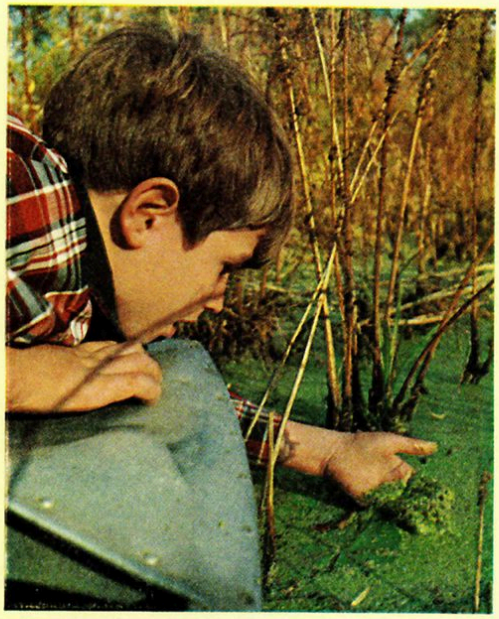


Teeming Life of a Pond

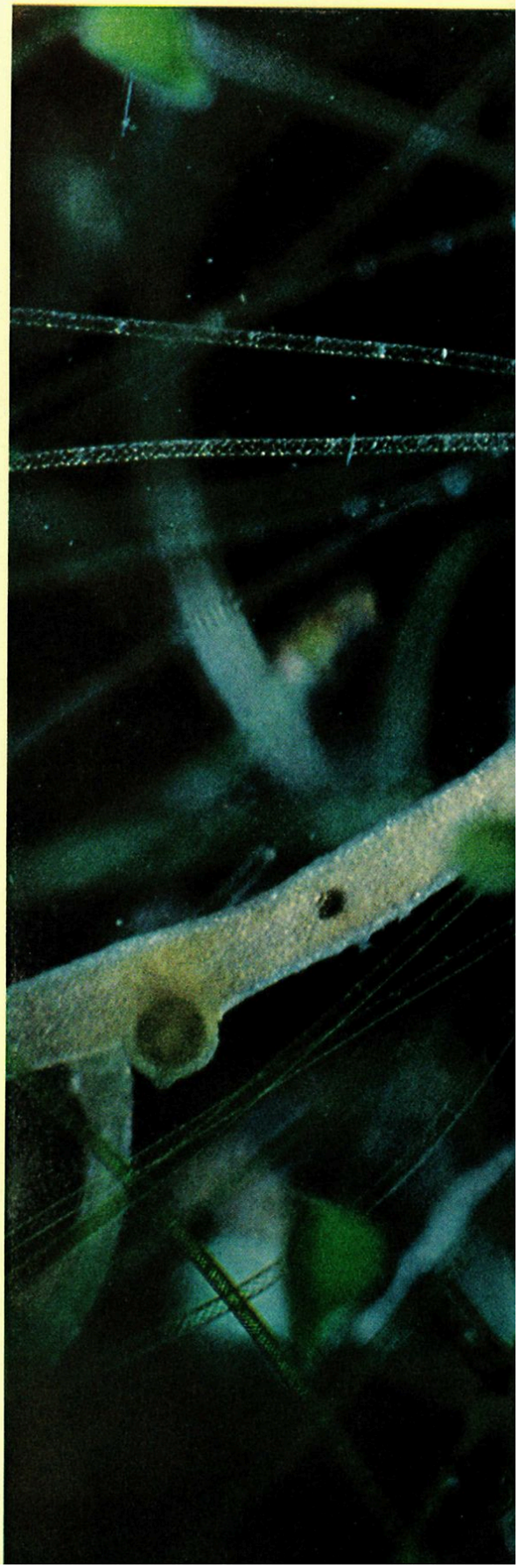
SUMMER DAYS on Noxontown Pond begin quietly enough. A painted turtle clambers out on a log to catch the warming rays of the sun. A kingfisher scoops a minnow from the shallows. A red-winged blackbird calls. And sometimes a biologist, who enjoys the two exciting worlds of laboratories and ponds, appears at water's edge.

I am that biologist and my life with Noxontown Pond goes back more than two decades, to the year when I joined the faculty of St. Andrew's School near Middletown, Delaware (maps, pages 284-5). The school borders most of the pond, a two-mile-long stretch of water with many wooded coves and a remarkable concentration of living creatures.

On still summer mornings, I often walk

Article and photographs by
WILLIAM H. AMOS

Wonder of a water world: Stirring duckweed and watermeal at a pond's edge, the author's son Steve sees



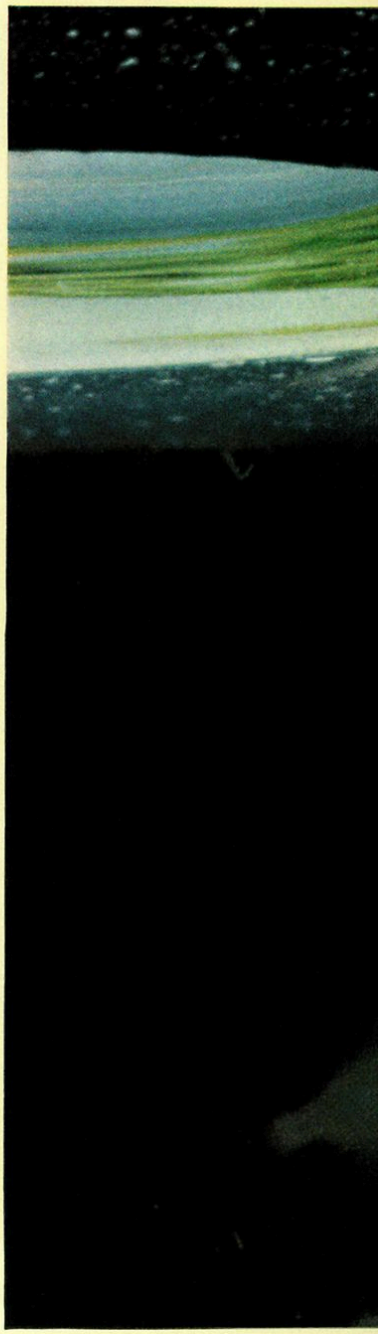
little of the marvels of magnification (below). Beneath the surface lies a tangle of bizarre forms. Stinging tentacles of a hydra—its tubular body bulging with a developing egg, left—reach toward green, cup-shaped Stentor *at right. Strands of algae,* Spirogyra, *resemble glass rods.*

15 TIMES LIFE-SIZE; KODACHROMES BY WILLIAM H. AMOS © N.G.S.

TWICE LIFE-SIZE; KODACHROMES © N.G.S.

the 50 yards from our home through the woods to the cove below. As the rising sun casts light upon the pond, I sense the stirrings of life evident only to those who will watch closely and listen patiently. I think of others who have praised such small bodies of water —Henry David Thoreau, for instance, who captured the essence of a pond so well, describing it as "the landscape's most beautiful and expressive feature. It is earth's eye; looking into which the beholder measures the depth of his own nature."

Not infrequently my thoughts drift back to my first plunge into this cove. I had been studying and photographing ponds for many months, yet during that dive I became, for the first time, a part of one. Explorations in succeeding years have made this underwater world more familiar to me, but no less exciting.



I CALL TO MIND one typical, yet special, June morning not long ago when I ventured once again into this complex community of Noxontown Pond. Face mask, snorkel, swim fins, and underwater camera all in place, I slowly submerged beneath tall, graceful columns of pondweed and stems of water lilies.

Delicate strands of bladderwort, with bulbous deathtraps awaiting small organisms, rose from the pond's bottom (page 279). Minute planktonic animals, illuminated by sunlight from above, danced in the water like dust motes in the air.

Dense clouds of minnows emerged from behind a forest of aquatic plants to greet me, momentarily obscuring my vision. Hundreds swarmed within three feet of my mask, ready to dart off at my least movement.

A giant water bug, more than three inches long, rose among the minnows and sculled to the surface, where it exchanged stale air for fresh, trapping a new supply under its wing covers.

When the cool water became uncomfortable, I waded ashore. As I walked beside the pond, peeling wet leaves and weeds from my hair and shoulders, I was met by my son Steve, who had come to call me to breakfast. "The Creature from the Black Lagoon!" he laughed, as he helped untangle weeds from my hair.

Steve (page 274) and his older brother Bill discovered the excitement of pond-exploring on trips we have taken all through the East. As we discussed this at breakfast that morning, Bill commented, "I'll bet we have seen a couple of hundred ponds, and every one is different."

"That's possible," I said, "but what makes them different?" Bill thought for a moment before replying.

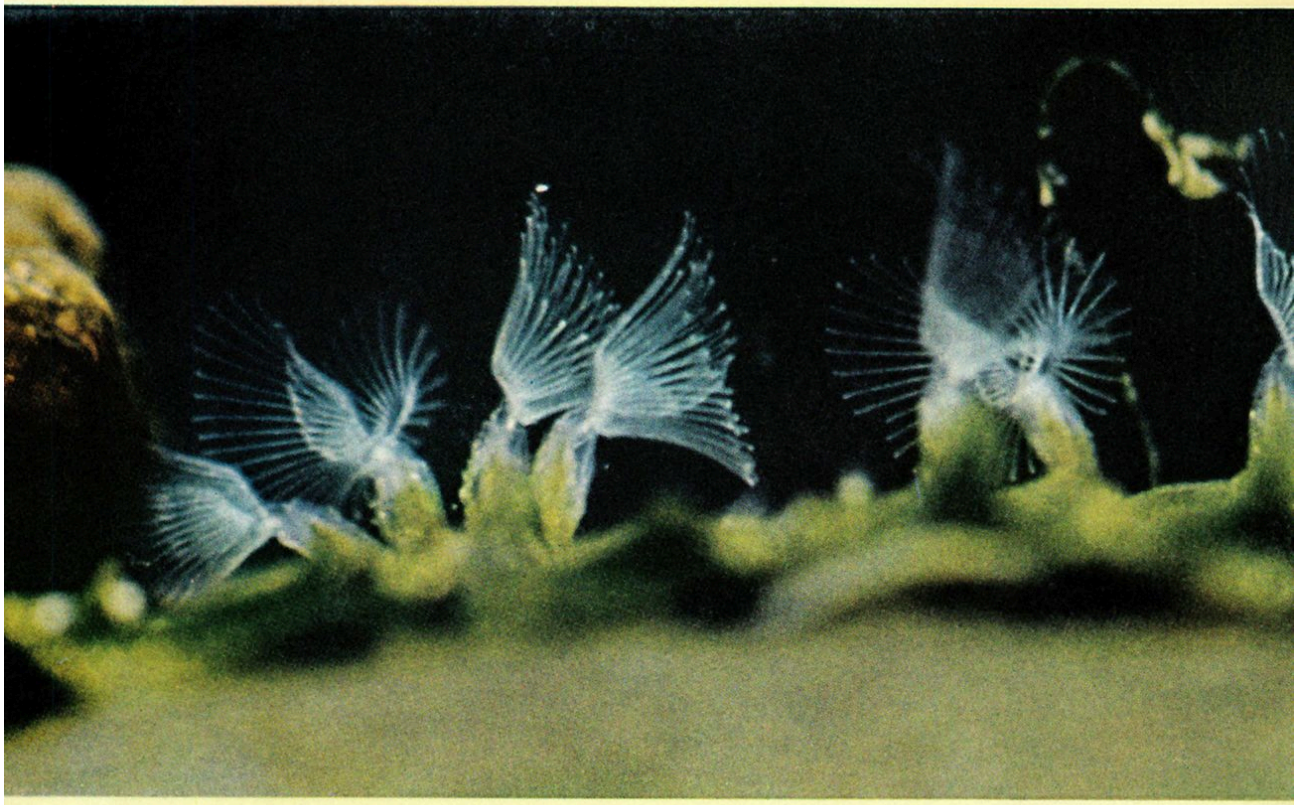
"A lot of things," he said finally, "like climate, the pond's age,

Water surface divides two realms

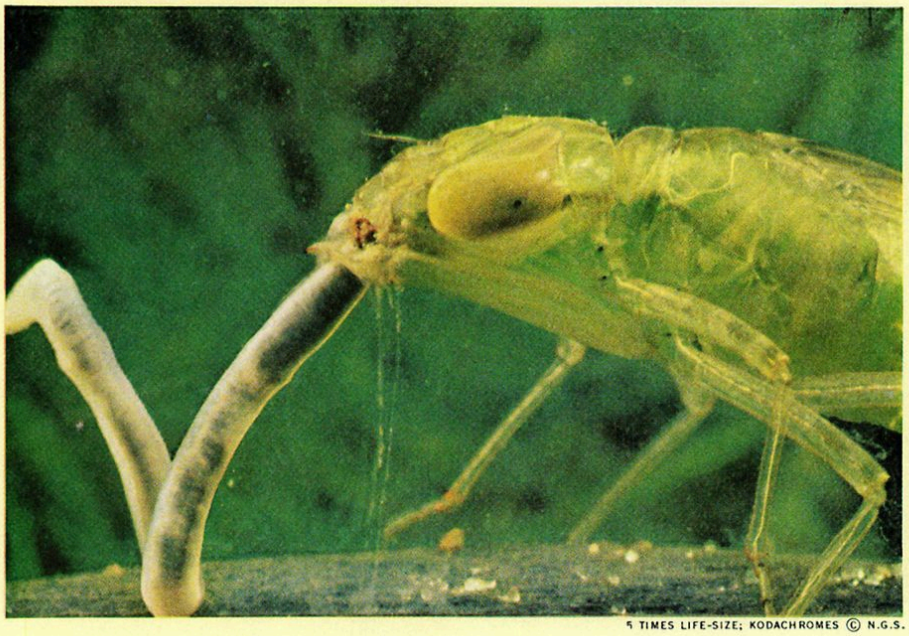
Man in water must either sink or swim, but the water's surface film provides a floor for some fragile creatures, a ceiling for others. Skating across the aquatic rink on six long legs, the water strider (left) makes a dent in the pond that mirrors its image. An underwater dweller, the damselfly nymph (below) presses against the surface tension, bending the water in its search for food.

Topside or in the depths, the pond offers hospitality to life in marvelous variety (pages 290-92). And each pond, among more than two million man-made and natural ones scattered across the Nation, boasts its own distinctive identity, whether just born, mature, or dying.

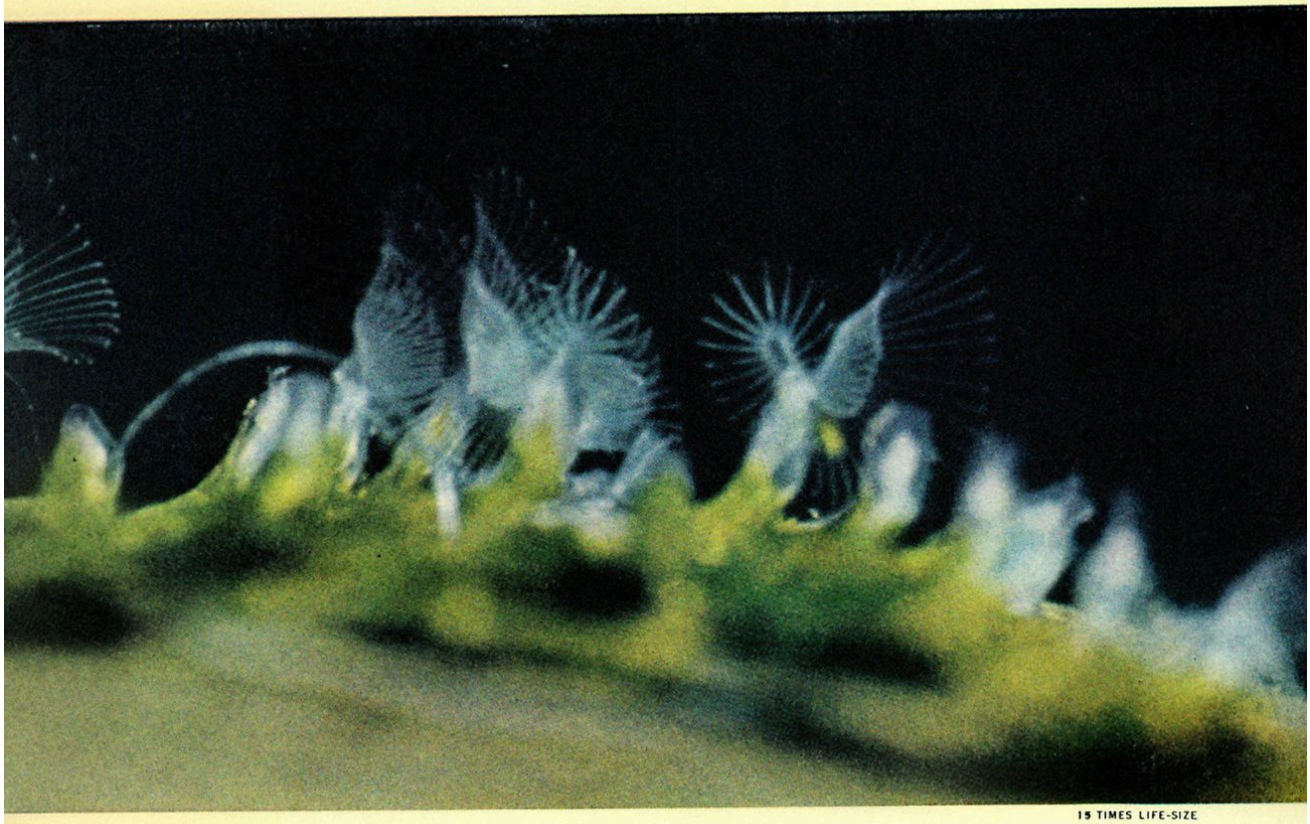
10 TIMES LIFE-SIZE



Endless quest: Underwater carnivores set fantastic traps for food



5 TIMES LIFE-SIZE; KODACHROMES © N.G.S.



15 TIMES LIFE-SIZE

TWICE LIFE-SIZE

Silvery crowns bear tiny cilia that waft meals of algae and protozoans into the maws of a colony of moss animals, called bryozoans.

On the prowl, a dragonfly nymph (far left) devours an earthworm caught by an ingenious lower lip, here folded beneath the head. Hinged and tipped with two pincers, the lethal lower lip whips out, grasps the victim, and flips it back to the mouth.

Pretty as a garden shrub, the bladderwort (left) packs deathtraps along its branches. In repose, the bladders appear as flattened sacs, but they can expand instantly to suck up any small creature that ruffles hairs guarding their openings.

the kind of bottom it has, the streams that enter or leave it, the plants and animals that live in it."

The ponds that Bill and the rest of us know best range over a 600-mile stretch of the Northeast, from Maryland to northern Maine and Quebec. Yet we always return to our home pond in Delaware with anticipation of learning more of its secrets.

When we first came to St. Andrew's, my wife Catherine, observing the pond's size, asked me, "Why isn't Noxontown a lake? What is a pond anyway?"

There are no set rules. Most limnologists agree that a pond is a small, completely enclosed body of water, shallow enough to encourage aquatic vegetation. Lakes are usually larger, deeper, and older.

ONE OF THE NICE THINGS about a pond is its accessibility. Nearly everyone lives close to some kind of pond. Scattered across the United States are more than a million man-made ponds serving as watering holes, swimming pools, or sources of water for fire protection. They harbor aquatic plants and animals, and sometimes game fish, too. Together with countless natural ponds, they form an aquatic chain inhabited by thousands of species of living things. Many ponds also provide resting and feeding stops on a flyway system. Thousands of waterfowl, including the great Canada goose, visit Noxontown Pond each year.

Often the children and I walk to the pond and pause on its bank, where our gaze spans almost its entire length. Once Julie spotted a bent stick half in and half out of the water. Momentary excitement erupted when the stick turned into a banded water snake that swam gracefully out of reach into the lily pads.

As the chatter of the children recedes in my consciousness, the days I have spent here begin to blend in a kaleidoscopic fusion of passing seasons and years. . . .

On a day in early fall, a handful of my students are following the intricate territorial flights of dragonflies.

Now, it is midwinter. The zoology class and I brave the bitter cold to cut holes in the ice through which we lower a generator-driven pump to obtain plankton.

With spring upon us, my family and I enter a lily-choked cove aboard our collecting barge. Son Bobby shouts excitedly, and somewhat inaccurately, "Look! A bald-headed eagle, a bald-headed eagle!" And there, sure enough, a bald eagle hovers directly above us, diving repeatedly only 50 yards away until it snatches a fish trapped in the shallows.

Toward the end of school, two students and I listen one night to a mixed chorus of frog voices: the guttering of the pickerel frog; banjo plunks from green frogs; the clicks of chorus frogs; the sonorous roar of a bullfrog. A sudden splash and a shrill scream, abruptly terminated, mark the end of a frog life and a meal for a snapping turtle or pickerel. . . .

Whenever our family travels about the country, the children watch for ponds in various stages of development. Each pond, they understand, is a living entity in itself. A pond has a birth, a slow period of growth, and a long maturity, before it declines into senescence and finally disappears.

Not long ago Howard Schmolze, a faculty colleague at St. Andrew's, invited me to look at a pond he had dug a few months earlier. He seemed puzzled that his pond could support so much activity so soon.

"How did these water plants get here?" he asked, "and where did all the diving bugs come from?"

His miniature shoreline already was crowded with spike rush, and the water teemed with back swimmers, water boatmen, diving beetles, water striders, and other insects.

A new pond, I explained, is invaded quickly by pioneer plants, such as the spike rush, which take root along the shore and grow outward into the water. Within hours after flooding, aquatic insects may arrive on the wing, drawn by light reflections. Bacteria, algae, and protozoans break out of resting spores and cysts to become active once more.

If the pond is stream-fed, fish soon take up quarters there. Ducks and other water birds transport on their feet additional cysts, spores, seeds, and eggs. Soon the pond, young as it is, supports a teeming population that grows richer with time (painting, pages 290-92). Only six months after the Schmolze pond was filled with water, it had become a thriving aquatic community.

Noxontown Pond is much older, of course. Originally a marsh, dammed in 1736 to serve the gristmill of Thomas Noxon, the pond still is watched over today by his descendant, Mrs. William Y. Ellison, who lives near the old mill. The pond is now at the height of its productivity, as measured by the plants and animals it supports. Someday, if nature has its way, sediment will accumulate, the shoreline will advance, and water will begin to

15 TIMES LIFE-SIZE; KODACHROME © N.G.S.

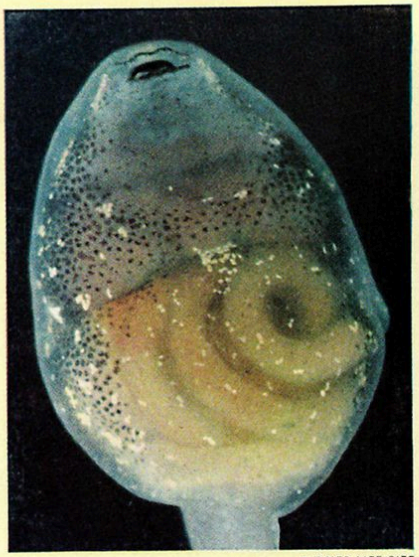
For a deprived midge, blood runs red

In oxygen-poor waters close to a pond's bottom the colorless body fluid of the midge larva turns fire-bright with a pigment related to hemoglobin in human blood. It shares the common name "bloodworm" with an aquatic worm fishermen use for bait. Other midge larvae appear yellow, green, or brown.

The incredible frog metamorphoses from a fishlike aquatic creature into a land-oriented amphibian.

Newly hatched tadpoles (left) squirm in the gelatinous egg mass. A month-old tadpole (right), with tail partly shown, digests food in a watch-spring intestine, easily seen in the almost transparent body; early pigment cells show as small dots.

As the tadpole turns into a frog, gills give way to lungs, heart and eyes prepare for the change from water to air, and the tail is absorbed as legs grow strong (below).



8 TIMES LIFE-SIZE

Tale of a tadpole

8 TIMES LIFE-SIZE (LEFT)

TWICE LIFE-SIZE; KODACHROMES BY WILLIAM H. AMOS © N.G.S.

disappear. The underwater plant and animal population will dwindle, then vanish. And where Noxontown Pond now stands, a stream will cut through the center of a small, fertile valley fringed with invading trees.

A pond's history can be read in its bottom deposits. There the events that have gone before lie recorded in the sequence of organic contributions made during different seasons. When students look closely into the three-foot-long cores brought up from the bottom of Noxontown Pond, they find, only six inches down, evidence of Thomas Noxon's world. Lower layers tell of earlier centuries, for the sediments reveal what the passing years were like, even what vegetation grew on neighboring fields. The history is all there for an expert to read.

ONE DAY, standing high on a point above the water, the children and I paid heed not to the pond's past but to its present. We looked over a sun-swept cove and took note of the distinct zones of life along the shore.

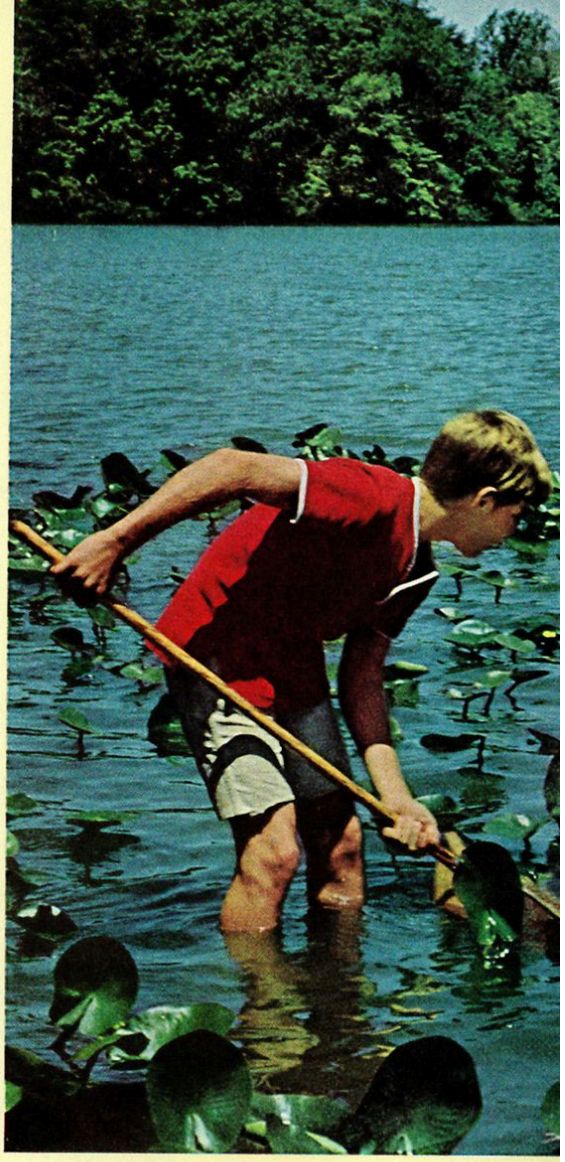
We recognized our favorite frog-catching grounds among the shallow-water emergent plants, such as cattails and reed grass. Farther out, in the zone of floating-leaved plants, tiny animals, we knew, were clinging to the undersides and stalks of lily pads. The undersurfaces of watermeal—the world's smallest seed plant—and duckweed provide attachment points for a whole community of living things.

Whenever we come out here, our youngest children, Alison and Bobby, like to hang over the edge of a wharf that projects into the cove. They squint their eyes and study the softly rippling water. The molecules of water at the surface create an elastic film so tough that aquatic insects and spiders can skate across it. They may dimple it with their weight, but they seldom break through (page 276).

If the children reach out to touch a nearby whirligig beetle or a fishing spider, however, the creature may penetrate the surface film and dive to safety, carrying air with it (page 294).

Even smaller animals live on the undersurface of the film, where they hang down or creep across it from beneath. Some are the familiar snails and hydras. A few of the smallest crustaceans, such as water fleas, may swim so close to the film that suddenly they find themselves caught in it. There on the quiet surface of the pond the upper parts of their curved, shelled bodies glisten in the sun.

The surface tension is so great that the little crustaceans can be caught there in a deathtrap. However, if they are in the process of molting,

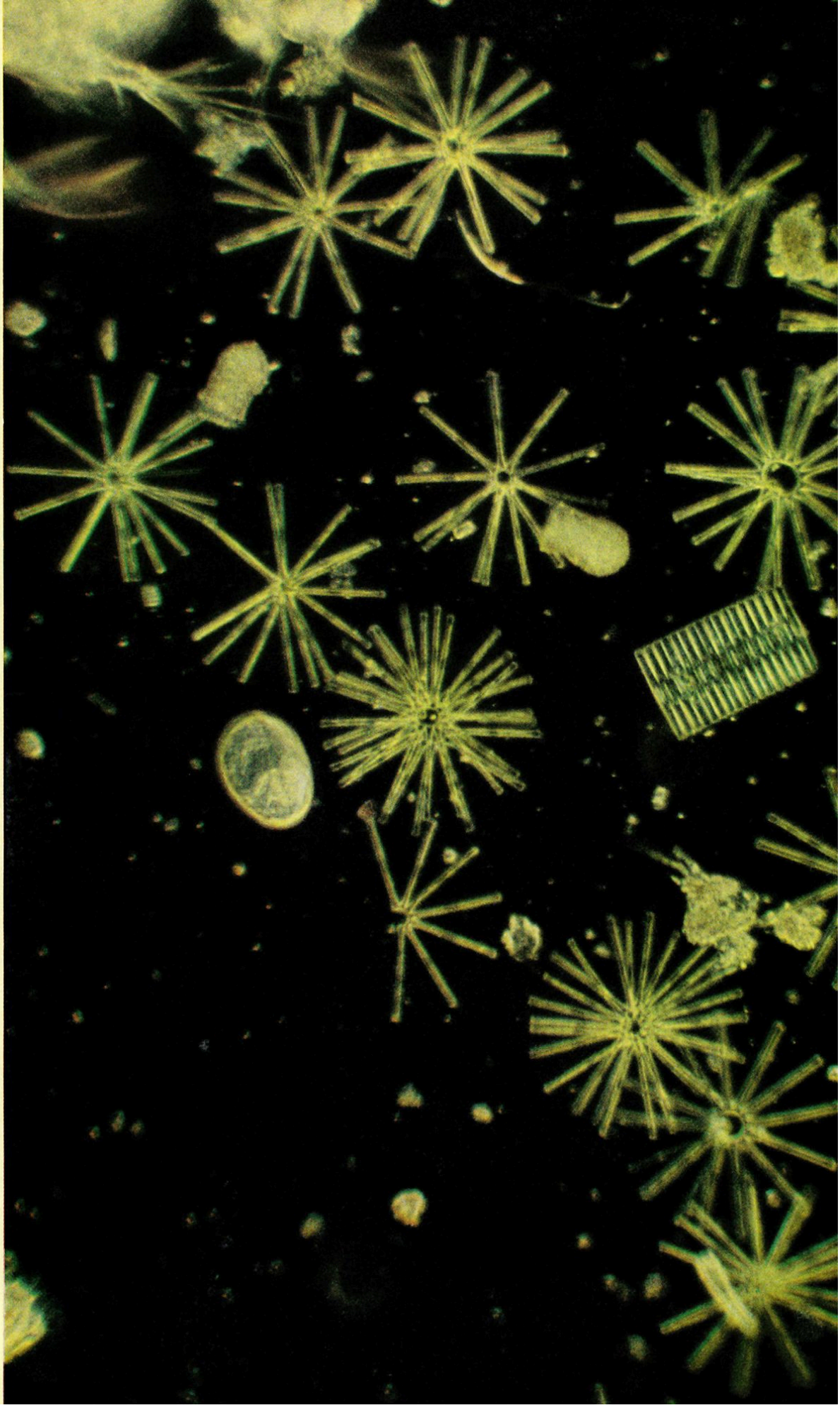


KODACHROME BY JAMES R. HOLLAND © N.G.S.

Noxontown Pond

Living laboratory, Noxontown Pond lies near St. Andrew's School, background, where the author, right, heads the science department. Here he and two students gather specimens for class study.

A two-mile sheet of water scalloped with wooded coves, the pond was created in 1736 when Thomas Noxon dammed a marsh to provide power for his gristmill. This "earth's eye," as Henry David Thoreau described a pond, is now in the prime of its life.



120 TIMES LIFE-SIZE

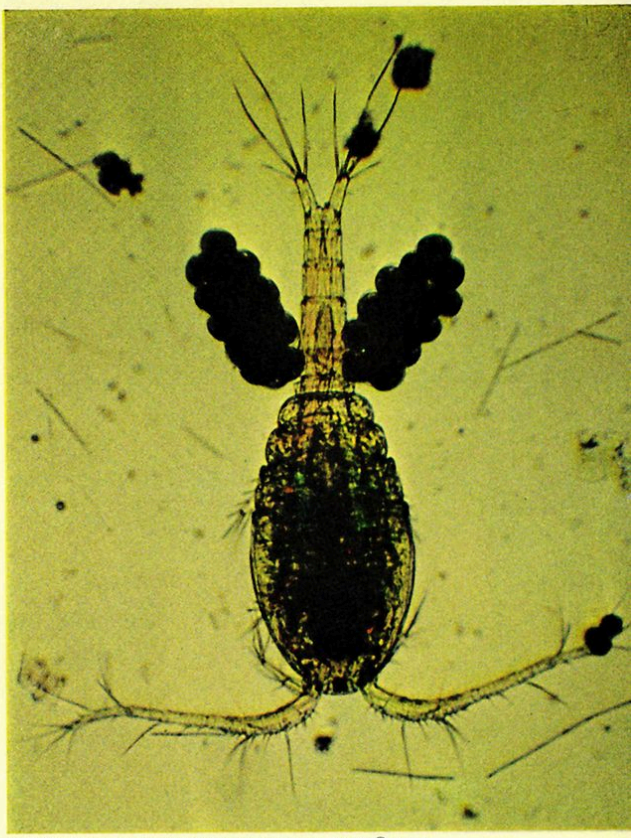
Life explodes in a burst of beauty

Microscopic galaxy of starlike Asterionella *diatoms (left) spangles pond waters. These one-celled plants, linked in a radial pattern, lie dormant in winter and burgeon in the spring, sometimes turning ponds yellow. With them in the watery firmament float a rectangular stack of* Fragilaria *diatoms and a rotifer egg.*

With its trunklike extension, the water flea Bosmina *(above), a crustacean about a fiftieth of an inch long, resembles the head of an elephant.*

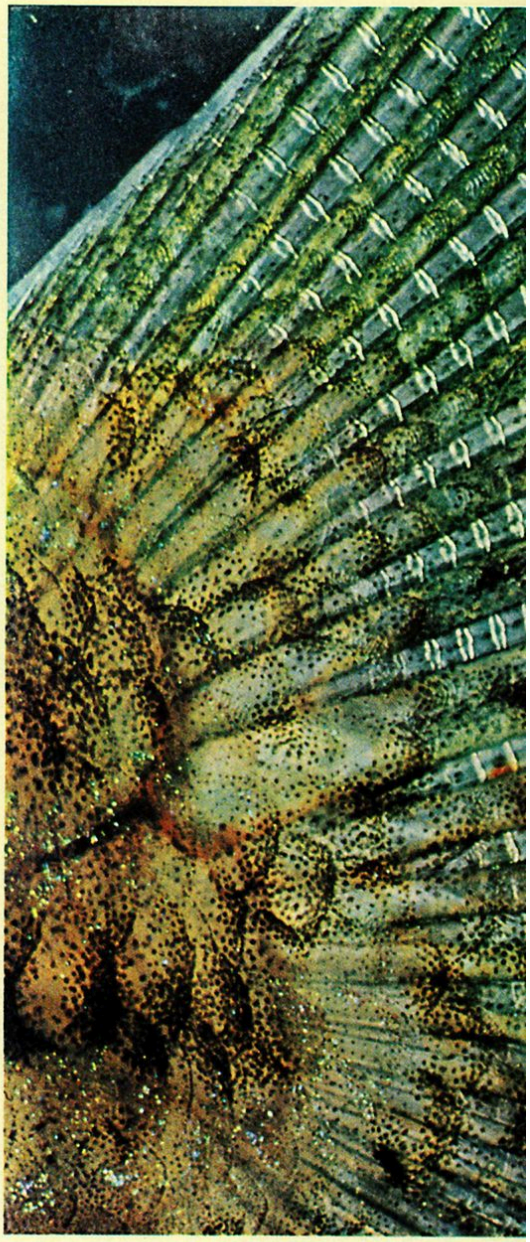
A female copepod (right) carries on the sides of her abdomen packets of eggs that may yield some 40 young.

200 TIMES LIFE-SIZE



40 TIMES LIFE-SIZE; KODACHROMES BY WILLIAM H. AMOS © N.G.S.

7 TIMES LIFE-SIZE



Free-loading leeches

Predators and parasites, leeches feed on their own kind as well as others. As the parent (above) broods its yellow-colored young, three small gray leeches attack them.

Caudal fin of a pumpkinseed sunfish (right) carries a couple of leeches along for the ride. These bloodsuckers cling by suction cups (one shown at top of picture above).

Of some forty leech species in the United States, only about half a dozen attach themselves to humans. Many are parasitic on fish, frogs, and turtles, and some feast on snails.

they may escape by slipping out of their skeletal coverings, which adhere to the surface, and dropping back into the watery world below. Their new outer skeletons quickly harden.

Through the next lower zone of life —the mass of the pond's water—swim leeches, mites, fishes, turtles, frogs, newts, diving ducks, insects, muskrats, and, on rare occasions, an otter. In the most densely inhabited zone, hidden from our eyes as we stand on the shore, the fragmented organic matter and mud of the bottom provide a home for scavengers—crayfish, worms, insect larvae, and snails, and many

15 TIMES LIFE-SIZE; KODACHROMES © NATIONAL GEOGRAPHIC SOCIETY

creatures seen only through a microscope.

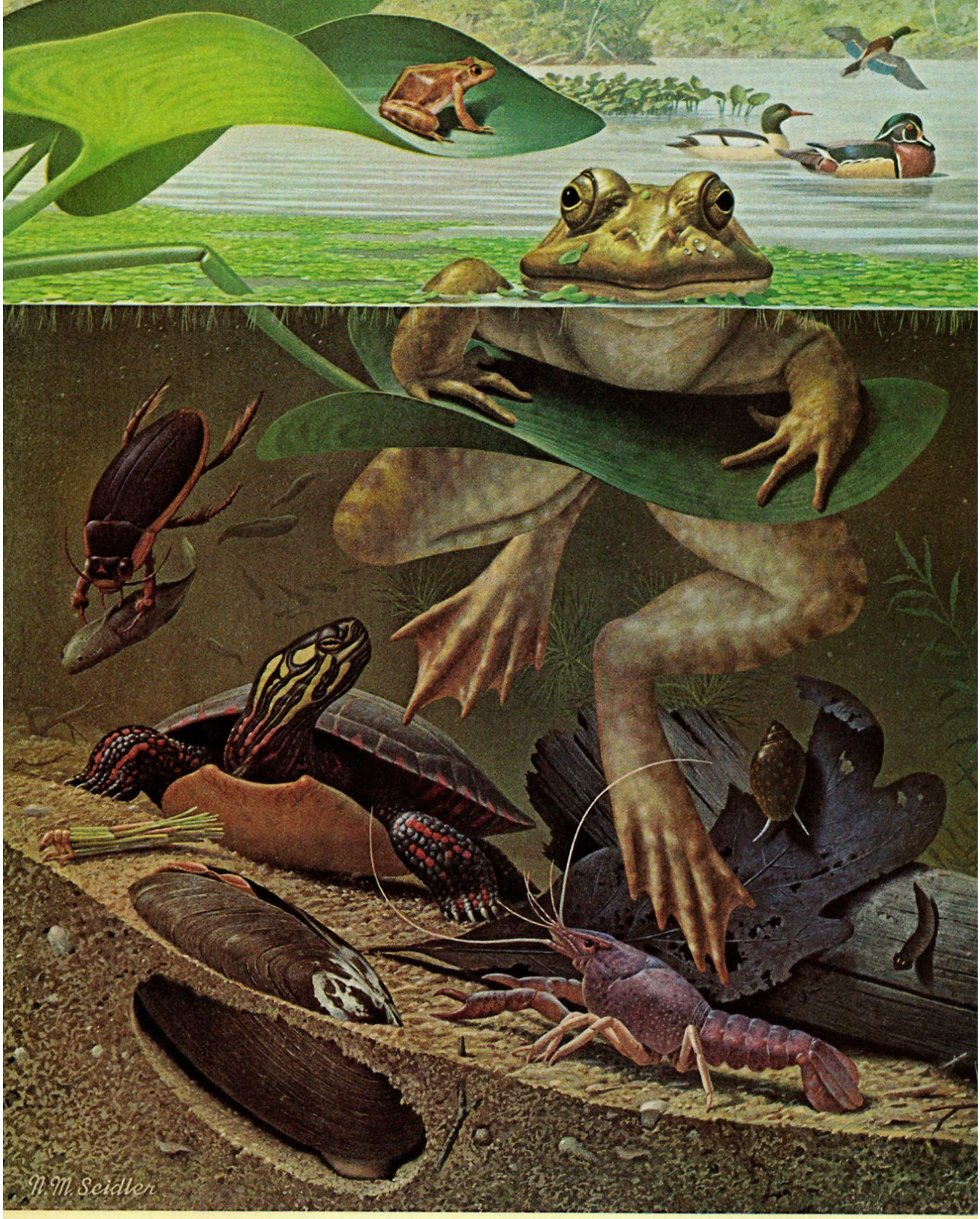
Earlier naturalists called ponds microcosms. In a general sense this is true, but we also know that no living community is completely isolated from the world around it. A pond is influenced by atmospheric changes, by contributions from streams, and by runoff from surrounding fields. A small pond, which is especially vulnerable, can be suddenly and often drastically polluted by many substances, from both domestic and agricultural sources.

Fortunately, only minor changes have taken place so far here at Noxontown Pond, and the water remains heavily populated. We spend countless and rewarding hours studying the habits and customs of its denizens. Take, for example, the ways in which they move about.

Many people think a fish swims simply by means of a tail fin; actually, most of its propulsive power comes from alternating waves of muscular contractions, down first one side, then the other. The fish bends in sinuous curves, creating pressure points that push against the water, much the way a skater thrusts out with blades to skim across ice.

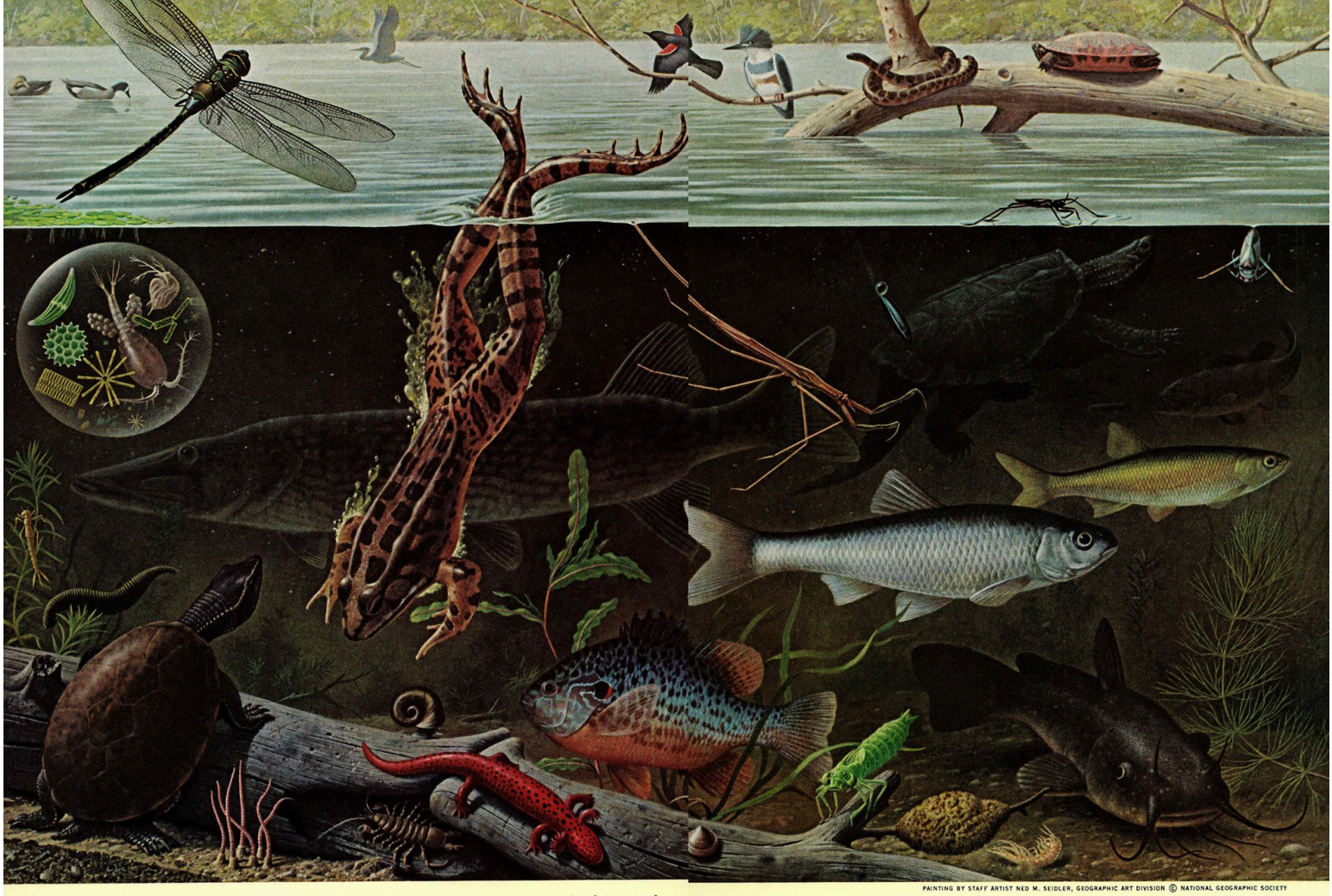
Swimming leeches also move by making muscular ripples that pass down their bodies, but they undulate up and down, not from side

(Continued on page 295)



What is a pond? To a fisherman it may offer a bass, to a boy a jar of tadpoles, but to a biologist it serves as a lesson in the balance of nature. Oxygen-giving plants and plankton—the food of mollusks, insect larvae, and young

PICKERELWEED
CRICKET FROG
SPATTERDOCK
COMMON MERGANSER
MALLARD
WOOD DUCK
WATER SURFACE
DUCKWEED
PREDACEOUS DIVING BEETLE
BULLFROG
TADPOLE
EASTERN PAINTED TURTLE
CADDISFLY LARVA
POND SNAIL
PLANARIAN
FRESH-WATER CLAM
CRAYFISH



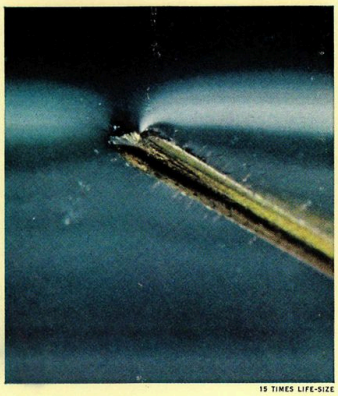
PAINTING BY STAFF ARTIST NED M. SEIDLER, GEOGRAPHIC ART DIVISION © NATIONAL GEOGRAPHIC SOCIETY

fish—thrive here. Predatory beetles dart amid fronds, and snails rasp at algae on stems. Insect-eating frogs may themselves provide a meal for turtles, fish, and snakes. Waterfowl dine on plants, fish, and insects, but seeds and eggs picked up at other pools drop from their feet to help replenish life. Bottom-feeding snails, crayfish, and catfish consume animal and vegetable debris. If undisturbed, these relationships may sustain a pond for centuries.

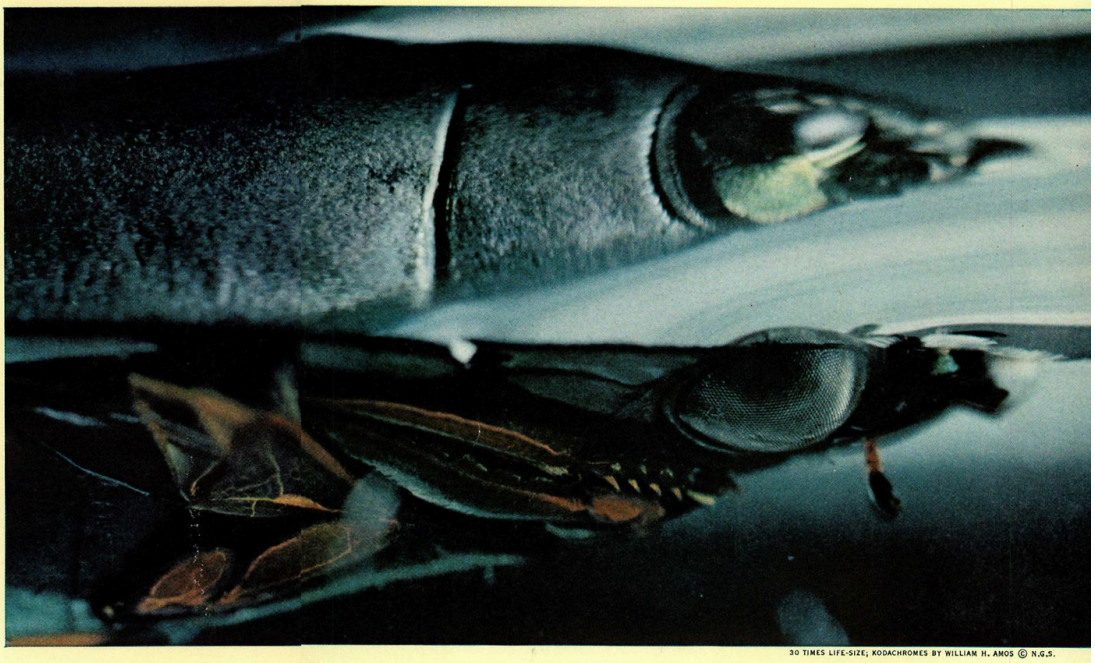
Snorkeling scorpion

Innocent looking as a dead twig, the patient water scorpion hangs beneath the pond's surface and breathes through a tail-like snorkel (below). Two grooved filaments bound together by interlocking bristles form the tube. Water-repellent hairs at the tip keep the opening in the surface film clear of liquid.

The water scorpion's powerful forelegs (bottom), similar to those of the praying mantis, capture passing insects and even small tadpoles. Parasitic larvae of the red water mite (page 297) find security on the scorpion's legs.



15 TIMES LIFE-SIZE



30 TIMES LIFE-SIZE; KODACHROMES BY WILLIAM H. AMOS © N.G.S.

Beetle with built-in bifocals

7 TIMES LIFE-SIZE

Keeping watch on both domains, each of the whirligig beetle's eyes is divided into two half-circles—the upper adapts to air, the lower to subsurface conditions. The beetle's water-repellent upper body helps keep it afloat as it darts and circles after insects caught in the surface film.

Occasionally the whirligig dives for the bottom, carrying air beneath its wings and in a bubble at the tip of its abdomen (right). This bubble acts as a gill, absorbing oxygen from water for the submerged beetle.

6 TIMES LIFE-SIZE

to side. Turtles derive most of their swimming power from their webbed hind feet; their clawed front feet are used primarily for shredding food and walking on land.

A dragonfly nymph, on the other hand, can employ a totally different method of movement. It can take off from a standing start by ejecting spurts of water from an abdominal cavity—a form of true jet propulsion.

All the manufactured devices we use in our studies—masks, snorkels, and swim fins—have natural equivalents in the pond world. Humans need a faceplate to see well underwater, but whirligig beetles have eyes with two hemispheres—one focused for vision in water, the other for vision in air (page 294).

AS FOR SPEEDY SWIMMING, many water animals enjoy a natural form of flipper or paddle. Some crustaceans, such as water fleas, swim with elongated, branched antennae or by rapidly moving legs. Water boatmen and back swimmers, two insect species that spend much time underwater, row through the pond with oarlike legs.

The legs of diving beetles have either folding plates or hairs that increase the surface area on the power stroke, then fold and offer little water resistance when the leg is brought forward.

A snorkel, too, is a device common to many of the pond's air breathers. With elongated nostrils, for example, snapping turtles and musk turtles can reach through the surface without revealing the rest of their heads.

Many aquatic insects come armed with long breathing tubes tipped with water-repellent hairs. When these insects rise to the surface, the hairs quickly penetrate the film and anchor the animals in place. At the same time, the hairs prevent water from entering the insects' breathing tubes (page 293).

Similar hairs cover large fishing spiders, which also enjoy still another invaluable piece of equipment—an air tank. When one of these spiders submerges, air trapped in its dense hair forms a silvery bubble that contains enough oxygen for an hour underwater.

In some cases the bubble of air that accompanies a submerging animal—like the whirligig beetle (page 294)—provides more than a reservoir it can draw upon. The bubble's surface acts as a gill membrane that allows oxygen to pass from the water to the insect and carbon dioxide from the insect to the water. Thus, the insect can remain submerged for as long as several hours. Nitrogen, which makes up most of the bubble's size, slowly escapes into the water and the sac collapses. At this point, the insect must rise again to the surface to capture a new air supply.

When we take our family to the pond, Catherine brings plenty of food. Sometimes we suspect that our children get hungry simply watching the constant—and often bizarre—feeding activities of our pond's inhabitants. All of us have watched with fascination, for example, as a dragonfly nymph, with its long hinged underlip tipped with a pair of pincers, grabs its prey (page 278).

Fiercest and largest predator in the pond world remains the snapping turtle, which is capable of amputating a small child's finger with a single bite.* A few years ago two of my students brought back a 48-pound snapper they had found in a net. I had no place to keep such a formidable beast in the laboratory, so I gave it temporary quarters in our bathtub. That proved to be a mistake.

The snapper barely had time to settle down in its new home before it greeted an unexpected guest—a visiting Chinese bishop who did not know that the bathroom was occupied. After a shocked silence, the bishop emerged quickly, lapsing momentarily into his native tongue. Explanations were difficult.

The next morning, at Catherine's prompting, I went to get the turtle and transfer it to more suitable quarters. I walked in and found my two-year-old son leaning over the tub, tenderly stroking the reptile's armored back, and crooning, "Nice turtle, nice turtle."

Unlike snapping turtles, some large diving beetles make good pets. I recall when Steve ran into the house, crying, "I found a monster, Dad!" His cupped hands held a two-inch water beetle that had blundered against the lighted screen door during its migration from one pond to another. We kept the "monster" for a year, feeding it bits of meat and an occasional earthworm until it died from an undetermined cause.

Numerous large oval water beetles became special pets of our daughter Alison when she was younger. One day she and I chanced upon a big red-bellied turtle on the bank, preparing to lay eggs. The turtle's foot-long back still glistened with moisture. Seeing us, she quickly

*See "Nature's Tank, the Turtle," by Doris M. Cochran, NATIONAL GEOGRAPHIC, May 1952.

PAGE 292 FOLDS OUT

pulled in her head and legs so that only the convex shell was evident.

Alison shrilled, "Look, Daddy! Look at the big, big bug!" As we watched, her big bug gradually turned back into a turtle and, ignoring us, went about the important business of laying eggs.

On another day, as the sun began to warm us, our barge drifted far up the pond and into a small cove. I watched as Bill, deftly swinging a dip net, captured a young bluegill. The other children gathered around and admired his catch. Bobby studied the fish closely and curiously, then asked me, "What are all those little black dots on the fins?"

"Clams," I replied, to the children's complete disbelief.

Large fresh-water clams release many minute embryonic young. Each of them bears stout teeth along the edges of its shell and a long filament that floats upward in the water. Whenever something moves nearby, the disturbance sends these tiny clams swirling. Their toothed shells snap wildly and must fasten to a fish fin or gill if they are to complete their life cycle. The clams then become embedded in the fish's tissues and undergo gradual development, later emerging and dropping to the bottom to grow to full size, as much as six inches long.

The reproductive behavior of pond animals like the clam often is a fascinating example of adaptation. Some leeches, for example, brood their defenseless young beneath their bodies. This protects the progeny against would-be predators. At times, however, other leeches may maneuver themselves under the female's body and attack the young anyway (page 288).

We moored the barge to the trunk of an overhanging beech, and the children scattered in search of treasures. The first to return, Alison, offered a prize find—tadpoles she had discovered skittering in the shallows among arrowhead stalks (pages 282-3). I admired her new pets and told her that, as frogs, they would spend all their lives along the shoreline, especially in weedy coves. Each kind of frog has its own special place where it lays its eggs, and its own time of laying, from late winter into summer.

When the other children returned, we sat on the barge and quietly watched and listened. A great blue heron alighted on an overhanging branch only 30 feet away. A resplendent wood duck and its mate paddled out of the thickets of water willow, feeding among the mats of duckweed and watermeal covering the surface. Startled by our presence, a large pickerel made a sudden rush through the surrounding pond lilies, causing them to bend and sway.

We stretched out on the barge and leaned over the edge until our noses practically touched the water. Water striders, both predators and scavengers, skated across the surface in search of dying and dead animals caught in the tension of the water (page 276).

"Watch this," Bobby called. Aware that water striders are attracted to any light-colored debris on the water, he tossed out bits of bread. As quickly as a morsel touched the surface, a strider would dart over and grasp it with nimble front legs.

NIGHT TIME on Noxontown Pond offers a whole new set of experiences. It was evening when we next boarded the barge and put out from shore, soon to become enveloped in another frenzy of activity and new dimensions of beauty.

We moved only a short distance, then sat silently listening to the insistent hoots of a barred owl from a tree leaning over the pond. Soon it was fully dark, and I turned on my headlamp. Here and there the light was reflected in pinpoints of green brilliance, revealing the eight blazing eyes of a great fishing spider resting on a lily pad.

Scores of small pond dwellers, seldom noticed during the day, came to life under the bright beam of my light. We watched the

All body, no head

Clown of nature, the red water mite Hydrachna *comes with big eyes set in a melon-shaped body and four pairs of hair-fringed legs that propel it helter-skelter through the water. Here, a specimen rests on a sprig of stonewort. Related to the spider, mites dare year-round life in the pond, even in ice-covered winter.*

30 TIMES LIFE-SIZE; KODACHROME BY WILLIAM H. AMOS © NATIONAL GEOGRAPHIC SOCIETY

5 TIMES LIFE-SIZE; KODACHROME © N.G.S.

Ingenious home builder

A soft-bodied caddisfly larva, which fishermen call "stick bait," lives in a protective case constructed of plant fragments glued together with its own secretion. Other caddisfly species build with sand or selected debris; material used in the abodes helps identify the occupant.

emergence of midges from their motile pupae that had struggled to the surface. Schools of young fish darted in and out of the beam. Bullhead catfish groped about in now deliberate, now frenzied fashion, then dived for cover beneath clumps of algae as the light picked them out. Small leeches, busily waving about for a passing fish victim, waited among these same clusters.

We noticed that the algae and surrounding plants were covered with tiny oval crustaceans, ostracods, so abundant that they lent the green filaments an orange cast. Some swam about, but most fed quietly on small forms of plant life, diatoms, which coated the plant stalks and pebbles of the bottom. As I bent close to the water's surface, I saw minute specks twisting and swimming about—protozoans and rotifers, too small to classify with the naked eye.

I snapped off the light. The sounds of night, dominated by a chorus of countless frogs, echoed across the pond. Holding our breath, we listened to a contrasting rhythm: the soft splashes, gulps, and gurgles made by the myriad and ever-moving animals of the hidden pond world.

When I flicked the light back on, its beam filled with insects, pulled out of the dark by uncontrollable reactions. They alighted on my head, crawled across my face, and burrowed under my shirt.

I again turned off the light, and almost at once I felt a gentle fanning breeze that came and went with the merest suggestion of larger wings. On went the light—to reveal the rapid, skillful flight of bats as they rushed out of the blackness to capture moths only inches from my face.

As we strolled home through the darkness, other sounds told us of many more creatures the night concealed. A quotation by Thomas Huxley came to mind: "To a person uninstructed in natural history, his country or seaside stroll is a walk through a gallery filled with wonderful works of art, nine-tenths of which have their faces turned to the wall."

Noxontown Pond, though so small a segment of the vast universe, helps me turn those beauties to the light.