in good condition, and have left plenty of spaces for sun lovers.

Standing alone at the far end of the garden is a specimen small tree, the dissected leaf Japanese maple (*Acer palmatum disectum* 'Watnong'). It is now about 12 feet tall with a spread of at least 20 feet. During the summer, this beautifully shaped tree has leaves of green and red; by early fall, they turn a vivid cardinal red. Another rare specimen is the golden moon Japanese maple (*Acer japonica aureum*), which is very difficult to grow in most North Jersey gardens. Its yellow leaves are breathtakingly lovely.

Japanese maple *(Acer japonica aureum)* or golden moon

A Korean dogwood cultivar, (*Cornus kousa* 'Gold Star') is another standout at Watnong because of its variegated green and golden foliage. The Donns also prize their dove tree (*Davidia involucrate*) with white bracts that resemble little handkerchiefs ('pocket handkerchief tree' is another of its common names). They have not neglected native Americans either, and cherish their rare plume tree, *Elliottia racemosa*, which is uncommonly found in South Carolina and Georgia.

Soothing Sounds of a Babbling Brook

Directly in front of the Smiths' old home, now the residence of Helen's sister, is the raised rock bed that the Donns rebuilt from an earlier Smith effort. The surface is nicely planted with diminutives, as are some chinks in the wall. A 23-year-old miniature that Hazel Smith planted in a tiny crack between two rocks has grown only fractions of an inch each year. Called 'Berkshire,' it is the common European or Asian juniper in diminutive form.

When the entire garden has been surveyed, guests usually take their ease on comfortable patio chairs near the house. However, if they are gardeners themselves, their eyes can scarcely rest because adjacent to them is a pool of recirculated water that emerges higher up in the rocky bed to simulate an ever-flowing brook. On its lowest level, the brook cuts through a berm on which are planted many dwarf conifers with creeping perennials as their companions. Within the pool are moisture loving irises and a light covering of water lettuce (*Pistia stratiotes*). The statue of a fisherboy, line dangling over the goldfish, sits on the ledge.

The remarkable thing about Watnong Gardens is that only two people plant and maintain it, a time-consuming endeavor of inspiration and endurance. As if this were not enough, the Donns are both active participants in the Watnong Chapter of the North American Rock Garden Society which, incidentally, was founded many years ago by the Smiths. And in recent years, both Helen and Frank have also become ardent members of the Tri-State Hosta Society. They hold offices in both organizations and, between their collecting forays and garden activities, they freely contribute both plants and information to interested club members.

Watnong's reputation has increased to the point that scarcely a week goes by during the growing season when one group or another does not find its way to this garden. The Donns accept visitors by appointment only, with no fee required, and are always on hand to answer the questions of others with horticultural inclinations. If you want to visit, telephone them well ahead of time, but don't expect to emulate these extensive holdings. Although Helen and Frank began this project when they were both in their mid-fifties, not many gardeners would be able to produce such complexity in an entire lifetime.

Ruby Weinberg is a long time gardener and landscape designer who occasionally writes for horticultural periodicals. She is now working on ***The Garden Reborn****, a book about garden renovation. She lives with her photographer husband Martin at Frog Pond Farm, where they have developed gardens on their 6-acre property.*

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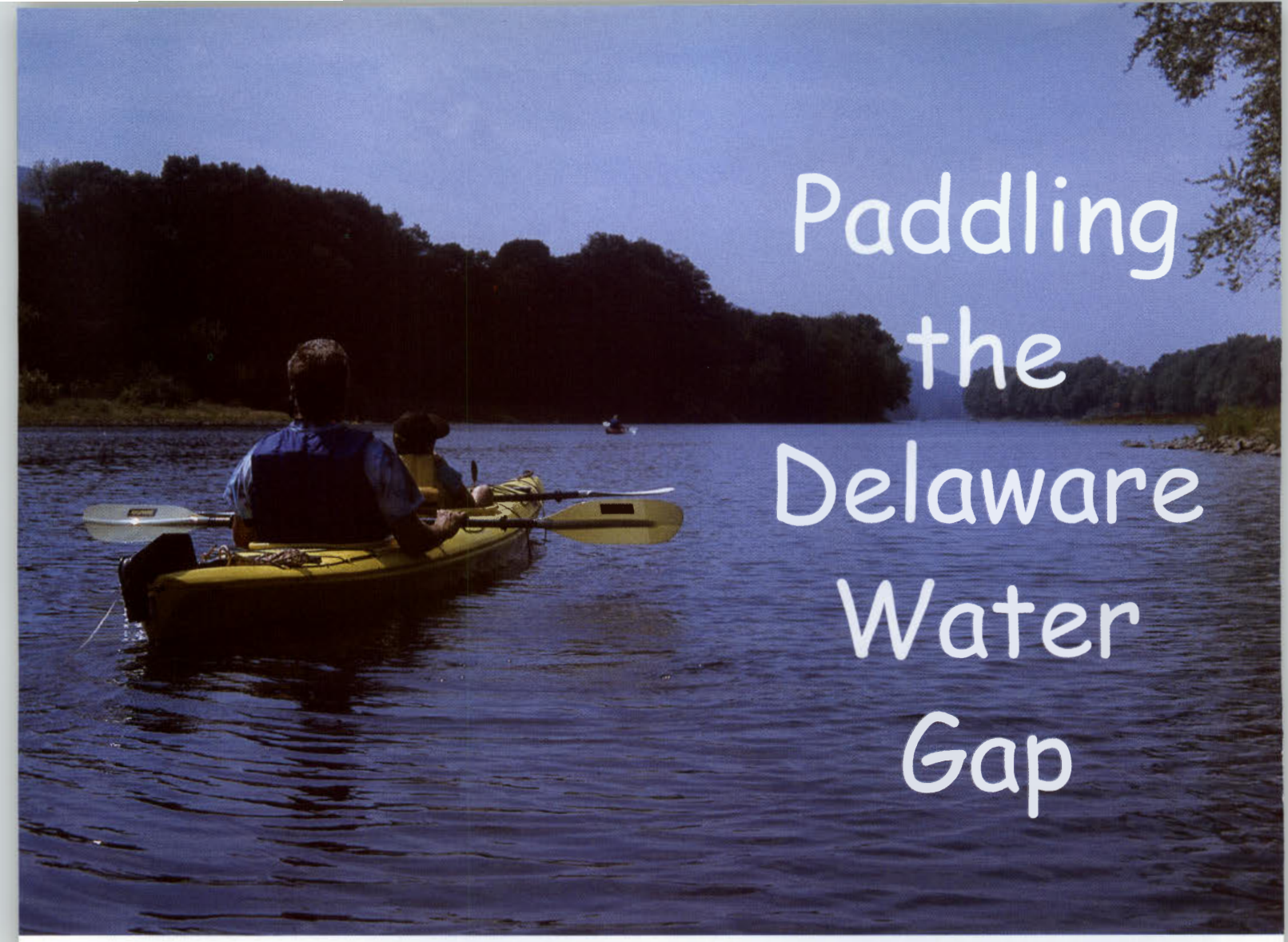


Paddling the Delaware Water Gap

Article & images by Cindy Ross

As soon as we dip our kayak paddles into the water and push off into the Delaware River, I am struck by its phenomenal clarity. On the river bottom, I see long green grasses combed straight by the current. Fish swim in holes amidst rocks. Freshwater mussels and clams lie nestled in the crannies. No matter how deep the water, we can easily see the bottom. I've witnessed this kind of clarity on wild trout streams in the mountains of Pennsylvania, but the Delaware is considered *Big Water* which, in the East, usually means pollution and dams.

The 330-mile Delaware, however, is the only major river on the eastern seaboard that is unshackled by dams. There are few big factories and power plants. All this translates into clean, clear water.

This is only part of the reason my family and friends chose to paddle 10 miles of this National Scenic River that creates the border between New Jersey and Pennsylvania. The other is the fact that it is an excellent choice for beginner canoeists or, in our case, young children in tow. There are no difficult rapids on the stretch that lies within the Delaware River National Recreation Area. A few riffles pop up for fun, but it mostly boasts glass-smooth water. And the scenery is stellar on this stretch, climaxing with the magnificent Delaware Water Gap at the end of the day.

Our family of four paddles two Northwest Tandem Kayaks, virtually indestructible plastic boats with two cockpits. My husband Todd and I each take a child in the front while we captain from the stern. This way, the little ones can assist at paddling if they so desire, or kick back and watch the passing scenery, wonder, sing. We put in at Depew Recreation Site on the east side of the river, and will take most of the day, with breaks, to reach our destination, Kittatinny Point Visitor Center in the Gap itself. River access points are conveniently located every 8 to 10 miles along the 40 miles in the park for easy day trips.

A Chunk of Heaven

The Delaware Water Gap National Recreation Area was established in 1965 when Congress secured almost 70,000 acres of land in Pennsylvania and New Jersey to preserve this relatively unspoiled natural and historic area for public use. When you consider that this chunk of heaven is wedged between two of the nation's biggest metropolitan areas and that this valley is relatively empty of

Sierra spends her paddling break seining for minnows.

development, it's no wonder that it's a prime recreational refuge.

To be designated as a National Scenic River under the Wild & Scenic Rivers Act, a river must remain undeveloped, preserved in its free-flowing condition, and protected for future generations. Its surrounding environment must also possess resources of outstanding quality, including scenic, geological, recreational, fish and wildlife, and historic and cultural resources. The mighty Delaware fits the bill in every category.

A white egret flies down the center of the river, spooked off its fishing post by our kayaks. Kingfishers dart and dive, providing riverside entertainment. There are nesting bald eagles on the river that the rangers advised us to keep an eye out for. Sightings of the American bald eagle are becoming more frequent as this endangered species makes a comeback along the upper and middle Delaware. Thirteen pairs were identified in 1999. Their nests are located on the Upper Delaware, but their fishing grounds encompass a large territory.

More than 250 species of birds are known to be present in the river area. The valley is an important segment of the Atlantic flyway for migratory birds and provides cover and space for breeding and nesting. Although we spot no eagles, the numerous turtles sunning themselves on rocks and protruding sticks are a happy substitute as far as our nature-loving kids are concerned.

A Bit of History

We dip our paddles in the silvery water and get into a comfortable rhythm. This mode of transportation has been enjoyed for centuries on the Delaware, dating back to the Lenni Lenape. These Native Americans traveled the river in dugout canoes hollowed out of a tree known in early times as the canoe tree. They built longhouses all along the river, tilled the same fields that are being worked today, and hunted these same woods that are still so rich in game. Little has actually changed since those early times, for much of the landscape here retains the same rural flavor.

The Lenape lodges are gone but their artifacts remain as evidence. And the dugouts no longer ride the river, but the tree species from which they fashioned them still thrives in great numbers. Only its name has changed—from canoe tree to tulip tree or yellow poplar.

Instead of canoes, however, we have chosen kayaks to experience the river. Something magical happens when you put people into a kayak for the first time, even if they've paddled a canoe before.

The water is so close because you actually sit in it. Your hands can reach out and touch it. You feel as though you are moving with the water like a cupped leaf floating on the surface, cruising with the current. My son Bryce says you feel like a duck.

A Break for Fishing

My daughter Sierra, who is my partner today, cannot tear her eyes away from the water. She sits, fishing net poised in hand, ready to nab a minnow as we float by. Because the Delaware's water is so clear, and fish are abundant, she has a hard time contributing to the paddling. She just wants to fish.

Sport fishing is very popular on the Delaware. Approximately 55 species of fish inhabit the Delaware and the area's streams. One of the neatest things about this river is that it gets ocean-run fish in fresh water. Shad come up the river from the Atlantic Ocean every spring in order to mate. Then the schools of shad fry head for the ocean in the fall attracting striped bass, who knock the youngsters unconscious with their powerful tails. There are also catfish, walleyes, and muskies to entice the angler, be it spin or fly-fishing. But minnows are all Sierra longs for.

When we stop for a break on Tocks Island, she immediately takes off for the shallows in hot pursuit, never minding her previous need for a snack. Children need to get out of boats about every hour, more out of boredom than anything else, for their attention span is much shorter than that of an adult. The important thing to remember is that speed and covering distance is not nearly as important as noticing the things along the way.

A Threat Defused

Tocks Island was the site of a very controversial project back in 1962, for here the free-flowing Delaware was scheduled to be plugged. Congress authorized construction of a dam that would have flooded much of the Walpack Valley and created a 37-mile long reservoir that would back up almost to Port Jervis.

It was bitterly fought by conservationists, who believed it would destroy the beauty of the Delaware River. The conservationists won and, because of this, the National Park System has been entrusted to see that the middle segment of the Delaware is managed as a free-flowing river with minimum impact along its shoreline. Part of its designation as a National Recreation Area meant many riverside houses were leveled and banks were restored to a primitive condition—a state the river had not enjoyed for years.

There are nine camping sites on Tocks Island that are strictly limited to boaters who are traveling from one access point to another. The park service provides steel fire grates, and some sites feature latrines; other than this, the sites are primitive. Campers are limited to a one-night stay at each area. An excellent river map is available showing all access points, beaches, and campsites. It provides overnight trip suggestions to help paddlers/campers plan their adventure.

Today, we only have time for a day trip, unfortunately, but we've seen enough already to know we want to return to the Middle Delaware for an extended paddle. That's when you really get to know the pulse beat of a river—sleeping with it, seeing it at sunset and at dawn.

A Melange of River Folk

As the sun climbs high in the afternoon sky, more river people—in inner tubes and boats rented from one of the many outfitters in the area—appear. A motorboat carrying two uniformed park rangers passes by. In a few moments they kill its motor to check on a canoe of teenage boys just ahead. They are fined for not having life jackets on board. (It's not mandatory that you wear one unless you are under the age of 12, but you must have a properly fitted life jacket on board for each occupant.) It seems strange to see law enforcement on a river, a symbol of freedom, but we are in a national recreation site and rules must be enforced for everyone's safety.

Motorboats must keep their speeds to 10 mph except for the Smithfield Pool area and Price's Landing Pool. Water skiing is allowed in these deeper waters, so paddlers are directed to the west side of the river, kept separated and safe by buoys. The kids enjoy watching slalom skiers speed and jump over their wakes.

The sound of the motorboats' engines is suddenly challenged by another motor, this time coming from the sky. Gas powered motor airplanes dip and dive in the sky as they perform tricks, their radio operators hidden in the forest. These are not the typical entertainment, but all add to the personality of the Middle Delaware.

Past and Present Glories

As we get closer to the Gap, more islands fill the river, stretching it wider as it skirts around the land. We hug the eastern arm, the wider and straighter of the two. A stiff afternoon headwind has picked up, counteracting our good progress. But these islands provide a break and narrow the river to an intimate width. Both shores can be easily seen and we love the close views of the birds, geese, and trees along the riverbank.

What knocks our socks off, though, is the sight of the approaching Gap. You see the wall of mountain, in the distance, looking blue and ethereal. After we hoot it up through the day's only set of riffles by the I-80 bridge, we focus on the dramatic cleft in the Kittatinny and find it difficult to pull our eyes away.

Since the 19th century, the Delaware Water Gap has attracted visitors from all over the world, from American landscape painters who came to capture the extraordinary scenery to businessmen and their families aiming to escape the city heat. They arrived via railroad to stay in one of the dozens of resort hotels that sprang up to serve thousands of visitors. These well-to-do vacationers would spend their entire summer enjoying the natural beauty, outdoor activities, amusement parks, and dance halls in the area. Once roads improved and air travel opened up the world, the resort business declined and whole-season vacationers were replaced by weekend travelers like us. The air quality is still invigorating, however, and the scenery of the water gap, once promoted as the world's eighth scenic wonder, is just as grand.

Nature's Handiwork

One of the things that make this spot so impressive is the force of power that created it in the first place. It was a level plain until the land uplifted and eroded to form ridges and valleys. An ancient river, whose waters originated near what is now Trenton, flowed backwards towards the Kittatinny Ridge. The river found the point where the rock was weak and fractured, and cut through to establish the present course of the Delaware. It continued to cut downward, widening the small cleft into the mile-long chasm that the Delaware Water Gap is today. Then, about 20,000 years ago, a continental glacier of thick ice extended south into Pennsylvania near the Gap, exaggerating the gorge even more.

When our canoes enter the tight "S" curve, our jaws drop open. The dark green wall of a mountain looms startling close, rising directly out of the river and 1,200 feet above us. The ridge on the far side of the gap imposes onto the river too, pushing and crowding the flowing waters. We have a hard time pulling our eyes away from it; we are so captivated that we neglect checking the river ahead for rocks or any other hazards.

But oh, here is the Kittatinny Ridge takeout point and our waiting vehicles. We linger in our boats in the still sides of the river, just gazing about, very reluctant to end the day.

The beauty of the Delaware Water Gap is that the show always goes on. We can return in any season, hike the steep sides on the famous Appalachian Trail for a stellar view, or climb aboard a canoe or kayak and experience it perhaps the best way, floating down the mighty Delaware.

Although Cindy Ross lives in Pennsylvania, she and her family frequently enjoy New Jersey's natural and historic attractions. Some that she has written about for ***New Jersey Outdoors*** *are Island Beach State Park, Liberty Science Center, and Batsto Village.*

For More Information . . .

Visit www.nps.gov/dewa

Write to, or call, the Delaware Water Gap National Recreation Area (Bushkill, PA 18324-9999; 570.588.2451).

Ask for the river guide, which will list all the access points, campsites, mileage between points, rules and regulations, and more. (We put in at the Depew Recreation Site located off of Old Mine Road on the Jersey side of the river. Reach it by traveling north of the Kittatinny Point Visitor Center parking lot. To get to the Kittatinny Point Visitor Center, go west on Interstate 80 to Exit 1. Turn left at the end of the exit and go back under the highway; the center will be on your right.)

Also ask for their canoe livery sheet, which lists more than a dozen commercial outfitters who can help you with shuttling and rentals. A sheet listing commercial campgrounds and state parks in the area also is available.

Playing Tag with Royalty

Article & images by Pete McLain

Imagine two grown women chasing, catching, and tagging thousands of monarch butterflies (*Danaus plexippus*) from September to mid-October in Cape May County. One may ask, *why*?

The answer is that these two women were part of the New Jersey Audubon Society's Cape May Bird Observatory *Monarch Monitoring Project*. Under the direction of Richard Walton, they studied the annual behavior of the most familiar butterfly in the United States and, possibly, the world. Millions of these beautiful insects winter roost in the mountains of Mexico and millions more—those living west of the Rocky Mountains—winter in coastal southern California.

With the first warm breath of spring air, the butterflies come to life and begin to leave Mexico and head north, leapfrogging into the United States and Canada. Some may fly 2,500 miles to lay their eggs only on the milkweed plants along the way. Then they die.

The offspring that hatch from the eggs pass through various stages to become adult butterflies; they are a marvel of the metamorphosis development process. Some monarchs develop from the larvae to adult in less than two weeks, and often they may require several weeks to pupate, depending on the air temperature. The larvae molt several times before emerging in the spring and summer as beautiful butterflies.

From August through November, they travel south over the United States. Some may cross the Gulf of Mexico, but the majority follow the Gulf coastline over Texas to Mexico. How an insect weighing from .5 to 1.0 grams can make this annual migration has baffled the scientific community for years.

Researchers have long studied and observed the monarch's annual migration, but there were, and still are, many unanswered questions about this insect's biology. Towards this end, Walton and Dr. Lincoln Brower developed what is now known as the Monarch Monitoring Project. Staff and volunteers working on the project observe, tag, and count populations as they follow the monarch's life cycle. Their work has added materially to our knowledge of this natural resource, and has provided for a better understanding of the world of animals.

Research under the Monarch Monitoring Project is sponsored by the New Jersey Audubon Society's Cape May Bird Observatory. It takes place in the area of Cape May State Park, an internationally known migratory bird observation site where butterfly watching has also become popular with area residents and tourists.

The 2001 Effort

Last year two women, project coordinator Louise Zemaitis and field technician Christina Kisiel, along with a few volunteers working with the bird observatory, spent seven days a week from September through October roaming around the tip of Cape May County. With butterfly nets in hand, they scooped the butterflies off goldenrod, milkweed, and a handful of other flowering plants growing both wild and in butterfly gardens cultivated by local residents.

From daylight to dark they walked or rode bicycles on their established routes, managing to catch and tag more than 6,800 monarchs. Vital information, such as weight, length, sex and other data, was collected on representative samples of the butterflies tagged.

Walton and Zemaitis conducted three daily five-mile road census counts of butterflies observed. These counts have provided some new information on the annual trends of the migrating butterfly population.

The average number of butterflies counted per hour on the census routes is the figure used to compare annual populations of the fall migrating monarchs. In 1999, an average of 328 monarchs were counted per hour of observation. A banner year!

The butterfly tagging program consisted of placing a small waterproof numbered white paper

A long-handle butterfly net is the main tool for catching butterflies.

Two wing-tagged monarchs feeding on goldenrod

Above: Goldenrod is one of the major plants on which migrating monarch butterflies feed in New Jersey and other states.

Right: Butterfly larva will feed on milkweed leaves for 14 days before developing into a chrysalis.

Below: A butterfly chrysalis will develop into an adult butterfly in 5 to 19 days.

tag, weighing only one one-hundredth of a gram and carrying a request to return the tag to the Monarch Project if found, on the monarch. To tag a butterfly, the researchers carefully remove a few scales on the leading edge of the butterfly's wing and apply the self-affixing tag, which in no way interferes with the butterfly's flight.

When the first northwest wind brings the temperature down to less than 50 degrees Fahrenheit in Cape May County, it forces the monarchs to head south toward Florida and along the Gulf of Mexico coast to their 10,000-foot-high wintering area near Mexico City. Here the butterflies gather in great masses on the tall trees.

The monarchs pass the winter months in great clusters in a semi-torpid condition. They will become active in late February and March when the air warms. Then they'll begin their northern migration to the United States and Canada, where they'll breed, lay eggs, and produce the next generation of butterflies.

Much of the biology of the monarch is generally understood, but there are many questions yet to be answered. The Monarch Monitoring Project is striving to fill some of the voids by gathering data related to annual censuses of monarch populations, migration routes to Mexico, what percentage may cross the Gulf of Mexico, and a number of physical and chemical properties of the monarchs.

Public education and information presentations are another major goal of the Monarch Monitoring Program at the observatory. During the fall butterfly migration, public butterfly tagging demonstrations are given five days a week at the Cape May State Park at Cape May Point.

The cycle of the monarch butterfly, as it is known today, is three to five generations a year. The generation that emerges in late August to October migrates south and may live up to eight months. The other generations may live only six weeks. When the Mexico wintering butterflies return to the United States in the spring, they lay their eggs and die. These eggs emerge as adults, lay eggs, and also die in six weeks. This cycle may repeat itself four or five times during the summer. The butterflies that emerge in August to October are the only ones that live beyond six weeks.

Butterflies protect themselves from predators by extracting a chemical poison from the milkweed plant. Predatory birds, small mammals, and other insects find the extract unpleasant to the taste,

and quickly learn to ignore both the caterpillar and the adult butterfly.

The life of the beautiful monarch butterfly is literally short and sweet. But during its lifetime it manages to provide for future generations of butterflies for us to enjoy during their migratory passage.

Pete McLain, a prolific outdoors writer from Toms River, has written frequently for **NJO**. *His most recent contribution,* ***A Saltwater Angling Primer****, appeared in the Fall 2001 issue.*

An Unprecedented Disaster

The American monarch butterfly population wintering 50 miles northwest of Mexico City suffered an unprecedented natural disaster in January of this year. A heavy rain, followed by freezing temperatures, caused the demise of an estimated 270 million monarchs that had been roosting in massive clusters in tall fir trees.

Christina Kisiel, who spent five days studying the disaster as a member of Dr. Lincoln Brower's expedition from Sweet Briar College in Virginia, is shown above lying in a foot-deep pile of the dead butterflies.

For More Information

Four Wings and a Prayer (Sue Halpern)

Chasing Monarch Butterflies (Bob Pyle, Houghton Mifflin Company)

www.monarchwatch.org

Top: Public education is an important aspect of the butterfly program. Five days a week in September and October lectures are given on butterfly tagging at the Cape May State Park Nature Center.

Bottom: This map shows the monarchs' wintering sites in Mexico.

EARLY BIRDING

Article and woodcuts by K. S. Fertig

About 8 years ago, I was introduced to birdwatching by Ken, a friend of mine who is a passionate, intense, and enormously fun birder. His enthusiasm is infectious. He loves the chase, will hop on a plane at a moment's notice to race across the country for a rare sighting, and travels the globe for a "lifer" (a bird he has never before seen). He once told me that he thought hunting is man's natural instinct and birdwatching a form of that; stalking and searching and listening and standing still for interminable periods of time.

As a matter of fact, I met someone who used to hunt but stopped to become an amateur photographer instead. Birds have become his favorite subject. Now he mounts his camera onto his empty rifle, dresses in fatigues, and goes out and "shoots" the birds.

Ken took me on my first birdwatching expedition. It was to a Neotropical migrant hotspot, where more than 230 species have been recorded: the Palmyra Refuge in Burlington County. (Editor's Note: See "Burlington's Ugly Duckling Story" in *NJO*'s Winter 2001 issue.) Much of that day, however, is one big blur. We were out for four hours—not a lot by a birder's standards, but enough for me. I was totally overwhelmed. Ken listed the different birds we saw. It was a banner day—80 species!

I remember five. Maybe.

What I do remember is walking down a path in the middle of the woods and little dark things darting over our heads with the speed of light. I remember twitchings in the brush, microscopic movements of leaves, momentary flashes of silhouettes against the sun and Ken calling out, "Look! Connecticut warbler! . . . There—a Nashville warbler! . . . Over there—winter wren!" and I saw . . . *nothing*.

I figured he was making this stuff up.

As we walked down a path Ken would halt in mid-stride and yell "Stop!" and I'd freeze in mid-stride also. Then he'd point, and I'd twist my torso towards where he was pointing, legs still glued to the spot, afraid to shift my weight for fear of precipitating the bird's flight. Sometimes I thought that I saw something, but by the time I could get my binoculars fixed on the movement I had seen with my naked eye, that bird was long gone.

Ken taught me that the most important element of birdwatching is patience. What birder isn't familiar with the phenomenon of walking down a wooded pathway or road and as you look up ahead of you, whole congregations of birds are flitting about and flying across the road or hopping from bush to bush, but when you reach that point, *where did they go?* You turn and look from whence you came, and they're all behind you. Flitting and flying and hopping. *La-dee-da.*

But birds are curious about us too, and if we are patient and wait, very often they will seek us out and comfortably settle in, going about their business with us as happy witnesses.

The best thing about that first day was running into a group of people banding birds. At that time, the Palmyra Refuge hadn't been designated as such yet and research was being conducted on species diversity and quantity. Mist nets, which look a little like badminton nets but are made of very fine, almost invisible, nylon thread, had been erected to catch the birds.

The researchers were kind and eager to show us their work. Tom Bailey, a key figure in fostering the development of the refuge (it is nicknamed Bailey's tract), demonstrated how to weigh the bird, look for a brooding patch by blowing on its breast, and band it with a teeny numbered metal band around its leg. The band, which aids in research about the bird's territory, migration habits and life span, is marked with a serial number and an 800 number or an address.

And then he handed the bird to me to release. It was a Swainson's thrush—so small, soft, and warm in my hands, incredibly light and delicate. It took my breath away. I wanted to hold it forever but when I gazed through my fingers I could see it was quivering a little from fear. I opened my hands. With the lightest touch against my palm, it was gone, effortlessly taking wing.

Though I was exhausted by the time my day ended (I left and Ken continued for another four hours), I was hooked. It wasn't the specific birds I saw that hooked me; it was the awakening of a new experience. (Actually, it was the mist net—I had walked straight into it.)

How had I gotten this far in life and never been conscious of the diversity and numbers of these avians all around us? I can't imagine my life without birds; without the pleasure of waking up to their morning songs. Or watching their great numbers migrating through. Or the thrill of hearing an unfamiliar bird song. Or feeling like a foster parent when they raise their young in my nesting boxes. Or witnessing, as I did just yesterday, the morning sun illuminating the red of the scarlet tanager as it sat on my birdbath.

A new world has revealed itself and, like the Swainson's thrush, I've been freed.

K. S. Fertig is a freelance writer and fine art painter who lives in Pemberton. Her pastel rendering of the red knot appeared on the inside back cover of ***New Jersey Outdoors'*** *Winter/Spring 2002 issue.*

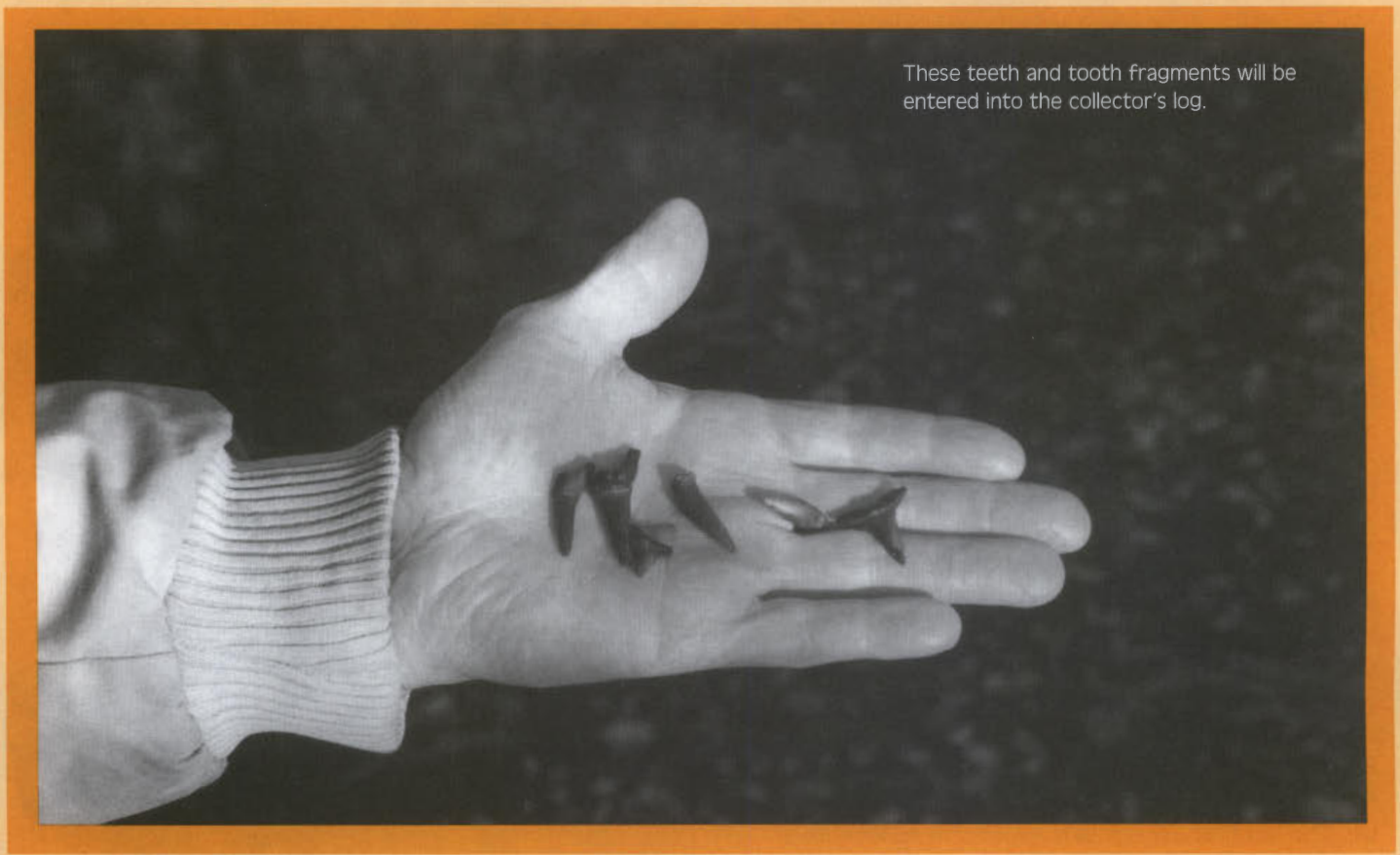
MONMOUTH'S CRETACEOUS CREEKS

Article & images by Glenn F. Harbour

There are hidden riches to be found in several of Monmouth County's better-known freshwater streams. What one is prospecting for in these innocent looking bottomlands, though, is not gold or buried loot, but a different kind of treasure: fossils.

For more than 40 years, amateur and professional paleontologists have been aware of these ancient troves of teeth, bones and shells. In fact, locations in eastern Monmouth and one site on the Monmouth-Burlington border have earned worldwide recognition for Cretaceous period fossils.

These fascinating prehistoric relics are available for local residents to collect and most of these creeks are no more than an hour's drive from anywhere in New Jersey.



These teeth and tooth fragments will be entered into the collector's log.

Beneath the Sea

Seventy-five million years ago, when dinosaurs still walked the Earth and flying reptiles filled the skies, lower New Jersey was covered by an inland ocean that split the North American continent in half. The Cretaceous Interior Seaway flowed as far northeast as the future Garden State. In the west it bordered modern Montana, reaching its other extremes in the arctic and today's southern Mexico.

This waterway's shallow depth (averaging 300 feet or less), and its close proximity to coastal areas, allowed it to teem with a great diversity of life. Some of the inhabitants of this underwater menagerie resembled images right out of science fiction while others would be easily recognizable today.

At the top of the food chain were huge marine reptiles with voracious appetites such as plesiosaurs and mosasaurs. These can best be described in lay terms as giant lizard-like creatures with short or long necks. Turtles included archelons (hard shell) and trionyx (soft shell), which could weigh in at 300 pounds. Sharks, although they had not yet evolved to their current large sizes, were very prolific—and just as lethal as their descendants.

Bony fish of every stripe swam this extinct sea, including a small fish with huge fangs (*Enchodus ferox*), a primitive ray (*Brachyrhizodus wichitaensis*), and a species of ratfish. Some bottom fish that fed on crustaceans such as crab and shrimp had crushing grinders and drum teeth that are easily found today. Bivalves by the billions supplied many other denizens of the deep with sustenance, while these shellfish consumed even smaller organisms.

On the land, dinosaurs (including hadrosaurs, duckbilled herbivores, and dromaeosaurs, meat eaters) hunted and were hunted. The king of New Jersey's extinct carnivores, the marine lizard *Mosasaurus maximus*, was fully capable of snatching an unsuspecting dinosaur from the water's edge and devouring it whole.

So the cycle of life and death continued until the Cretaceous period ended about 65 million years ago when a huge asteroid fell from the sky and brought an end to this fragile world.

The Big Four

Ramanessin Creek cuts through the heart of rural Holmdel. Growing up in Holmdel, I was often exposed to this stream and its fossil gems, evidence of a time long before our own. It was a lesson that would later encourage me to pursue amateur science. But other citizen paleontologists came before me, and it was these individuals who helped make academic scientists aware of the area's significance.

In Gerard Case's identification book, *A Pictorial Guide to Fossils*, dozens of excellent samples from the Ramanessin are cited along with many other finds from Central Jersey locations. Jerry Case can still be found searching through the gravel of Ramanessin on occasion. With many new species under his belt, in a career that spans four decades, Case has assured a place for himself in the halls of amateur paleontology.

Ralph Johnson is another collector pioneer who has left his mark on New Jersey's prehistory. As the guardian of the now-defunct Monmouth Amateur Paleontological Society's collection, Ralph is responsible for preserving and cataloging thousands of specimens from all over the Garden State.

Big Brook, Marlboro's famous fossil creek, can be considered the Ramanessin's sister stream. The type and age of specimens found are the same and the environs are almost identical; the only real difference is accessibility. Until recently, the Ramanessin was difficult for the general public to hunt. Also, Big Brook probably has a more productive fossil layer than other local sites and has yielded several new species within the last two decades.

In 1999, a private contractor, Tony Fabian of the Highlands, discovered the type of fossil that has made Big Brook important to the scientific community. During a routine dig he uncovered something very atypical; so unusual, in fact, that he hadn't a clue as to what it was. He showed the sample to Dave Parris of the Trenton State Museum, who identified it as the tooth of a lungfish that was not known to inhabit the Cretaceous Seaway any further east than modern-day Texas. Thus, another paragraph was written into the book of life, compliments of New Jersey amateurs.

Crosswick Creek (located on the Monmouth-Burlington border) recently became the focus of yet another important amateur discovery. It was here, in the mid 1980s, that local fossil hounds made a significant find in the Ellisdale area. The fossils found here are also of an Upper Cretaceous age, a time just prior to the global extinction of dinosaurs and some marine species.

The unique thing about Ellisdale is that in the geologic past there were estuaries and shorelines inhabited by early mammals. Cretaceous mammals are rare and quite critical for life today. These small, warm-blooded animals survived the cataclysm of 65 million years ago because they lived in the shadows of huge creatures. Millions of years later they would evolve into man. Today, the Ellisdale site is a protected preserve and no unauthorized digging is permitted.

The ***Shark River*** and her sister river to the south, the Manasquan, are Miocene to Eocene in age (around 25 to 35 million years old), which is 50 million years younger than the Cretaceous creeks to the north.

As the demise of the dinosaurs led to the rise of mammals, so did the

extinction of large marine reptiles allow smaller fish, such as sharks, to evolve. Therefore, it is possible to find two- to three-inch shark's teeth (an inch of tooth equals 10 feet of shark), as well as a wider variety of fossil shark species, in these southern zones. Also, cetaceans (sea mammals such as whales) had developed by this time and their mineralized bones and teeth can be found.

Since both of the rivers are in the county parks system, digging is forbidden and only beach combing is allowed.

Maintaining Accessibility

In the near future, development will probably have more to do with accessibility to fossils than any other single factor. Without the ability for all to hunt, discovering new species and making great finds will be the domain of the professionals only.

In Marlboro, suburban sprawl marches on. Already the area around Route 79 has gone from being explorable to becoming off-limits as the banks of upper Big Brook slowly turn into back yards. Last year, in Holmdel, a group of concerned residents worked to help preserve a large section of farmland that borders Ramanessin Creek, leaving it open for future generations. It was an uphill fight, though, and without continued citizen involvement against overdevelopment, fossil collecting in our local creeks may someday be just a memory.

Hunting in the Field

Before taking to the streams, future fossil hounds need to do their homework. A seeker's ability to find might only be as good as the last specimen studied or identification book leafed through. There is no doubt that a knowledgeable mind makes for a successful hunter. Read books, visit museums, and attend lectures. Fossiling can be competitive and know-how is the sharpest tool one can possess.

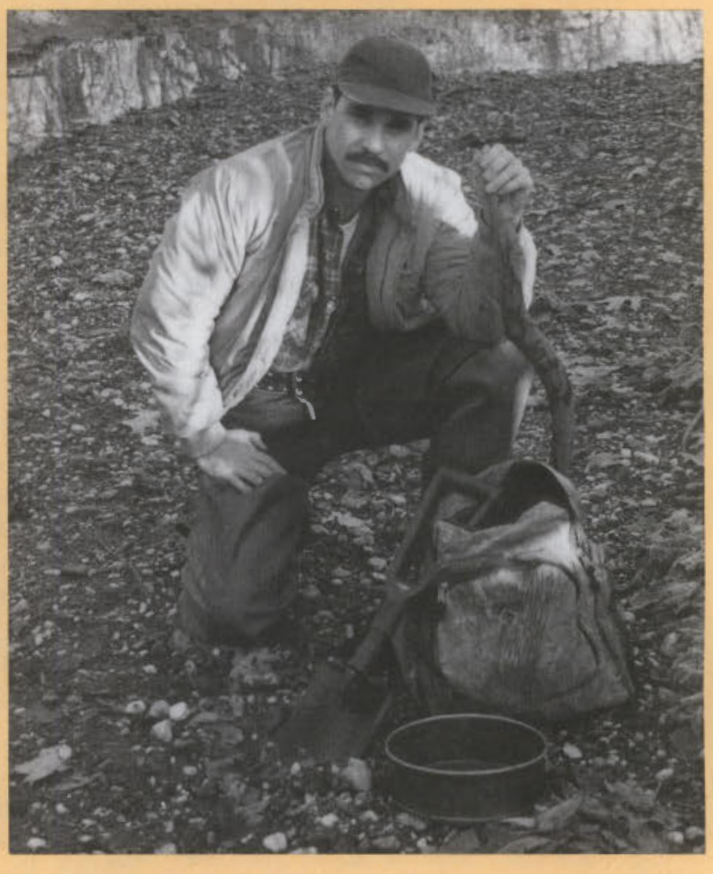
There are two legal methods of actually hunting the creeks: digging and screening and beach combing the gravel bars. Both approaches net similar results; the differences involve the types of tools used and the clothing worn. Digging requires a small shovel, sieve, and collecting pack, whereas gravel looking usually includes a pair of fishing waders, a collecting bag, and plenty of water.

Screening for fossils involves digging the loose gravel out of the streambed and shaking it through a strainer to see what fossils might be found. This method usually requires little hiking and it is hardest on the lower back (a lot of rock usually has to be shaken to recover a few good fossils). Beach combing, however, depends on good vision, reliable fossil recognition and the ability to hike long distances. Gravel bars (where the stream's current pushes rock material together) will be encountered at random spots in the creek. The hunter can either bend and search, or crawl on all fours. This is hard on the knees, but remember that there's a world of difference between five feet and five inches! Use tight police lanes to be sure to view all of the gravel.

There is a third method of collecting that is strictly forbidden: digging the marl. Marl is the green mud-like clay that makes up the lower banks of the streambed. This composite represents the compressed remnants of the ancient sea floor. In the 19th century it was also farmed and used as fertilizer. This, in fact, was how the first dinosaur skeleton found in the Western Hemisphere (a hadrosaur) was discovered in 1858 in southern New Jersey.

These dark clays are the actual fossil formations (mostly the Navesink and Mount Laurel in central New Jersey), and are where all specimens originate. Situ fossils, however, are extremely thin and many more of them accumulate in the gravel over time. Also, bank digging is high impact and dangerous, whereas sieving or looking have little effect on the environment and are safe.

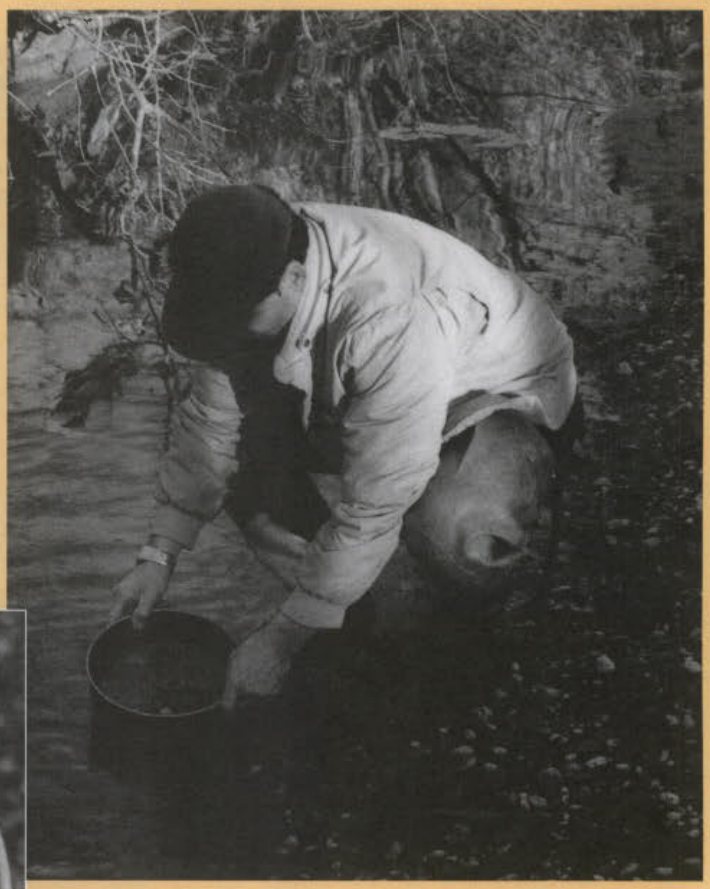
Below: The author and his equipment—waders, a small folding shovel, sieve, and collecting pack.



Some final words of advice involve children, bug spray, and attitude. Exercise caution in allowing children to hunt in deeper streams; depending on their size, those under the age of 8 to 10 may have trouble with water depth and current. Also, New Jersey hosts Lyme disease and now West Nile fever. Deer and tic checks are the best defense. Finally, when fossil hunting, don't be myopic. Most beginners make the mistake of looking for only shark teeth.

An ancient world awaits one in our local creeks; its treasures are many and varied. Hunt hard, hunt often, and good luck!

Highlands resident Glenn Harbour spends much of his time digging for bottles, bones, fossils, teeth, and other remnants of the past. When he's not engaged in the pursuits of amateur paleontology, he is often found writing articles about it. His ***Bottle Diggers' Paradise*** *appeared in the Summer 1997 issue of* ***New Jersey Outdoors****.*



Above: Sieving gravel in the creek can be backbreaking, but it also can be quite rewarding.

Left: Most of these fossils are shark teeth.

REGULAR FINDS CHART

Type	Tooth	Appearance	Length	Rarity
Shark	Shark teeth	Yoked root and blade	.25" - 2"	Very Common
Bony Fish	Enchodus fangs	Long thin blade	.25" - 2.5"	Uncommon
Marine Reptile	Mosasaur teeth	Short conical tooth	.25" - 3"	Rare
Marine Reptile	Crocodile teeth	Long conical tooth	.5" - 2"	Rare
Bottom Fish	Drum teeth	Oval smooth buttons	.25" - 1"	Common
Bottom Fish	Grinder teeth	Rectangular with ridges	.25" - 1"	Common

Events

General information is provided here for frequently mentioned event sponsors. The bold-faced name is all that will appear in an event's description unless contact information differs.

Ag Museum—NJ Museum of Agriculture, 103 College Farm Rd, N Brunswick; www.agriculturemuseum.org; 732.249.2077; ♿; $
Albert Hall—Albert Music Hall, 125 Wells Mill Rd (Rte 532), 1/4 mile west of Rte 9, Waretown; www.alberthall.org; 609.971.1593; ♿; $
Allaire—Allaire State Park, Farmingdale; www.allairevillage.org; 732.938.2253 (park), 732.938.6707 (visitor center), 732.919.3500 (village), 732.938.2003 (Interpretive Center), or 732.938.5524 (Pine Creek Railroad); parking fee
ALO—Alliance for a Living Ocean Environmental Center, 2007 Long Beach Blvd, N Beach Haven; 609.492.0222
Cold Spring—Historic Cold Spring Village, 720 Rte 9, Cape May; 10am-4:30pm daily through Labor Day, then weekends only in Sept; hcsv.org/; 609.898.2300; $
Cooper Mill—Cooper Mill at Black River County Park, 66 Rte 24 and State Park Rd, Chester Twp; 973.326.7645; $
Cream Ridge—Cream Ridge Winery, 145 Rte 539, Cream Ridge; www.creamridgewinery.com 609.259.9797
Deep Cut—Deep Cut Gardens, Red Hill Rd, Middletown; 732.671.6050
Dutch Neck—Dutch Neck Village, 97 Trench Rd, Bridgeton; www.dutch-neckvillage.com; 856.451.2188
Frelinghuysen—Frelinghuysen Arboretum, 53 East Hanover Ave, Morris Twp; 973.326.7600
Hermitage—The Hermitage Education & Conference Center and Museum, 335 N Franklin Tpk, Ho-Ho-Kus; www.thehermitage.org; 201.445.8311; ♿; $
Horse Park—Horse Park of New Jersey, Rte 524, Stone Tavern (Millstone Twp, Monmouth County); open to spectators for equine events; riding/lessons not available; www.horseparkofnewjersey.com/; 609.259.0170; ♿
Howell—Howell Living History Farm, Valley Rd (just off Rte 29, 2 miles south of Lambertville), Hopewell Twp (Mercer County); 10am-4pm, unless otherwise specified; 609.737.3299; ♿
Hunterdon—Hunterdon County Arboretum, 1020 Hwy 31, Lebanon; 908.782.1158
Island Beach—Island Beach State Park, Rte 35, Seaside Park; 732.793.0506
Long Pond—Long Pond Ironworks State Park, Route 511, W Milford Twp; www.users.nac.net/folpi; 973.657.1688
Longstreet—Longstreet Farm, Longstreet Rd, Holmdel; 732.946.3758
Pequest—The Pequest Trout Hatchery and Natural Resource Education Center, Rte 46, Oxford (9 miles west of Hackettstown); 10am-4pm daily; www.njfishandwildlife.com/pequest.htm; 908.637.4125
Ringwood—Ringwood State Park (Ringwood Manor, Skylands Manor and NJ State Botanical Garden), Morris Rd, Ringwood; www.njbg.org/; 973.962.7031(Ringwood), 973.962.9534 (Skylands); $ to enter park on weekends from Memorial Day weekend through Labor Day and to enter Skylands Manor
Smithville—Historic Smithville, Route 9 & Moss Mill Rd, Smithville; historic side open from 10am-6pm Sun through Fri and from 10am-7pm on Sat; the Village Greene is open from 11am-6pm daily; 609.652.7777, 609.748.6160
Space Farms—Space Farms Zoo and Museum, 218 Rte 519, Sussex; www.spacefarms.com/; 973.875.3223
Trailside—Trailside Nature & Science Center, Coles Ave & New Providence Rd, Mountainside; 908.789.3670
Tuckerton Seaport—Tuckerton Seaport, 120 W Main St, Tuckerton; open daily 10am-5pm; 609.296.8868; $ (ages 6 and over)
Waterloo— Waterloo Village (in Allamuchy Mountain State Park), 525 Waterloo Rd, Stanhope; www.waterloovillage.org; 973.347.0900; open for general admission from 10am-5pm, Weds-Sun, from May 26-September 1 (2002); $
Wetlands—Wetlands Institute, 1075 Stone Harbor Blvd, Stone Harbor (3 miles east of Garden State Parkway exit 10B); www.wetlandsinstitute.org; 609.368.1211; $
Wheaton—Wheaton Village, 1501 Glasstown Rd, Millville; closed on New Year's, Easter, Thanksgiving and Christmas, and on Mon and Tues from Jan through Mar; 10am-5pm; www.wheatonvillage.org; 856.825.6800, 800.998.4552; ♿; $

Events
Ongoing, July

Notes: Information listed was accurate at the time it was submitted to *New Jersey Outdoors*. Before traveling to an event, readers are advised to call the number listed to confirm the information provided and obtain any additional information desired.

Where the sponsor has provided such information, symbols have been used to indicate that the event is handicapped accessible (♿), that an entrance or participation fee will be charged or a donation will be requested ($), and that preregistration is required or strongly suggested (✎). Lack of the indicative symbol may mean either that the opposite is true or that the sponsor did not provide the information. Please call the contact number for any event about which you have questions.

Ongoing

Pequest Trout Hatchery and Natural Resource Education Center Visitors can see how and where trout are raised for stocking NJ's public waters, visit the exhibit hall, hike, picnic, and attend weekend programs covering a wide range of wildlife and natural resource topics; **Pequest**

Saturdays except Dec 21 and 28
Live Bluegrass, Country & Folk Music (Special events listed separately); 7:30pm; **Albert Hall**

Sundays, May to Oct
Guided Garden Tours 2pm; **Ringwood**

Sundays, July and August
Concerts at the Gazebo Bring blankets and chairs; 7pm; **Lavallette**; 732.793.3652

Mondays, June 17 through August
Stories by the Sea A free story and game hour for children ages 3-7; 2pm; **ALO**

Tuesdays, July and August
Inherit the Earth Trips to area points of interest including Jenkinsons Aquarium, Cattus Island, and Popcorn Park Zoo; **ALO**; $

Wednesdays, July and August
Eco Tour of a Barrier Island Discover Long Beach Island's hidden treasure on a Jolly Trolley tour; 9am-noon; Chamber of Commerce parking lot, 9th St, Ship Bottom; 609.492.0222; $

Wednesdays and Thursdays, July 10 to Aug 28
Free Beach & Family Fun Days Arts & crafts program, sand sculpting, kite flying, beach parties and live entertainment; Carteret Ave stage and beach area, Seaside Heights; www.seasideheights-tourism.com; 800.SEA.SHORE

Thursdays, July and August
Twilight at the Bay Live music, games, a touch tank, a mystery guest, and a chance to learn about beautiful Barnegat Bay; 7-8pm; Taylor Ave bay beach, Beach Haven; 609.492.0222

Fridays, July through Aug 23
Inlet Lore An hour-long hands-on environmental experience; 11am; Barnegat Lighthouse State Park, Barnegat Light; 609.492.0222

Fridays, July 12 to Sept 27
Jersey Fresh Farmers' Market at Smithville Produce direct from the farmer to you; noon-5pm; **Smithville**

Through Sept 22
Introduction to The Hermitage Gallery exhibition and tour; **Hermitage**

July

Sundays
Concerts on the Riverfront Bridgeton; 856.451.9208

Mondays
Outdoor Live Music Entertainment Seaside Heights; www.seasideheightstourism.com/-calendar.asp; 800.SEASIDE

1 to 6
Cumberland County Fair Fairgrounds, Carmel Rd, Millville; 856.825.3820

1 to 7
Happy 75th Birthday Space Farms Animal talks, artifacts, and more; **Space Farms**

2 & 3
Jekyll & Hyde 8:30pm (Box Office opens 5:30pm); BYO chair; Roosevelt Park Amphitheater, off Grandview Ave, Edison; www.playsinthepark.com; 732.548.2884; $

3
Tidal Wave Band Soft rock; 7:30pm, Promenade & JFK Blvd, Sea Isle City; 609.263.TOUR

Sand Sculpting Contest 9am; 12th St beach, Ocean City; 609.525.9300

4
4th of July Celebration Alden Field, Bridgeton; 856.451.9208

4th of July Celebration Union Lake Park, Millville; 856.825.7000, x392

Independence Day Celebration Celebrate 1890s style; noon-3pm; **Longstreet**

Cape May County String Band Rain date July 6; 9:30pm; Sea Isle City; 609.236.TOUR

Independence Day Celebration Rally, parade, games, speeches, music, and town ball; **Cold Spring**

Declaration of Independence Reading at Ringwood Manor A living history event that portrays the delivery of the Declaration of Independence to Ringwood; noon, with reading at 1pm; **Long Pond**

Oceanfest at Long Branch Entertainment, food, arts and crafts, and a world class fireworks display; Promenade at Long Branch, One Ocean Blvd, Long Branch; 732.222.0400; ♿

Independence Day Family Festival Horse rides, magic show, Revolutionary period groups, fireworks, and more; 5-11pm; North Branch Park, Bridgewater; 908.722.1200, x225

5
Cape May County Lifeguard Championship 6pm; Rambler Rd & the beach, Wildwood Crest; 609.522.3825

5 & 6
American Gloxinia & Gesneriad Society Flower Show & Sale **Frelinghuysen**

July Events

5 to 7
Sussex County Native American Festival Food, dancing, crafts, and more; Sussex County Fairgrounds, Plains Rd, Augusta; http://redhawkarts.home.mindspring.com; 718.686.9297

5 to 13
Jekyll & Hyde See July 2 & 3

6
Ice Cream Party Music, wagon rides, games and contests, a children's craft program, and lots of ice cream making (11am) and eating (noon-3:30pm); Howell

Starwatch Sunset-11pm; Fort Mott State Park, Pennsville; 856.935.3218; ♿

Deep Cut Gardens Tour 1pm; Deep Cut; $

Congress St Band 6:30pm; Cold Spring

6 & 7
Gazebo-By-The Sea Craft Show 9am-5pm; Ocean Ave & Rambler Rd, Wildwood Crest; 609.522.1669

7
Cookstove Demonstration Noon-2:30pm; Longstreet

Founder's Day 1-4pm; Allaire

Concert in the Park *David Cedano* (salsa); 7pm; Duke Island Park, Bridgewater; 908.722.1200, x351

N.J. Storytelling Festival Waterloo

8
Verdi Concert Band 7:30pm, Promenade & JFK Blvd, Sea Isle City; 609.263.TOUR

8 to 18
Public Sails on NJ's Tall Ship, *A. J. Meerwald* A 2.5-hour sailing adventure; Island Heights Yacht Club, River Dr, Island Heights; 800.485.3072; $

9
NJ State Rowing Championships Bridge-to-bridge row from south of the Mantoloking Bridge to north of the Mathis-Tunney Bridge in Seaside Heights; 8am check-in, race starts 9am; 732.237.0576

9 to 18
Charter the *A. J. Meerwald* NJ's official tall ship will be available for half-day and evening cruises leaving from the Island Heights Yacht Club; Island Heights; 908.647.5022

10
Summer Constellations 8:30-10pm; ages10 and up; Main Parking Lot, Deer Path Park, W Woodschurch Rd, Readington Township; 908.782.1158; $;

Theatre in the Park Donald Rainear Amphitheatre at Sunset Lake; 856.451.9208

Belmar Annual Sandcastle Contest All are invited to participate; beach at 18th & Ocean Aves, Belmar; 732.863.1900; ♿

11
Garden Tour: Perennials 6:30-8:30pm; ages 16 and up; Hunterdon; $

Concert in the Park Corson Park, Millville; 856.825.7000, x392

Gardens by the Sea Tour Gardens/streets indicated on map provided with ticket; tickets sold only at Plants Plus, Bridge Ave., Bay Head; 800.4.BAYHED; $

12
Beschen-Callahan Memorial Lifeguard Races 6pm; on the beach at 15th Ave, N Wildwood; 609.522.7500

12 to 14
Anglesea Blues Festival Old New Jersey Ave, N Wildwood; 800.882.7787

New Jersey State Barbecue Competition 9am-9pm; 2nd & Old New Jersey Ave, N Wildwood; 609.522.5916

13
Wheat Harvest Watch or help the harvest crew, then try your hand at wheat threshing and milling in the granary; Howell

Deep Cut Gardens Tour See July 6

A Visit from the Music Man 1-3pm; Longstreet

Duke of Fluke Fishing Tournament 7:30am-5pm; Sterling Harbor Marina, Rio Grande Blvd, Shawcrest; 609.729.1425; $

Cooper River Bass Buddy Tournament Cooper River Park, Camden; 856.869.3252

Snake Brothers 6:30pm; Cold Spring

Summer Crafters' Market; 19th Century Guilds Open House & Demonstration Day Rain date July 14; 10am-4pm; Allaire

Jr. Zookeeper's Day at Space Farms Zoo Kids assist with animal care while learning interesting facts about the species; Space Farms

Auto Jamboree Waterloo

13 & 14
Hereford Inlet Lighthouse Craft Show 9am-5pm; First & Central Aves, N Wildwood; 609.522.4520

Boardwalk Craft Show 10am-6pm; The Wildwoods Boardwalk; 609.523.1602

Handcraft Unlimited Summer Craft Show Sat 10am-9pm, Sun 10am-5pm; The Wildwoods Convention Center, Burk Ave & the boardwalk; 717.656.3208; $

20th Annual Wooden Boat Festival Vendors, food, seminars, music, and more; NJ's official tall ship, the *A. J. Meerwald*, will be wet docked for boarding; Huddy Park, Water St, Toms River; 732.349.9209

14
Traditional Blacksmith Demonstration 1-3pm; Longstreet

School Days 1830s Noon-3pm; Allaire

Concert in the Park *Leon Redbone* (rock); 7pm; Duke Island Park, Bridgewater; 908.722.1200, x351

15
Ken McBride Himself 7:30pm; Promenade & JFK Blvd, Sea Isle City; 609.263.TOUR

The Belmar 5-Mile Run Along Ocean Ave, Belmar; 732.681.3700; $ for participants

16
Sara the Turtle Festival Rain date July 18; exhibit, puppet show, races, and more; 6-9pm; JFK Blvd & The Promenade, Sea Isle City; www.seaislecity.org; 609.263.4371; ♿

17
Midiri Brothers Dixieland/Jazz Band 7:30pm; Promenade and JFK Blvd, Sea Isle City; 609.263.TOUR

Theatre in the Park Donald Rainear Amphitheatre at Sunset Lake; 856.451.9208

17 to 20
Mid-Atlantic Tuna Tournament Cape May; 609.884.2400

18
Concert in the Park See July 11

18 to 21
NJ Junior Quarter Horse Show
908.879.7415; Horse Park

19
Merchants in Venice Seafood Festival
Food, crafts, and entertainment; 5-9pm; Asbury Ave from 6th-9th Sts, Ocean City; www.oceancity-nj.com; 609.525.9300

Funtasia Festival for Kids Ocean County Park (rain location: Lakewood High School, Somerset Ave), Lakewood; 10am-2pm; 732.506.9090

20
Evening Hayrides A 20-minute ride over the lanes of the 130-acre working farm; Howell

One Mile *Ocean Challenge* Swim
Registration from 2:30pm, race at 6:30pm; awards (male & female) in age groups; on the beach at 15th Ave, N Wildwood; 609.522.7500

Christmas in July Boat Parade and Home Decorating Contest See boats, homes, & docks decorated in a Christmas theme; 8pm, back bays throughout The Wildwoods; 609.729.5501

Sunset Sprint Triathlon 856.696.3924

Salamander Expedition 9-11am; ages 5 and up; Echo Hill Environmental Area, South Branch Reservation, Lilac Drive, Clinton Twp; $;

Deep Cut Gardens Tour See July 6

Atlantic Brass Band 6:30pm; Cold Spring

JazzFest A full day of jazz; Smithville

Jersey Fresh Summer Fair & Honey Harvest Farmers market and more; Ag Museum

2nd Annual Garden Party Lectures, workshop, music, refreshments, and more; 3-7pm; Perennial Garden, Colonial Park, Lot F, 156 Mettlers Rd, E Millstone; www.park.co.somerset.nj.us; 732.873.2459; $

Pt Pleasant Elks Annual Fluke Tournament $10,000 in prizes; 6-10pm; Pt Pleasant Beach; 732.899.7638; $

20 & 21
Boardwalk Craft Show 10am-6pm; on The Wildwoods Boardwalk; 609.523.1602

21
Garden State Iris Society Plant Sale Frelinghuysen

Concert in the Park See July 14

21 to September 1
Stained and Fused Glass Gallery of American Craft, Wheaton

22
Serenaders Big Band 7:30pm, Promenade & JFK Blvd, Sea Isle City; 609.263.TOUR

24
Irish Night With Blarney 7:30pm, Promenade and JFK Blvd, Sea Isle City; 609.263.TOUR

Theatre in the Park See July 17

24 to 28
Monmouth County Fair 5-11pm Weds & Thurs, 11am-11pm Fri & Sat, 11am-6pm Sun; E Freehold Park & Show Grounds, Kozloski Rd, Freehold Twp; 732.842.4000; $

24 to August 3
Crazy For You 8:30pm (Box Office opens 5:30pm); BYO chair; Roosevelt Park Amphitheater, off Grandview Ave, Edison; www.playsinthepark.com; 732.548.2884; $

25
Volunteer Trail Project 6pm; Huber Woods Park Environmental Center, Brown's Dock Rd, Middletown; 732.842.4000, x4283

Concert in the Park See July 11

25 to 28
Bells Are Ringing Theatre in the park; 8pm (7pm on Sunday); Thompson Park, Newman Springs Rd, Lincroft; 732.842.4000

26 to 28
Quick Chek NJ Festival of Ballooning
Concerts, 125 hot air balloons, and more; Solberg Airport, Readington; www.balloonfestival.com; 973.882.5464; ♿; $

26 to Aug 2
Public Sails on NJ's Tall Ship, *A. J. Meerwald* A 2.5-hour sailing adventure; Municipal Marina, First St, Atlantic Highlands; 800.485.3072

27
Evening Hayrides Howell

Deep Cut Gardens Tour See July 6

Sandblast Beach Run Two-mile run 6:15pm, five-mile run 7pm; on the beach at 15th Ave, N Wildwood; 609.522.8581; $;

Bob Ferris Band A Tribute to Sinatra; 6:30pm; Cold Spring

38th Annual Open House Display garden tours, plant sales, gardening talks, and clinic; Rutgers Gardens, 112 Ryders Ln, New Brunswick; 732.932.8451; $

27 & 28
Co-Ed Beach Ultimate Frisbee Tournament 4-on-4 team competition; 18 yrs & up; noon-6pm; on the beach between Oak & Poplar Aves, Wildwood; 856.696.9705

Mid-Summer Craft Show 9am-5pm; Gazebo, Ocean Ave & Rambler Rd, Wildwood Crest; 609.522.1669

Jersey Fresh Food and Wine Festival NJ food, wines, produce, and more; noon-5pm; CornerCopia, Princeton-Hightstown Rd (Rte 571), E Windsor; 609.588.0085

Carriages, Coaches & Wagons History and sight of variety of horse drawn carriages; Cold Spring

NE Peruvian Horse Club Regional Championship Show Horse Park; 973.744.8500, x363

Mid-Summer Antiques & Collectibles Show & Sale Wheaton

28
1830s Temperance Rally & Charitable Society Fair 1-4pm; Allaire

28 to Aug 3
Warren County Farmers' Fair Horse shows, hot air balloon festival, and more; Harmony Twp Fairgrounds, 165 Rte 519 S, Belvidere; www.warrencountyfarmersfair.org; 908.475.6505; $

29
Jimmy Buffet Tribute Band 7:30pm; Promenade and JFK Blvd, Sea Isle City; 609.263.TOUR

30 to Aug 4
Festival of the Sea Brant Beach; 609.494.8861

31
Sand Sculpting Contest 9am, 12th St beach, Ocean City; 609.525.9300

Miss Crustacean Beauty Pageant & Race
The world's only hermit crab beauty pageant; pageant 1pm, race 1:30pm; 12th St beach, Ocean City; 609.525.9300

Double Shot Rock 'n Roll; 7:30pm, Promenade and JFK Blvd, Sea Isle City; 609.263.TOUR

Events

August

Sundays
Sunday Night Concert Series at the Riverfront Bridgeton; 856.451.9208

Thursdays
Concert in the Park See July 11

1 to 4
Bells Are Ringing Theatre in the park; 8pm (7pm on Sunday); Thompson Park, Newman Springs Rd, Lincroft; 732.842.4000

2 to 11
The 2002 NJ State Fair and the Sussex County Farm And Horse Show 37 Plains Rd, Augusta (off Rte 206); www.newjerseystatefair.org; 973.948.5500; $

3
Evening Hayrides Howell

Deep Cut Gardens Tour See July 6

Woods Hollow Classic Mountain Bike Race An exciting race for beginners (7.5 miles) or more experienced riders (11.25 miles); 8am & 9:30am Tatum Park, Holland Rd, Middletown; 732.542.1642

A Visit from the Music Man 1-3pm; Longstreet

Jack Jennings Jazz Jiants 6:30pm; Cold Spring

Second Annual FantaSea Festival Rain date 8/4; nautical theme craft show with food, contests, touch tank, DJ, and more; 10am-4pm; Bicentennial Park, Engleside & Ocean Aves, Beach Haven; 609.492.0222

18th Annual Peach Festival Flea market peach desserts, fresh peaches, entertainment, pony rides, and face painting; 10am-5pm; Dutch Neck

3 & 4
Country Corn Festival Music and corn roast; Cold Spring

Civil War Encampment, Virginia Co. K Complete military and civilian camp, marching drills, and musket-firing demonstrations; Smithville

Revolutionary War Days Camps, drills, demonstrations; Sat 10am-4pm, Sun 10am-3pm; Red Mill Museum Village, 56 Main St, Clinton; 908.735.4101; ♿; $

Northeast Connection-Zone 7 Paint-A-Rama Horse Park; 856.468.5366

4
Vineland Jersey Fresh Festival Giampietro Park, Lincoln and Landis Aves, Vineland; 856.794.4077,x633; ♿; $

Black River Park Day Discover the history of the Black River; Cooper Mill

Concert in the Park *Ken Navarro* (jazz); 7pm; Duke Island Park, Bridgewater; 908.722.1200, x351

5
Second 2 None Rock 'n roll concert; 7:30pm; Promenade & JFK Blvd, Sea Isle City; 609.263.TOUR

6 to 9
Salem County Fair Pig races, horse pulling contest, musical entertainment, and more; Salem County Fairgrounds, Rte 40, Woodstown; 856.769.0090

7
Jonathan & Brett Classic rock concert; 7:30pm; Promenade and JFK Blvd., Sea Isle City; 609.263.TOUR

Solar System Presentation 7:30-9pm; ages10 and up; Echo Hill Environmental Area, South Branch Reservation, Lilac Drive, Clinton Twp; 908.782.1158; $;

36th Annual Seashore Open House Tour A self guided tour; north end of Long Beach Island; 609.494.1241

7 & 8
Revolutionary War Encampment Military encampment; Cold Spring

8
Pine Creek Railroad's Railroaders Day & 50th Anniversary Celebration Tours, rides, and more; Allaire

8 to 11
Bells Are Ringing Theatre in the park; 8pm (7pm on Sunday); Thompson Park, Newman Springs Rd, Lincroft; 732.842.4000

9
Sculpture Contest 11am; 2nd Ave beach, Cape May; 609.884.9565

9 to 11
Honey Harvest Help uncap and extract honey, taste and buy some, and see the insides of working hives; Howell

Bentley Brothers Circus Cooper River Park, Camden; 800.514.SHOW

10
Canal Festival Noon at Delaware & 18th Aves, 7pm boat parade from 5th-20th Aves, N Wildwood; 609.522.2397

Pickling Demonstration Noon-2:30pm; Longstreet

Deep Cut Gardens Tour See July 6

Doctors of Rhythm 6:30pm; Cold Spring

The Gigantic Yard Sale 8am-3pm; Allaire

Airfest 2002 NASW Aviation Museum, 500 Forrestal Rd, Cape May County Airport, Rio Grande; 609.886.8787; ♿; $

Captain Bill Gallagher Island Run A 10-mile run; 5:30pm; 44th St beach, Sea Isle City; 609.263.3655; $

BKF Sport Horse Breeding Show Horse Park; 908.647.5801

10 & 11
11th Annual Bluegrass Festival noon-5pm; Cream Ridge; $

11
Traditional Blacksmith Demonstration 1-3pm; Longstreet

Village Town Meeting 1-3pm; Allaire

Concert in the Park *West Point Army Band*; 7pm; Duke Island Park, Bridgewater; 908.722.1200, x351

Festival of Horses Horse Park; 609.984.4389

12
Hawkins Road Country Band 7:30pm; Promenade and JFK Blvd, Sea Isle City; 609.263.TOUR

14
Harmony Show Choir 7:30pm; Promenade and JFK Blvd, Sea Isle City; 609.263.TOUR

Garden Tour: Designing for Seasonal Value 6:30-8:30pm; ages 16 and up; Hunterdon; $

14 to 24
Titanic 8:30pm (Box Office opens 5:30pm); Roosevelt Park Amphitheater, off Grandview Ave, Edison; BYO chair; www.playsinthepark.com; 732.548.2884; $

15 to 18
Forked River Tuna Club Annual Fluke Tournament 609.693.5353

16 to 18
NJ Palomino Exhibitors Assoc. Horse Park; 732.846.9283

17
Potato Harvest Help gather and sort potatoes that will be donated to local hunger projects; Howell

Tree & Shrub Identification Walk 9-11am; Wescott Nature Preserve Raven Rd-Rosemont Rd, Delaware Twp; $;

Lacemaking Demonstration 1-3pm; Longstreet

Deep Cut Gardens Tour See July 6

Mummers Strutting Contest The N Wildwood Stringband plays, you strut; 2pm; Old New Jersey Ave, N Wildwood; 609.889.2241

Annual Clambake & Maritime History Day 4-H Fairground, Cape May Court House; 609.465.3535; $ for food

Hobo Band 6:30pm; Cold Spring

Big Barn Bash Learn about barns, square dance, and more; Ag Museum

17 & 18
Garrison Weekend Fort Mott State Park, Pennsville; 10:30am-4:30pm; 856.935.3218 or 302.834.7941; $

Hereford Inlet Lighthouse Craft Show 9am-5pm; First & Central Aves, N Wildwood; 609.522.4520

The Wildwoods Boardwalk Craft Show 10am-6pm; Wildwoods Boardwalk; 609.523.1602

3rd Annual Classic Boat Show 10am-5pm; Tuckerton Seaport

Garden State Re-Enactors Waterloo

18
Volunteer Trail Project 9am; Turkey Swamp Park Shelter Bldg, Georgia Rd, Freehold; 732.842.4000, x4283

Antique Fire Apparatus Show & Muster Wheaton

Dog Day Road Race Five-mile run; Harvey Cedars Fire House, Long Beach Blvd, Harvey Cedars; 609.361.9364; $ for participants

Bayou Fest *Geno Delafose* and *Zydeco-A-Go-Go*; 5:30pm; Duke Island Park, Bridgewater; 908.722.1200, x351

18 to 23
2002 Mid-Atlantic $500,000 Marlin and Tuna Tournament Cape May; www.sjmarine.com

19
Good Tymes Band Oldies concert; 7:30pm; Promenade and JFK Blvd, Sea Isle City; 609.263.TOUR

21
Midiri Brothers Dixieland/Jazz Band 7:30pm; Promenade and JFK Blvd, Sea Isle City; 609.263.TOUR

21 & 22
Civil War Weekend Military encampment with candlelight tour, military trial, and memorial service; Cold Spring

22
Volunteer Trail Project 6pm; Hartshorne Woods Park, Rocky Point Portland Rd, Middletown; 732.842.4000, x4283

23 to 25
Sussex Airshow 2002 Open at 8am, show time 1:30-5:30pm; Sussex Airport, 53 Rte 639, Sussex; www.sussexairportinc.com; 973.875.7337; ♿; $

State 4-H Horse Show Horse Park; 732.932.9794

24
Fiddlin' Contest The largest, longest running (this is the 18TH) traditional fiddle contest in New Jersey; Howell

Deep Cut Gardens Tour See July 6

Market Street Day Antique cars/motorcycles, music, crafts, arts, antiques; 10am-4pm; Salem City; 856.935.0379

Woodbine Port Authority Annual Festival Of Friends Rain date Aug 25; plane rides, radio control plane demos, food, crafts, music, and more; 11am-4pm; 660 Henry DeCinque Blvd (off Rte 550); 609.861.2153

Wildwood Music Festival Music, dancing, food, vendors; 3-9pm; Pacific Ave between Oak & Lincoln Aves; 609.729.6818

Ralph Roberts Swing Band 6:30pm; Cold Spring

JCSA Fluke Tournament Brielle; 732.840.1999

24 & 25
Wildwood Classic Cup Hobie cats ocean sailing competition; Sat 10am-10pm, Sun 10am-5pm; on the beach at Primrose Rd, Wildwood Crest; 856.914.1787

Wildwood Yacht Club Regatta Opti and 420 on Sat, Laser and Sunfish on Sun; 10am-2pm; Sunset Lake, New Jersey Ave, Wildwood Crest; 609.522.0969

Boardwalk Craft Show 10am-6pm; The Wildwoods Boardwalk; 609.523.1602

Salute to Summer Wine Festival noon-5pm; Renault Winery, Galloway/Egg Harbor; 609.588.0085

19th Century Harvest Days Taffy making, apple butter, applesauce and children's apple pie making, and music; Cold Spring

19th Annual Barnegat Bay Crab Race & Seafood Festival Blue-claw crab races, entertainment, crafts, and more; 9am-4pm; Veteran's Field, Bay Blvd, Seaside Heights; 732.349.0220, 800.SEA.SHOR

Antique Auto Show Rain date Sept 1; 8am-3pm; Allaire

Concert in the Park *The Dupreez*; 7pm; Duke Island Park, Bridgewater; 908.722.1200, x351

25
Peaches & Cream Sunday 1-3pm Longstreet

Friends of the Parks/NJRRC Trail Run 8am; Hartshorne Woods Park, Henry Hudson Regional High School, Highlands; 732. 578.1771

27
Bus Trip to Brigantine Wildlife Reserve Seating is limited; 9am-1:30pm; ALO

28
Mayor's Farewell To Summer Concert 7:30pm; Promenade and JFK Blvd, Sea Isle City; 609.263.TOUR

Main St Colonial Day Colonial costumes, crafts, foods, and more; 10am-4pm; Broad St, Woodbury; 856.845.8655

28 to Oct 20
History Comes Alive in Flemington Tours & more; Historic Hunterdon County Courthouse, 75 Main St, Flemington; 908.782.2610

Lindbergh & Hauptmann: The Trial of the Century Reenactment; Fri and Sat at 8pm, Sun at 2pm; Historic Hunterdon County

Events
August - September

Courthouse, 75 Main St, Flemington; www.famoustrials.com; 908.782.2610

30 to Sept 1
CDI*/CDI-Y/J Allentown and BFK South Horse Park; 908.647.5801

31
Plowing Match Pony rides, wagon rides, pig roast, and ox plowing demonstrations during the 19th annual plowing match; Howell

Deep Cut Gardens Tour See July 6

Bob Ferris Band Music of the movies; 6:30pm; Cold Spring

31 & Sept 1
Handcraft Unlimited Labor Day Craft Show Sat 10am-9pm, Sun 10am-5pm; The Wildwoods Convention Center, Burk Ave & the boardwalk; 717.656.3208; $

Labor Day Craft Show 9am-6:30pm; Wildwood Crest Gazebo at Ocean Ave & Rambler Rd; 609.522.1669

Manahawkin Good Ol' Days Festival 9am-5pm; Heritage, A. Paul King, & Manahawkin parks, Rte 9 at Bay Ave, Manahawkin; 609.597.3211; ♿

18th Annual Antiques & Collectibles Faire Ocean County Historical Society, 26 Hadley Ave, Toms River; 732.341.1880

Boat Parade Lighted and decorated boats cruise Tuckerton Creek; 6pm; Tuckerton Seaport

September

1
Election Day 1830s 1-4pm; Allaire

Scandinavian Festival Waterloo

2
Mayor's Labor Day Race 8:30am; 23rd St beach, Ocean City; 609.398.6900

4 to 8
Forked River Tuna Club Tuna Tournament 609.693.5353

5 to 7
Dance-in-the-Park 2002 (Rain date Sept 8); 8pm (Box Office opens 5:30pm); Roosevelt Park Amphitheater, off Grandview Ave, Edison; BYO chair; www.playsinthepark.com; 732.548.2884; $

5 to 8
Rip Curl/Heritage Memorial Pro-Surfing Tournament 7am-2pm; 41st St beach, Sea Isle City; 609.263.3033

6 to 8
Surf Fishing Tournament Adult & youth divisions/prizes; Fri & Sat 6am-8pm, Sun 6am-noon; 2nd Ave toward inlet, N Wildwood; register at Gazebo, 3rd & JFK Ave; 609.522.2955; $

7
Back to School Activities centered around the c. 1900 rural one-room schoolhouse; Howell

Historical Museum Annual Fair Tabernacle Grounds, Ocean City; 609.399.1801

Deep Cut Gardens Tour See July 6

7 & 8
Mummer's String Band Weekend Sat 11am-6pm—street festival on Old New Jersey Ave, Sun 1pm—string bands march & play on the boardwalk, N Wildwood; 800.882.7787

Mall Art Show Washington St Mall, Cape May; 609.884.8628

Street Rod Weekend Sports & Civic Center, 6th St off of the boardwalk, Ocean City; 609.525.9300

NJ Bred All Breed Horse Show Horse Park; 908.996.2544

8
Sprint Triathlon A .25-mile ocean swim, 13-mile bike ride, and 4-mile run; 7:45am; Seven Presidents Oceanfront Park, Ocean Ave, Long Branch; 732.542.1642

Friends of the Parks/NJRRC Trail Run 732.578.1771

Fall Birding in Hunterdon County 7am-3pm; bring lunch, binoculars if you have them and wear appropriate clothing; Hunterdon; $;

All-Corvette Show Rain date Sept 15; Wheaton

Allaire Storytelling Festival 1-4pm; Allaire

17th Ocean County Bluegrass Festival Noon-5pm Albert Hall

Bye-Bye Butterfly & Mexican Monarch Fiesta Garden State Discovery Museum, 2040 Springdale Rd, Cherry Hill; www.discoverymuseum.com; 856.424.1233; ♿; $

Seafood in Seaside Seafood festival; Grant Ave next to Water Works, Seaside Heights; www.seasideheightstourism.com; 800.SEA.SHORE

Irish Feis 8:30am-6pm; Waterloo

12
Evening Nature Walk 6-7:30pm; Coldbrook Reserve, Old Turnpike Rd, Oldwick; 908.782.1158; $;

13
Firemen's Weekend Craft Show 9am-5pm; Gazebo, Ocean Ave & Rambler Rd, Wildwood Crest; 609.522.1669

Doo Wop Show Waterloo

13 to 15
22nd Annual Fleet Raritan River Festival Greek music, canoe rides, water taxis, children's rides, and fireworks; Boyd Park, Rte 18, New Brunswick Riverfront, New Brunswick; 732.745.5125; ♿

Harvest Show Exhibits of home grown flowers and vegetables, and beautiful floral displays; Frelinghuysen

14
Heirloom Tomato Contest & Canning Howell

Hereford Inlet Lighthouse Craft Show 9am-5pm; 1st and Central Aves, N Wildwood; 800.882.7787 or 609.522.4520

Anglesea Surf Anglers Surf Fishing Tournament Registration 6-7:30am, fishing 7:30am-2:30pm; The Wildwoods beaches, 5th Ave in N Wildwood-Cresse Ave in Wildwood Crest; 609.522.1526; $ for participants

Deep Cut Gardens Tour See July 6

Antique and Classic Boat Show/Maritime Artists and Artisans Show Refreshments, artworks and collectibles available; 9am-5pm; NJ Museum of Boating, W Lake Ave, Bldg 12, Pt Pleasant; 732.295.2072

Beach Wheels 2002 Beach recreation day for the physically challenged; various locations on Long Beach Island (call for locations); www.beachwheels.com; 609.597.6993

Antique Boat Show Johnson Brothers, 9800 Bay Ave, Pt Pleasant; 732.295.2072

Call for Entries . . .

New Jersey Outdoors 2002 Photo Contest

This *New Jersey Outdoors* photo contest will feature eco-tourists, outdoor recreation enthusiasts, history buffs, and others enjoying our state's abundant natural and historic resources. Examples include: people fishing, birding, sailing, skiing, hiking, and watching reenactments or living history demonstrations.

Images of individuals and groups of all ages are eligible. Pictures may have been taken anywhere in New Jersey, indoors or outdoors, at any time from December 2001 through November 2002.

Photo Contest Rules

- The contest is open to any New Jersey resident or visitor, except Department of Environmental Protection employees and their immediate families.
- Images should show people enjoying New Jersey's natural or historic resources. Both interior and exterior shots are eligible, and pictures may have been taken at any time from December 2001 through November 2002.
- Signed releases are required for entries showing identifiable people or (from the artist) works of art.
- Only unmatted, unframed prints (no larger than 8" x 10") may be entered. Images must be crisp and in focus, except where depth of field applies. Images should not be under- or overexposed.
- Dated images are not eligible, nor are images that have been stapled, torn, written on, or marred in any other way.
- A completed entry form must be taped to the back of each image. (The form on this page may be reproduced as needed.)
- All entries become the property of the Department of Environmental Protection and may be published or displayed for any purpose, such as illustrating a story or advertising *New Jersey Outdoors.*
- Images will not be returned.
- **Entries must be received no later than December 31, 2002.**
- Mail entries to:

New Jersey Outdoors
PO Box 402
Trenton, NJ 08625-0402

Categories, Prizes, and Publication

- Eligible entries will be placed into a seasonal category based on when the image was taken. There will be a first, second and third place winner in each category (assuming a sufficient number of entries).
- Prizes will include camera gear, subscriptions to New Jersey Outdoors, and more.
- Winning photographs will be featured in the Spring 2003 issue of *New Jersey Outdoors.*

NJO 2002 Photo Contest Entry Form

Name _____

Address _____

City _____ State _____ Zip _____

Daytime phone ( ) _____

E-mail (optional) _____

Where taken _____

When taken _____

Description _____

_____

Form may be photocopied if needed.

Eastern Oyster

by Russ Babb

The eastern oyster, *Crassostrea virginica*, has been known for its unique taste and high meat quality since the early 1800s. It was extremely popular on the oyster market and had significant economic importance to the bayshore communities of New Jersey and Delaware. During the 1880s, about 80 train cars of oysters were shipped daily from Bivalve, New Jersey's oyster industry center, in Cumberland County. Throughout the early 1900s, oyster landings ranged from one to two million bushels annually.

The filter feeding eastern oyster is an estuarine animal with a tolerance for a wide salinity range. The optimal range is about 14 to 28 parts per thousand. Oysters will grow on almost any type of clean, hard, stable bottom. Eastern oysters are a protandric alternate hermaphrodite species. They have both male and female reproductive systems, but the male organs mature before the female organs, thus inhibiting self-fertilization. Although it is relatively unclear what factors influence it, there is some evidence that the process of switching sexes is reversible during subsequent years.

Oysters spawn in response to temperature. The first spawning generally occurs when the water temperature reaches 77 degrees Fahrenheit (25 degrees Centigrade), typically during the first week of July. The larvae are free-swimming for about two weeks; during most of this period, they are passively transported by tidal and wind driven currents. Only in their last few days of larval life do they exhibit a tendency to descend from the water column on slack water, remain on the bottom during ebb tides, and return to the water column on flood tides. In this manner, late stage larvae tend to move toward the headwaters of the estuary. When they are ready to set, the larvae seek a hard, clean surface upon which to attach. The availability of clean substrate, preferably oyster shell, is critical for the successful settlement of juvenile oysters, or spat.

Many oyster experts speculate that approximately 95 percent of larvae are lost to predation and other causes of mortality prior to settlement. Unfortunately, successful settlement is not the only hurdle oysters face. Once oysters find a suitable substrate, they become vulnerable to a number of new predator organisms. Mud crabs, blue crabs, gastropods, black drum, starfish, skates, and rays all take a toll on oysters, some more than others. The principal predators in Delaware Bay are the oyster drills, *Urosalpinx cinerea* and *Eupleura caudata*. Their abundance over the downbay market beds can have a significant effect on whether juvenile oysters survive to reproductive maturity.

Oyster beds provide habitat for many marine organisms. Bryozoans, hydroids, sponges, barnacles, ascidians, tube-building worms, and other bivalves live upon oysters and the affiliated structure of the reefs they create. These, in turn, attract various crustaceans and small fish. This furnishes, as many anglers know, a concentrated food source and spawning habitat for gastropods and fish such as striped bass, weakfish, croaker, and black drum.

Since the inception of its oyster industry nearly 300 years ago, New Jersey's natural seedbeds have been the major provider for both the seed oyster and the market oyster. During the industry's early history, oysters were harvested from the natural beds and sold directly to market. In the mid 1800s, oystermen—concerned with the scarcity of market-sized oysters occurring on the seedbeds—began to plant on privately leased grounds in the lower bay the smaller size oysters that they had formerly sold. The transplanted oysters reached a large size quicker in the higher salinity water than if they had remained on the natural seedbeds. From 1880 until 1950, annual Delaware Bay oyster landings ranged between one and two million bushels.

In 1957, heavy mortalities were discovered in oysters planted the previous year on the New Jersey leased grounds. The cause was a protozoan parasite previously unknown to the scientific community. Initially given the acronym MSX, standing for *multinucleated sphere unknown*, it was later classified *Haplosporidium nelsoni*. By the end of 1959, 90 to 95 percent of the oysters on the planted grounds, and about half of those on the seedbeds, had died. Total harvest in Delaware Bay fell from 711,000 bushels in 1956 to only 49,000 in 1960.

Over a period of time the native Delaware Bay oyster apparently developed a level of resistance to MSX, but in 1990 another disease, seemingly associated with abnormally high winter temperatures, caused a significant epizootic. The latest culprit is another water-borne protozoan parasite, *Perkinsus marinus*, commonly known as Dermo. (The disease is host specific and does not affect humans.) The Delaware Bay oyster industry faced an uncertain future.

The presence and intensity of Dermo made the transplanting of oysters in the lower bay very risky. In 1995, an old strategy—direct marketing from the state's natural seedbeds—was revisited. Initiated by the New Jersey Division of Fish and Wildlife and supported by the oyster industry, it has become the industry's predominant method of oystering.

Each year an industry allocation is set and participants are charged a $1.75 per bushel fee. These landing fees are deposited in the Oyster Resource Development Account. This account is typically used to fund the transplanting of oysters from underutilized seed beds to the downbay seed beds primarily used for the direct market program, and to purchase and plant clean shell on selected areas of the seed beds to enhance the setting of oyster larvae.

It has been 12 years since the first significant Dermo epizootic and, although stocks have been significantly affected by disease, habitat loss, and in some cases, over-harvesting, the eastern oyster remains an integral part of the Delaware Estuary. Oystermen, managers, and scientists are hopeful that the oysters are again on their way to recovery and there is consensus that the biological potential for oyster production in Delaware Bay remains quite high. However, all parties agree that it will take consistent and expanded efforts in enhancement activities such as shellplanting, transplanting, and oyster replenishment projects.

Russell Babb coordinates the Delaware Bay Oyster Management Program for DEP's Division of Fish and Wildlife. As a senior fisheries biologist, he is also involved with marine finfish trawl surveys of Delaware Bay and hydrographic surveying and mapping of leased shellfish grounds. Russ works out of the division's Bivalve Shellfish Office, which is located on the Maurice River in Bivalve (Cumberland County).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