

May/June 1981

New Jersey OUTDOORS





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NEW JERSEY OUTDOORS is the bi-monthly magazine of the Department of Environmental Protection of New Jersey. This publication is dedicated to the wise management and conservation of our natural resources and to foster a greater appreciation of the outdoors.

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

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

New Jersey Outdoors (USPS 380-520) is published bi-monthly (six times a year) by the N.J. Department of Environmental Protection. Second-class postage is paid at Trenton, N.J. and additional mailing offices. Subscriptions are \$4.00 for one year, \$7.00 for two years, and \$10.00 for three years payable by check or money order to New Jersey Outdoors Mailing Office, P.O. Box 1390, Trenton, N.J. 08625. Single copies, if available, cost 80¢. Change of address should be reported to the above New Jersey Outdoors mailing office. Send old and new addresses and the zip code numbers. The Post Office will not forward copies unless forwarding postage is provided by the subscriber. Allow eight weeks for new subscriptions and change of address to take effect. New Jersey Outdoors welcomes photographs and articles, but will not be responsible for loss or damage. Permission granted to reprint with credit to New Jersey Outdoors. Publication office at 3885 Quaker Bridge RD, Mercerville, N.J. 08619. Copyright © 1980 N.J. Outdoors

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Conservation Is Back In Style By Paul H. Arbesman, New Jersey Drought Coordinator

New Jersey is in the throes of a drought, which (as of this writing in mid-March) shows a precipitation pattern strikingly similar to the one registered by the so-called "great drought of the 1960's." We must bear in mind that a drought doesn't mean no precipitation at all, but it does mean not enough to keep up with water demands. That's why Governor Brendan Byrne declared a water emergency in September of 1980 and put 113 northeastern communities under rationing. Emergency projects were also built under a Presidential Disaster Declaration requested by Governor Byrne. That helped bring previously untapped reserves into hard-hit areas. With these actions, we were able to make it through the late summer and fall. Then we were hit with a December-January period that was the lowest precipitation period on record. This forced Governor Byrne to expand the areas under the rationing program in February, and the Governor and the Legislature acted to appropriate funds for emergency water projects to maximize our ability to utilize and transfer the water that we do have available.

A much wider area of the state is subject to a ban on non-essential uses of water such as watering of lawns and gardens, washing of streets, sidewalks and other paved areas; flushing sewers and using fire hydrants for purposes other than fire-fighting.

That earlier drought lasted from early 1964 far into 1966—nearly three years. As of now the current drought is barely a year old, but we would be indeed foolish if we gambled on it being a shorter drought than the one in the 1960's. Scrutiny of rainfall and reservoir records then and now show a remarkable parallel between what is occurring

now and that terrible period in the 1960's. Since our northeastern reservoirs were full to overflowing in June 1, 1980 we've already seen them dip in late January of this year to barely 20 percent of capacity, compared to the low of 24 percent recorded in the mid-1960's. The limited art of long-range weather predictions makes it impossible for us to look ahead with any significant degree of certainty.

Therefore, with the "great drought of the 1980's" entering its second year, we can only renew our resolve to reduce consumption of water in every way possible, pending that time when we can look back and be certain that continental weather patterns have returned rainfall levels to normal. The only way to beat a drought is to save water, so that our supply lasts until it rains—enough!

Remember that there are many things we can live without, but water isn't one of them! So follow these basic water conservation tips:

- Do not keep the water running while washing, shaving or brushing teeth.
- Do not let the water "run cold" when getting a drink. Keep a bottle of water in the refrigerator.
- Wait until the dishwasher or clothes washer has a full load before turning it on. A partial load takes as much water as a full load. Better yet, wash your dishes in a dishpan.
- Check for dripping faucets or leaky toilets. One such leak can waste 20 or more gallons per day.
- Don't flush the toilet so often. Don't flush to get rid of tissues or cigarette butts. And take showers instead of tub baths (with shower flow restrictors installed), and turn off the shower while soaping yourself.

In this issue

The lead article in this issue (as promised) is the second half of the *Forestry in New Jersey* article by Duke Grimes, titled *Forestry Management*.

A new author, Libby Johnson, describes *Swallow Power*, or how to keep a barnyard insect-free without the use of chemical sprays.

The Asbury Park Fishing Club or How to Stay Young at 92, by William M. Feinberg (another new author) is the chronicle of a 92-year old fishing club, one of the oldest in the state.

Dr. Joanna Burger, Livingston College, Rutgers University, a frequent contributor, writes about the *Cattle Egret: White Robin of the Future*. Author Burger discusses the rapid spread of this native of Central Africa and the new niche it occupies in the U.S.A.

An alarming title, *Rats Bigger than Tomcats*, introduces this article by Richard Lore, Lorey Takahashi, and Robin Palkovitz of Douglass College, Rutgers University. "Rats Bigger than Tomcats" is a common expression used when describing a large rat, but the authors claim the expression is an exaggeration. And to back their claim, they offer a \$500. bounty for the first three-pound Norway rat (*Rattus Norvegicus*) found in New Jersey.

For the freshwater fishing fraternity we have included *The Shrimp Fly*, by Mary S. Kuss, a frequent contributor. Flyfisher-woman Kuss tells us how to construct the shrimp imitation and *how and where* to use it.

More on fresh water fishing... *Stone Tavern Lake*, by fish biologist Mike Welshko. Species present in this lake are largemouth bass, sunfish, brown bullhead, chain pickerel, channel catfish and others. Purchase a 1981 fishing license, get your gear, and try this spot.

"As you start to think of your garden this spring, you may want to consider planting perennial wildflowers, gathered on outings to the countryside and forests." Author Laura Hooper makes this suggestion in the article, *Gardening with Perennial Wildflowers*.

"Since 1976, the Biology Department at Jersey City State College has been studying problem lakes at the request of concerned communities." *Lake Restoration/A Case Study* by Dr. Oliver Donovan, a frequent contributor discusses a study of Lake Rogerine.

"Within the boundaries of our eastern shoreline, a 117-mile-long ribbon of water exists that each year yields almost a million fluke to anglers sportfishing this aquatic-rich

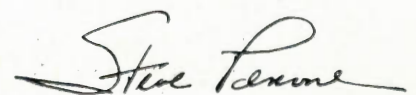
area." With this statement author Don Kamienski introduces the article titled *A Ribbon of Fluke*.

Starting in mid-June more and more saltwater anglers will try *Fishing for Sharks* this year. This article by Pete Barrett, editor, Jersey Fisherman, is a *where, how to, and what* to use to land a high-flying mako shark.

Spring Fishing in Great Bay by Paul Olsen is part two of the article which appeared in the May/June 1980 issue of NJO by the same author. Water Resources biologist Olsen tells us *why* Great Bay is a great fishery, and *when and where* (see map) the fish are biting.

As announced in two previous issues, the subscription rates for *New Jersey Outdoors* (because of increased production costs) will be increased to \$5.00 for one year; \$9.00 for two years; and \$12.00 for three years. These increases will be effective July 1, 1981. The good news is that you can subscribe *now or renew* before this date for up to three years at the old rate.

Do it today.



Continued from
March/April Issue

Forestry in New Jersey

Forestry Management

By Duke Grimes

FORESTRY—“*The science, the art and the practice of managing and using for human benefit the natural resources that occur on and in association with forest lands.*” (Definition adopted by the Society of American Foresters, April 1967)

Why practice forestry? The answer will vary depending upon the ownership and forest type, but basically, each landowner has particular needs and objectives which can best be achieved through proper forest management. The State of New Jersey was first made aware of the need for forestry by the State Geologist's Report to the Governor in 1898, which recommended the establishment of a Forest Service whose main objective would be forest fire control. Acceptance of such advice was slow in coming. In June, 1905, the Forest Park Reservation Commission was formed, with powers to acquire and manage land for State Forests, and to appoint firewardens for the protection of these lands. This commission provided the basis for the wide variety of forest management programs offered by today's New Jersey State Forestry Services.

The protection of New Jersey's forests from wildfire is still a primary management task of the Forestry Services. But since 1905 the needs and objectives of forest landowners have broadened. Many types of assistance have been developed over the past 75 years in an attempt to meet these needs. Examples of this service include the sale of seedlings, advice on harvesting, and insect and disease control. And, no matter what the activity, each management program is designed not only to meet the individual's objectives but to improve the quality and quantity of New Jersey's forest resource as well.



Wildfire is a threat to and may result in the loss of life and property. It can destroy natural resource and degrade the environment. However, if controlled and used properly, fire can be a useful tool in managing our forests.

"The New Jersey Bureau of Forest Fire Management is responsible for protecting 2.7 million acres of the State's forest, brush, and grasslands. It has the annual goal of limiting the number of forest fires to 2,000 and acreage burned to .5% of the 2.7 million acres protected on 13,500 acres.

"The New Jersey Pine Barrens represent a special problem. Repeated cutting and severe wildfire have had a primary role in the development of a forest cover type considered to be one of the most hazardous in the nation. The tremendous wildfire potential was realized on the weekend of April 20-21, 1963, when 183,000 acres were burned, killing seven people, destroying 186 homes and 197 outbuildings, and causing an estimated loss to improved property of more than \$8.5 million. The Pine Barrens faces an even more disastrous situation today because of increased development and escalation of property values.

"New Jersey's high population and small land area have created extreme land use pressures. Increased recreational activity and building in or near our forest have significantly increased the number of fires. To combat this rising trend, the State Bureau of Forest Fire Management pursues an active program of fire prevention, presuppression, and suppression of all dangerous or destructive fires which threatened natural resources or improved property.

The first step of any forestry activity on privately-owned lands is the development of a forest management plan. A forester from the Bureau of Forest Management visits with the landowner, walks with him through his woods, and then writes a plan which recommends the activities that should be implemented based on the owner's objectives and the condition of his woods. In 1980, foresters met with 2,897 people involving a total of 33,438 acres.

One of the activities which is frequently recommended is Timber Stand Improvement (TSI). Most forest stands have been abused by repeated, unmanaged cuttings and will benefit by removing poorly formed, damaged, or otherwise unwanted trees, thereby creating more growing space for desirable trees. In TSI the forester will mark with paint the trees which should be removed. Approximately 1,800 acres were marked for this purpose last year.

Continued on page 4

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Forestry In New Jersey

Often a management plan will indicate the need for some type of timber or pulpwood harvest. According to the management plan, trees are harvested either to provide more room for the remaining stand or to allow the establishment of new, vigorous-growing trees. A forester will mark those trees to be included in the sale, provide marketing assistance to the landowner, and monitor the logging to ensure compliance with the best harvesting practices.

There is a considerable amount of open land suitable for tree planting. In the past several years much of this acreage has been planted for Christmas tree production. A forester will survey the proposed site and advise on the procedure which should be followed and recommend the species which could be planted. About 1,000 acres per year are reforested through this type of assistance.

"Prescribed Burning is frequently used in reducing the accumulated fuel in the pine region. In addition, it also provides a number of beneficial side effects: site preparation, recycling nutrients, improving wildlife habitat, managing understory hardwoods, controlling certain diseases, enhancing appearances, and improving access. It is used extensively on both private and State land. The Bureau of Forest Fire Management has the goal of burning 100,000 acres per year.

One program of the Bureau of Forest Management involves assisting the primary wood users in the state. Loggers are given guidance on best harvesting techniques and the proper utilization of the trees that they cut. This assistance continues at the sawmills in an effort to increase operating efficiency and create more board feet of lumber from each log.

The Bureau offers a unique program of assistance to the State's wood product manufacturers. The goal is to increase the efficient utilization of the industry's wood resource by providing services in lumber procurement, processing techniques, improved lumber drying and storage practices, and wood waste marketing assistance.





The Bureau is responsible for the forest management of the 247,000 acres of state forests and parks. Activities include management planning, timber and pulpwood sales, prescribed burning, homeowner firewood programs, and insect and disease control.

Tree seedlings have been available from the State Forest Nursery since 1907. Production presently includes a wide variety of species designed to fulfill various landowner needs and regional requirements. About one million seedlings are produced annually, but demand is so great that plans are being implemented to increase production to two million.

A large percentage of New Jersey's forests are actually within or in proximity to urban areas. The Urban and Community Forestry Program of the Bureau assists communities with technical advice concerning the protection and management of this resource in an effort to improve the beauty and livability of the urban environment.

Much research and work has been done over the years to develop improved seedlings for reforestation. Seed from the best trees is collected for the state forest nursery. Orchards have also been established for the purpose of producing superior seed. One of the most exciting projects involves the cross-pollination between pitch pine and loblolly pine. It is hoped that the resultant hybrids will hopefully exhibit the cold and drought resistance of pitch pine with the improved growth and form of loblolly.

The primary insect and disease problem in New Jersey forests is the Gypsy Moth. The Bureau's State Lands staff are responsible for the control of the Gypsy Moth in our State forests and parks. This includes extensive surveying in the fall and winter, and conducting the control program in late spring on those acres which are threatened with severe defoliation and high mortality. □



Female ready to feed

PHOTOS BY DAVE JOHNSON



Mud gathering



Rebuilding nest



Bird lands on nest



4th egg layed—other flying in

SWALLOW POWER

BY LIBBY JOHNSON

We tried fly swatters, sticky tapes, and dry bait. We bought a sprayer and misted the barns, barnyards, and paddock with any and every product recommended for getting rid of flies and mosquitoes. But not until we encouraged "swallow power" did we gain relief from the miserable pests. The fortunate discovery that the feeding habits of nesting barn swallows could give us a virtually bug-free summer took a few years and came about quite by accident.

When we moved to an old abandoned farm some years ago, there were only a few once-used swallow nests tucked in the eaves of the barn or daubed on the wide barn siding. As we acquired horses and sheep, began to till the fields and mow the grass and hay, the swallows moved back in, feeding on the insects stirred up by the mower and the grazing animals. They preempted beams and rafters for nest sites and helped themselves to the mud, straw, and horsehairs that were so plentiful in the barnyard. Their nests were as likely to be placed directly over an entrance door or a hayrack as they were to be secreted in a remote corner of the hayloft.

Our third spring on the farm started off with a gay and lilting rhythm. The chittering swallows swept elegantly about the farm, gladdening us with their spirit and beauty and feeding first themselves and then their young. But once the nestlings were ready to fly, the barnyard turned into pandemonium as the ever-protective birds dived on any moving creature that approached the barn—dogs, cats, and shrieking teenage children.

The diving nuisance aside, we found ourselves welcoming the

swallows and watching our barn colony more and more closely. We were able to observe how they constructed their nests, shared the duties of brooding and feeding the young, related to each other in their colonial life. We built blinds and began to photograph them.

By the fourth summer the barn was home to eight pairs of nesting swallows. When their broods of four to five each fledged in late June, the fences and utility lines provided perches for some 50 birds, all scooping up insects like so many airborne carpet sweepers. By late July, when five of the pairs raised a second brood, as many as 70 birds were launching themselves in a seemingly endless quest for food.

All these years, mind you, we had been spraying and swatting flies and mosquitoes. But we noticed—that fourth year—that we were remarkably bug free. Maybe it was the dry season. Or was the latest spray more effective? And then the 70 swallows lined up on the wires one last time before they took off for the south. The time was late August.

One week later we were awash in flies and mosquitoes, swatting and slapping. Could it have been the swallows that had been protecting us all summer? They and their effective recycling of insects—more effective than any synthetic chemicals!

I picked up the first bird book within reach, *Audubon Guides, All the Birds of Eastern and Central North America*, and read under Barn Swallow: "Since they greatly reduce flying insects around barnyards, every farm building should have one or two small openings to let them in to nest." So far so good.

The next, Charles T. Flugum's *Birding from a Tractor Seat*, said virtually the same thing: "By living near our dwellings, barn swallows help a great deal in reducing the number of flies, mosquitoes and other insect pests of man and his livestock."

But enough of general statements about the barn swallow. For the specifics of *Hirundo rustica erythrogaster* (Latin: *Hirundo*, a swallow; *rustica*, of the country; *erythrogaster*, red-bellied), I went to Arthur Cleveland Bent's *Life Histories of North American Flycatchers, Larks, Swallows*. I was not disappointed in my search. "Professor Beal (1918) analyzed 467 stomachs of the barn swallow and found that the food was made up of 99.82 percent animal matter and 0.18 percent vegetable. 'Diptera are evidently the choice food of the barn swallow. They average 39.39 percent of the food, or more than twice that of any order of insect.' " The order Diptera includes the true flies and mosquitoes.

We soon began the collection of specific statistics of our own. As a start we took turns one day sitting in a blind from 5:00 a.m. to 9:00 p.m. counting the number of trips a pair of swallows made to feed their five nestlings. The count was 462—462 bulging swallow mouthfuls of insects for one nest alone, for one day alone. We had not been imagining things!

The following spring, late in April, we opened all the barn doors—even the loft doors to the corner. What better welcome mat could we place for the barn swallows? And they accepted it. More nesting pairs settled in. Again we were insect free until late August—all the proof we needed. □



PHOTOS PROVIDED BY AUTHOR
Members of The Asbury Park Fishing Club in Front of John Seger's Tackle Shop During Run of Large Striped Bass in 1913. From left to right: L.J. Brown (18 lbs.), A. Hunt (34 lbs. 7 oz.), John S. Eger, Dr. Dulaney, Dr. W.W. Flavell (36 lbs.), Wm. N. Applegate (27 lbs. 14 oz.).

The Asbury Park Fishing Club

Or

How To Stay Young At 92

BY WILLIAM M. FEINBERG, ESQ.

Over the years, many fishing clubs, like other organizations, have come upon the scene only to disappear after a short life. Yet a few have remained, seemingly gaining strength with the passage of time. One of the oldest of this latter group

is the Asbury Park Fishing Club, now in its 92nd year. Why does one club survive and prosper when so many others have died on the vine? A glance at the Asbury Club's background may provide a clue.

In 1888, Colonel James A. Brad-

ley, founder of the City of Asbury Park, and nine of his friends formed an informal surf-fishing club. Bradley donated four rocking chairs and an old brass bell which were installed on a pier at the south end of Asbury Park. Whenever any of the club members caught a striper, the bell was rung—one chime for each pound of the fish's weight. The fame of the club spread quickly and its ranks soon swelled. By 1890, it took the official name Monmouth County Protective Association and adopted as its purpose "to prevent the useless waste of fish and to assist in breeding game fish." Owing to the steady increase in its membership, the Club found it necessary to move its home to increasingly larger quarters. In 1902, it changed its name to The Asbury Park Fishing Club, adopted a new constitution and a new purpose—"To protect saltwater game fish, to create good fellowship and to promote the interest of anglers." These objectives continue to guide the Club even to the present time and still appear in its constitution.

In 1913, the Club membership numbered 350. In the year from 1919 to 1920, more than 200 new members joined, bringing the enrollment to 552. This figure increased to almost 650 by 1925. Since then, the numbers have ebbed and flowed and at the present time, about 200 members are on the roster.

One of the Club's sources of strength, in addition to its purpose, was the fact that its membership was always open to sportsmen "of good moral character," and it was an early melting pot of rich and poor, illustrious and unknown. All had one quality in common—their love of the sea and saltwater angling. Over the years, certain names did stand out among the others on the membership list. These would include Hartie I. Phillips, writer of renown; Joseph Cawthorn, described as "one of America's leading actors"; Christian W. Feigenspan, owner of the Feigenspan Breweries of Newark; Ezra A. Fitch, cofounder of Abercrombie & Fitch; A. C. Steinbach, department store magnate; J. Lyle Kinmouth, organizer of *The Asbury Park Press*; A. F. Meisselbach, manufacturer of the

well-known Meisselbach fishing reels; A. E. Griffith, manufacturer of the Griffith piano; and Van Campen Heilner, renowned outdoor writer and editor of the *Field & Stream*, to mention only a few.

Starting early in the lifetime of their Club, the men from Asbury have accounted for their share of record fish. These would include a 63-pound channel bass caught in 1909 by Joe Cawthorn breaking the New Jersey high mark; a 286-pound bluefin tuna caught by Jacob Wirtheim in 1915 which toppled another Jersey record, only to be surpassed by fellow member Christian Feigenspan in 1923 with a world-record bluefin of 407 pounds; a 55-pound striped bass caught by Frank Henes in 1913 topped another New Jersey record only to be beaten by Club member Abe Flavell with a 58-pound, 3 oz. fish the following year. More recently, Club member Barry Goldman captured the world's record for Atlantic Bonito in the 20-pound-line class with a fish caught in 1978.

The list could go on, and would include such exotics as sharks taken from the New Jersey beaches and weighing hundreds of pounds. In addition, the Club has actively participated in fishing and casting tour-

naments capturing many prizes and honors. In the R. J. Schaeffer Salt Water fishing tournament, the Asbury Park Fishing Club took first place in New Jersey and stood among the upper five clubs overall for many years running.

Of all its activities, however, none have been more significant to the Asbury Club than those promoting its purposes to "protect saltwater game fish and . . . to promote the interest of anglers." As part of these charges, it became an active charter member in such organizations as the Association of Surf Angling Clubs; the Izaak Walton League of America; and the New Jersey Fish and Game Conservation League. Its present memberships include the International Game Fish Association; the Federated Sportsmen's Clubs and the American Littoral Society. Its members fought successfully to make striped bass a game fish in New Jersey. It has waged an ongoing fight against pollution, and its efforts in that area were recognized as early as 1922 by President Warren Harding who, in writing to the Club, said "I do wish you to be assured of my keen interest in behalf of the effort your organization is putting forth, for I regard it as of very great importance to the whole nation and of course, particularly to those sections

of the Coast line and tidewater country in which industrial development has been particularly extensive. Your organization, I am informed, has been able to develop a public understanding of these problems and has given very helpful consideration to the matter of methods in approaching that solution." Club members have occupied numerous fishery positions including membership on the International Convention for the Northwest Atlantic Fisheries; Mid-Atlantic Fishery Management Council; the Governor's Marine Fisheries Advisory Council; state and federal fishery boards, and the like. At the present time, member Cole Gibbs is president of the New Jersey Federation of Sportsmen's Clubs. Under the guidance of its president, Sig Kislowski, the Club has instituted legal action to preserve the fisherman's right of access to the beaches and has testified on fishery matters before governmental bodies. It regularly takes affirmative action in such issues as the Saltwater fishing license (which, incidentally, it opposes), U.S. control of the bluefin tuna, dredging of Romer Shoal; ocean dumping of sewage sludge, and numerous others.

In summary, a strong, diverse membership; a reason for existing other than for pleasure alone; an active participation in the sport of fishing; and service in the cause of the environment have undoubtedly all combined to keep the spirit of comradeship alive among successive generations of Asbury fishermen for almost a century. Fishing is still, as always, the common bond. Today, just as in the past, the love of their sport and their ties to one another are important parts of the lives of the members of the Asbury Park Club. Perhaps their sentiments were best summed up by member Bob Inch, who some years before his death earlier in the century penned the following lines:

*When our fishing days are over,
And we lay our rods aside,
And we bow our heads to meet
Old Father Time
Of all the things we ever did
We never shall forget
Those fighting fish
that hung upon our line. □*

An Asbury Team takes Honors at the Long Beach Island Fishing Tournament, 1976.



Cattle Egret:

White Robin of the Future



JOANNA BURGER

Imagine a stately white egret with buffy plumes plummeting down his back, walking haltingly beside your lawnmower. Three quick steps, a rapid movement of his head as he takes aim, and the egret stabs at a gigantic green grasshopper, startled up by your approach. As you circle around the lawn, the egret runs to catch up, then stealthily creeps beside the wheel, peering into the grass. More rapid movements of the head, and the egret jabs quickly at another hapless insect seeking escape. As you put away the mower, the egret flies three lawns away, to another lawnmower, and more startled insects, perfect prey for pacing, patient, peering Cattle Egrets. Is it impossible that Cattle Egrets will soon be as common as robins on New Jersey lawns?

Cattle Egrets are native to central Africa, where they foraged on insects in grassy and shrub fields. Insects, however, often remain hidden in the safety of the grass, and emerge only when disturbed. A Cattle Egret stomping through the grass is simply not heavy enough to startle or beat up such insects. In the past, Cattle Egrets were successful by relying on other, heavier animals to beat up the insects for them. And so they followed the large wild ungulates such as Wildebeest and Buffalo. The egrets had to walk quickly to keep up with the moving Buffalo,

but each animal step startled prey, making the foraging method more successful than walking alone.

In the noonday sun, when the wild animals rest under shade trees, the egrets also rest, and preen while waiting for the animals to begin moving. Although adapted to feeding with wild animals, Cattle Egrets did not increase in numbers because they were limited by the amount of grassland for feeding. Tropical rain forests and deserts provided impenetrable barriers to their spread in all directions. Wherever the herds of ungulates fed, the egrets followed. And then Europeans invaded Africa, clearing land, planting crops and pastures, and raising cattle. The wild game animals were displaced, shot for food, ivory, or skins. They dwindled with the shrinking savannah, and were often seen as competitors of the cows, so cherished by the Europeans. The Europeans provided more foraging grassland for Cattle Egrets, but they all but eliminated the native animals that the egrets depended on as beaters. However, to a Cattle Egret in search of a wild ungulate, a cow is a suitable beater. Cows plow slowly through the grass, munching, changing locations, and startling up insects just as did the wild animals. While in South Africa recently, I often saw a cow pursued by three or four Cattle Egrets, each finding two to five insects per minute. Without habitat barriers such as rain forests and deserts, they easily followed herds of cows. And thus Cattle Egrets spread throughout South Africa, and moved into Europe and on into southern Asia.

The first Cattle Egrets reached Surinam in South America by the 1880s. The few birds that arrived, bred, and slowly expanded their range, some spreading south into Brazil, while others moved northward. A few Cattle Egrets began appearing in Florida in the 1940s, where the white, elegant egrets with buffy crowns and plumes were exotics to be looked for eagerly. In 1953, a pair built a nest at Lake Okeechobee, and the first native Cattle Egret chicks climbed among the branches. Since then they have spread along the Gulf Coast, up the Atlantic Coast, and into Canada. In less than 30 years of breeding in the United States, they have become the

most common heron or egret along the coast of the Gulf of Mexico; and along the entire Atlantic coast they are third in number of breeding pairs, only to White Ibis and Snowy Egret. Their amazing spread has been attributed to their use of a new niche. Unlike all our native herons and egrets, which feed on fish, Cattle Egrets feed on insects in fields. But they are very adaptable, and recently while in Florida I found more than 3000 feeding ferociously on a garbage dump. Large bulldozers roamed over the surface, mashing and redistributing the garbage. Unlike the gulls that stayed a respectable distance from the large mashers, the egrets followed close by, as if the wheels were simply giant feet, exposing fresh food with each step. Their adaptation for feeding on garbage is awesome, for New Jersey alone has some 240 active "sanitary landfills." No longer need they even look for cows. Though far removed from Wildebeest and Buffalo on the African plain, bulldozers at dumps provide a readily available and dependable food supply throughout the year.

Ornithologists and conservationists, concerned for our native herons and egrets, began to study competition between Cattle Egrets and the native species. In the Gulf region and in Florida, Cattle Egrets often breed several months later than our native herons and egrets. Thus the early reports noted that Cattle Egrets did not compete with our native species for food and nest sites. But slowly we began to realize that heronries once filled with Snowy Egrets, Louisiana Herons, and Little Blue Herons were shifting to encompass more and more Cattle Egrets. Heronries that once contained only Little Blue Herons now are filled only with Cattle Egrets.

In the mid-1970s I began studying Cattle Egrets in New Jersey where they are still relatively rare, as they breed in only 7 of the 32 known heronries. Islajo Island, in the bay near Atlantic City, is the second largest heronry in New Jersey, second only to Stone Harbor. The dense stand of needs covering Islajo Island usually sways gently in the breezes and the smell of salt spray drifts through the vegetation, including the harsh poison ivy trees nestled in the higher, drier areas. In early March



Cattle Egrets normally follow cows, where the tramping of the animals' feet scares up insects for the egrets. Often two or three egrets follow beside each cow, fighting over who gets to walk in front.

PHOTOS BY AUTHOR



Adult Cattle Egret in full breeding plumage with buffy plumes cascading down his back.

when I first visited the island, the brown reeds seemed inhospitable, a cold breeze left frozen droplets on the leaves, and as I sat in my hide all day I wondered if birds ever broke the silence. A lone Black-crowned Night Heron settled in a few yards from my hide, awaiting other Night-herons and the warm, bright, sunlight. Two weeks passed, the breeze warmed, tiny green shoots began to appear, but still the Night-herons hunched silently in the reeds. And then, slowly, Great Egrets, Snowy Egrets, Glossy Ibises, Louisiana Herons, and Little Blue Herons arrived, until more than 1200 pairs bustled in

the marsh, defending nest sites, collecting nest material, and seeking mates. By late April the first nests swayed gently in the bushes, and lone birds chased all intruders while waiting patiently for their mates off foraging in the nearby bay. In early May the first Cattle Egrets arrived, but they did not hunt for their own nest sites among the unoccupied reeds. Instead they landed next to Snowy Egrets and Louisiana Herons that nested in the strong, protective poison ivy bushes. The Cattle Egrets aggressively sidled up to their nests, and fights erupted. The Louisiana Herons warded off these intruders, but often lost nest material or eggs in the process. Some Snowy Egrets, unaccustomed to such behavior, eventually left their sturdy nest locations, and moved to the edge of the colony. Other Snowy Egrets simply moved lower in the vegetation or built nests on the ground, eventually losing eggs and chicks to the rats that found low nests an easy source of food. Since by this time the safest nest sites were all claimed by other herons or egrets, the Snowy Egrets had to settle for places which were more vulnerable to strong winds as well as to predators.

Other Cattle Egrets who were not successful at stealing nests simply stole nest material. Some bold Cattle Egrets even removed sticks from beneath incubating Snowy Egrets with only a jab from the rightful owner. During the next heavy rain- and windstorm some of these weakened, Snowy Egret nests fell, while in others eggs tumbled between twigs and smashed to the ground. The Cattle Egrets laid eggs quickly and continued to steal nest material from the other herons and egrets rather than search for their own. They never



They have now taken to feeding on garbage dumps. In southern states they outnumber the gulls at dumps. They forage close to the bulldozer as if it were merely another cow.



Roaming in the garbage, they search furtively for garbage and the occasional insect.

really constructed proper, strong nests, but continued to add a twig now and again when the nest seemed too flimsy for the soft breezes. One Cattle Egret built a nest six inches from my hide, and seemed unaware of my comings and goings. I grew quite used to his calm stare and his occasional pecks at the string that tied my hide to the swaying branches.

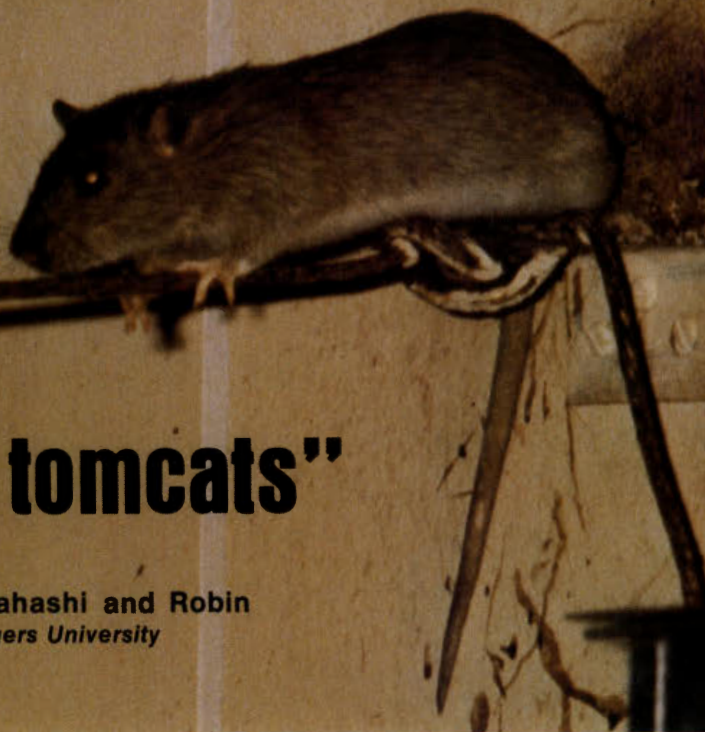
By late May the new green shoots have grown tall, completely hiding me as I pass silently beside nests to enter my hide. All around me egret and heron eggs are hatching, and the soft calls from the pipping eggs give way to the loud demands of hungry chicks. And still the Cattle Egrets harass the Snowy Egrets by continued pilfering of twigs. The breezes now are warm, and the gentle swaying of the reeds provides soothing music. The chicks creep slowly into the vegetation in the heat of the day, safe from the glaring sun and the gleaming eyes of avian predators who might glide over. Each chick claims a favorite hiding place, and predictably plunges there at the least sign of danger. The constant

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"Rats

bigger than tomcats"

By Richard Lore, Lorey Takahashi and Robin Palkovitz, Douglass College, Rutgers University



GEORGE L. WASSER

PHOTOGRAPHS BY THE AUTHORS AND GEORGE L. WASSER, N.J. Dept. of Health

***Rattus norvegicus* is the rat species responsible for most of our rat problems in New Jersey. These animals are heavy-bodied with blunt noses and short ears. Larger males seldom weigh more than a pound and their fur can vary in color from light grey to dark brown.**

Two years ago, a local zoning board was considering arguments for and against the expansion of a neighborhood supermarket. A landowner placed a small paper bag on the table and announced that he wished to have the bag's contents—a frozen rat body—entered as evidence. The board members gasped, became quite uncomfortable, and soon demanded that the bag be removed. For all we know, the bag may have contained stale jellybeans because no one volunteered to open it. Later, the still-unopened bag was locked in a safe as evidence, where the overpoweringly vile odor it produced eliminated our jellybean theory. Still, the bag's contents are unknown. According to the homeowner, the rat had not been taken from the supermarket but retrieved from his swimming pool. No one questioned the shakey assumption that the market was responsible for the uninvited pool guest. The board tabled its decision and at this writing, the supermarket's expansion is still undecided.

Organizations involved in producing or distributing anything remotely edible live in fear of this kind of disastrous publicity. A Maryland bakery learned the lesson the hard way when it was driven to the verge of bankruptcy after a housewife discovered a rat baked into a loaf of rye bread. Municipal authorities are equally reactive to reports of rats within their boundaries because nothing short of an earthquake makes as good copy for the local media. Our aversion to these

creatures is not entirely rational.

The term "rat" is not very meaningful since more than 500 different species belong to the genus *Rattus*. Most of these small rodents occupy limited ranges and are beneficial to man because they consume huge amounts of insects and weed seeds and are in turn a source of food for fur-bearing carnivores and predatory birds. In New Jersey and most other parts of the world with a temperate, moist climate the term "rat" usually refers to a single species with the Latin name *Rattus norvegicus*. The proper name has its origins in the mistaken belief that these animals originated in Norway. In truth, the Norway rat is an Asian native that colonized the rest of the world by hitching rides with humans.

In the eastern United States the same animal goes by a variety of common names. On the docks they are called "wharf" or "river" rats, while farmers refer to the same creature as the "barn" or "chicken" rat. You might also hear them called "cellar," "sewer" rats or just plain "brown" rats in urban locations. In any event, the animal in question is thick-bodied with short ears and a blunt nose. Its most unattractive feature is the hairless tail that is often 9 inches long in adult males.

Everywhere, you will hear something to the effect that, "Our rats are bigger than tomcats!" Don't believe it. Males rarely weigh more than a pound and the female is 20% smaller. What, then, accounts for the

wild exaggerations about size? Rats are most active during the early evening hours when viewing conditions are poor. Moreover, human encounters with rats are usually unexpected and frighten the observer. Size perspective under these conditions is poor and the likelihood of confusing rats with other creatures (e.g., tomcats, muskrats, woodchucks) is high. For all you disbelievers, we hereby offer a \$500 bounty for the first 3-pound *Rattus norvegicus* found in New Jersey and presented to us for a weight check.

The human population explosion has driven numerous animal species to extinction and sharply limited the range of many others. Yet Norway rats manage to thrive despite our fears and the elaborate exterminating technology our superior primate brains have developed to combat these animals. There is no single reason for their success. Like us, rats are generalists who adjust to a variety of environments. Again, like us, they learn quickly and are highly social animals that derive strength from group membership.

The feeding habits of Norway rats are determined by what is available. Our affluent but sloppy society provides abundant food in the form of edible garbage and overflowing warehouses that make easy pickings for rats. Do you keep farm animals or feed dogs and cats in your yard? What about food scattered on the ground for birds? If so, chances are good that you are also supporting rats.

If necessary, a local rat population is capable of learning some rather bizarre food-gathering skills. For example, rats living at a fish hatchery in West Virginia learned to feed on food thrown into the water for the fish. They are excellent swimmers and the hatchery rats were not above catching and eating fingerling fish. In Italy, rats have been observed feeding on shellfish in tidal areas. Italian biologists were amazed at how rapidly rats trapped in these locations could shuck clams. Isolated populations of rats living on islands often became specialists in stealing bird eggs and even learn to stalk and kill small birds.

The egg-stealing capabilities of rats are legendary. The grandfather of the senior author swore that he once watched two rats working as a team to haul eggs down the steps from a second-story roost in his barn. One rat was on his back with the egg held tightly to his stomach while his partner pulled him down the steps by his tail. But grandfather also made whiskey in that barn in eastern North Carolina and he was his own best customer; hence, maybe his report is not entirely reliable. However, this same tale has been told by farmers since the 13th century. Of course, animal experts dismiss these accounts as amusing legends because they cannot believe that rats are capable of this degree of teamwork. But then, animal experts don't spend much time in chicken coops. Rats will steal eggs by gnawing a small hole in the shell and hauling the egg away with their sharp incisors locked in the hole.

Food will not be eaten where it is found if shelter is not available. Instead, it will be carried to the nearest protected area or to the home burrow and eaten at leisure. In north Jersey, we found piles of steak bones among rubble and bushes 20 feet from a restaurant's

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GEORGE L. WASSER



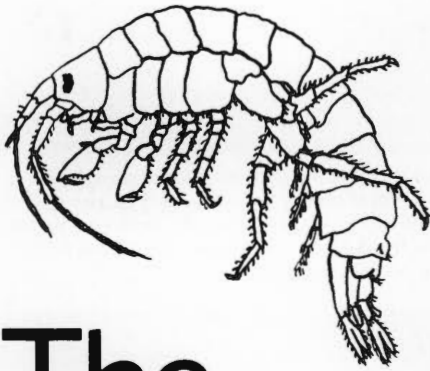
Rattus rattus or the "roof" rat, is another troublesome species but these animals are rare in New Jersey because they prefer warmer climates. Light and agile, roof rats are superb climbers. In 14th-century Europe, 25% of the human population died from bubonic plague carried by fleas on this species.



Three main entrance holes are clearly visible here, but the burrow system's emergency exits, or "bolt holes," are farther up the slope and difficult to detect.



One of 8 burrows located behind a central New Jersey supermarket. Tunnels (white strips), entrances (small circles) and two chambers (large circles) are visible in the photograph but one tunnel segment and another entrance on the other side of the fence are not visible.



The Shrimp Fly

BY MARY S. KUSS

Populations of freshwater shrimp occur in many of the lakes and streams in New Jersey and surrounding states. They are very sensitive to pollution, however, and require cool temperatures and high levels of dissolved oxygen. In waters where they are found, they constitute an important and highly preferred food item for trout and other fish species.

The most common genera of freshwater shrimp found in this area are *Gammarus* and *Hyalella*. *Gammarus* range up to 25 mm. (about 1 in.) in length, *Hyalella* up to 8 mm. (about five-sixteenth of an inch). They are sufficiently similar in appearance that the same fly pattern can be used to imitate both.

Numerous fly patterns have been devised to imitate shrimp in both fresh and salt water. The common Hare's Ear Nymph is often used with great success in waters harboring shrimp populations, but many an-

glers prefer a pattern that is more closely imitative of the characteristic shape of the shrimp. Each tyer should experiment with various materials and techniques until he or she finds a pattern that can be tied and fished with confidence. In this experimentation, keep in mind the principal features of the animal you seek to imitate: size, color, the characteristic curved shape of the body, its segmentation, the smoothness of the dorsal (back) surface, and the legs jutting out from the underside.

Shrimp imitations vary widely in complexity, the simplest consisting of nothing more than a dubbed fur body, the more complex styles utilizing latex or clear plastic sheeting and nylon monofilament in the construction of the body, often with strikingly realistic results. The pattern given here represents a compromise between these extremes. It is a fairly close imitation, without being overly difficult or time-consuming to tie. Few things are more disheartening to a fly tyer than to snag on the stream bottom and lose a fly that took 40 minutes to tie the night before.

This pattern is tied on the "English bait hook," which gives the finished fly a nicely curved body much like that of the natural. When purchasing this style of hook, always look before you buy to make sure that you are getting the size you want. For some reason, these hooks are about two or three sizes larger than the size number would suggest. A #16 English bait hook is about the same overall size as a #10 regular wet or dry fly hook.

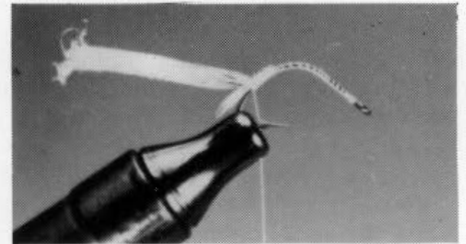
The fly may be weighted with lead wire under the body or not, according to the preference of the tyer. I prefer to use split shot on the leader when weight is needed. An unweighted fly is more versatile. It may be fished deep with the use of shot, or fished alone over a shallow weed bed. When fished deep, the unweighted fly rides up off the bottom slightly, resulting in fewer snags.

The color of live freshwater shrimp is highly variable from one time or place to another. The most common color is probably a greenish or brownish grey, but many other col-

ors have been noted including various shades of brown, cream, whitish, purple, greenish, bluish, and pink. Oddly, you will often find that a fly whose color appears to you to be a close imitation of the naturals in a certain stream will be less effective than a fly whose color appears radically different. Yellowish-cream or pink imitations, for instance, often work very well in waters where the naturals are grey. Again you must experiment. Here is the dressing for a pinkish shrimp:

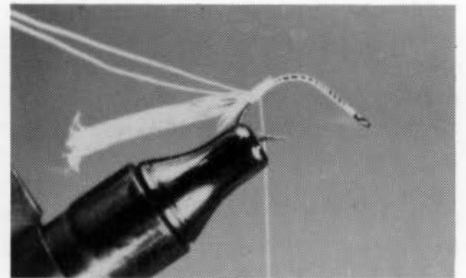
- Hook:** Mustad # 37140 or 37160, size 12-18
- Thread:** 6/0 pre-waxed nylon, yellow
- Tail:** Tip of segment of light turkey quill
- Shellback:** Light turkey quill
- Ribbing:** Same as tying thread
- Body:** Pinkish fox belly dubbing
- Legs:** Picked out body dubbing
- Feelers:** 3 or 4 cream hackle fibers (optional)

PHOTOS PROVIDED BY AUTHOR

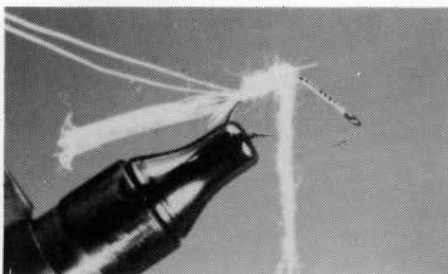


1. Place hook in vise, attach thread at eye, and wind back to tail position.

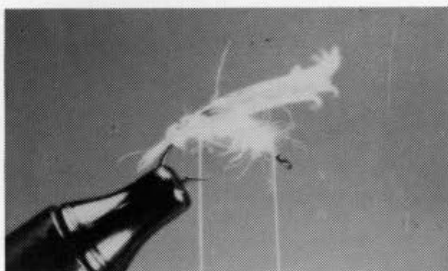
2. Tie in slip of turkey quill, using the tip to form a short stubby tail. Wind thread forward several turns over quill segment (perhaps one-third of the way up the hook shank), then double the quill back and wind the thread back over it again to tail position. In this way the thin, fragile tip portion of the quill segment is bound to the hook shank, leaving the more sturdy butt end to form the shellback.



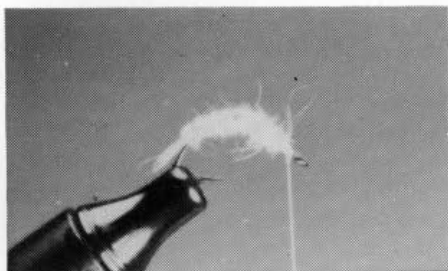
3. Form a loop of tying thread at the tail position and take several turns of thread over and around the base of the loop to secure and close it. This loop will be the ribbing. Leave it idle for now.



4. Apply lacquer to the entire hook shank, then dub a tapered body onto the working thread and wind forward.



5. Take the loop of ribbing thread and make one turn around the body, then pull the quill segment up over the back of the fly and take the next turn of ribbing over it and the body, binding it down. Continue to spiral the ribbing in evenly spaced turns over the body and shellback, keeping constant tension on the ribbing thread and adjusting the position of the quill segment as necessary to keep it centered on the mid-line of the fly.



6. When you reach the front of the body, bind down both ribbing and quill with the working thread and trim off excess. You may now finish off the fly with half-hitches or a whip finish, and go directly to step 8, or go to step 7 if you wish to add feelers.



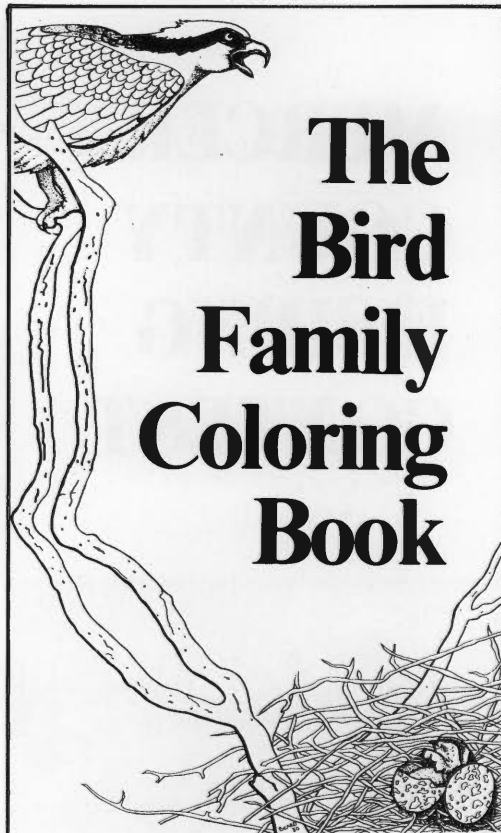
7. (optional) Invert fly in vise and tie on three or four cream-colored hackle fibers approximately one-third the length of the body. The butt ends of these fibers may be trimmed off or left on to further suggest legs. Tie off and lacquer head.



8. Remove fly from vise and use a needle to pick out some fibers from the underside of the body to suggest legs. Be careful not to get the needle under a loop of ribbing and pull it loose. Trim away all stray fibers from the sides and back of the fly. Finally moisten the shellback slightly with lacquer and stroke with a finger tip to achieve maximum smoothness and increase durability.

In streams, shrimp imitations are usually fished dead drift on or near the bottom. Concentrate your efforts around weed beds, if present, since weeds are a favorite habitat of shrimp. In streams where weed beds are not found, shrimp live among the rocks and detritus where they feed on algae and other organic material.

In lakes and ponds, shrimp also tend to concentrate around weeds. Cast to the edges of weed beds and allow the fly to sink as far as possible before beginning a very slow retrieve. Many strikes will occur as the fly is sinking, so stay alert and watch carefully the point where your leader enters the water. Respond quickly to any unnatural movement or change in sink rate. Tight lines! □



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MERCER COUNTY FISHING CONTEST



PHOTOS BY JOE SCHMELTZ



The third Saturday in June is a big day for the youngsters of Mercer County. Not because it's normally the day after school closes for the summer, but it's the day that the Mercer County Federation of Sportsmen's Clubs normally holds its annual fishing contest.

This will be the 14th year that the contest will be held at the Belle Mountain Ski Area Pond, rain or shine, and the fifteenth year of the modern day contest. The attendance started out between 100 and 200 youngsters and has grown each year. In 1980 there were 916 youngsters registered, plus some that did not—when you add on the parents, we had 2,000 people. Along with the 4,000 hot dogs, they consumed 350 dozen rolls, 12 halves of Draft Birch Beer, 18 gallons of Orange Drink, 7 gallons of relish, and 5 gallons of mustard.

This free contest is open to children living in Mercer County between the

ages of one year through 13 years of age. They bring their own equipment for the most part, but a can of worms or a cane pole can sometimes be found for that youngster who is short of equipment. No casting is allowed for safety reasons and Mom and Dad cannot assist junior except maybe to bait a hook.

Every child receives a prize. Those children not catching a fish are registered after the contest and go into the prize area also. Although the children are still allowed to fish after their first registration, there is only one prize allowed per person. The exception to this is with large prizes, when the child leaves the prize area, they are given a raffle ticket for a drawing for the major prizes. These consist of bicycles, large tackle boxes, and rods and reels, just to name a few. Children who didn't catch a fish have been known to go home with the largest prizes.

The object of the contest is to promote INTEREST IN FISHING and for the CHILDREN TO HAVE A GOOD TIME. The size of the fish may be important to Mom or Dad but to junior that "Bobber" dancing and going under means more than the size of the fish doing the pulling. Stocking of the pond is accomplished by moving 600 or so sunfish from Rosedale Park (under permit of course) and whatever fish DEP's Division of Fish, Game and Wildlife can extend.

None of this would come about without the cooperation of the 52 Sportsmen's Clubs affiliated with the

Mercer County Federation, whose members go out and collect prizes and donations from merchants and interested persons throughout the County under the direction of Roland Sparling, a founding father, and Dave Weaver. These gentlemen also coordinate the various groups associated with the contest such as the bow and arrow demonstration, the balloon distribution, and the setting up of the various food, beverage, and prize areas.

To try and name everyone who contributes annually would be folly, but special mention must go to: *The Trentonian* and sportswriter Herb Blackwell; Marty's Cycle Shop; Union First Aid and Rescue Squad, Titusville, who always have an ambulance and crew standing by, (it was needed only once when a child hurt himself in a noncontest related activity); Joe Nagren and Joe Varga, master fund raisers; "Red" Ayres—"The Cook"; and the Mercer County Park Commission for the following—use of the area, providing a truck and two men, in addition to the Park Police for security and traffic control, donating the trophies, and the stocking under the direction of Naturalist/Photographer Joe Schmeltz.

Anyone who wishes further information on setting up or conducting such an event, may write to Mr. Sparling at 50 Klein Avenue, Trenton, New Jersey, 08629, or call and leave a message at the Mercer County Park Commission (609) 989-6532, which will be forwarded. □



Environmental News

DROUGHT UPDATE

... Recent rains have helped, but not enough

When Governor Brendan Byrne issued Executive Order #104 on February 7, average stores of water in northeastern New Jersey reservoirs were hovering around the 21 percent mark, lower than they had fallen during the drought of the mid-1960's, and the outlook was grim.

The order continued rationing which had been in effect in 113 northeastern municipalities since September 27, 1980, and added rationing in central New Jersey areas served by the Elizabethtown Water Company and several other purveyors. The total of rationed towns became 192, and those under a ban on nonessential uses of water rose to 187. This includes communities in the Delaware River basin part of the state which had gone into the nonessential use ban phase a short while earlier, in line with interstate action of the Delaware River Basin Commission.



Paul H. Arbesman

Executive Order #104 also created the emergency post of Drought Coordinator, and named its first holder, Paul H. Arbesman, deputy commissioner of DEP. Donald T. Graham, DEP assistant commissioner for Natural Resources became Deputy Drought Coordinator. The Drought Coordinator reports directly to the Governor, and the Governor's Water Emergency Task Force in turn reports to Arbesman. Also in February, Governor Byrne named the Citizens' Water Emergency Advisory Task Force to muster expertise from outside of government. Dr. Saul Fenster, president of the New Jersey Institute of Technology, is chairman of the group.

NEW JERSEY OUTDOORS—MAY/JUNE 1981



By the end of January 40 billboards showing the last drop of water falling from a faucet and carrying the message, "Be Wise, Save Water. Not a Drop to Spare," were erected in Bergen, Essex, Hudson, Middlesex, Passaic, Somerset and Union counties as the first step in a public information campaign, organized by the Governor's office, to stress the importance of water conservation in the effort to stretch available water supplies. "An effective conservation effort demands the cooperation of every resident and every business in New Jersey," said Governor Byrne. (Billboard space was donated by the Eller Outdoor Advertising Company of Fairfield. The State assumed the costs for printing and posting the messages.)

The order also imposed bans against certain practices which had been permitted under policies set by the Water Emergency Task Force following the start of rationing last year. This included limited watering of golf course greens and outdoor tennis courts, and the filling of swimming pools.

On March 12, Graham signed regulations officially adding those earlier policies. This made it legal to fill a pool from purveyor's pipes (provided the necessary excess use charge is imposed in ration areas), as well as from private wells, and again permitted minimal greens and tennis court watering.

Arbesman explained that unusually heavy February rains, which had returned reservoir levels to two-thirds of normal, made it advisable to permit pool filling because of their potential use as sources of emergency firefighting and sanitary water should system failures occur later. He stressed also that marked declines in reservoir levels, and evidence that the state is headed into another year of drought, would lead to renewal of the February 7 bans.

Emergency pumping of 25 million gallons of water a day (MGD) from Lake Hopatcong into a stream leading to Jer-

sey City's Boonton Reservoir ceased on February 26 due to the ending of the planned 100-day pumping period. Equipment was left in place should it be necessary to resume later. Stopping at that time allowed the lake and its related aquifers to undergo recharging which occurs normally at that time of year. Pumping of 10 MGD from Lake Wawayanda to Newark reservoirs continued.

Early in March pumps were turned on in the Mount Hope iron mine, in Rockaway Township, to send another 3 to 4 MGD toward Boonton Reservoir. It was estimated that the mine contained about 400 million gallons of water.

A novel emergency water supply measure began in mid March with the start of construction of a 20 MGD, 24-inch pipeline across the George Washington Bridge. This will carry Delaware River water WEST across the Hudson River for injection into pipes of the Hackensack Water Company at Fort Lee. The water is to be drawn from the New York City aqueduct leading from upstate New York reservoirs in the Delaware River system. The 20 MGD meanwhile would be subtracted from New Jersey's daily quota from the Delaware.

Continued on page 16D

Commissioner's Spotlight on . . .



The Passaic River Basin Flood Management Program

Ironically, much of the northeastern section of New Jersey now subjected to water rationing because of the drought-induced water supply emergency is the same area—the Passaic River Basin—which historically suffers the most severe flooding in the state. Even as we concentrate our efforts to alleviate the water shortage, the work to find solutions to the flood problem goes on.



Susan Small, director of DEP's Passaic River Basin Flood Management Program, in the article below gives an overview of the situation

and stresses the importance of public participation in the development of an acceptable comprehensive flood control plan for the Basin area.

The Passaic River Basin includes 787 square miles in northeastern New Jersey and 148 square miles in southern New York State. The Passaic River and its tributaries flow through major portions of Bergen, Essex, Morris and Passaic counties and lesser parts of Hudson, Somerset, Sussex and Union counties in New Jersey as well as parts of Orange and Rockland counties in New York. Flood damage in Passaic River Basin communities has been estimated at more than \$48 million annually, representing the most serious flood problem in New Jersey. Extensive urbanization, industrialization and economic development in the flood plain has continued in recent years and has increased the flood damage potential in the event of another storm similar to those of 1968, 1971, 1972, 1973 and 1975.

Over the years the U.S. Army Corps of Engineers (Corps) developed plans for meeting the flood control and other water resource needs of the people of the Passaic River Basin but these failed to win public or political support because they relied on extensive structural solutions. The Corps then was directed

by Congress to survey a full range of nonstructural flood control alternatives in a new study.

A major element of the Corps new Passaic River Basin Study (Study) is public involvement in the planning process. This is where DEP's Passaic River Basin Flood Management Program (Program) steps in. The Program office, located at 1140 Bloomfield Avenue, West Caldwell, provides administrative support and serves as an information and communications center for the seven citizen groups—called Subbasin Coordination Groups—involved in the Corps Study. In recruiting members for the Subbasin groups, representation was sought from a broad range of Basin interests as well as municipal officials. DEP and the Corps jointly sponsored orientation meetings with each group in November and December (1980) and a Basinwide meeting of all groups is slated for May.

Contributing to the difficult task of developing a comprehensive flood plan is the diversity of interests within the Basin. For example, business, industrial and real estate interests often disagree with environmentalists regarding an approach to flood control; flood victims do not necessarily hold unanimous agreement on acceptable solutions to their plight; municipalities already at the peak of their development do not share the land use and flood control goals of towns in less developed areas; towns are faced with the conflict between the need for zoning regulations to achieve environmental goals and the pursuit of valuable ratables which are attracted by liberal development policies; and elected officials strive to make decisions which meet the unified needs of all their constituents.

The solution depends upon the development of a plan which is publicly and politically acceptable to the people of the Passaic River Basin. This can be accomplished through the involvement of the people in the planning process itself.

The Passaic River Basin Study will identify flood control and other water resource needs. It will develop alternate plans for their solution. Ultimately, one plan will be chosen for recommendation to Congress. The scheduled completion date of the Study is March 1985. □

MARINE POLICE TO BE UNIT OF STATE POLICE

In accordance with Chapter 96, Public Laws of 1980, the Marine Police force will be transferred from DEP's Division of Coastal Resources to the Department of Law and Public Safety's Division of State Police. The effective date of the change is July 1. □



FRANK J. MARKEWICZ ACTING STATE GEOLOGIST

Frank J. Markewicz of Chester (Morris County) has been named acting state geologist of the New Jersey Geological Survey, a unit within DEP. A career employee, Markewicz entered state service in 1953 as an assistant geologist and rose through the ranks to his present position. A specialist in economic geology, Markewicz through his research and field study is credited with the discovery of ilmenite deposits near Lakehurst and sand and gravel deposits near Plainsboro. These have resulted in the establishment of plants to mine the materials. In addition, he discovered an important zinc-lead mineralized zone near Lafayette. Before joining the state, he worked in private industry and with the U.S. Geological Survey in Alaska and California. Markewicz received his degree in Geology/Economics from Upsala College. □

CANOEISTS, TAKE NOTE!

DEP has published a new brochure on canoeing in the million-acre Pinelands region. The foldout, color brochure, *Canoeing the Pinelands Rivers*, is printed on water-resistant paper stock. The guide highlights those major Pinelands rivers accessible by canoe and contains a map showing the principal access points to each. Locations are given for many of the historic sites and other points of interest found along the region's waterways. The brochure contains information that will be helpful to both novice and experienced canoeists, such as trip planning and facts about Pinelands rivers canoeing. The brochure is available from DEP, State Parks Service, P.O. Box 1420, Trenton 08625. □

VACATION PLANNING GUIDE

The popular parks/forest color, fold-out brochure entitled *New Jersey Invites You to Enjoy Its—State Forests, Parks Natural Areas, Marinas, Historic Sites, Wildlife Management Areas*, also may be obtained by writing to the State Park Service. □



D.E.P.

Park development, D & R Canal



D.E.P.

Parks development, Monmouth Battlefield



D.E.P.

Harbor Cleanup, Exchange Place, Jersey City



T & M ASSOCIATES, INC.

Construction of wastewater treatment facilities under the Sewerage Construction grant program has resulted in cleaner waters and thousands of construction and related jobs.

DEP CAPITAL PROJECTS

The New Jersey Department of Environmental Protection, created by law in 1970, has remained steadfast in its efforts to make New Jersey a better place to live and work, for present and future generations, through the protection, conservation, preservation and restoration of our natural resources. Although the enforcement of rules and regulations promulgated by the state and federal governments is vital to the effort to solve certain environmental problems, the answers to others are found in the massive employment of capital funds.

The pipes and bricks in the "Green Sheet" logo represent the capital projects aspect of DEP's responsibilities. This "Green Sheet" not only explains where the money comes from but also where the money goes (current projects listed below).

New Jersey voters, recognizing the need for capital-intensive solutions to solve specific environmental problems, have approved several bond proposals: The 1969 Water Conservation Bond Act, the 1976 Clean Waters Bond Act, the 1977 Beaches and Harbors Act, the 1978 Emergency Flood Control Bond Act, the 1971, 1974, and 1978 Green Acres bond acts, and the 1980 Natural Resources Bond Act. These bond acts authorize a total of \$1.1 billion. The \$630 million obligated to date from these bond funds have levered \$1.7 billion in federal money. Local matching grants to date total \$470 million. Thus, over the past 11 years, nearly \$3 billion has been invested in the improvement of New Jersey's environment through DEP's capital programs.

STATE DEVELOPMENT PARKS, FORESTS, AND FISH & GAME LANDS

D-Design C-Construction P-Planning

Project	Type	Project Cost
Monmouth Battlefield—Historic and Recreational Facilities	D	\$ 250,000
Liberty State Park—Peninsula Dredging	C	1,426,000
Sanitary Facilities—Stokes, Voorhees, Round Valley and Cheesquake	D	235,000
Administrative/Maintenance Facilities—Cheesquake, High Point, Atsion Lake, Frank S. Farley Marina, and Parvin	D	280,000
Day Use Facilities—Lebanon	D	200,000
Historic Sites Restoration—Rockingham, Indian King Tavern, Wawayanda, Allaire, Fort Mott	D	145,000
Day Use Facilities—High Point	D	50,000
Delaware and Raritan Canal	D	50,000
Dam Repairs—Lake Hopatcong	D	25,000
Park Access Program	C	3,000,000
Liberty State Park—Environmental Education Center	D	938,000
Liberty State Park—North Embankment Site Work	C	1,849,000
Liberty State Park—Phase III Terminal Restoration	D	3,500,000
Liberty State Park—Marine Walk Black Tom	D	125,000
Liberty State Park—Interpark Roadway	D	125,000
Liberty State Park—Demolition of Remaining Structures	D	525,000
Liberty State Park—Seawall Schematic Design—Port Authority	D	900,000

(Continued)

Project	Type	Project Cost
Administrative/Maintenance Facilities—Lebanon and Island Beach	D	2,660,000
Batssto Visitor Center	D	900,000
Allaire Visitor Center	D	1,300,000
Twin Lights Historic Site	D	485,000
Pequest Trout Hatchery	C	9,350,000
Pequest Access Road	D	1,500,000
Round Valley Fisherman Access	D	240,000
Kingwood Fisherman Access	D	35,000
Mad Horse Creek Fisherman Access	D	142,000
Sanitary Facilities Improvements—Washington Crossing, Stokes, Spruce Run, Bulls Island, Wharton	D	1,198,000
Ringwood—Shepherd Lake Bathhouse Complex	C	1,900,000
Ringwood—Shepherd Lake, Lake Front Facilities	C	450,000
Wawayanda Access Road	C	2,700,000
Wawayanda Office Maintenance Complex	C	800,000

SHORE PROTECTION

Project	Type	Construction Cost
Aberdeen Township—Beachfill	D	\$1,200,000
Neptune City—Beachfill	D	108,000
Fort Mott State Park	D	500,000*
Middletown Township—Stone Seawall	D	800,000
Sea Isle City—4 Stone and Timber Groins	D	800,000
North Wildwood—Stone Seawall	D	1,200,000
Asbury Park—Rehabilitate Groin	D	450,000
Cape May City—Rehabilitate Seawall	D	600,000
Aberdeen Township—Fossil Exposure	D	150,000
Carney's Point Township—Revetment	D	500,000
Sea Isle City—Sand Dune Stabilization	D	30,000
Keansburg Flood Gate	D	100,000*
Longport—Rehabilitate Seawall	D	800,000
Storm Damage—October 25, 1980		
Sea Isle City—Beachfill	D	700,000
Upper Township—Beachfill	D	1,400,000
Shark River—Bulkhead	C	440,061*
Ocean County—Bulkhead	C	306,550
Beach Haven—Bulkhead	C	90,000

*100% State Funds

WATER SUPPLY

Project	Type	Project Cost
Perdicaris Place Waste Gate—Rehabilitation	D	\$ 20,000
US 1 Storm Water Bypass—Mapping	P	850
Sullivan Way Aqueduct—Rehabilitation	D	48,060
Hackettstown Reservoir—Engineering Analysis	D	330,000
Manasquan Reservoir—Mapping	D	38,000
South Branch Rockaway Creek—Discharge Improvements	D & C	580,000
Spruce Run—Round Valley Dams— Rehabilitation	D	400,000
Raritan Confluence Reservoir—Force Main and Pump Station Study	D	218,896
US Route 1 Conduit Cleaning	D	717,000
Shipetaukin Creek Culvert	D	819,000
Elizabethtown—Newark Interconnection	D	15,000,000
Improvement at Passaic Valley Treatment Plant	D	1,000,000
George Washington Bridge Interconnection	D	2,000,000
Fairlawn Avenue Interconnection	D	3,000,000
Design of Raritan—Passaic Pipeline	D	4,000,000

DREDGING

Project	Type	Construction Cost
Shark River—Back Channel	D	\$450,000
Hereford Inlet	D	500,000*
Townsend Inlet	D	500,000*
Spicers Creek	D	350,000
Long Reach Thorofare	D	450,000*
Waackaak and Thorns Creeks	D	425,000

*50/50 Cost Shared with Local Municipality

HARBOR CLEANUP

Project	Type	Estimated Cost of Constuction
Exchange Place, Jersey City	D	\$1,700,000
Jersey City	P	975,000
Hoboken	P	2,100,000
Elizabeth	P	1,800,000

SEWERAGE CONSTRUCTION GRANTS

Grantee	Description	Project Amount
Mt. Holly S.A.	Treatment plant expansion	C 13,490,063
Ocean County U.A.	Interceptor	C 9,642,500
Hamilton Twp.	Interceptor	C 6,680,000
Cape May Co. M.U.A.	Treatment plant	C 19,468,620
Trenton City	Interceptor	C 8,314,843
Camden Co. M.U.A.	Treatment plant	C 11,933,640
Lambertville S.A.	Treatment plant expansion	C 4,552,129
So. Toms River	Collection system	C 3,324,208
Barnegat Twp.	Collection system	C 2,956,219
Stafford M.U.A.	Collection system	C 7,157,657
Parsippany-Troy Hills	Advanced treatment	C 27,046,000
Morristown Town	Treatment plant modifications	C 3,519,112
Berkeley Hts. Twp.	Treatment plant	C 8,824,200
Bergen Co. U.A.	Treatment plant expansion	C 60,665,800
Rockaway Valley S.A.	Interceptor	C 24,242,746
Ewing-Lawrence S.A.	Treatment plant additions	C 12,393,706
Sussex County M.U.A.	Regional system	C 5,570,000
Warren County U.A.	Regional system	C 2,752,306
Warren County U.A.	Regional system	C 3,801,709
Northwest Bergen Co. S.A.	Interceptor	C 10,203,828
Bridgewater Twp.	Interceptor	C 4,063,036
Middlesex Co. U.A.	Interceptor	C 116,500,000
Rahway Valley S.A.	Sludge facilities	C 4,165,615
Linden-Roselle S.A.	Sludge facilities	C 3,859,898
Passaic Valley Sew. Comm.	Sludge facilities	C 9,471,000
Middletown Twp. S.A.	Sludge facilities	C 4,485,977
Wayne Township	Treatment plant modification	C 20,250,559
NE Monmouth Co. Reg. S.A.	Sludge facilities	C 2,264,513
Franklin Borough	Interceptor	C 5,855,645
Bridgewater Twp.	Interceptor	C 2,692,265
Secaucus Town	Interceptor	C 9,616,917
Oxford Twp.	Collection system	C 2,217,759
No. Plainfield	Collection system	C 1,923,041
Ramsey Borough	Collection system	C 7,258,754
Belvidere Town	Collection system	C 2,405,913
Randolph Twp.	Collection system	C 218,660
Parsippany-Troy Hills	Collection system	C 10,031,122
Bridgewater Twp.	Collection system	C 2,692,265
Wall Twp.	Collection system	C 5,690,122
Monroe Twp. M.U.A.	Collection system	C 9,143,504
Bridgewater Twp.	Collection system	C 12,392,859
Passaic Valley Sew. Comm.	Plant upgrading	C 386,000,000
Burlington Twp.	Facilities plan	P 467,051
Moorestown Twp.	Facilities plan	P 355,926
Northwest Bergen Co. S.A.	Facilities plan	P 530,000
Manchester Twp.	Facilities plan	P 65,903
Cape May Point	Facilities plan	P 33,600
Florham Park S.A.	Facilities plan	P 211,650
Edgewater Borough	Facilities plan	P 351,787
Pequannock River S.A.	Facilities plan	P 17,663
Camden County M.U.A.	Facilities plan	P 1,527,819
Jackson Twp. M.U.A.	Facilities plan	P 58,923
Roosevelt Borough	Facilities plan	P 59,344
Pine Beach Borough	Facilities plan	P 44,571
Oakland Borough	Facilities plan	P 238,160
Rockaway Twp.	Facilities plan	P 192,804
Woodstown S.A.	Facilities plan	P 57,000
Pompton Lakes M.U.A.	Facilities plan	P 279,751
Jefferson Twp.	Facilities plan	P 268,765
Willingboro Twp.	Facilities plan	P 436,775
Monmouth County	Facilities plan	P 304,420
East Brunswick S.A.	Facilities plan	P 219,051
Warren County U.A.	Facilities plan	P 79,916

Grantee	Description	Project Amount
Western Monmouth U.A.	Facilities plan	P 157,890
Wyckoff Twp.	Facilities plan	P 156,448
Upper Millstone Group	Treatment plant expansion	D 578,899
Cape May Co. M.U.A.	Regional system	D 705,449
Stony Brook Reg. S.A.	Treatment plant	D 488,652
Hudson County S.A.	Regional system	D 8,885,000
Keansburg M.U.A.	Collection system	D 335,029
Hudson County U.A.	Regional system	D 2,075,000
Hudson County U.A.	Regional system	D 4,100,000
Carteret Borough	Interceptor	D 516,800
No. Haledon Borough	Collection system	D 824,345
Manville Borough	Collection system	D 912,463
Old Tappan Borough	Collection system	D 387,423
Cape May County M.U.A.	Regional system	D 400,517
Ringwood Borough	Collection system	D 996,024

1978 GREEN ACRES LOCAL DEVELOPMENT GRANTS

Urban grants:

Applicant	Project	Grant Amount
Atlantic City	Uptown Park Complex	\$ 175,000
Bergenfield Boro	Vivven Fields	85,000
Cliffside Park Boro	Cliffside Athletic	380,000
Hackensack City	Carver Park	137,500
Lodi Borough	Lodi Memorial Park	1,200,000
Rutherford Borough	Memorial Field Lighting	41,000
City of Camden	8th & Thurman Parks	285,000
City of Camden	9th & Ferry	45,000
Cherry Hill Twp.	Cherry Hill E. Tennis Centers	143,000
Gloucester City	Three Corner Park	24,500
Maplewood	DeHart Park	234,500
Nutley	Owens/DeMuro	170,000
South Orange	Waterlands Park	327,000
West Orange	Tennis Rehabilitation Project	37,500
Union City	Multi-Service Park	175,000
Trenton	Marine Terminal Park	331,000
Carteret Boro	Carteret Park	96,000
Edison Twp.	Central Ave. Park— Phase II	1,200,000
Jamesburg	K of C Park	60,000
Perth Amboy	Chamberlain Park	15,000
Keansburg	Collins Field Ballpark	40,000
City of Passaic	Col. Johnson Park	21,176
Somerville Boro	Vanderveer Rec. Area	98,000
Union County	Rahway Pool	235,650
City of Elizabeth	Jefferson Park	62,000
Linden	Memorial Park	694,500
Plainfield	Madison Ave./Hannah Atkins	19,000
Rahway	Brennan Field	85,000
Phillipsburg	Delaware River Park	337,400

Non-Urban grants:

Buena Vista Township	Cedar Ave. Park	21,000
Leonia Borough	Highwood Hills Park	25,000
Bordentown Township	Central Com. Park	499,000
Burlington City	Riverfront East	445,000
Burlington Township	Assiscunk Creek Park	620,750
North Hanover Township	North Hanover Park	150,000
Berlin Borough	Centennial Sq. Mini-Park	8,500
Hi-Nella	Ballfield Improvement	31,000
Middle Township	Goshen Road	52,700
Fairfield Boro	Combee Tract	475,000
Livingston	Fitness Trail	7,000
Gloucester County	Bethel Mill Park	694,800
Monroe Township	Earl E. Owens Field	100,000
Mercer CPC	Central Park Boating Facility	500,000
South River	Varga Park	167,000
Belmar Boro	Marina Park	68,000
Marlboro Township	Municipal Park Complex	475,000
Rumson Boro	Meadow Ridge Park	391,500

Applicant	Project	Grant Amount
West Long Branch	Wall St./Monmouth Natural Area	145,500
Morris CPC	Silas Condict Park	400,000
Chatham Boro	Shepard Kollock Park	267,500
Hanover Township	Malapardis Park	260,500
Riverdale Boro	Post Lane Recreation Area	125,000
Washington Township	Sandt Tract	116,000
Wanaque Boro	Memorial Park	100,000
West Milford Township	Browns Point Park	15,000
Andover Township	Lake Iliff	116,500
Byram Township	C.O. Johnson Park	70,000
Hamburg Boro	Hamburg Park	35,000
Clark Township	Bartell Place Park	40,000

1974 LOCAL GREEN ACRES DEVELOPMENT PROGRAM

Applicant	Project Name	Grant Amount
Absecon City	Pitney Road Park	\$ 56,500
Atlantic City	Multi Parks	160,500
Brigantine City	S. End Rec. Complex	50,500
Hamilton Twp.	Harding Lakes Rec. Facility	6,000
Hammonton Town	Cedar Branch Park	30,000
Margate City	Huntington Ave. Mini Park	37,500
Pleasantville City	Leeds Avenue Park	21,500
	Neighborhood Parks	23,500
Englewood City	Mackay Park	948,000
	Flat Rock Brook	179,000
Fairview Boro	Municipal Rec. Facility	268,000
Glen Rock Boro	Memorial Park	167,000
Lodi Boro	Lodi Memorial Park	115,000
Montvale Boro	Chestnut Memorial Park	172,000
Oakland Borough	Oakland Park	25,000
Bordentown Twp.	Northern Comm. Park	391,500
Moorestown Twp.	Stanwick Park	81,500
Mt. Holly Twp.	Ironworks Park	60,000
Camden County	Pyne Poynt/Dudley Grange	425,000
Camden County	Waterfront Park- Phase I & II	4,000,000
Camden City	Multi Parks	550,000
	Johnston & Butler Mem. Park	37,500
Haddon Twp.	Crystal Lake	13,500
Lawnside Boro	Lawnside Rec. Complex	200,000
Cape May City	Physick Estate	194,500
N. Wildwood City	Delaware Ave. Park	290,000
Bridgeton City	Bridgeton City Park	321,500
Greenwich Twp.	Municipal Tennis Courts	11,000
Essex County	West Side Park	837,500
	Branch Brook Park	2,000,000
Belleville Town	Belleville Rec. Complex	118,000
Caldwell Boro	Kiwanis Oval	30,000
Cedar Grove Twp.	Bowden Pond Rec. Area	37,500
Newark City	St. Peter's Park	712,000
	Ironbound Park	126,000
	R6 Park	800,000
	Hayes West Pool	400,000
S. Orange Village	Cameron Field/Meadowland Park	205,000
Deptford Twp.	Community Rec. Area	335,500
	ICYA Park	75,000
Hudson County	Park Improvements	800,000
Bayonne City	Kill Van Kull II	1,000,000
Hoboken City	New Parks	212,500
Jersey City	Van Vorst/Hamilton	300,000
	Lafayette Street Park	200,000
	Country Village Park	35,000
	Multi Parks Project	97,500
Union City	Roosevelt Stadium	158,000
Weehawken Twp.	Parks Improvement Project	35,500
Clinton Twp.	Round Valley Park	81,500
Readington Twp.	Recreation Site	66,000
Mercer County	Central Park	780,000
	Central Park	1,220,000
Hamilton Twp.	Hamilton Park	1,000,000

(Continued)

Applicant	Project Name	Grant Amount
Ewing Twp.	Hollow Brook Locker Facility	37,500
Lawrence Twp.	Central Pk. Soccer Field	22,000
	Colonial Lake Park	623,000
Princeton Boro	Bike Path	14,500
Trenton City	D & R Canal	1,000,000
Middlesex County	Wm. Warren County Park	1,007,500
Edison Twp.	Central Ave. Park	288,500
Metuchen Boro	Kentnor Park	42,000
Old Bridge Twp.	Lawrence Harbor Park	30,000
Perth Amboy City	Waterfront Park	800,000
Piscataway Twp.	Columbus Park	362,500
Sayreville Boro	Kennedy Park	977,500
Belmar Boro	Three-Acre Park	122,500
Eatontown Boro	Walcott Park	245,000
Freehold Twp.	Georgia Road Park	469,000
Highlands Boro	Snug Harbor	30,000
Howell Twp.	Echo Lake Park	73,000
Keyport Boro	Cedar Street Park	90,000
Marlboro Twp.	Nolan/Marlin Park	51,000
Millstone Twp.	Sweetmans Lake Park	56,000
Ocean Port Boro	Main Street Park	176,000
Tinton Falls Boro	Hockhockson Road Park	25,000
Morris County	Hedden Park	650,000
	Patriots Path	9,000
Hanover Twp.	Patriots Path	34,500
Morris Twp.	Patriots Path	25,000
Morristown Town	Burnham Pk Swimming Complex	478,000
Par.-Troy Twp.	The Knoll	721,500
Randolph Twp.	Brundage Park II	200,000
Rockaway Twp.	Lake Ames Park	138,000
Barnegat Twp.	Lower Shore Road Park	77,500
Berkeley Twp.	Township Recreation	860,000
	Golf Course	470,000
	Winding River Park	1,985,000
Jackson Twp.	Hulse Road Rec. Area	53,500
Ocean County	Cattus Island Park	322,500
Passaic County	Garrett Mt. Rec. Area	500,000
Clifton City	Albion/Robin Hood Park	37,500
Passaic City	Pulaski/Dundee Park	175,000
	Second Ward Park	187,000
Paterson City	Great Falls	1,050,000
W. Paterson Boro	Rose Place Park	350,000
Mannington Twp.	Fenwick Rec. Area	17,000
Somerset County	Public Tennis	122,000
Bound Brook Boro	Middle Brook Park	66,000
Franklin Twp.	Quarry Park	103,000
Hillsboro Twp.	Docherty Memorial Park	175,000
Montgomery Twp.	Burnt Hill Tennis Courts	75,000
Union County	Mattano Park	372,000
Hillside Twp.	Central Ave Park	237,000
Plainfield City	Tract 19 Recreation Area	425,000
Scotch Plains Twp.	Village Green Park	75,000
Union Twp.	Bicentennial Park	342,500
Westfield Town	Brightwood Park	191,500
Washington Boro	Washington Park	250,000
Mansfield Twp.	Tennis Project	25,000

HISTORIC PRESERVATION GRANTS

Projects	Grantee	Grant Amount
The Hermitage—Restoration	Friends of the Hermitage	\$ 75,000
Second Reformed Dutch Church—Acquisition	Ironbound Education and Cultural Center	50,000
Twin Lights—Restoration	NJDEP—Bureau of Parks	132,500
Lucy, The Margate Elephant—Restoration	Save Lucy Committee	48,000
Barclay Farm—Restoration	Township of Cherry Hill	18,000
James Street Commons Historic District—Rehabilitation—54-56 James Str., 82½-84 University Str.	Newark Housing and Redevelopment Corp	42,000
William Clark House—Restoration	North Ward Education and Cultural Center	96,826

Applicant	Project Name	Grant Amount
Cathedral of the Sacred Heart—Preservation	Archdiocese of Newark	46,764
Philadelphia and Reading Railroad Freight Station—Rehabilitation	City of Trenton	100,000
Oxford Furnace—Stabilization	NJDEP—Bureau of Parks	22,000
The Hermitage—Structures Report	Friends of the Hermitage	11,000
Greenwich Historic District—Restoration—Richard Wood Store	Mrs. Richard Wood	41,500
James Street Commons Historic District—Stabilization—Lloyd House	Newark Preservation and Landmarks Committee	4,500
St. James A.M.E. Church—Stained Glass Restoration	St. James A.M.E. Church	9,835
Old Bridge Historic District—Rehabilitation Simpson Methodist Ch.	Township of East Brunswick	42,000
Mill Hill Historic District—Rehabilitation—205 East Front Street	City of Trenton	111,000
State House Historic District—Rehabilitation—186-196 West State Street	New Trenton Corp	57,000
Delaware and Raritan Canal—Preservation—Canal House	City of Trenton	12,000
Cape May Historic District—Restoration—Physick Estate	City of Cape May	16,200
Great Falls of Paterson S.U.M./Historic District—Rehabilitation—Ivanhoe Sheelhouse	City of Paterson	17,000
Old Eagle Tavern—Restoration	City of Trenton	60,000
Delaware and Raritan Canal—Rehabilitation—Port Mercer Canal House	Lawrence Historical Society	6,000
Pomona Hall—Restoration Phase IV	City of Camden	50,000
Allaire Study—Structures Report, Plans and Specs	NJDEP—Bureau of Parks	15,000
Ambrose/Ward Mansion Study—Structures Report	City of East Orange	10,000
178-184 Edison Place Study—Plans and Specs	Ironbound Education and Cultural Center	30,000
Fort Mott Study—Structures Report, Plans and Specs	NJDEP—Bureau of Parks	17,500
Majestic Theater Study—Structures Report	Stinchcomb and Merkelson, Inc.	12,000
Old Barracks Study—Structures Report	Old Barracks Association	10,000

1978 EMERGENCY FLOOD CONTROL

Project	Grantee	Grant Amount
Construction of stormwater detention basin; Moses Creek	Borough of Roselle Park	\$ 71,180
Construction of a stormwater detention basin; Tributary of Rockaway River	Township of Rockaway	80,965
Channel Improvements; Overpeck Creek	City of Englewood	534
Construction of a detention basin and channel improvements; Branch of Rahway River	Township of Cranford	1,000,000
Construction of a stormwater retarding basin and channel improvements; Rahway River Basin	County of Union	1,256,983
Detention Basin, Channel Improvements and Culverts; Ireland Brook	County of Middlesex, Board of Chosen Freeholders	831,250
Channel Improvements; Canoe Brook	Township of Livingston	650,000

Brendan Byrne
Governor

Jerry Fitzgerald English
Commissioner

FREE ENTERTAINMENT IN 26 STATE PARKS

This summer the New Jersey State Council on the Arts and the Department of Environmental Protection will present free performances of mime, theatre, dance, music and puppet shows on a regular schedule (below) at 26 state parks/forests. A flag carrying the picture of a butterfly will be raised on performance day at the parks . . . watch for it! Specific program information will appear in local newspapers.

Allaire—Alternating Saturdays,
beginning July 4 2:00 PM and 7:00 PM
Atsion—Tuesdays 1:00 PM
Bass River—Fridays 7:00 PM
Batsto—Sundays 1:00 PM
Belleplain—Saturdays 8:00 PM
Cape May Point—Sundays 2:00 PM
Cheesequake—Tuesdays 2:00 PM
Fort Mott—Wednesdays 1:00 PM
Hacklebarney—Saturdays 2:00 PM
High Point—Sundays 3:00 PM
Hopatcong—Tuesdays 2:00 PM
Island Beach—Mondays 1:00 PM
Lebanon—Saturdays 7:00 PM
Liberty—Saturdays 2:00 PM
Monmouth Battlefield—July 11
Parvin—Tuesdays 1:00 PM
Ringwood—Fridays 2:00 PM
Round Valley—Tuesdays 2:00 PM
Farley State Marina—Sundays 4:00 PM
Spruce Run—Thursdays 1:00 PM
Stephens—Saturdays 7:00 PM
Stokes—Fridays 7:00 PM
Swartswood—Fridays 7:00 PM
Washington Crossing—Holidays
(5/25, 7/4, 9/7) 1:00 PM
Wawayanda—Tuesdays 2:00 PM
Worthington—Saturdays 7:00 PM

CAMPSITE RESERVATIONS AT STATE PARKS/FORESTS

Though general camping information pamphlets are available from DEP's Division of Parks and Forestry, Box 1420, Trenton 08625, NO RESERVATIONS ARE HANDLED BY THE TRENTON OFFICE. All arrangements should be made through the park or forest office in charge of the campsites desired.

For specific information about cabins, shelters, campsites, lean-tos, group camping and application forms for reservations at a particular campground, write directly to that park/forest area office as follows:

Northern New Jersey Locations: Bull's Island section of Delaware and Raritan State Park (SP), R.D. #1, Box 4, Canal Rd., Belle Mead 08502; High Point SP, R.R. #4, Box 287, Sussex 07461; Jenny Jump State Forest (SF), Box 150, Hope 07844; Round Valley SP, R.D. #1, Round Valley Rd., Lebanon 08833; Spruce Run

Continued on page 16D



PLEASE KEEP OFF THE BEACHGRASS. A little-known beachgrass is playing a large role in preserving one of New Jersey's prime tourist attractions—the shore. A variety of American beachgrass called "Cape" was planted in massive quantities last summer to keep sand dunes along the coast from being washed or blown away during wind and rain storms. Cape grass, developed by the U.S. Department of Agriculture's plant center at Cape May Courthouse and tested in selected Atlantic coastal state areas for several years, has stronger roots to hold down the sand and broader leaves to help prevent the raindrops from pounding down into the dunes. Though Cape grass grows more vigorously than earlier types, it is easily killed by being walked on or smothered by blankets thrown over it. Vacationers are urged to "keep off the beachgrass" to allow it to flourish. Roy Atkinson, seed certification chief of the N.J. Department of Agriculture's Division of Plant Industry, stressed that without the beachgrass, much of New Jersey's beaches would be destroyed. (Above, Cape grass plantings in Avalon.)



LIFEGUARDS, TRAINED AND READY. All state-administered swimming areas are served by lifeguards who had to pass a difficult series of performance tests at the various facilities, and who must take part in a summer-long program of physical conditioning, first aid and water safety. The scene above was taken at Wawayanda State Park, one of the 15 inland bathing spots that will open for the 1981 season on May 23. The two oceanfront areas will open three weeks later, June 13, when the water temperature becomes more comfortable.

Here's the list, by county, of state-operated facilities with swimming areas: Inland: BURLINGTON—Atsion Recreation Area in Wharton State Forest (SF), Bass River SF, Lebanon SF; CAPE MAY—Belleplain SF; HUNTERDON—Round Valley State Park (SP), Spruce Run SP; MIDDLESEX—Cheesequake SP; MONMOUTH—Prosperatown Recreation Area; MORRIS—Hopatcong SP; PASSAIC—Shepherd Lake in Ringwood SP; SALEM—Parvin SP; SUSSEX—Stokes SF; High Point SP, Swartswood SP, and Wawayanda SP. Oceanfront: OCEAN—Barnegat Lighthouse SP and Island Beach SP.

NATURE PHOTOGRAPHY CONTEST ANNOUNCED

The Northeast Natural Science League, a nonprofit environmental organization, recently announced the sponsorship of its third annual natural science photographic competition. The deadline for entries is June 15, 1981.

Photographs must be taken anywhere in the thirteen state area of the Boston-Richmond megalopolis (Virginia to Maine), and may be of either nature subjects on earth or phenomena of the sky and space. In other words, subjects may range from salamanders to stars. Color slides, color prints, and black and white prints will be included. A total of five slides and/or prints may be entered by each participant.

The winners of the four major divisions—FAUNA, FLORA, ENVIRONMENT, and ATMOSPHERE & SPACE—will be awarded engraved plaques while those placing first, second, third and honorable mentions in the eight subdivisions will receive certificates of merit. A selection of the winning photographs will become the basis of an exhibit to be circulated to various institutions in the northeast.

The winners will be selected by a panel of judges at Princeton University during the week of June 20th. All photographers, young and old, amateur and professional, are welcome to enter. For entry forms and complete details send a stamped, self-addressed envelope to the Northeast Natural Science League, P.O. Box 427, Peapack, New Jersey 07977.

Continued from page 16A

DROUGHT UPDATE

Water is scheduled to begin flowing through the pipe May 1.

Rejection by federal officials of Governor Byrne's appeal for a disaster area declaration for New Jersey, and resulting federal grant money, made it necessary for the state to attempt such emergency facilities solely with \$26 million re-allocated early in February by the Legislature from other public works projects. Arbesman reported that this money should cover the cost of the George Washington Bridge project plus one and perhaps two of the three steps in an engineering program to increase the capability of the Newark water system to receive water from the Elizabethtown Water Company. □

TO REPORT ABUSES
OF THE ENVIRONMENT
CALL ACTION LINE
609-292-7172

NEWARK RECYCLING CENTER IN OPERATION

Newark Recycling Incorporated located on the corner of Central Avenue and Lock Street (across from the Housing Authority's, 57 Sussex Avenue office) is now open every third Saturday of the month for the purchase of aluminum and newspaper. Individuals with aluminum and newspaper may redeem them for cash from 8:00 A.M. until 3:00 P.M. at NRI's facility, 215 Central Avenue, Newark, New Jersey on the third Saturday of the month.

Those interested in recycling newspaper and aluminum should be aware that the newspaper (not magazines and phonebooks, etc.), should be in bundles or bags for easier weighing. Additionally, only beverage containers that are all aluminum or all aluminum scrap objects, such as pie plates, siding, beach chairs, etc., will be accepted.

A sure method of determining if something is all aluminum is a magnet test. A magnet will not stick to aluminum. Remember to test both top, bottom and sides of the object to determine if the object is all aluminum. Aluminum should be separated into two groups: Can and scrap aluminum, to facilitate processing.

This Saturday opening will afford individuals who are not able to redeem their aluminum and newspaper during the work week hours, the opportunity to do so on the weekend.

If you require additional information please contact NRI at (201) 643-7750. □

Continued from page 16C

CAMPSITE RESERVATIONS

SP, Box 289-A, Van Syckels Rd., Clinton 08809; Stephens section of Allamuchy SP, Hackettstown 07480; Stokes SF, R.R. #2, Box 260, Branchville 07826; Swartswood SP, R.R. #5, Box 548, Newton 07860; Voorhees SP, R.D. #2, Box 80, Rte. 513, Glen Gardner 08826; and Worthington SF, Old Mine Rd., Columbia 07832.

Southern New Jersey Locations: Allaire SP, Box 220, Farmingdale 07727; Bass River SF, New Gretna 08824; Belleplain SF, P.O. Box 450, Woodbine 08270; Cheesecake SP, Matawan 07747; Lebanon SF, New Lisbon 08064; Parvin SP, R.D. #1, Elmer 08318; and Wharton SF, Batsto, R.D. #4, Hammon-ton 08037. □

GET HOOKED ON
TROUT FISHING

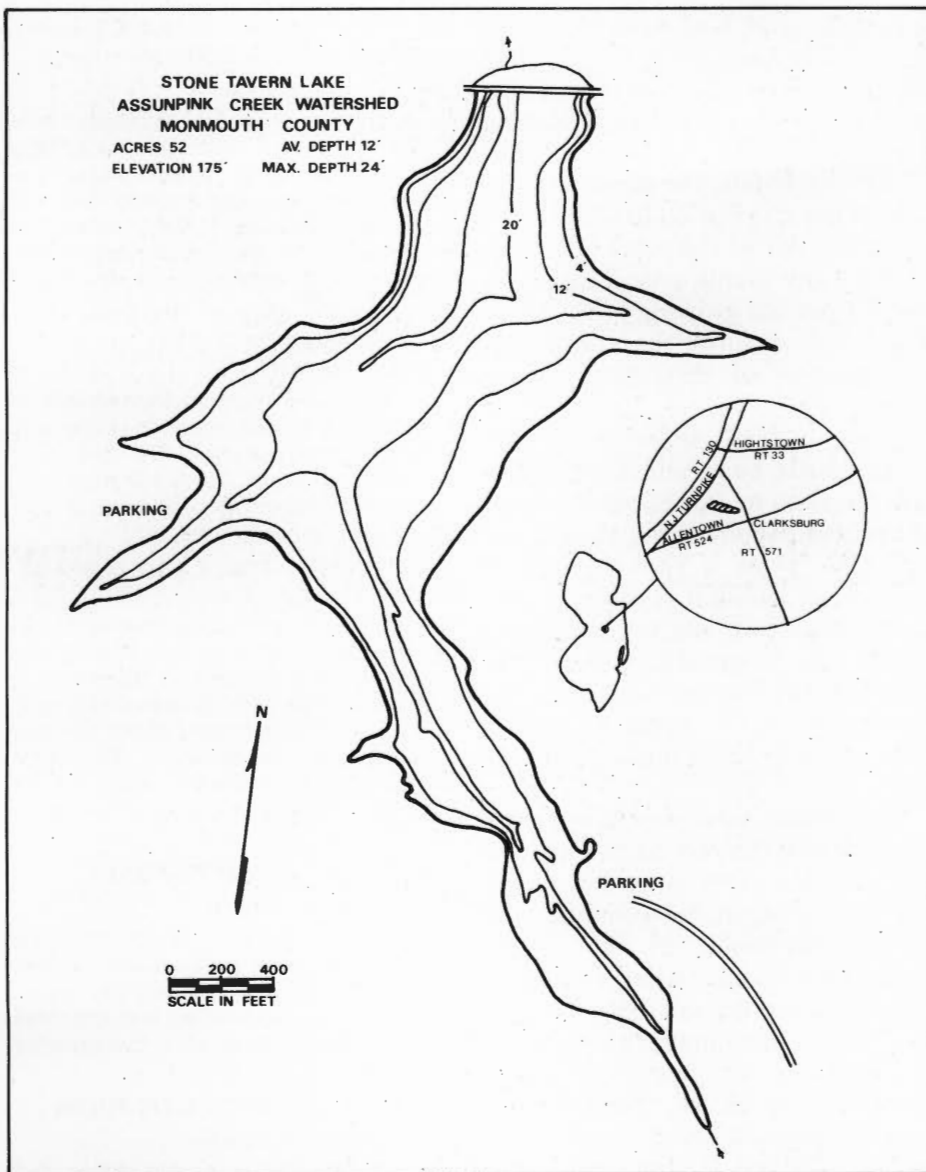
Alaska 1984?

WHAT DOES THE GOVERNOR OF ALASKA SAY TO THE GOVERNOR OF N.J.

The following poem illustrates the kinds of frustrations felt by the author, Alaska Governor Jay Hammond, in attempting to govern a state which he loves dearly.

Remember how lousy things used to be?
Why—before we had oil, fish cluttered the sea.
And Cook Inlet's waters were coffee-hued
instead of the shimmering, sheen of crude!
Now, it didn't take long to cover the mud.
For it's a mighty short step from "crude" to "crud!"
Yes, the black gold sure outglitters the old 'silver horde"—
Since we reconstituted the fish and game board.
With oil-stock holders who seldom think petty—
After all, as commissioner they got J. Paul Getty.
And remember all of those stupid, dumb clucks?
Who complained we might lose a few million ducks?
(A duck—you'll recall—had web feet and a bill,
The last one expired the year of "The Spill".)
How lonely 'Twas then to roam about, man,
Clear out of sight of a friendly beer can
Now, what a comfort to climb the remotest outcroppings
Picking your way through the "People Droppings".
But the woods are now safe—for we've bountied the bears
And all dangerous game—including varying hares.
You know, years ago one could hardly tell
When he was breathing—for air had no smell!
No wonder smoking was popular then
For, though costly, it satisfied some people's yen
To fill up their chests with a rich aroma
And selfishly grow their own carcinoma.
Now—everyone has the chance to soak
His lung tissues with hydrocarbonous smoke.
The water drunk then was new and untried
It's a wonder that only a few people died.
True—now that we've grown so much more chummy
We find that our water may be a bit gummy
But you know doggone well when you slake your thirst—
That the guy survived who drank it first!
They say, God died in those days and that's on the level.
Can't blame Him anymore for "Acts of the Devil".
Still, occasionally yet we are brought to our knees—
By the sonic boom of the S.S.T.'s!
But there's one thing I've noticed I really deplore:
Legislators I knew ain't around anymore.
It seems that most of them fled the scene
Packing big, black bags filled with lots of long green.
Seems we found the cash and incentive to quit
By putting votes up for competitive bid!
Now, Rep. Tillion and I are the only ones here.
We sold out to fish—much too cheaply, I fear.
We live on an old, rusty tanker whose bottom was stove
In near Clem's place renamed—of course—"Halbouty Cove"!

Get Wise to
What's Happening
In Your State
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New Jersey Outdoors



STONE TAVERN LAKE

BY MIKE WELSHKO

Stone Tavern Lake is the product of the joint efforts of the U.S. Soil Conservation Service, the New Jersey Division of Fish, Game and Wildlife, and the New Jersey Green Acres Program. It was built to provide flood protection for the Assunpink Creek drainage and fish and wildlife habitat and related recreational opportunity. It was first filled in 1971. Stone Tavern Lake has a maximum depth of 24 feet and an area of 52 acres.

The fisheries management program here is directed toward a warmwater fishery based on largemouth bass as the major predator and game species.

Largemouth bass and bluegill were originally introduced in 1971.

Parking and launching facilities for both car top and trailer boats are available at two sites; one at the extreme eastern end of the lake and the other on the lake's south shore off of East Branch Road. Only electric motors are permitted. Most of the impoundment's shoreline is readily accessible to bank fishermen.

During the fall the lake is a popular resting spot for migratory waterfowl, which also makes it popular with duck hunters.

Location:

Near the center of the Assunpink Wildlife Management Area, on Roosevelt Rd. which runs from Roosevelt to the Stone Tavern Crossroad on Monmouth County Route 524.

Chemical Factors:

pH: Slightly acidic, generally ranging from 6.0 to 6.8.

Dissolved Oxygen:

Adequate for fish life at all depths except in summer when it is generally adequate only between the surface and a depth of 10 to 12 feet.

A variable-level water release capability is a feature of the dam. It benefits the fish production capabilities of both the impoundment and the stream below. Cold oxygenated water is maintained in the stream below and the volume of lake water capable of supporting fish is increased by the drawing off of some of the deep, oxygen-depleted waters that are present during the summer.

Productivity:

Moderate

BIOLOGICAL FEATURES:

Aquatic Vegetation:

Limited to the perimeter shallow waters, where light stands of submergents are found.

Water Color:

Normally a slight reddish-brown (cedar) tint.

FISH AND FISHING:

Largemouth bass: Good. Population checks have invariably found large numbers of bass in the two- to three-pound class. Reproductive success has not been sufficient to maintain year-class strength in some years and in these instances supplemental stockings of yearling bass have been made.

Sunfish: Both Bluegill and pumpkinseed are present, with the bluegill being the more numerous. Possibly as a result of their abundance, the growth rate of the bluegill appears to be below average. Fishermen are encouraged to fish for and harvest these species, as most are less than 5 inches in length.

Brown bullhead: Present, but not taken in great numbers.

Chain pickerel: Limited number present, none larger than 12 inches taken during surveys to date. Expected to increase in abundance and size.

Brook trout: An occasional "native" taken. Brook trout were present in the stream prior to its impoundment.

Channel catfish: Good. Stocked in 1975 and 1977 by the Division, some of these have now reached lengths of 20 or more inches.

Other Species: The following have been verified:

Creek chubsucker, Golden shiner

Gardening with Perennial Wildflowers

By Laura Hooper

As you start to think of your garden this spring you may want to consider planting perennial wildflowers, gathered on outings to the countryside and forests.

At one time New Jersey was a natural woodland abundant with native wildflowers. Later the farmers came, bringing with them the vegetables and flowers of their native homes and many of these flowers escaped and naturalized themselves in the fields and roadsides combining with the native wildflowers. Abandoned farms and open meadows are often good places to start hunting specimens for your garden.

The perennials discussed here are not demanding but do have minimal requirements. They do well in good soil and in their appropriate natural habitat. Choose plants that will adapt to the sun, soil, moisture, and climate of your particular garden. Do use caution with fertilizer; in some cases it may actually kill the plant. A good fertilizer is bone meal, because it releases its nutrients slowly.

Prepare the soil *before* you collect specimens. Spade the ground deeply. Give the soil a good texture (the soil should compress into a ball when held tightly in the hand and crumble when released). Add sand or peatmoss if the soil is heavy with clay; use leaf mold if the soil is sandy and rocky. Remove most of the rocks; this is not absolutely necessary but your plants will double in size if they are given good soil. Take into account the habitat of the wild flower that you intend to plant. If it comes from a swampy, moist area, add more peat or leaf mold; if it is growing in a dry sunny field, add more sand. If you live in an area that is rich in

limestone and you wish to collect acid-loving plants, mix a lot of peat in the soil; you will have to add lime to your soil if you are transplanting lime-loving plants to an acid area.

Always obtain the permission of the owner of your collecting site to remove some of the plant life. Never take any plants unless there are more than ten growing in the same area. This insures the continuing propagation of that plant in the area.

Bring a small spade or trowel, some plastic bags, and a notebook when you go to dig the plants. Note the moisture conditions, the type of soil each plant is growing in, the amount of sunlight it receives. After you carefully dig out the plant, being sure to get all of the roots (some of the flowers have deep tap roots), wrap the roots in plastic bags to keep them moist til planting.

Transplant your wildflowers the same day or the very next. This will prevent the roots from becoming dry or damaged by sunlight and reduce likelihood of the plants going into shock. After you have planted, tamp the soil firmly. Water thoroughly to eliminate air pockets. If the plant is a member of the cactus family let the roots dry for several days to heal any of the wounds caused during the transplanting, then water.

Following is a list of some wild flowers and their natural habitats.

SWAMP MILKWEED— *ASCLEPIAS INCARNATA*

Blooms June to August

Found near lakes, streams, and wet roadsides, this species' pink flowers form umbrella-shaped clumps. It likes wet ground and full sun but will tolerate light shade. Space roots two feet apart and plant the crown (roots) close to the soil surface. This plant will attract butterflies, as does every species of milkweed.

BUTTERFLY WEED— *ASCLEPIAS TUBEROSA*

Blooms June to September

This plant is similar to swamp milkweed, except that it has bright orange flowers. It is found in sunny dry fields. Include sharp sand in the growing medium.

MAY APPLE, MANDRAKE—

PODOPHYLLUM PELTATUM

Blooms April to June

An inhabitant of moist woodlands this 12-inch plant has umbrella-like foliage with a single white flower under the leaves. It is very fragrant and bears a large lemon-like berry. May apples like moisture but not too much peat or leaf mold. Water frequently if in a dry area.

SLENDER BLUE FLAG—

IRIS PRISMATICA

Blooms May to July

A graceful, sword-leaved plant similar to a garden Iris. Usually found in sunny, wet meadows and marshes. The blue flag prefers an acid soil that holds moisture. Mix a large amount of peat moss or leaf mold in the growing medium.

COLT'S FOOT—*TUSSILAGO FARFARA*

Blooms March to June

One of the earliest spring flowers, found near roadsides in drainage ditches and meadows near streams. It resembles a dandelion and goes to seed like one. Colt's foot thrives in poor rocky soil that receives a lot of moisture. The large leaves resemble rhubarb; some can be cut away to allow space for other plantings.

TIGER LILY—*LILIUM TIGRINUM*

Blooms July to August

This spotted orange Lily, an escapee from local gardens, grows two to five feet tall. It can be found in sunny dry areas. Be sure to include the bulb with the roots and include sharp sand in the growing medium.

DAY LILY—*HEMEROCALLIS FULVA*

Blooms June to August

Found on roadsides in light shade, this orange-flowered plant likes moist acid soil. Plant the bulb in a growing medium with much peat moss or leaf mold.

STEEPLE BUSH— *SPIRAEA TOMENTOSA*

Blooms July to September

This native pink-flowering shrub grows two to four feet high. It is found in sunny meadows, pastures, and old fields. It prefers a sunny plot with peat moss or leaf mold and sharp sand in the soil.

SPRING BEAUTY— *CLAYTONIA VIRGINICA*

Blooms March to May

This delicate white flower grows six to twelve inches high. It is found in moist woods, usually growing in colonies. Include much peat moss or leaf mold in the growing medium and plant in open shade.

BUTTER AND EGGS— *LINARIA VULGARIS*

Blooms June to October

One of the longer blooming wildflowers, this alien resembles a yellow snapdragon. One to three feet high with many flowers on one spike, it is found growing in colonies along dry roadsides, waste places, and fields. Combine much sharp sand in the growing medium.

**WILD GERANIUM—
GERANIUM MACULATUM**

Blooms April to June

The purple flower is found on roadsides and in open woods. It prefers light shade and grows one to two feet tall.



WOOD LILY—LILIUM PHILADELPHICUM

Blooms June to July

This orange-spotted lily grows upright (most spotted lilies nod). Found in open shade along roadsides and in woods, it grows one to three feet. It likes a dry acid soil, so mix peat moss and sharp sand in the growing medium.



**FRINGED LOOSESTRIFE—
LYSIMACHIA CILIATA**

Blooms June to August

This loosestrife bears many yellow flowers and grows one to four feet high. It is found in sunny swamps, wet thickets and shores. If you have a spring or wet ground this variety is excellent. Mix peat moss or leaf mold with the growing medium.



TRUMPET CREEPER—CAMPSIS RADICANS

Blooms July to September

This climbing vine with showy three-inch orange flowers is found near old foundations, barns, and low thickets and woods. It will grow in light shade. Mix peat moss or leaf mold in the growing medium and provide moisture.



NEW YORK ASTER—ASTER NOVAE-BLEGII

Blooms July to October

This aster is found in meadows, open woods, and along roadsides where the soil is fertile. It likes sun and much moisture.

Mix peat moss or leaf mold in growing medium. Space the roots two or more feet apart if grown with a heavy mulch and rich soil. Plant the roots one inch deep.



**JACK IN THE PULPIT—
ARISAEMA TRIPHYLLUM**

Blooms April to June

This unusual green and brown flower grows one to three feet high in damp meadows and open woods. It enjoys open shade and moisture. Include peat or leaf mold in the growing medium.



HEPATICA—HEPATICA

PHOTOS BY AUTHOR

Blooms March to April

This white flower of dry or moist upland woods grows six to ten inches high. Its leaves persist during winter, the new ones appearing after the flowers bloom. It prefers a lime-based soil that is dry to moist. Mix lime and sharp sand in the growing medium. Plant in open shade.



The lake in late May.

Photos by Walt McCabe



The lake in August, showing infill by rooted vegetation.

LAKE RESTORATION / *a case study*

BY DR. OLIVER DONOVAN

Natural lakes may be formed by any number of processes ranging from glacial action to, unlikely as it may seem, strikes on the earth's crust by very large meteors. There are a number of examples of the latter around the world including Elgygytgyn (no kidding!) in north-eastern Siberia. Not to worry though, since statistically, such a strike is probably only about once in 300,000 years.

No matter how the lake is formed, it, like everything else in our fertile,

constantly oxidizing and eroding biosphere has a finite lifetime. A lake in its infancy generally has very clear water, a hard bottom, and low nutrient levels. Such a lake is known as an **oligotrophic** ("food-poor") lake. Lakes "trap" many nutrients from inflowing streams, however, and with time, buildup of nitrogen, phosphorus, and other nutrients encourages the growth of large masses of aquatic vegetation. Eventually the lake begins to fill from the sides in with submergent and emergent veg-

etation and from the bottom up with a rich organic ooze composed of a mixture of silt and the remains of organisms. This type of lake is known as **eutrophic** ("food-rich") because of its highly fertile nature and will in time give way in the process of ecological succession to freshwater marsh, swamp, and finally, upland habitat.

This natural aging process is common to all lakes and is called **eutrophication**. Like so many other processes in our biosphere, however, it can be, and frequently is, strongly influenced by the activities of our own species. For example, the lifetime of a large lake uninfluenced by human affairs may run into the tens, or even hundreds, of thousands of years. But given unnaturally heavy inputs of nutrients from such sources as storm water and treated sewage discharges, septic drainage, erosion from cleared land surfaces, cattle lot runoff, and agricultural and domestic fertilizers, a lake can be "pushed" into its eutrophic phase, complete with nuisance growths of rooted plants and algae, odors, and turbid waters in tens rather than thousands of years. This is "cultural" as opposed to "natural" eutrophication, a process which the President's Council on Environmental Quality has defined as one of the serious environmental problems facing the United States today.

Can anything be done to reverse the situation once a lake is experiencing obvious water-quality problems such as heavy plant growths and high bacterial counts? The answer is a qualified "yes," depending on, among other things, the nature of the problem, the size of the lake, and the willingness of the community to fund restoration efforts.

Since 1976, the Biology Department at Jersey City State College has been studying problem lakes at the request of concerned communities. Our most recent work was a biological and physiochemical survey of Lake Rogerine carried out during the summer of 1979. Extensive weed growth, turbid water caused by high algal densities, and occasionally high bacterial counts were (and are) making the little lake less and less appealing as a recrea-

tional and aesthetic resource. The Department managed to carry out the study free of cost to the community by using the lake as a living laboratory for its Limnology course and as a subject of study for a number of undergraduate students interested in the study of aquatic biology and chemistry.

It's an old axiom in the study of limnology (the study of lakes) that the productivity of a lake reflects its watershed. Somewhat simplified, this means that if the watershed is forested, and the inflow to the lake (tributary streams, stormwater runoff) is uninfluenced by human activities, the lake water will probably be clear and aesthetically pleasing, with excellent potential for recreational activities such as swimming, fishing, and boating. If the watershed is rapidly and thoughtlessly developed, however, destruction of vegetation may lead to erosion and rapid siltation of the lake water. If the development has taken place on steep slopes, delivery of drainage from poorly operating septic systems can be rapid following heavy rains. Runoff from roadways and other impervious surface (roofs, parking lots) is often routed directly into the lake with no treatment whatsoever.

Since these various drainages and runoffs are contaminated with silt, high bacterial levels from human and animal waste, and essential plant nutrients (especially compounds of nitrogen and phosphorus), deterioration of the lake water can be rapid and dramatic. Siltation will begin to hasten the filling-in process and provide a substrate on which aquatic vegetation can grow. Whereas in its pristine state the lake water was clean and clear, nutrient-induced algal growths will make it cloudy and turbid. High bacterial counts may make it unsafe for swimming. More desirable organisms, such as salmonid fishes (trout), will disappear and be replaced by more pollution-tolerant forms (carp).

In our study of Lake Rogerine we began by simply looking at a U.S. Coast and Geodetic survey quadrangle map. This revealed high development densities combined with steep slopes, indicating that the principal problem was probably



If problem continues, recreational use will undoubtedly be curtailed.

rapid delivery of septic drainage and storm water runoff to the lake after periods of intense precipitation. Bacterial and chemical testing during the summer of 1979 essentially confirmed this preliminary judgment. For example, coliform bacteria counts in the lake water shot up dramatically after heavy storms, indicating rather large inputs from septic and road drainage. That siltation was playing an important role in the aging process of the lake was made evident by observation of silt-laden runoff during storms. Also, the shallow, highly silted, flat bed of the lake, and conversations with long-term residents who remember a much clearer, deeper Lake Rogerine, further confirm recent high rates of sediment deposition.

Our studies on primary producers (plants) showed, that the entire volume of the lake was becoming choked by vascular plants such as pondweed, and that algal densities in the water column were high enough to constitute an almost summer-long algal "bloom." Also, on a number of occasions the phytoplankton (suspended microscopic plants, usually algae) of the lake was dominated by blue-green algae and/or dinoflagellates, a further indication of deteriorating water quality. At times phytoplankton blooms were so intense that a green floating scum washing up on the leeward side of the lake. Needless to say, one does not have to be an aquatic ecologist to observe these conditions. They were the primary reason that the Lake Rogerine Civic Association, chaired by George Tett and Ed Tis-



The lake still has a productive recreational fishery—yellow perch, bullhead, calico bass, bluegill, pumpkinseed.

chner, had requested the College to do the study in the first place.

In November 1979 the Biology Department presented the results of its lake study to Civic Association in a technical document entitled, "A Study of Biological, Physiochemical, and Hydrologic Factors Influencing Eutrophication in Lake Rogerine." Although the report included sections on geomorphology, hydrology, water quality, finfish, invertebrate populations, plankton, and macrophytes, we also emphasized techniques by which the process of

Continued on page 22

LAKE RESTORATION

eutrophication might be arrested and the lake restored to its former high quality. Our recommendations were as follows:

(1) **Alter drainage patterns.** Uncontrolled road drainage delivers a considerable load of sediment to the little lake. This hastens the filling-in process, provides additional substrate for plant growth, and is a source of nutrients for unwanted plants. It was recommended that storm water be intercepted via either ditches or drains and passed through settling basins before being allowed to enter the lake. As long as the basins are inspected and cleaned periodically they will remain highly efficient in the removal of sediment and organic nutrient-bearing solids.

(2) **Alter the lake's outlet structure to allow periodic drainage for purposes of freezing and consolidation of lake bed sediments.** Wintertime drawdown is a proven method of improving water quality in shallow lakes. Freezing destroys the root structure of aquatic vegetation and thus enhances recreational use and aesthetic value during the following season. Also, consolidation of the bottom sediments by compaction and drying reduces nutrient exchange between sediments and water after the lake is refilled.

Not the least advantage of wintertime drawdown is the fact that it allows entry onto the lake bed for mechanical removal of dead vegetation and trash, and for deepening projects. Lake Rogerine's relatively high level over mean sea level assures hard freezing of the exposed bed for significant periods in January/February.

(3) **Remove biomass.** Aquatic plants and fish contain significant amounts of nitrogen and phosphorus incorporated into their tissue as protein and other organic compounds. After the plant or animal dies, the action of decomposers (bacteria, fungi) releases these critical nutrients to support new plant growth. For Lake Rogerine, the Biology Department recommended that masses of vegetation be re-



Students testing and recording data in field and laboratory.

moved mechanically during wintertime drawdown and that nongame fish not be returned to the lake. These actions could remove a significant mass of tissue-bound nutrients from the lake ecosystem.

(4) **Institute sound land use practices.** We recommended that the Lake Rogerine Civic Association encourage land-use practices which would decrease the annual mass of nutrients entering the lake. More specifically, new septic systems on steep slopes should be discouraged. Grassy swales should be encouraged and maintained around the perimeter of the lake, for these have been shown to be very effective in reducing the nutrient content of runoff water before it enters a lake. Also, lawn fertilization should be kept to the minimum necessary to maintain the grass in good condition.

(5) **Use herbicides only if necessary.** If, even after implementation of the above measures, sufficient levels of nutrients to cause occasional algal blooms still enter the lake, then safe, carefully calculated dosages of a registered herbicide might be applied to control the blooms. Although this is a highly effective technique, herbicides should not be used carelessly. A firm registered with New Jersey's Department of Environmental Protection should be contracted with for the actual application. At Lake Rogerine, given the small lake volume, costs should be minimal.

So, even though it can truly be said that cultural eutrophication of lakes is one of the serious environmental problems facing New Jersey (and the nation) today, the problem on any given lake can at least be arrested. Many lakes, depending on

a number of factors such as the size of the lake and the cohesiveness and will of the surrounding community, can be completely restored.

Funding, of course, is also important. For example, if our goal at Lake Rogerine was complete restoration, it would have been necessary to dredge the bottom sediments to some extent. The lake however, is a private one, and the Civic Association did not feel that it could bear the costs of dredging operations. Consequently, our recommendations were tailored to achieve maximum results at minimum expense. Indeed, the whole program could theoretically be carried out by the Association, given the availability of a certain amount of technical expertise, time, and strong backs.

If your favorite lake is having problems, and if it is a public lake, or if significant public access exists, then it is eligible for funding under the Federal Lakes Restoration Program. The Biology Department here at Jersey City State College, for example, is currently involved in a study of Braddock Lake in North Hudson County Park as a public service to the Hudson County Parks Commission. The Commission will use the data generated by the study to apply for a Lakes Restoration Grant.

Further information regarding lake restoration can be obtained through the Lakes Management Program of New Jersey's Department of Environmental Protection. The authors are also willing to provide guidance.

Write to Dr. Oliver Donovan, Biology Dept., Jersey City State College, Jersey City, N.J. 07305.

Clean lakes, after all, are one of our state's most valuable natural resources. □

A Ribbon of Fluke

BY DON KAMIENSKI



PHOTO BY AUTHOR

Within the boundaries of our eastern shoreline, a 117-mile-long ribbon of water exists that each year yields almost a million fluke to anglers sportfishing this aquatic-rich area. The ribbon, which begins in the north at the Manasquan Inlet, and has its southern terminus at the Cape May Canal, actually encompasses 9 inlets, 2 rivers, 9 bays, 2 harbors, and 4 sounds. If you're still somewhat puzzled as to the identity and location of this ribbon, let me clear things up by describing New Jersey's section of the Atlantic Intracoastal Waterway. To locate the Waterway, pick up one of those once-free service station maps or a copy of the National Oceanic & Atmospheric Administration charts #12324 and 12316. The Waterway is plainly marked on each source: just look for such legendary spots as Barnegat Bay, Little Egg Harbor, Lakes Bay, Peck Bay, Grassy Sound, and Jarvis Sound.

The Atlantic Intracoastal Waterway is actually a connected chain of navigable, toll-free bodies of water which extend from New York to Florida. The entire length of this waterway exceeds 1200 miles, but New Jersey can claim only approximately 10 percent. Originally, during the late 19th century, the Waterway was planned to form a continuous channel from New York to Brownsville, Texas, but the necessary canal work through northern Florida was never completed; thus there are two separate sections—the Atlantic and Gulf. This federally maintained waterway was extremely valuable during World War II, as it provided the shipping industry with a passage relatively safe from submarines. Now, however, the waterway attracts both pleasure boaters and anglers along most of its length.

New Jersey is especially fortunate in that its section of the total Waterway is dotted with 9 inlets that funnel both fish and water between the Atlantic Ocean and the sheltered waters of various inland bays, harbors,

sounds, and thorofares. These 9 funnels, through which the tides flow, both act as avenues for both forage and predator fish and control the amount and temperature of the water in the Waterway. Without access to the Waterway via the inlets, fluke and other gamefish would tend to stay offshore, out of the reach of the many small-boat anglers.

This, however, is not the case, as the Waterway sometimes seems to be paved with fluke in certain areas. From a creel survey taken for the past several years, state fishery biologists estimate that nearly 200,000 fluke are taken annually from Great Bay alone. Considering that this bay represents only five to six miles of the Waterway, the fluke-catching potential of the entire length is staggering. So let's begin describing how you can locate fish along the ribbon.

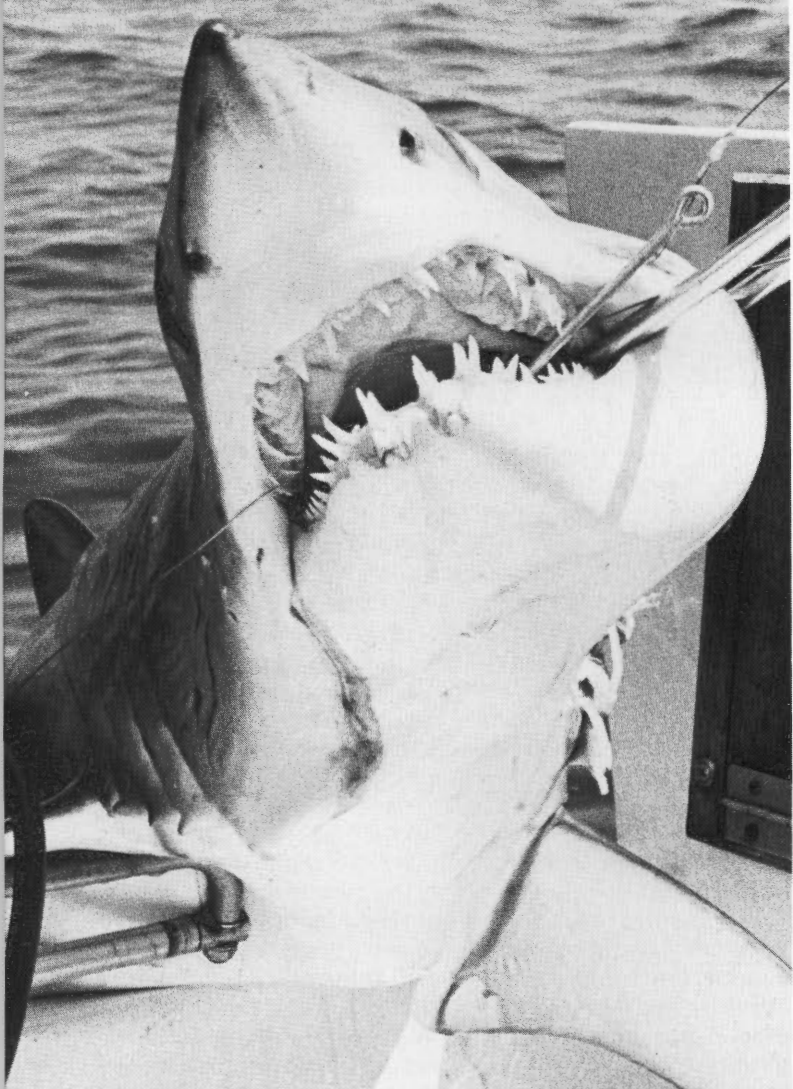
For the most part, fluke begin their inshore migration from the Continental Shelf in early spring, so that their vanguard of mature adults arrive at the aforementioned inlets by mid-May. Once through the inlets, the schools of fluke spread out along the Waterway seeking bottom structure that will provide opportunities for catching shrimp, sand eels, killies, and other forage fish.

Most talented fluke anglers will contend that along the waterway the six-week period of mid-May through June is probably the best time of the year to catch fluke in terms of quality and quantity. As the season advances, the catches of fluke will decline somewhat until the end of summer arrives. When this cooling season does occur, fluke will bunch into schools at the various inlets before they begin their return migration offshore.

What makes the Waterway an especially good choice for seeking fluke is the fact that the waters of this ribbon are usually deeper than the surrounding areas. This deeper water attracts baitfish, and this quantity of bait in turn attracts the fluke. Knowing the stages of the

Continued on page 26

Fishing for Sharks



The "Real Jaws" of a mako shark. This fish grows to large size, performs aerial leaps that rival those of billfish, and is a top gamefish.

PHOTOS BY AUTHOR

BY PETE BARRETT

Sharks! No other fishes have quite so captured the imagination of fishermen in recent years as the sharks. Awesome in size, loaded with strength and power, and surrounded with an aura of mystery and danger they are excellent gamefish and worthy opponents. Some call them

the "poor man's" gamefish because you don't need a fancy boat, expensive tackle, a captain and a mate to run to offshore areas to catch them. Probably the tackle you own right now will be OK for sharking.

The season usually gets under way sometime in June and progresses through the fall, although many anglers stop fishing for sharks by August as other offshore species like the tunas take over the limelight.

Your main target when sharking will be the high-flying, acrobatic mako. Next to this sleek fish all other sharks pale in comparison. They are tough, mean, and scary. Among the most abundant sharks will be the blue, dusky, and brown sharks. In midsummer you may run into a huge tiger or a hammerhead. Threshers and great whites are few and far between, but they are here in our waters and occasionally show up in the slicks.

The basic technique for catching sharks is to drift while setting out a long chum slick of ground-up bunker or mackerel. A sea anchor will help to keep your boat sideways in the drift for maximum fishing room and to keep the baits spread apart so they don't tangle.

Most sharks you will meet can easily be handled with a 30-pound or 50-pound class rod and reel since their weights will run from 40 to 200 pounds. There are many sharkers, however, who fish with much heavier gear, usually 80-pound class tackle, just to be ready for HIM—that one shark of each season that weighs over 500 pounds.

My own outfits were custom made by the Mud Hole in Toms River, pioneers in modern shark tackle. The rods are soft 80-pound class rods, with rod blanks longer than usual to tire the fish faster while not tiring the angler. My reels are the Daiwa Sea-Line 900H, and are filled with 600 yards of braided dacron 80-pound line.

Some anglers prefer mono, but I feel that the small amount of stretch in the braided line applies more pressure to the fish and it is more positive when setting the hook.

Leaders are made in two pieces from #10 to #14 Malin tobacco-stain (brown) single-strand wire. Each section is about 7-1/2 feet long and is connected in the middle with a large barrel swivel. This swivel relieves the twisting or kinking pressure as a big mako goes nuts doing tailspins after you strike the hook. Mustad #7699 hooks with ringed eyes and an offset bend are the best sharking hooks and are attached with a haywire twist to the wire, as are the barrel swivels. You can use a snap swivel at the end of your fishing line to attach the leader, but a single swivel is failproof when haywired to the leader.

The latest IGFA regulations allow a total length of 40 feet for the double line and leader combination. The leaders are already about 15 feet total length so I splice a double line in the dacron of about 25 feet, always being a little short to be certain I stay within the rules. Every spool of dacron has splicing instructions and a splicing needle supplied. Mono lines require a bimini twist to double the first 25 feet of line.

Once at the fishing grounds, the chum slick is immediately started, then baits are rigged. Mackerel and whiting are favored, either whole or filleted. Rigging the baits is easy if your leaders are tied in the following manner. At home I haywire the hook to the lower leader section, leaving the bitter end free. The swivel is tied to the upper section and its bitter end also left free. The leaders are stored in ziplock bags in a small tackle box until needed. When fishing I take

one upper leader section and haywire it to the swivel at the end of the fishing line. Use a bait-rigging needle to pull the lower leader through the mackerel from vent to head and firmly slide the bait until the hook is seated properly. Haywire the open end to the middle swivel and you are all set. It takes about a minute to do this.

I use three rods to set out lines at three different depths and positions for the baits. If the rods were numbered, the main rod (#1) would be positioned so the bait would be dropped down about 60 feet, a styrofoam float attached and then the bait drifted in the slick about 125 feet from the boat. The #2 rod has its bait dropped down about 45 feet and positioned 75 to 90 feet from the boat. The #3 rod has no float and the bait is dropped down in the slick until out of view in the clear blue water, a distance of about 30 feet. All reels are in free spool with the clicks on.

The styrofoam blocks are tied on by taking two wraps of line around the block and then pulling the line tight so it bites into the block. When a shark hits, the block breaks away, allowing you to fight the fish unencumbered.

Each shark seems to hit the bait differently, yet a mako generally takes the bait and then runs with it—fast! Let him go for a count of 20 so he can swallow the bait, then engage the reel in gear, reel in the slack line, and when the line comes tight lift the rod smartly three or more times to deeply set the hook.

Other sharks like blues and browns often play with the bait and may never actually run off a lot of line. If this happens, set the hook quickly. You'll either hook the fish so you can get him in fast and save your hook, or you'll miss the fish entirely. Either way you can quickly re-rig and be ready for that mako, not a pesky brown.

There is some controversy about shooting sharks if you intend to keep the fish. Makos are especially dangerous to bring into a boat, and so for safety's sake I like to put a single 30-06 round in their brain to stun and kill them so they are safer to handle. Since I fish out of a 23' Mako center console I feel that this is mandatory; however, larger boats equipped with a gin pole can hoist the fish high, keeping fishermen safely out of the way of gnashing teeth.

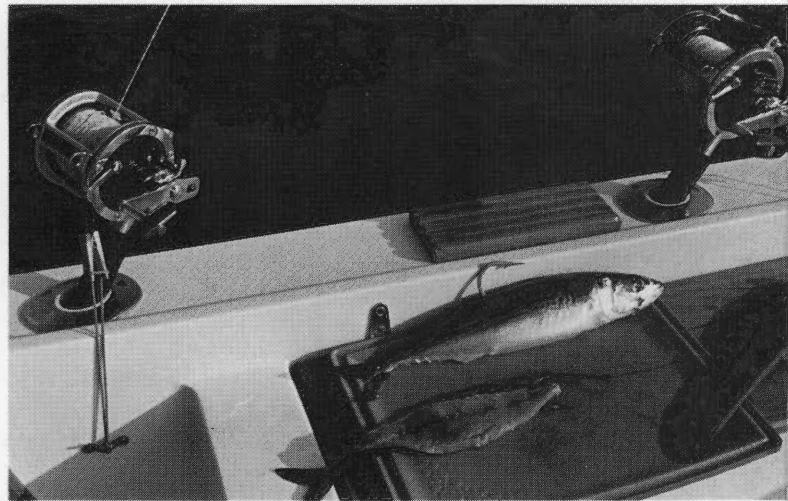
Most sharks, such as browns, blues, duskies, hammerheads and tigers, are edible but not overly desirable as table fare. Tagging and releasing such sharks helps scientists gather important data to better study these unique fish. Tagging information is available from Dr. Jack Casey, National Marine Fisheries Service, Narragansett, R.I.

Sharks are found in nearly all offshore waters, but the best action occurs where there is either changing bottom structure or a mixing of ocean currents. Chart #12300 clearly shows the 20-fathom line as it stretches from along Long Island's south shore, through the Mud Hole, down along the coast east of Barnegat and down to Atlantic City. Some of the more popular spots are the BA buoy (045T approximate from Shark River), the HA buoy (085T approximate from Manasquan Inlet), The Rezor Wreck (100T approximate from Barnegat Inlet) and the 28 Mile Wreck (155 approximate from Absecon Inlet). A careful check of the chart will show you plenty of bottom structure to try on your own.

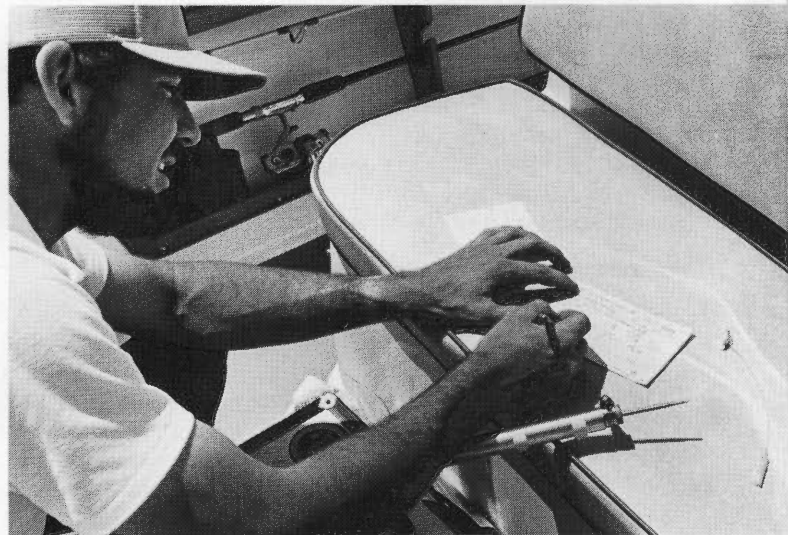
Sharking is exciting. The sight of whales near your slick, big sea turtles, and the solitude of the offshore waters are unique among fishing experiences. One trip offshore and you are certain to be "hooked" by sharking. □



To be safe, even dead sharks like this 155-pound mako are tied securely at head and tail before being taken back to the dock. Makos are excellent eating, identical in flavor to swordfish, and a favorite in many New Jersey coastal restaurants.



Stout tackle in the 6/0 size is preferred to handle these large fish that may go over 700 pounds! Baits are usually whole or filleted fish.



All sharks not destined for the dinner table are released unharmed, usually with an American Littoral Society or National Marine Fisheries Service tag to aid scientific study of sharks. Mark Leggett fills out a data card that matches the tag he has just placed on a blueshark of 130 pounds.

A Ribbon of Fluke

tidal currents is very important while angling for fluke. For instance, when the tide is rising in areas where the Waterway is adjacent to shallow flats, the baitfish will move out from the deep channels and onto the more shallow areas. When this happens, fluke will invariably follow their food supply, so look for your quarry on the inshore edges of the Waterway. However, when the water is receding, the baitfish will head back for the deeper channels, and so will the fluke.

Locating the inshore edge of the channel that makes up the Waterway is quite simple. Just locate the red or black buoys that denote the Waterway, and in most cases, the edge of the channel is five feet inshore of the buoys—so keep this basic guideline in mind. Remember that fluke are structure-loving fish, so you should place your bait at areas where the bottom contour changes. Such places include dropoffs, tidal holes, and sandbars. A good depth recorder comes in handy for finding these areas, but even without one, a change in the bottom's contour can sometimes be detected by a difference in wave action or pattern over that particular piece of structure.

Generally, most anglers will fish the Waterway using three methods; drifting, trolling, or casting. Some anglers do anchor their boat, and attempt to attract fluke by chumming, but by far the most productive techniques are the preceding three. Since the Waterway is a major thoroughfare for most area boat traffic, anchoring can sometimes be dangerous unless you are out of the channel proper. The wakes of passing large boats can sometimes cause problems for small craft which are anchored. In a few instances, such as the two canal areas, fishing the Waterway can be accomplished on foot, but for the most part, you need the advantage of a moving boat.

If a spot survey were to be taken, the results would show that most anglers fish the Waterway for fluke by drifting along with the incoming or outgoing tide. This is probably the easiest and cheapest technique to use. All that is required is a lightweight saltwater rod and reel, some hooks, bait, and sinkers. There are probably a hundred fluke rigs on the market today, and a quick stop at your local tackle dealer for his recommendation is a good starting point. In my own case, I use a 2/0 wide-gap hook that is attached to a long leader, and

trailing behind a three-way swivel. Since the depth in the Waterway can vary from 8 feet to 45 feet along its entire length, a two-ounce sinker is generally my rule. This weight will keep your bait near the bottom, and the bottom is the haunt of the fluke—so you must keep your bait there. Several paragraphs ago, I mentioned the importance of fishing the break line of the bottom structure. Therefore, if you select drifting as your fishing technique, try to position your boat so that it drifts parallel to the channel edges. Drifting across the channel is rarely productive as few fluke will be found in mid-channel.

Occasionally, drifting the Waterway is almost impossible because of the tide and wind directions. As I mentioned before, your bait must be moving across the bottom to attract fluke. Should the wind and the tide be coming from opposite directions, so that your boat remains stationary, try trolling your bait against the tide—again, along the channel edges. Usually, you will have to use a heavier sinker while slow trolling, and the proper weight can be determined with a little trial and error—just keep your bait on the bottom and moving.

Another very effective technique to use for fluke is to cast a white leadhead bucktail that has been tipped with a piece of squid. Dragging or hopping this lure along the bottom will often outproduce any other technique. The use of bucktails seems to be more accepted at the southern end of the Waterway than in the northern section, but believe me, it works at either end. Bucktailing is so effective that masters of this technique will sometimes boat more than a hundred fluke in a single day. Their only problem is finding friends, neighbors, and relatives to accept the large numbers of fluke fillets!

At last count, there were almost a hundred tackle dealers, boat rentals, and launching ramps adjacent to the Waterway that cater to visiting anglers. Locating these establishments is just a matter of checking the local newspapers, telephone yellow pages, or the few weekly fishing periodicals that deal with New Jersey fishing. Which facilities you pick is up to you, as well as the section of the Waterway you fish. Admittedly, some sections are more crowded than others, but eventually you will find those sections that are free of both boat traffic and competing anglers, but loaded with hungry fish. When this occurs, you'll probably make a mental note of the location, and return again and again to your ribbon of fluke. □

Endangered Species Book

A new publication, "ENDANGERED AND THREATENED SPECIES OF NEW JERSEY," has been assembled through cooperative efforts of the Division of Fish, Game and Wildlife's Endangered and Nongame Species Project and the U.S. Department of Agriculture's Soil Conservation Service (SCS).

This 44-page publication will provide much needed information to the field personnel, environmental consultant agencies, environmental educators, school libraries,

and interested citizens. It is hoped that this publication will serve as a guide and at the same time increase awareness of the plight of our wildlife species.

You may contact the Project office or the SCS to order a copy of this book. To order your copy from the Project, send \$6.50 to:

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



PHOTOS BY AUTHOR

"Striped bass, weakfish, bluefish, and flounder comprise a major portion of this sport fishery."

Spring Fishing In Great Bay

BY PAUL OLSEN

The inland bays and waterways which line the New Jersey coast lie closely parallel to the migratory paths of many species of saltwater fish. Some winter over in these protected waters before traveling northward or offshore in spring, while others enter to feed or to spawn on their migrations from the south. Striped bass, flounder, bluefish, and weakfish form the major component of this sport fishery. Though they may have been spawned in larger estuaries, or in the ocean, these fish concentrate their activity each spring in the smaller bays and adjoining channels. Great Bay is situated mid-

way along this network which lies between the more prominent estuaries of the Delaware and the Hudson rivers. Around most of its perimeter, Great Bay offers the angler productive locations, many with direct access. Though the annual migrations of fish are governed by the change of seasons, their exact whereabouts and feeding activities at a given time are influenced by local environmental conditions.

Sea waters are funneled through estuaries by tidal forces, creating visible current patterns which aid fish in navigating to areas of optimum conditions. Hydrographically, Great Bay resembles Delaware Bay and the Sandy Hook/Raritan estuary, though on a smaller scale. Here, large rivers meet the ocean almost directly, with the mouth of the bay wider than the mouth of the inflowing river. Effects of the earth's rotation (Coriolis forces) cause the flood and ebb currents to flow to their respective right sides, producing a counter clockwise pattern of tidal circulation. In Great Bay the dominant flood is into the northern section, converging on Graveling Point and the mouth of the Mullica River. The ebb, from the river mouth, is in a general southeasterly direction, with a dominant flow through the southern part of the bay continuing along the ocean side of Little Beach. Thus, Great Bay is completely flushed by tidal action.

In spring a temperature differential is created between ocean waters and the faster-warming shallows of the bays. Flood tides bring an influx of colder ocean water through the inlets, while the warmer water is retained within the bays. The wide inlet of Great Bay allows a divergence of flood currents. Here, colder water is conducted through the northeastern section, while warmer water is pushed into marshes on the south and west sides of the bay and into the Mullica River. At high tide a difference of 10°F or more may exist between waters around Seven Islands (typically 50° in late April) and those near the opposite sides of the bay (typically 60° in late April). Flood currents are funneled into the mouth of the Mullica River, where cooler temperatures may exist in lower layers of the deep channel. Fish

often migrate before feeding substantially, and normally enter the bay in late April or early May when ocean temperatures are in the 50s. Optimum water temperatures for the major species from mid-April through June are generally from 60° to 70°F; when bay temperatures approach 75°, fish move to deeper sections or to the ocean.

At low tide, temperatures across the bay may be more equalized and somewhat warmer than at high tide. For this reason the outgoing tide is often productive in early spring. In the southern portion of the bay, the warming process is enhanced by three factors: the dominant flow (the ebb) from a landward direction; extensive shallows, less than five feet deep, on the south side; and, reciprocally, the presence of vast shoals on the ocean side of Little Beach. This area drains primarily through Grassy Channel, which lies between the Intracoastal Waterway and the southeastern shore of Great Bay. Warming is augmented here by the adjoining flow in the vicinity of Main Marsh Thorofare, where large areas of mud and sand flats are exposed at low tide.

The ebb flow also brings an influx of fresher water, primarily from the Mullica River and its tributaries. In spring, anadromous species such as striped bass and herring approach or enter freshwater reaches, where spawning may take place. River water normally becomes more saline as it mixes with the flood of ocean water through Great Bay. In favorable conditions, summer flounder enter the mouth of the river; while weakfish, small ("snapper") bluefish, and other species travel upstream to the vicinity of the Garden State Parkway bridge. However, during periods of much rainfall, the increased freshwater influx may drive these fish toward the ocean or into deeper sections of the bay. Bay waters are relatively turbid in nature, but are especially so after heavy rains. This condition (at times resembling coffee with cream) is common in spring, and undoubtedly hinders the ability of fish to feed by sight. In this situation the use of natural baits can be effective, in providing scent to attract fish.

Normally, weather associated with

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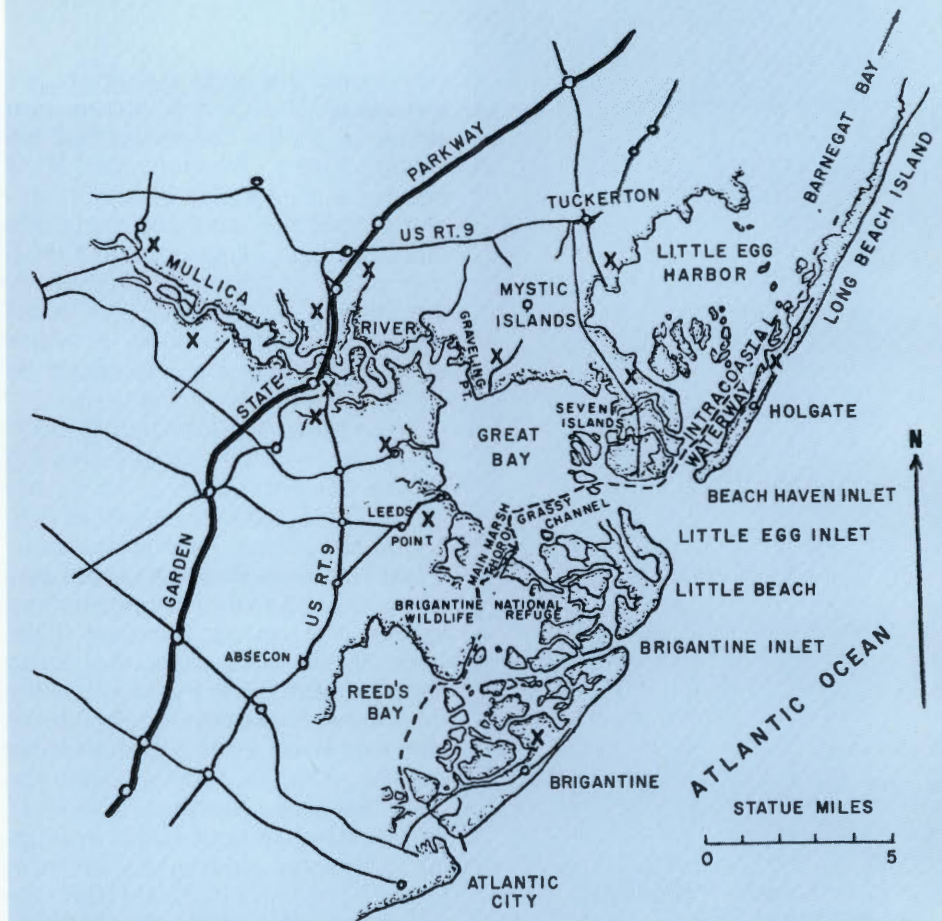
Fishing in Great Bay

a high or rising barometer is conducive to good fishing. Sunny, warm weather hastens warming of the water, especially in the shallows where sunlight penetrates to the bottom. A major nemesis in early spring is the northwesterly wind associated with a high pressure to the west or over Canada. These fresh winds, blowing along the axis of the bay, produce waves of two feet or more, which churn the shallows and sustain turbid conditions.

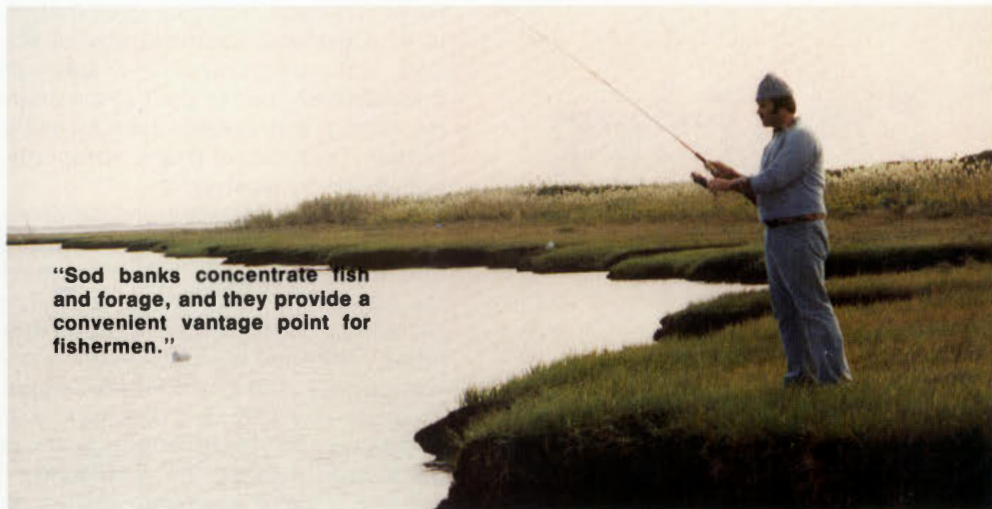
The turbidity, sometimes aggravated by recent rains, carries through the southeastern portion which receives the brunt of northwest winds. A day or two of moderate weather may be required to restore clearer water and better fishing.

Storms, too, can cause sudden changes in fishing conditions. A low-pressure center advancing through this region (typically a "northeaster") generates wet weather and rough seas with onshore winds. According to local lore, fish (especially stripers) can be active at the onset or just after a storm, possibly because of changes in barometric pressure or to the stirring of bait. The turbulence or lowered barometer, however, also may temporarily drive them deeper, while the weather puts a damper on fishermen. A northeaster may bring an initial influx of colder water in spring; although, as the season progresses, winds from a northeasterly direction serve to hold warmer water along the New Jersey shore. A high-pressure or fair-weather system centered more locally tends to bring moderate winds, often from a southerly quarter, in spring and summer. This allows settling and clearing of waters, particularly with breezes from a seaward direction, which is conducive to better fishing within the bay. Westerly winds carry a greater threat of electrical storms or squalls in late spring and summer.

Thus, the serious fisherman must become an amateur meteorologist. He should follow weather reports and maps for several days prior to an excursion, and plan accordingly. Monitoring local newspapers, and



MAP OF GREAT BAY AREA. "X" INDICATES ACCESS ROADS OR FACILITIES



"Sod banks concentrate fish and forage, and they provide a convenient vantage point for fishermen."

the National Weather Service marine forecast (Atlantic City) by telephone or radio, is quite helpful in this regard. Important factors to note include water temperature (in both ocean and bay), precipitation, and wind direction and velocity.

Wind has the most immediate bearing on fishing, especially in these unsheltered coastal reaches. Bay fishing is usually best when the surface is moderately choppy, with

waves less than two feet and winds not greater than 15 knots—conditions which often occur in evenings during late spring and summer. In shallow areas, bottom-dwelling creatures are stirred by wave action. Where waves are washing off shallow flats, a dropoff to deeper water on the downwind or leeward side can be productive. From a boat, conditions are often optimal when wind and tide are in about the same direc-



"Northeasters generate rough seas, but in the long run they bring conditions favorable for fishing."



"Spring fishing in the bay is often best in evenings with a moderate breeze."

tion. When the wind is calm, and the surface unbroken, activity of predatory fish in the shallows appears to be minimal. On the other hand too much wind, with consequent turbulence, can be detrimental to both fish and fishermen. These conditions become most pronounced toward the leeward side of the bay; but going windward, waves will gradually diminish. In a fresh breeze (greater than 15 knots) the windward side may afford the only fishable conditions. In Great Bay such a sheltered location can be found with a wind from any quarter, though use of an anchor may be necessary to slow the speed of drift. Generally, you will need tackle somewhat stouter than that used in freshwater, with lines testing eight to fifteen pounds. For casting into the wind, a fast-taper rod provides needed power, particularly with baits or lures of less than one ounce.

Just as moderate wave action provides surface cover for fish, their foraging in the bay also corresponds with periods of diminished light intensity—that is, fish bite best early and late in the day or at night, especially where the water is very clear or shallow. This situation may be modified when the sky is overcast or hazy, or the water is somewhat turbid. When the sun is higher and bright, it may be best to fish the deeper places of the bay, or in the ocean. While this is true for most predatory fish, it is particularly so for striped bass; it may be less so for bottom feeders such as flounder. Here, unlike in fresh water, the additional factor of tides can be combined with a particular time of day in order to enhance fishing.

Tides play an important role in bay fishing. Generally, fish feed where currents are running, although slack periods may see activity in certain locations. A productive bank or flat with very little water at low tide may have four to six feet of water at high tide. This will allow approach by a small boat, and surface plugs or shallow-running baits can be effective. Channels are best fished near the bottom of the ebb as currents subside and fish leave the adjacent shallows. When currents are running, fish will often hold in a slough or at some point where a tide "rip" forms. In deep channels such as in and near the inlets and rivers, currents run very swiftly making fishing difficult. To the side of main channels currents disperse with lowered velocity, and not more than two ounces of weight should be necessary to keep baits near bottom. Similarly, in the wide main basin of Great Bay, depths and currents are uniformly moderate and can yield fish on either ebb or flood. When drifting in a boat it is possible to jig with lures, such as weighted bucktails, of one-half ounce or less. These can be tipped with bait such as bloodworm or pork rind, squid or mackerel strips. The bait itself can be drifted without weight or sparingly tossed overboard as chum.

If tide and wind do not permit successful drifting, you can try fishing at anchor, when fish are more effectively drawn by the scent of the bait carried with the current. Bloodworm, clam, and mackerel are the local early-season baits fished on either top-and-bottom or "doodlebug" rigs. This method can be enhanced by chumming with

ground fish or clam; however, you may need two (bow and stern) anchors to maintain a steady slick. In later season, weakfish are often taken by chumming and baiting (on the surface) with live grass shrimp, or using shedder crab as bait.

Bottom characteristics, related to tides or river flow, also affect the activities of predatory fish. A large portion of the diets of these fish in spring consists of small invertebrates including grass shrimp, baby crabs, and various smaller forms. Areas of moderate flow with a bottom of fine sand, or a mixture of sand and mud, are conducive to the presence of these creatures; such places may also promote plankton growth, thus attracting small baitfish. Areas of slightly greater flow, or exposure to wind and wave action, may have a harder or sticky bottom but provide attachment for aquatic plants and animals. Shellfish beds are usually found in such areas; they also harbor food organisms, particularly grass shrimp. These bottom types are often of moderate depth in areas which warm relatively fast in spring, and are found throughout much of Great Bay. Places of concentrated flow with a bottom of coarse, shifting sand (such as in or near the inlets) are less conducive to fish forage in spring. Conversely, stagnant places with muck bottoms are usually removed from the main tidal course and pathways of predatory fish. Nautical Chart 12316 (National Oceanic and Atmospheric Administration), which is available at marinas, gives a general indication of bottom types as well as depths, contours, and flow patterns.

Continued on page 30

Cattle Egret

chatter of chicks chattering constantly accompanies the rustle of leaves. When a parent returns with food, the chicks scramble up branches beneath the nest. Clamoring for the first food, they peck frantically at their parent's bill, stepping on their siblings to reach the top. And then it is silent again as the parents leave, and the chicks climb carefully back to their familiar hiding places. The pattern repeats itself day after day, and the chicks are imperceptibly larger each day. No one seems to notice that the smallest chick, the last to hatch, has perished beneath the nest, leaving more food for the other young clamoring above.

All around me now young herons and egrets flap their wings, eager to fly. For it is early July, and breeding is almost over. Elsewhere in the colony, the Snowy Egrets nested high in the vegetation, well off the ground and away from the hungry, hunting rats. But here, where Cattle Egrets nest among them, the Snowy Egrets raised only two young per nest, while in areas of the colony devoid of Cattle Egrets, the Snowy Egrets raised three young per nest. The Cattle Egrets have claimed their toll, and the Snowy Egrets have suffered.

The din of the colony reaches a peak as in nest after nest the parents return with food for young. At the first sight of their parents, egrets and herons rush to intercept parents



In New Jersey, Cattle Egrets nest very high in the vegetation with the much larger Great Egrets. Cattle Egrets have displaced the smaller species such as Snowy Egret and Little Blue Heron, forcing them to nest in lower positions which are vulnerable to predators.

before they reach the nest or scramble rapidly back to their nests. Flapping furiously, blundering from bush to bush, young egrets make their first flights. Branches bend, bow break, under the weight of a young egret that tumbled through, unable to land gracefully. The sun is clearly overhead, its hottest rays slicing through the leaves, making it impossible for chicks to capture any shade or to hide among the stalks. No breeze intrudes, no clouds cast shadows. The three Cattle Egret chicks who lived beside my hide for so long return only sporadically to wait expectantly for parents that never seem to come. Somehow above the clatter they recognize their approaching parent, and they each begin climbing for the top branches. Feeding takes only a few seconds now, and the parent soon departs. Moments pass, and finally facing their desertion, the chicks fly

gracefully to distant branches, then to distant bushes, before disappearing in the far reeds. The reeds have grown so tall that only a small circle of sky peers through, they wave ever so gently in the warm salt air. The colony is quiet, few chicks remain to wait for parents. And I wait, for minutes, for hours, and then for days. But the caustic clamour of my Cattle Egret chicks has ceased; they come no more to peer into my hide. As I walk slowly through the strong green stalks, the silence I had long waited is deafening. One long, wistful glance back at the gently waving reeds where hundreds of young herons and egrets had recently fledged, and I turn and face the clear, calm, blue bay. As I pass by a shallow mudflat, I see a young Snowy Egret foraging, darting here and there. And only I know that last year three young Snowy Egrets foraged in that same mudflat. □

Continued from page 29

Fishing in Great Bay

Vegetation also gives an indication of fish activity. Submerged vegetation provides a haven for small aquatic animals, although it may rule out the use of bottom baits and lures. Beds of sea cabbage, found in very shallow areas, may attract predatory fish at high tide. Some productive places with little tidal flush, such as in Barnegat Bay, contain dense beds of taller plants, mainly eelgrass. These areas are usually lined by mud flats or gently sloping sandy beaches, often with tall reeds (*phragmites*). Also, most of Great

Bay and the lower Mullica River are lined with shorter *Spartina* grasses and steep marsh banks of clay or peat, visible evidence of tide and wave action. They form a vertical barrier to further concentrate fish and harbor forage creatures, especially at high tide. These "sod banks" can be approached by boat when the tide is up, and some locations afford direct access for shore-based anglers.

There is a tendency in coastal waterways for those channels which concentrate fish to be those which also concentrate boat traffic. In Great Bay, however, many potential fish havens are passed by. Fishing is

more often successful where boat traffic is at a minimum, although this may be less apparent when fish are feeding in deeper water or near the bottom. Weakfish and striped bass, especially, are spooked by boat noise, so the fisherman should pursue them on weekdays whenever possible. Success is enhanced by observing environmental conditions and tidal cycles during the periods when fish are abundant, and planning activities accordingly. Thus, the natural setting of Great Bay with its surrounding marshes, beaches, and adjoining channels offers the perceptive angler many productive locations away from crowded thoroughfares.

Rats

garbage bin. In landfills, abandoned tires surrounding the dumping site provide convenient shelter for eating food retrieved from fresh garbage. Tires filled with the remnants of thoroughly gnawed bones are a good indicator that rats are present.

Their dietary preferences are similar to ours and they also have an enormous sweet tooth. Marshmallows, jelly beans, and peanut butter make attractive baits. The traditional slice of cheese is okay but sweets are taken much faster.

The razor-sharp incisors of rats grow continuously throughout life and it is difficult to deny them access to food because even the smallest crack in a food container is attacked tenaciously. Inch-thick boards will eventually be penetrated if food is regularly stored on the other side. Electric blackouts and fires are common in rat-infested areas because their penchant for gnawing insulated wires causes short circuits. Although the Norway rat is not as good a climber as his more agile cousins such as the squirrel, he is competent enough to gain access by walking powerlines into buildings. When frightened, rats will flee to cover but if the way is blocked, they will climb anything nearby. While excavating burrows, a colleague panicked a rat who promptly ran up his pants leg. We now wear thick rubber bands around our pants legs when doing field work with rats.

The cost of heating and cooling our houses has reached astronomical levels and architects are recommending we go underground for efficient comfort. Rats have been subterranean dwellers to great advantage for thousands of years. The elaborate burrow systems these animals construct provide protection from climatic extremes and predators and also make ideal nurseries and storage space for surplus food.

When humans are about, rats prefer to dig their burrows under some structure such as a pile of logs, or a chicken coop. If no appropriate structure is available the next best alternative involves a site next to a heavy object such as a building foundation or fence post. The banks of creeks and drainage ditches are also preferred. At these latter sites, the burrows will not be close to the water's edge but at the crest of the slope, well above flood level. At all locations, it's a good bet that a permanent source of food and water will be available within 50 yards of the burrow. The above accounts by no means exhausts all possibilities for a home. Rats can be happy within the hollow walls of buildings, particularly during cold weather, and have even been found living in bird nests and tree cavities. As in the case of their food habits, they make do with what's available.

Rat infants are born after a brief 21-day gestation period and become sexually mature when about 75 days old. Thus, rats are often grandparents at the ripe old age of 100 days. In the lab they can live to be more than three years old, but in the wild most rats probably die before the second year of life is completed.



The albino rat is widely used in scientific work. Note the similarity in body configuration to the wild rat in Figure 1. The similarity is not accidental since they are the same species, *Rattus norvegicus*. Wild rats and laboratory rats will mate with each other and produce fertile offspring.

The female has 9-12 pups in each litter and at birth her infants are hairless and cannot see, hear, walk or regulate their own body temperature. In short, they are totally dependent upon mother for survival, and rat mothering would be an impossible job without the security and warmth of a burrow. Large litters are possible for such a small animal only if the young are tiny and undeveloped at birth. In turn, undeveloped young would die if born in a more exposed setting. Thus, burrow living is indirectly responsible for their remarkably high reproductive rate. We suspect that females sometimes pool their young and cooperate in raising two or more litters together since a nursing female will readily suckle the young of another female.

The main entrance tunnels are easy to spot. Look for a circular hole 2-3 inches in diameter with lots of excavated dirt thrown carelessly about and well-worn trails radiating from the hole in several directions. Similar but larger holes are not inhabited by rats as big as tomcats; look for woodchucks. About 15 inches down the entrance tunnel, an oval chamber is constructed and filled with whatever nesting material is available. Emergency exits or "bolt holes" are constructed in reverse order—from the inside to the outside. Bolt holes are difficult to spot. No excavated dirt or trails are present and they are often plugged with leaves or stones to camouflage the location. The basic single-chamber burrow doesn't stay that way for very long. If left undisturbed, additional chambers and tunnels will be added and entirely new systems built nearby. In areas supporting a large rat population, the elaborate underground networks make the ground feel spongy underfoot and cave-ins are frequent since the burrows are seldom deeper than 18 inches.

Burrows are not castles to be defended at all costs but simply represent a temporary deterrent. A determined mammalian predator such as a fox can expose a small burrow system in five minutes of digging. By that time, however, the rats have slipped out the back entrances and disappeared into an adjacent burrow. Moreover, a fortress strategy wouldn't be smart even when the burrow could not easily be dug up

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Rats

because a hungry snake could still prowl effortlessly through the tunnels.

Rats are never a problem if there are snakes about. We have visited smaller landfills in New Jersey that are rat-free despite abundant food and no exterminating program. Rats will be continuously introduced into landfills as they are trapped in trash containers and trucked in with the garbage. The newly introduced rats, however, are quickly killed and eaten by snakes living in the landfill. In contrast, domestic cats and dogs are not very efficient at controlling wild rats. In fact, food left for cats and dogs often attracts rats and it is not uncommon to find rat burrows under dog houses.

Clearly, one important ingredient in the rat's ability to survive as our neighbor involves the fact that we drive off his most efficient predators. Weasels, snakes, and owls don't hunt behind supermarkets and restaurants where the urbanized rat chooses to live. At the present time our exterminating technology is a poor substitute for these normal biological controls on the rat population. Local Public Health officials and the State Rodent Control Project do an excellent job but they have many other responsibilities and are hopelessly understaffed. About the only way to sweep New Jersey free of rats is to either develop a fad for coats made of rat fur or push fried rat as a gourmet meal.

We do not wish to convey the impression that rats are about to take over New Jersey. Indeed, our rat population right now is much smaller than it was 50 years ago when sanitation practices were primitive and chickens and other domestic animals were raised on thousands of farms throughout the state. In theory, rat control is deceptively simple. If rats can be denied access to either food, water, or hiding places, they cannot survive. In practice, these principles can be

difficult to achieve. Food should be kept only in rat-proofed structures and garbage containers should be made of metal and have tight-fitting lids. The surrounding property should be kept free of junk and rubble and sources of water eliminated if possible. We often find rats living in and under old display counters and packing cases behind shopping centers, and air-conditioner condensate provides an ideal source of water during the summer months. Keep in mind how well these animals adapt to our environment and look at your property from their point of view.

Rats are not all bad. The domesticated Norway rat is used by the million in research labs throughout the world. The gentle albino rat is a favorite lab animal because he is hardy, easy to maintain, and physiologically similar to humans. Many people doubt that the immaculately groomed and docile lab rat could be even closely related to the "ferocious and filthy" wild variety. Domesticated and wild rats, however, readily interbreed and the expression "dirty rat" is not true of either variety. Wild rats trapped in even the most filthy environments are usually clean and well groomed. Moreover, their ferocity is also exaggerated. A cornered wild rat might emit a high-pitched squeal and make a brief lunge at an attacking human but this is a bluff tactic born of desperation. Rats are highly social animals and among their own kind, social interactions are generally very peaceful.

Very little basic research has been done on rat populations since World War II when the federal government sponsored several pioneering studies out of fear that the Axis nations were planning to use rats as vehicles for germ warfare. As a result, we still have a great deal to learn about these animals. If you have a problem with rats on your property, it is possible that you can help us gather data for a current research project at Rutgers. Our research would also be a direct benefit to you since we take your rats back to Rutgers. Call (932-9846 or 932-9861) or write Dr. Richard Lore, Douglass College, Rutgers University in New Brunswick, for further information. □



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Small boy, little fish—Photographed by Jeanne Quinn



