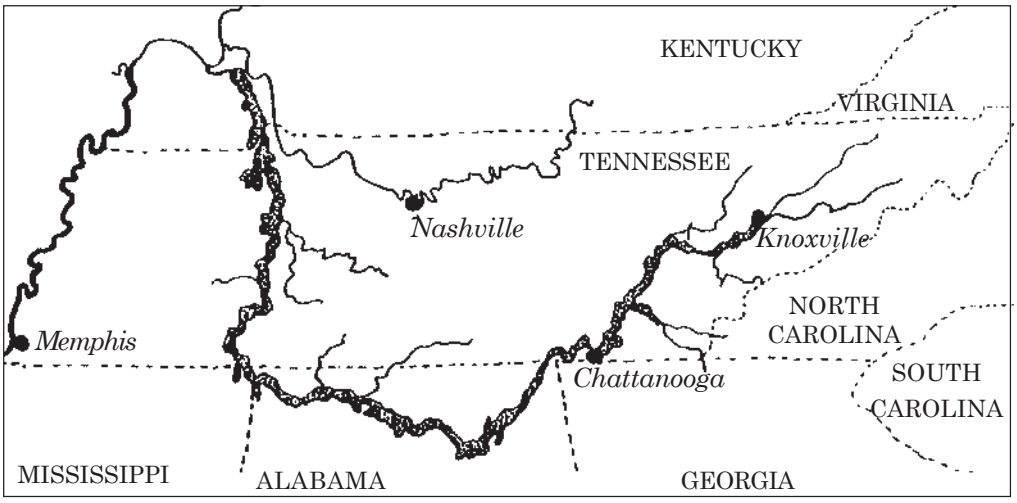
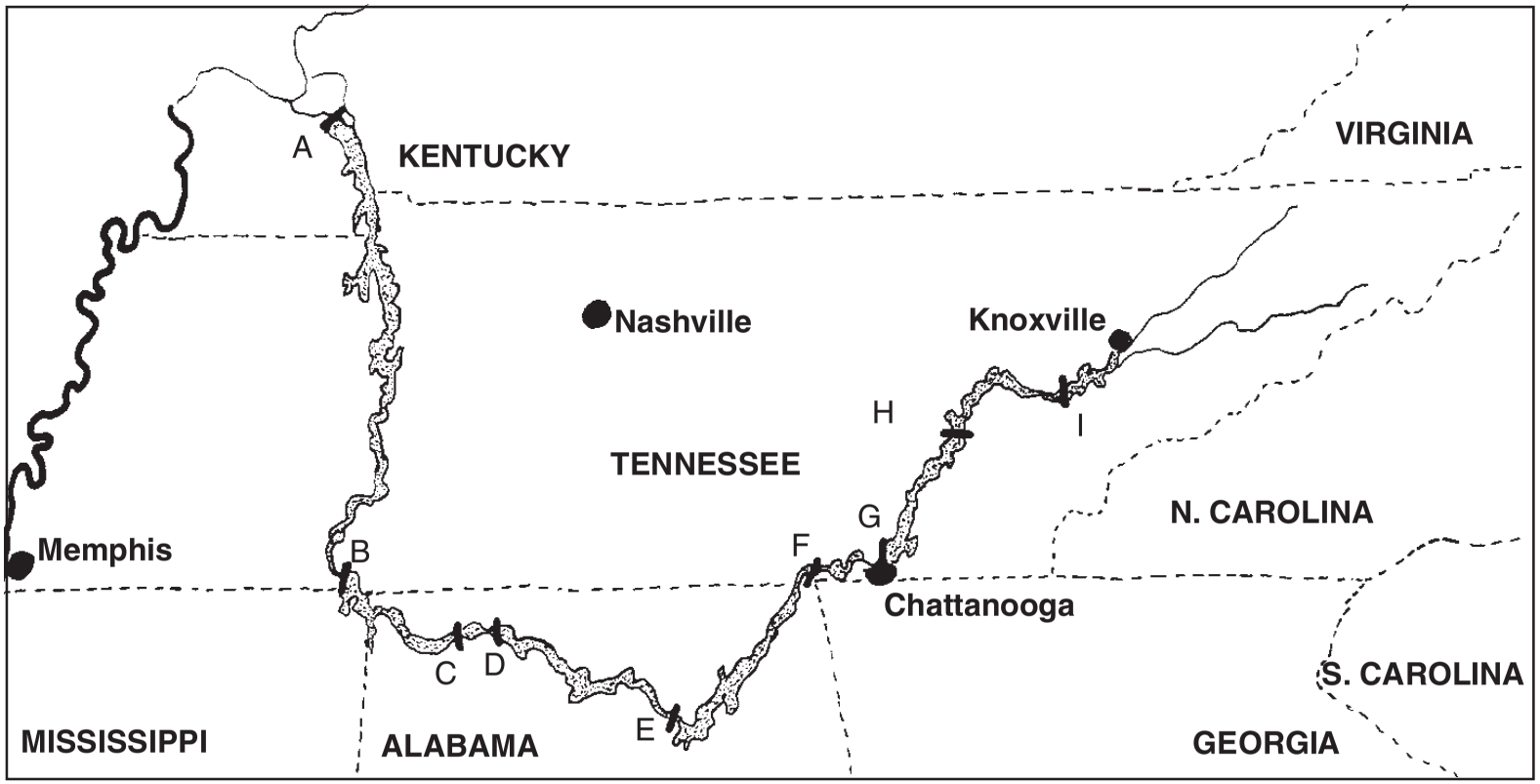
TENNESSEE RIVER

No matter their length, width or depth, all rivers share a common destination. They are all flowing to the ocean, and they usually accomplish this by taking a winding path seaward. The Tennessee River is unique geologically as the river begins its journey southward but then turns northward away from the ocean. It continues its northerly route until it reaches Paducah, Kentucky where it empties into the Ohio River. From beginning to end, the Tennessee River extends over 650 miles. The Tennessee River divides Tennessee into three distinct sections—the mountainous region of east Tennessee, the hills of middle Tennessee, and the flatlands of west Tennessee.



TENNESSEE VALLEY REGION

The Tennessee River begins above Knoxville where the French Broad and the Holston Rivers combine. The Tennessee River has undergone much change this century. Before human intervention the Tennessee River was perilous and unnavigable in many stretches and periodically flooded its banks. Following World War I the Tennessee Valley Authority was created as a regional development agency. One of TVA's main objectives was the construction of dams and reservoirs along the Tennesee River and its tributaries. This dam system was designed to control flooding of the river as well as to make it more navigable. At present, TVA operates nine dams on



TVA'S TENNESSEE RIVER DAMS

A. Kentucky Dam
B. Pickwick Dam
C. Wilson Dam
D. Wheeler Dam
E. Guntersville Dam
F. Nickajack Dam
G. Chickamauga Dam
H. Watts Bar Dam
I. Fort Loudon Dam

the Tennessee River and 37 dams on tributary streams. TVA has accomplished many of its initial goals and has aided the people of the Tennessee Valley in many ways. It is one of the nation's largest electric power producers, using a combination of coal, water, and nuclear fuel. Flooding of the river is controlled by the dam system so that the river rarely exceeds its banks, and during periods of drought TVA is able to keep a supply of water flowing to the cities and towns along the river. TVA is also developing ways to control water pollution from farms, streets, industry, and other sources. Every coin has two sides however, and for all the good the dam system has done, it has also had adverse effects on some wildlife, natural habitats, and fisheries. There are animals and plants that have adapted to people's influence on the river. Some species, however, have been unable to adjust to the changes that the damming has created and are no longer found in the river.

TENNESSEE RIVER FACTS

- The Tennessee River flows in a northerly direction farther than any other river in North America except the Mackenzie River in Canada. The Tennessee River is 652 miles long.

- The Tennessee River was known to the Indians who lived in the area over 8,000 years ago.

- Before the white man moved into the Tennessee area, the Cherokees, Chickasaws,Choctaws, Chickamauga, and Creeks dwelt at various points along the river. The Indians underwent severe persecution after the arrival of white settlers. The Cherokees were finally forced from their homeland during the presidential term of Andrew Jackson. The route used by the Cherokees as they moved westward to Oklahoma is known as the Trail of Tears. During the course of this journey, one quarter of the Cherokee population died.

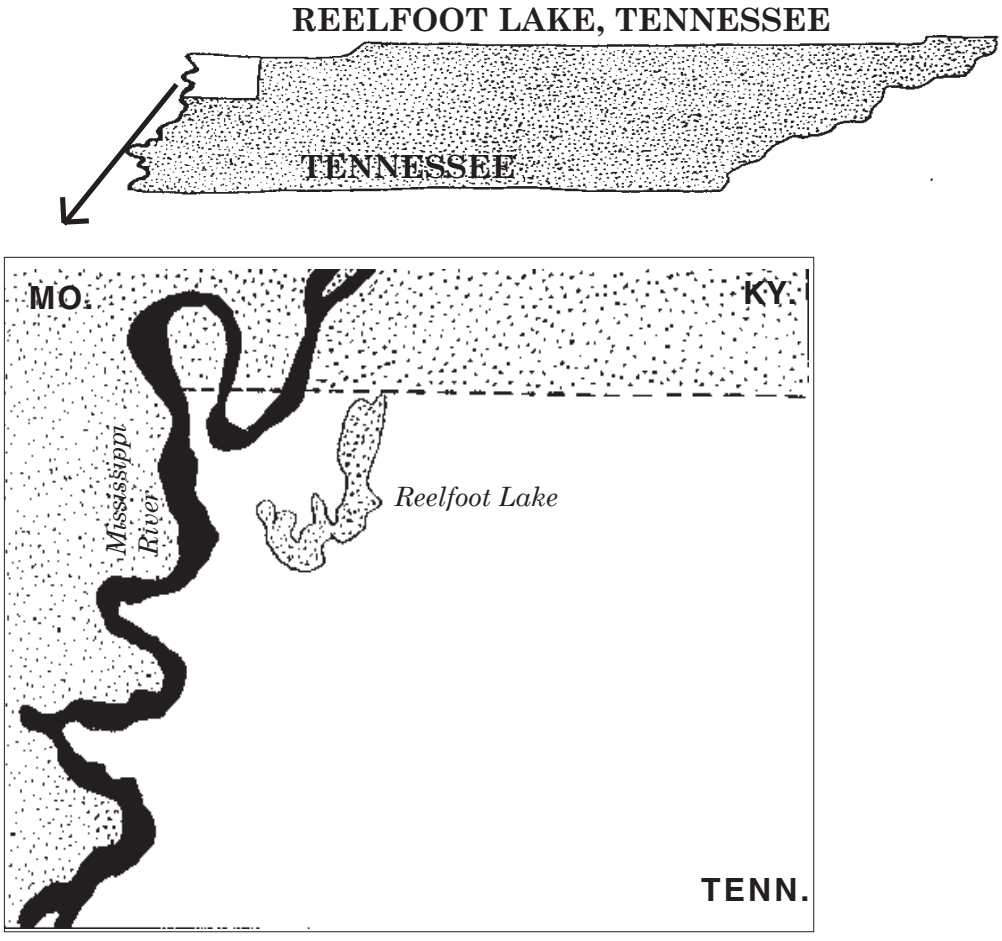
- The Tennessee River drains some 40,910 square miles over a seven state area.

- The initial Tennessee River began in the east on flat coastal plains and drained southward from the newly formed Appalachian Mountains.

- The word Tennessee originates from the Indian word for the river, Tanasi. The exact meaning of this word has been lost.

REELFOOT LAKE

All was quiet in the small Spanish settlement of New Madrid, Missouri on the cold winter night of December 15, 1811. In the early morning hours on December 16, the town's citizens were startled from their sleep by the sound of cracking timber, rattling furniture, and crashing chimneys. Along one of the country's most volatile fault lines, a violent series of earthquakes caused the ground to move in a rhythmic motion resembling waves. The quakes were so severe that huge tracts of land were lifted up as much as 30 feet while others sank. Boats on the Mississippi River were left high and dry while others were capsized by monstrous waves. This rising and falling of the earth made the waters in some parts of the Mississippi flow backward into the sunken areas of land. In the midst of this tumult, a large fissure situated across the river from New Madrid was filled by the Mississippi River, the Bayou de Chien Creek, and Reelfoot Creek. This was the birth of Reelfoot Lake. Located in a region of dense forest in what was then Indian country, Reelfoot Lake became a natural wonder. Surrounded by water, the trees of this forest were eventually ravaged by fire from lightning strikes. The stubs of these trees can still be seen today just below the water's surface. Because of its unique habitat and rich food supply, Reelfoot Lake supports an abundance of plant life, many game and non-game fish species, various mammals, and a huge population of resident and migratory birds.



Reelfoot Lake Facts

- Scientists predict that another major earthquake will occur along the New Madrid fault line in the near future.

- The New Madrid quakes of 1811 and 1812 are thought to be some of the most severe of this country's history. They are not widely known because the area was only sparsely inhabited and there were few casualties. Although no measuring device was present at that time, scientists theorize that the largest quake measured approximately 8.9 on the Richter scale. (Comparatively, the earthquake in Armenia also measured approximately 8.9 on the Richter scale.)

- The New Madrid quakes cracked sidewalks in Washington, D.C. and rang church bells in Boston.

- Reelfoot Lake has an average depth of only about five feet, and is about 25 feet at its deepest point.

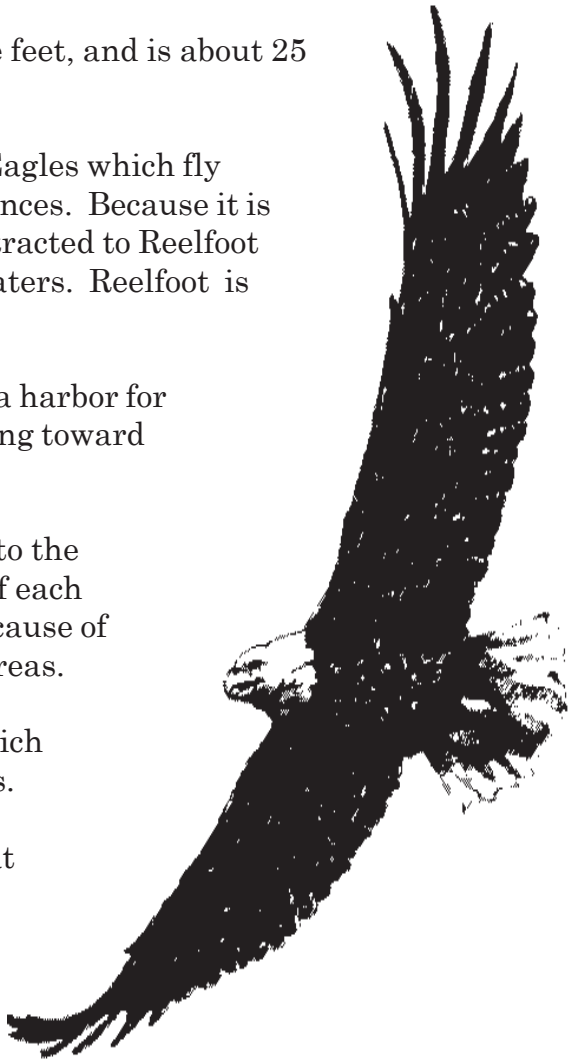
- Reelfoot Lake is the winter home to American Bald Eagles which fly down the Mississippi flyway from the Canadian provinces. Because it is a fish-eating raptor, the country's national bird is attracted to Reelfoot Lake because of the abundance of fish in the lake's waters. Reelfoot is a very shallow lake, making capture of food easy.

- Located on the Mississippi flyway, Reelfoot serves as a harbor for almost every species of shore and wading bird migrating toward the Gulf of Mexico.

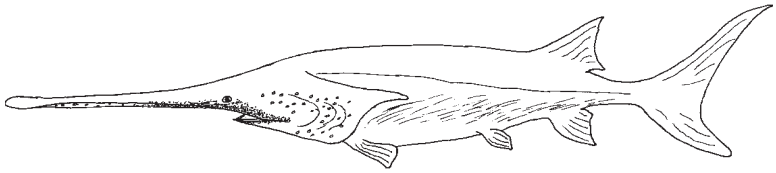
- Reelfoot Lake has a highly organic floor. This is due to the tremendous amount of aquatic vegetation that dies off each year and sinks to the bottom. Siltation also occurs because of abundant soil runoff from surrounding agricultural areas.

- Bald cypress trees dot the shores of Reelfoot Lake, which is one of the most northern of the bald cypress swamps.

- The lake encompasses 25,000 acres with 15,000 of that as open water. This figure is about half the size the lake was at its creation in 1811.



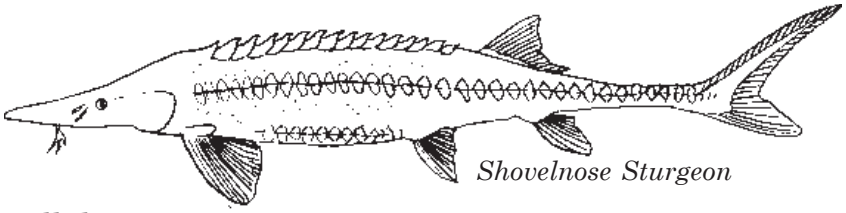
REELFOOT LAKE FISH



PADDLEFISH
Polyodon spathula

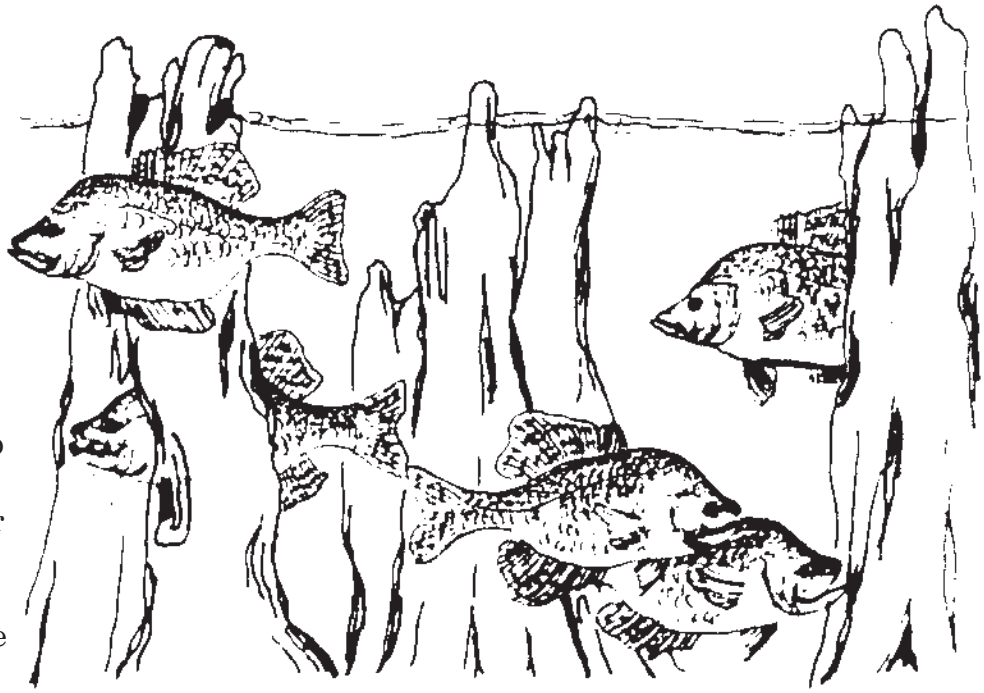
Paddlefish are archaic fish whose fossil relatives are found as far back as the Paleocene. Today, they are found mainly in large, silty river systems such as the Mississippi River system. Paddlefish are commonly called "spoonbill catfish" although they are unrelated to true catfish. Paddlefish have a cartilaginous skeleton, a large heterocercal tail and are virtually scaleless. Internally, they possess a spiral valve intestine, similiar to that found in sharks. They are most noted for the long paddle-like projection extending from their nose. The paddle is thought to contain thousands of tiny sensory receptors tthat detect electrical activity. This function aids in prey detection. Paddlefish may grow to lengths of five feet, weigh up to 184 pounds and live more than 20 years. Their eggs are often a source of caviar, as they produce over 500,000 eggs per spawning period. Their flesh is also a noted food source. Baked fillets are described as having the consistancy and mildness of chicken. Paddlefish use their gill structure for feeding. The gill rakers are used as a sieve to strain water and other particulate matter from the water similar to the method used by baleen whales for feeding. In addition to the young paddlefish exhibited in the Reelfoot Lake exhibit, there are currently three adult paddlefish residing in the Nickajack Lake exhibit. These fish have become conditioned to receive food from the divers although they continue their filter feeding behavior.

PALLID STURGEON
Scaphirhynchus albus
SHOVELNOSE STURGEON
Scaphirhynchus platorynchus



Shovelnose Sturgeon

The pallid and shovelnose sturgeon are closely related fish. The pallid sturgeon is restricted to the main channels of the Missouri and Mississippi rivers. It has decreased in numbers to the extent that it has been proposed for endangered species status. The shovelnose sturgeon occurs in the Mississippi river drainage and is considerably more common than its relative, the pallid sturgeon. These two sturgeon differ from the lake, white, stellate, and Russian sturgeon in that they lack a spiracle at the anterior margin of the operculum and have feathery rather than smooth barbels. Their life spans are not nearly as long as the aforementioned species at 13-15 years. The largest pallid sturgeon grows somewhat larger than the shovelnose sturgeon at a record weight of 67 pounds compared to the 10 pound weight for shovelnose. Both are benthic feeders as demonstrated by their terminal mouth. Their diets consists mainly of aquatic insect larvae but they will also consume small fish and invertebrates. These sturgeon are taken by commercial fishermen for their flesh and small amounts of caviar. Shovelnose sturgeon spawn in spring to early summer prior to the late summer spawning of pallid sturgeon. Shovelnose sturgeon produce up to 50,000 eggs.



CRAPPIE
Black Crappie
Pomoxis nigromaculatus
White Crappie
Pomoxis annularis

Crappie are members of the sunfish family which are characterized by spiny-rayed dorsal and anal fins and a deep body. Like most sunfish, crappie build nests in the spring for spawning, usually in waters that are free from turbidity. Crappie are very popular game fish in much of the United States. Adult crappie feed on other fish while juveniles eat invertebrates and small insects.

Both the white and black crappie are housed in the Reelfoot tank and are very similar in appearance. They both have black spots on their body however, the spots of the white crappie form faint broken vertical bars. The record size for white crappie in Tennessee is 5 pounds one ounce and the black crappie record is 4 pounds 4 ounces.

BLUE SUCKER
Cycleptus elongatus

The blue sucker is the only species in its genus. It is a steel-blue color, becoming much more intense in males during the late-spring spawning season. Like other suckers, the male developes breeding tubercles over most of its body including its fins. The blue sucker, also known as the Missouri sucker or blackhorse, prefers the flowing water sections of large rivers. Due to impoundments and siltation problems, the sucker population has declined over its range. In Tennessee, the sucker is listed as threatened by the Tennessee Wildlife Resources Agency. Female suckers are typically larger than males with a record size of 40 inches and 15 pounds. The blue sucker is a benthic feeder whose diet consists of invertebrates, insect larvae and fingernail clams. They are also know to eat algae and detritus.

BACKWATERS

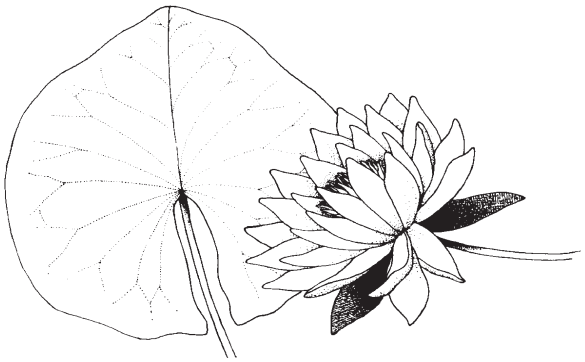
Within a lake or riverine habitat, water depths often vary greatly from shore to open water. This depth variation has a direct effect on the kinds and quantities of animal and plant species found in a particular location. It is in the shallow backwaters that fringe a river or lake that aquatic plants, insects, crustaceans, mollusks, reptiles and young fish thrive.

A RIVER'S NURSERY

Among the tangle of water plants, turtle hatchlings and fish fry seek refuge from predators and feast on crustaceans, mollusks, and insect larvae which abound in the nutrient-rich sediments. In this sense, backwaters serve as protective nurseries to a variety of young animal species.

Aquatic plants adapt to fluctuating water levels as well as changing water temperatures and light levels. Some aquatic plants are completely submerged like the vallisneria; whereas, vegetation such as water hyacinth has floating leaves. Some, such as water lilies, root underwater but are emergent plants. The pitcher plant, which lives above the water line, is a carnivorous plant. It uses its nectar to attract animals into the top of the plant. Once inside, insects find themselves in a pool of digestive enzymes as the pitcher plant feasts on its prey.

In the Tennessee Aquarium's Tennessee River gallery, visitors can gaze on the tiny Barren's topminnow. This small, delicate fish is highly endangered and the focus of Tennessee Aquarium conservation efforts. Raising and releasing Barren's topminnows is part of the Aquarium's continuing mission to reintroduce this species into its native range. In a cooperative project with TNARI, Conservation Fisheries, Inc., U.S. Fish and Wildlife Service, Tennessee Wildlife Resources Agency and the Nature Conservancy, the Aquarium has participated in rearing and reintroducing several thousand topminnows into their native habitats right here in Tennessee.



Vallisneria
Vallisneria americana
Coontail
Ceratophyllum demersum

A member of the frog-bit family, vallisneria is a submerged plant with very thin simple leaves growing up to 7 feet long. It flowers from July to October with male flowers at the base of the leaves and female flowers on long stalks. Often found in brackish waters, it prefers habitats along the southern Florida and Texas coasts but can be found as far north as Nova Scotia and Quebec. Coontail is a free-floating plant with branched stems that form large masses. It is a member of the hornwort family.

NICKAJACK LAKE

The Tennessee Aquarium's Nickajack Lake exhibit is an exploration of the murky and fascinating aquatic habitat found in the huge Nickajack reservoir in south Tennessee. Nickajack Lake was created by the Tennessee Valley Authority in the 1930s to reduce flooding and to provide a reliable source of drinking water for the state's citizens. The lake is presently 46 miles long and has a surface area of 10,370 acres. Some of the shoreline that was created as the lake was made is now submerged, creating underwater habitats of sunken forests, stump fields, abandoned bridges, and road beds. The Nickajack Lake exhibit displays the diversity of life found amidst the natural and artificial terrain of the reservoir. The exhibit offers a unique view of this slice of the Tennessee River. Never before has the visibility been so high, and the animals' behaviors so apparent. Fishermen may study the locations of the largest fish and dream of the "big catch." Biologists can study animal behaviors as they are revealed through the gigantic acrylic panels, and others might choose to just soak up the beauty of Nickajack Lake.

Nickajack Lake Facts

- The Nickajack Lake tank at the Tennessee Aquarium contains 138,000 gallons of water and is the largest freshwater tank in the Aquarium.
- Construction of the Nickajack Dam, a project of Tennessee Valley Authority, was begun on April 1, 1964 and was completed in December of 1967.
- The official total cost of the dam was $73,164,258.
- Nickajack Dam replaced the old and inadequate Hales Bar Dam which was located 6.4 miles upstream from the Nickajack project.
- The Nickajack reservoir is 10,370 acres with a total shoreline length of 192 miles including islands.
- Nickajack Lake lies in a valley known as Browns Valley in Alabama and as Sequatchie Valley in Tennessee. The valley averages five miles in width and is over 150 miles in length. It extends from southwest of Guntersville, Alabama to northeast of Pikeville, Tennessee.
- Nickajack Lake was named after a Cherokee town that existed as early as 1730.

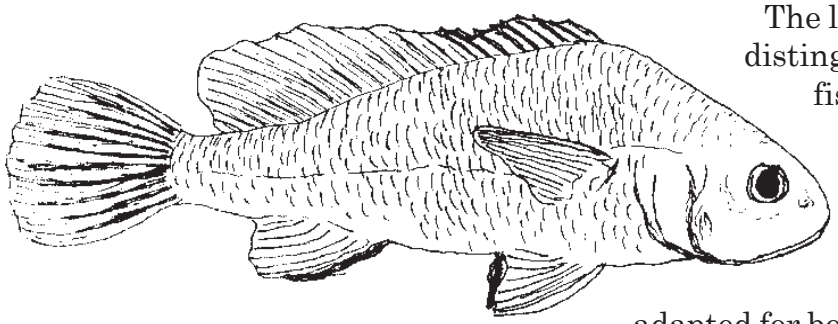
Nickajack Lake Fish

The Nickajack exhibit presents a wonderful opportunity for interpretation. Much forethought and study went into the design of the tank, and the finished product recreates the habitat that the animals are accustomed to in their natural environment. The results of the research and careful planning are apparent - the animals are behaving just as they would in the wild. The blue and channel catfish are cruising around the bottom staking out their territory, and the flathead catfish is lying motionless among the brush on the bottom. Several smallmouth buffalo are scouring the gravelly substrate using their sucker mouths to pull up algae and detritus. The largemouth and smallmouth bass are hanging out in the shadowy crevices of the fabricated sandstone ledges. Cigar-shaped, long-snouted gars are suspended near the surface, and the sunfish are attracted to the supports of the boat dock. Are all these fish displaying the same habits they would if they were in the real Nickajack Lake? They most certainly are!

FRESHWATER DRUM
Aplodinotus grunniens

The freshwater drum is the only species of the family Sciaenidae that occurs in fresh water. This fish comes by its name because of the loud drumming sounds that it makes. This drumming noise is created by the vibration of a muscle close to the swim bladder. The bladder works as a resonator and amplifier of this vibration. Some scientists speculate that this drumming may be associated with spawning activity.

IT'S LONELY AT THE TOP
Unlike most North American freshwater fishes who deposit eggs in nests or natural cavities, the fresh water drum's eggs and larva float at the water's surface.



The lateral line of the freshwater drum distinguishes it from all other freshwater fish because it extends all the way to the tip of the caudal fin. The freshwater drum prefers large rivers, lakes, and impoundments, and avoids strong currents. Its mouth is inferior (located ventrally) and is adapted for bottom feeding. The drum eats fish as well as mollusks . They have heavy pharyngeal teeth for crushing shells.

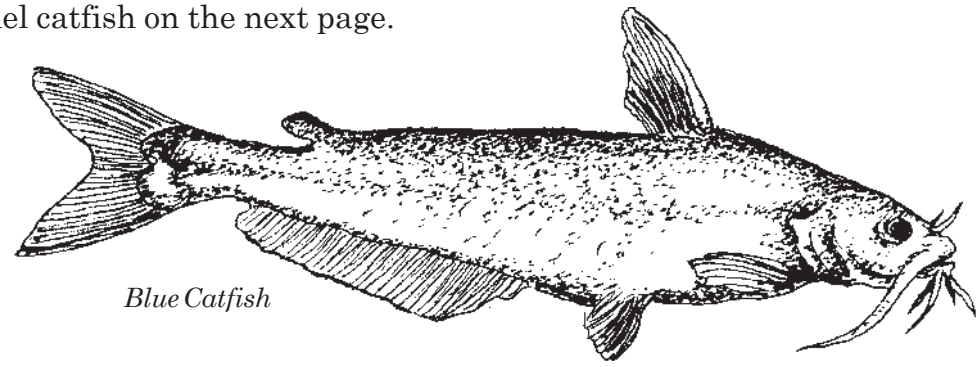
WHO NEEDS A RABBIT'S FOOT WHEN YOU'VE GOT OTOLITHS?
The freshwater drum has especially large otoliths, or "ear bones," which are structures that help the fish keep its balance. These inner ear growths are carried by some people as good luck charms!

FLATHEAD CATFISH *Pylodictis olivaris*
CHANNEL CATFISH *Ictalurus punctatus*
BLUE CATFISH *Ictalurus furcatus*

Perhaps one of the most easily identified and familiar fish is the catfish. This bottom-dwelling animal has a flat head, long slender barbels that resemble a cat's whiskers, and usually has "naked" or scaleless skin. The barbels have many tastebuds and when food comes in contact with them a feeding response is triggered. Catfish rely more on this taste and touch response than they do on sight and they are active at night, on dark cloudy days, or in murky muddy water. Catfish are omnivores, which means that they will eat practically any kind of food. There is a band of teeth on the roof of the catfish's mouth that point toward the throat, making it nearly impossible for prey to escape once the catfish grabs it. A sudden drastic change in water depth (i.e. flood rains or dam openings) will send these fish into a feeding frenzy which may last for many hours. To deter predators, the catfish has sharp, venomous spines on its dorsal and pectoral fins.

GREAT BIG BLUE
Of commercial importance in some areas are the flathead catfish, channel catfish, and blue catfish. The largest of the three is the blue catfish which may weigh as much as 150 pounds!

North American catfish belong in the family *Ictaluridae* and are distributed throughout the world, with Canada and the United States being home to 37 species. All catfish have long barbels and smooth, scaleless skin. The fins are made of soft rays except for sharp spines at the front of the dorsal fin and each of the pectoral fins. The blue catfish is abundant in our largest rivers. They are relatively long-lived with specimens recorded as living more than 20 years. The blue catfish is more migratory that other species, thus it has a lower tolerance for impoundments. The blue catfish can be distinguished from the channel catfish by its straight-edged anal fin. Comparte this fin to the rounded anal fin of the channel catfish on the next page.

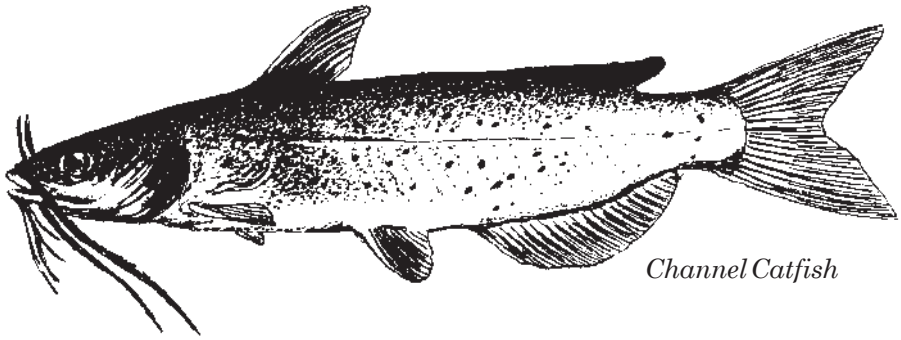


Blue Catfish

WATCH THOSE SPINES!
Some North American catfishes possess a mild venom that is associated with the pectoral and dorsal spines. The venom is used as a defense when the fish is alarmed or threatened, but is not dangerous to humans.

Unlike many fish species, catfish administer much parental care toward their young. Most catfish species deposit eggs in constructed nests or natural cavities and, depending on the species, one or both parents will attend the eggs until hatching. The parental instinct is so developed in the bullheads that they will stay with their young for a relatively long time after the young are free-swimming.

The channel catfish has high commercial and sport value. It is an excellent food fish, is widely distributed, and has unique sporting qualities. The channel catfish seems to be the most versatile catfish as it is found in a variety of habitats. Because of its adaptability and excellent food quality it has been studied more widely than other species. Channel catfish spawn in late spring and large females may lay up to 70,000 eggs per year. The male is responsible for guarding the nest. Adults are primarily fish eaters, while juveniles feed on insect larvae. Channel catfish are fast and powerful making them a great sport fish for many anglers. The Tennessee record for a channel catfish is 41 pounds.



Channel Catfish

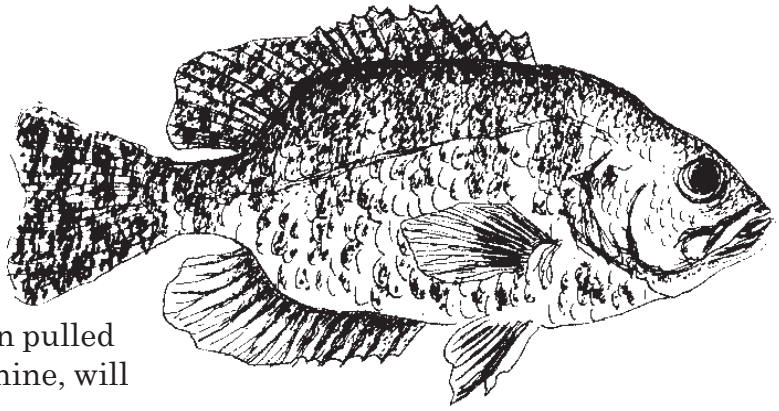
"STINK BAITS"

Fishermen have had success in catching catfish with an enormous variety of bait. The superior ones, however, are the "stink baits." The catfish's abundant taste glands located on the body and concentrated in the barbels hone in on the fishermen's offerings of "soured" clams, "ripened" chicken entrails, and cheese and doughball mixtures that have been allowed to "cure" and acquire an extra stinky odor.

LAKE STURGEON
Acipenser fulvescens

The Nickajack Lake exhibit is home to one adult lake sturgeon along with several juveniles. The adult fish arrived at the Aquarium in 1993 from the Steinhart Aquarium. This fish is a favorite of the aquarium divers, as it readily accepts food from their hands. The younger sturgeon were transferred to the exhibit after they outgrew the touch tank. Lake sturgeon are one of the slowest fish to reach sexual maturity. There is also no visible way to determine if the fish is male or female. For more information on lake sturgeon, refer to the Discovery Hall chapter in your docent manual.

ROCK BASS
Ambloplites rupestris



A secretive member of the sunfish family, the rock bass is the "chameleon" of weedy lakes, ponds, and clear, slow-moving streams. The rock bass can undergo drastic color changes depending on its surroundings. A rock bass hiding in a dark, shadowy crevice will appear almost black in color. The same fish, when pulled from its gloomy nook into the bright sunshine, will quickly change to a yellow hue.

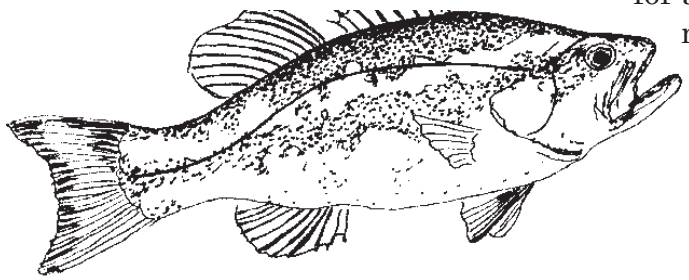
Rock bass build nests over a bottom of sand or gravel, and similar to other members of the sunfish family, the male rock bass will guard the eggs and newly hatched young.

SEEING RED
The large red eyes of the rock bass have gained it the nicknames "goggle-eye" and "redeye."

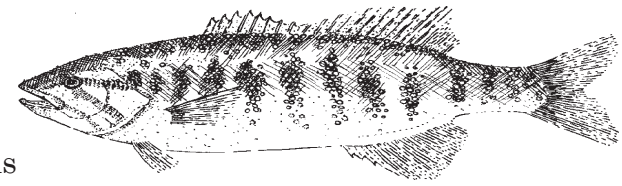
LARGEMOUTH BASS
Micropterus salmoides

The largemouth bass is an elongated member of the sunfish family which usually appears green and silvery on its upper parts and white on its belly. Its huge mouth, which extends past its eye, enables it to feed on both large and small prey. Largemouth bass are opportunistic feeders, taking everything from small fish, salamanders, and crayfish to turtles, frogs, and even mice!

Two sub-species of largemouth bass exist: the northern largemouth (*Micropterus salmoides salmoides*) and the Florida largemouth (*Micropterus salmoides floridanus*). The Florida largemouth has been stocked in other states such as California, Tennessee and Texas because it keeps the population of smaller, faster breeding fish in check. The Tennessee record for a largemouth bass is 14 1/2 pounds. The largemouth bass is a powerful fighter when caught on hook and line. It rises quickly to the surface and attempts to throw the hook from its mouth. Because it presents such a challenge, it has become increasingly popular as a sport fish.



SMALLMOUTH BASS
Micropterus dolomieu

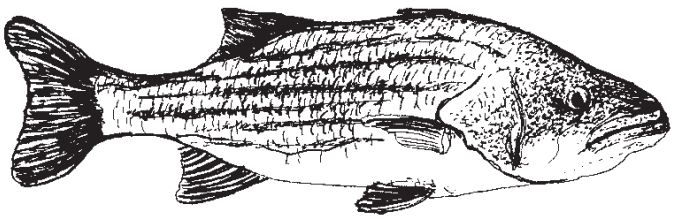


Also a member of the sunfish family, the smallmouth bass is a favorite game fish. Millions of dollars are spent annually in the attempts to land "the big one." The smallmouth bass has been known to cause many a fisherman to lose lures that become tangled in submerged brush piles, as these are its favorite haunts. These fish spawn in early spring, constructing nests in coarse gravel beds. Males guard the nest until hatching approximately six days after eggs are laid. "Smallies," as they are often called, are bronze colored with dark blotches along its dorsal surface and three dark bars radiating from its eyes across its operculum. Juveniles feed on insect larvae but gradually progress to eating fish as they mature. It is often confused with the redeye bass as it frequently hybridizes with this related species. The Tennessee record for a smallmouth bass is 11 pounds 15 ounces.

STRIPED BASS
Morone saxatilis

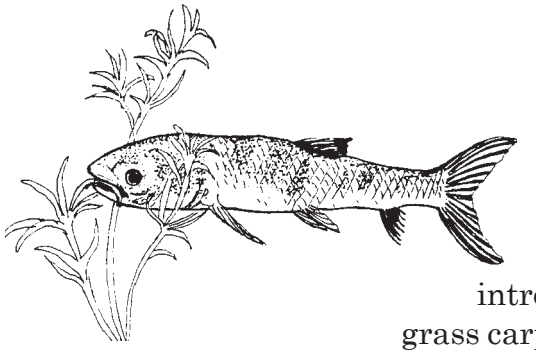
FISH TALES
Striped bass can live as long as 25 - 30 years, and the record striped bass in Tennessee weighed 60 1/2 pounds. Striped bass are also commonly called rockfish, stripers, or linesides.

The striped bass gets its name from the seven or eight unbroken black lines that extend the length of its light olive and silvery body. The underside of this fish is white, and yellow is common on the head, pectoral fins, and caudal fins. The natural home for striped bass is the Atlantic Ocean; when these fish prepare to spawn, however, they move out of the ocean and into the freshwater rivers and lakes along the east coast and the southern states. A 50-pound female may lay as many as 5 million eggs! These semi-buoyant eggs require waters of high current in which they remain suspended until hatching. If these specific requirements for development are not met, the eggs will sink to the bottom and die.



In many areas of the United States, striped bass have been introduced by biologists and wildlife agencies into landlocked lakes. In some striped bass spawning areas, such as the Chesapeake Bay and the Hudson River, severe pollution is causing significant decline in populations of this species. Striped bass have several close freshwater relatives, such as the white perch and the white bass. When striped bass are placed in landlocked lakes, they begin to mate with these two species to produce offspring which are a combination of both parents. This process is called hybridization. In the case of a striped bass/white bass hybrid the body stripes are broken both above and below the lateral line.

GRASS CARP
Ctenopharyngodon idella



A native of Asia, the grass carp was introduced into the United States as early as 1963 and into Reelfoot Lake in the early 1980s. Although some countries rely on the grass carp as a food fish, it was introduced in U. S. lakes and ponds as a biological control for aquatic vegetation, which is its primary diet. The excessive amount of aquatic vegetation in Reelfoot Lake warrants the introduction of the grass carp into its waters. In one day the grass carp can ingest plant quantities equal to its own body weight. Each year abundant plant matter dies off and sinks to the bottom of Reelfoot Lake. This organic material that has built up over the years in combination with the siltation from surrounding agricultural areas have made the lake shallower. The grass carp is the world's largest minnow achieving a length of 4 feet and a weight of nearly 100 pounds.

CONSERVATION NOTE

Initially released in lakes, ponds, and rivers, the grass carp has now gained access into streams. Although there is little danger that the grass carp will become a menace in Reelfoot Lake, ichthyologists are concerned that this fish may compete for food and space with native fish species in other bodies of water.

GAR
Spotted Gar *Lepisosteus oculatus*
Longnose Gar *Lepisosteus osseus*

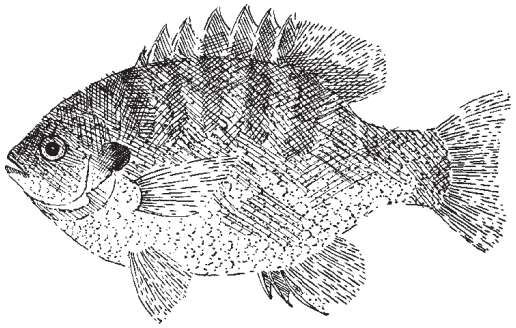
Gars are easily recognizable fish with their cigar-shaped bodies and long slender jaws armored with prominent teeth. Gars feed largely on other fish and use their strong teeth to capture and hold prey until struggle ceases. The numerous sharp teeth make escape by the prey almost impossible. Equipped with tough diamond-shaped scales and a hard bony skull, gars are invincible against most predators. They live in slow-moving, weedy water, and like bowfins, can survive in poorly oxygenated areas by surfacing periodically to take air into the swim bladder. Gars are the only surviving members of a primitive group of fishes known mostly for their fossilized remains. Gars and bowfins are thought to be two of the few living remnants of the ancient fishes that were forerunners to all present day species.

TOUGH SKIN

The scales of the gar fit together likes bricks in a wall, and are composed of a very hard substance called *ganoin*. Indians used large gar scales for arrowheads and pioneer farmers covered their wooden plowshares with gar skins.

SUNFISHES

BLUEGILL *Lepomis macrochirus*
REDEAR SUNFISH *Lepomis microlophus*
REDBREAST SUNFISH *Lepomis auritus*
GREEN SUNFISH *Lepomis cyanellus*
WARMOUTH *Lepomis gulosus*



The sunfish family is widely recognized by many people. This family contains many familiar fish such as the bluegill, shellcracker, crappie, and large and smallmouth bass. Collectively they are often called bream. The name sunfish is derived from the bright colors that appear on breeding males. They occur widely throughout North America and have been introduced as sport fish throughout the world. Unfortunately, such introductions have often caused the decline of some native species. The dorsal fin of sunfish is quite spinous and care should be used when removing them from a hook. Sunfish are territorial and disputes can often be witnessed among males
guarding favorite habitats or nesting areas. As a group, they prefer submerged stumps, logs, rocks or other vegetation. Sunfish have well developed eyesight and feed using this sense. They often lie in wait and make sudden lunges for food.

Spawning involves circling activity by the pair with periods of egg deposition. Males are responsible for building and guarding nests. Some species seem to be quite indiscriminate about the nests they visit leading to hybridization of species.

Bluegills spawn in late spring through late summer. Young bluegills are gregarious but tend to become solitary as they mature. They feed on invertebrates and insect larvae along with
vegetation during the summer months. The bluegill is a popular sport fish and probably accounts for more individual catches than other sportfish. They readily take crickets, worms, grubs, small lures, flies and popping bugs. They launch a good fight when hooked and are often stocked in lakes with largemouth bass. Stocking young bluegill with bass aids in balancing the ecosystem as the prolific bluegill serve as prey for the larger species. Deemed a tremendously tasty pan fish, its meat is firm and white with a mild flavor. The Tennessee record for a bluegill is three pounds.

The redear sunfish or shellcracker gets its name from the red spot at the tip of its short opercular lobe along with its specialized mouth structure used for crushing mollusk shells. The Tennessee record for the redear sunfish is 3 pounds 5.5 ounces. For assistance in distinguishing the species of sunfish, consult the *Fishes of Tennessee* by Etnier and Starnes.

Birds

COMMON GOLDENEYE
Bucephala clangula

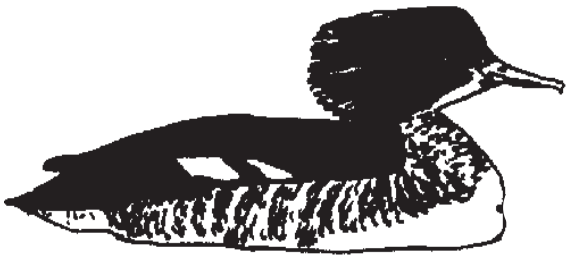
The Nickajack Lake exhibit abounds in various species of fish and turtles. Another interesting inhabitant of one of the world's largest freshwater exhibit is most likely identified only by its snow white underside and paddling webbed feet. Webbed feet? Yes — the owner of these feet is a species of duck called the common goldeneye. The male of this species has a white body heavily marked with black, and a black head with a splash of irridescent green. The distinct white spot before the golden colored eyes is perhaps its most distinguishing characteristic.

The common goldeneye's diet is greatly controlled by the seasons. During the summer and fall when the ducks are residing inland on clear lakes and ponds, the diet consists of aquatic insects, crayfish, fresh water crustaceans, and vegetation. Residency on coastal harbors and bays during the winter months results in a feast of mud crabs and saltwater snails and mussels. The common goldeneye is an expert diver capable of reaching depths of 20 feet and remaining submerged for up to 21 seconds. The diving technique of this impressive duck will present very interesting interpreting possibilities for you as docents! Common goldeneyes nest in lofty tree cavities as high as thirty feet above the water. When the ducklings are strong enough to leave the nest, the mother will drop to the base of the tree and call to her young. In a frenzied flapping, the young drop to the ground. Within minutes after the first fledgling takes the "big step," the entire duck family is on the ground. The mother immediately herds her young off to the water for their first taste of aquatic life.

SPLASHY SHOWOFF

Many species of male birds put on courtship displays to attract a mate. When the male common goldeneye begins to feel the mating itch, he will swim in a circle around the female of his choice, thrust his head directly backwards almost to his tail, and kick up a huge spray of water.

HOODED MERGANSER
Lophodytes cucullatus



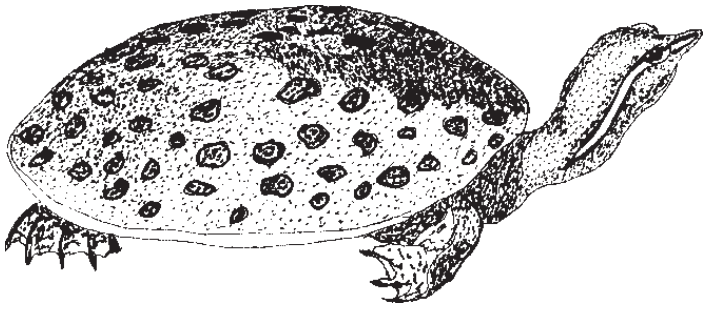
Look quickly! The hooded merganser is not one to hang around for long. A small, beautifully plumed duck, the hooded merganser is a lightning fast diver that swims with a flying motion using its wings and feet. Its speed is not confined to its swimming ability either. A hooded merganser rises from the water and is on the wing immediately, not needing the "runway" that many other duck species require. If alarmed, the hooded merganser is among the fastest flying of North American ducks.

Hooded merganser are most often found in pairs or small flocks of a dozen or less. They are usually found feeding in ponds and other gently moving waters. Swift-flowing streams are also frequented when their preferred habitat is frozen. With such excellent diving skills, the hooded merganser is quite adept at catching fish, crayfish, aquatic insect larvae, frogs, and tadpoles.

Hooded mergansers nest in almost any hole or tree cavity that is large enough for the female to enter. They will even nest in an opening of a fallen log or a hole in the ground, proving that they are not picky about the height of the site from the ground.

Reptiles

SPINY SOFTSHELL
Apalone spinifera



What type of turtle resembles a green pancake? The softshell turtle fits this description remarkably well. Unlike their hard-shelled relatives, softshell turtles are unique in that their internal organs are covered with a tough, leathery shell. A softshell's head is also unusual in appearance. The neck is very long, and the head is slender, ending in a decidedly pointed nose. Softshells are aggressive predators who use the ambush technique for capturing prey. A softshell will bury its body on the bottom of the lake or river in which it resides with only its eyes and nose protruding out of the substrate. In this position the softshell patiently waits for an unassuming fish to swim within reach of its lightning fast jaws.

LOOK BUT DON'T TOUCH!
Softshells are extremely agile in the water as well as on land. A close encounter with either the jaws or the sharp claws of this feisty reptile will leave a lasting impression!

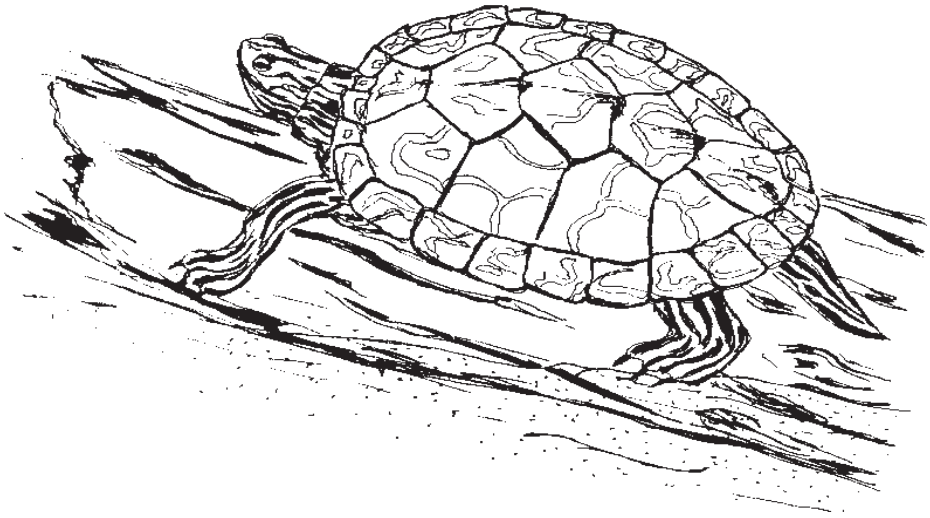
COMMON MUSK TURTLE
Sternotherus odoratus

The musk turtle, or stinkpot, emits a musky secretion when stressed or alarmed. The common musk turtle, like all species in this family, is a bottom dweller and can often be observed leisurely scouring the floor of shallow, clear water lakes, ponds, and rivers looking for food. Still waters are the preferred habitat. Mostly aquatic, the common musk turtle rarely leaves the water. It does bask on occasion, ascending severely slanting slender trees at the waters' edge. This turtle has been observed at basking heights as high as six feet! These treacherous feats are made possible because the musk turtle's small plastron lends great mobility to the legs.

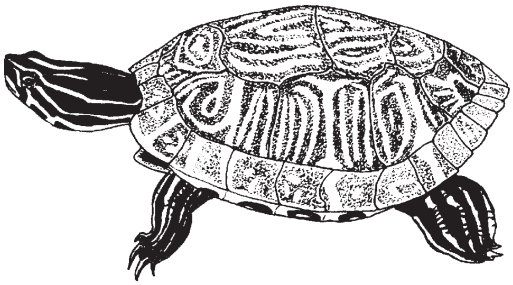
EFFICIENT "UNDERWATER BREATHERS"
Like most turtle species, the musk turtle can absorb oxygen from the water by way of blood vessels in its skin, throat, and cloaca. The musk turtle has been known to survive submerged for five months in low temperature aerated water!

FALSE MAP TURTLE
Graptemys pseudogeographica

The map turtles get their name from the map-like pattern of lines on the carapace, and are some of the most ornately and beautifully marked turtles. All have prominent dorsal keels and some have sawtooth projections on the keel. In all species of map turtles the females grow larger than the males. The Nickajack Lake exhibit is home to the false map turtle and a related species the Ouachita map turtle. The false map turtle inhabits the deeper waters of lakes and rivers. The males have greatly elongated toenails on the forefeet which they fan in the face of a female as a mating inducement. They are habitual baskers that often choose steep, slippery basking sites that are rejected by other turtles. False map turtles eat snails and other mollusks, grasping them in their broad mouth and using their strong jaws to crush the shells. The meaty part of the mollusk is digested and the shell passes through the animal's system.



SLIDER
Trachemys scripta



There are six species of slider turtles in the genus *Trachemys* that occur in both North and South America as well as on several Caribbean islands. Often called the red-eared slider, this species has bright red, orange or yellow patches on each side of its head. The oval carapace is olive-brown with yellow stripes or dark-centered yellow spots. Older males often appear solid black. The plastron is yellow with patterns that varies geographically. The neck of the slider is marked with yellow stripes with a central chin stripe that forms a Y-shaped mark. This species prefers quiet waters with soft bottoms, aquatic vegetation and suitable basking sites. It is not uncommon to see numerous sliders lined up on prime basking logs with legs and arms outstretched for maximum heat absorption. Like other aquatic turtles, males are generally smaller than females and often exhibit elongated claws used during courtship rituals. Courtship and mating occur in the spring and fall. An interesting courtship pattern is seen in sliders involving the elongated claws used to stroke the face of the female. Males will swim to the female face and energetically wave their claws at her nose. Males lacking these claws vigorously pursue females biting her posterior end, feet and tail. Clutches up to 25 eggs are laid on the land and hatch in approximately 70 days. Young turtles are highly carnivorous feeding on tadpoles, snails, small fish, insects, and mollusks but as the turtles mature, vegetable matter becomes a more prominent feature of their diet.

RIVER COOTER
Pseudemys concinna

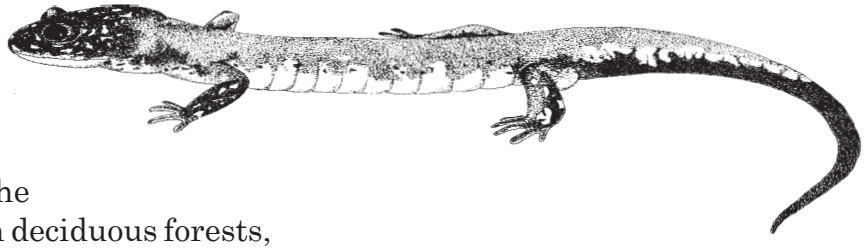
The river cooter is one of five species of basking turtle in the genus *Pseudemys*, all of which are restricted to North America. This species is larger than the sliders with a distinctive C-shaped mark on the second pleural scute of the carapace. Its carapace is elongated and flattened suitable for its aquatic lifestyle. The river cooter prefers rivers with some current, thick aquatic vegetation and a rocky bottom. Adult males have long, straight claws on their forelimbs and long, thick tails. Like some sliders, the male cooter uses its long claws to stroke the face of the female during his courtship efforts. River cooters are typically shy turtles, leaving the water to bask but quickly retreating if startled. Adults are herbivorous, feeding on a variety of aquatic plants and algae.

Salamanders of the Southern Appalachians

The southern part of the Appalachian mountain range is a mecca of salamander diversity. Found under leaves, along stream beds, in caves, and in ponds salamanders thrive in this region of isolated valleys, hollows, cove forests, and swamplands.

The moist, rich forest floor of Appalachian woodlands provides a safe haven for many salamander species. Some species prefer refuge in the crevices of rocky outcroppings, amid the rotting debris of fallen trees and limbs. Despite their preferred habitat each species must find a spot that provides protection from extreme temperatures and dry weather.

YONAHLOSSEE SALAMANDER
Plethodon yonahlossee



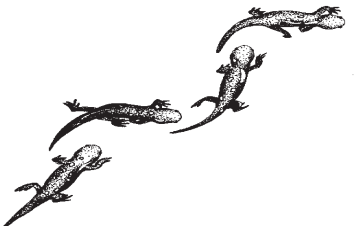
The Yonahlossee is a large, handsome salamander with a broad red or chestnut stripe down the back extending from the neck to the base of the tail. Yonahlossee's prefer second growth deciduous forests, living in long burrows that it uses to move about underground or beneath fallen logs and rotting stumps. In the twilight of evening, they will venture out of their daytime refuges to search for insects and other invertebrates. This agile salamander will beat a hasty retreat into its burrow, forest litter or under any nearby rock if it is disturbed. This salamander was first described in 1917 by E.R. Dunn, a noted salamander biologist. Mr. Dunn named the species after the old Yonahlossee road on Grandfather Mountain in North Carolina, a location very near his collecting site. These salamanders have a relatively narrow range restricted to the southern Blue Ridge Mountains and the French Broad River valley. From northeast Virginia to southwest North Carolina and extreme eastern Tennessee. It is found at elevations of 1400-5700 feet.

SLIMY SALAMANDER
Plethodon glutinosus
LONGTAIL SALAMANDER
Eurycea longicauda
RED SALAMANDER
Pseudotriton ruber

Slimy salamanders, as their name implies, exude a white glue-like material when disturbed. If allow to dry, the substance is quite difficult to remove. Slimy salamanders are black with white flecks on the dorsal surface. Longtail salamanders are yellow or orange with dark spots on the dorsal surface. Their tail length is at least 65% of their total body length. Both species are found under logs ro stones in wooded areas. The red salamander is probably one of the most colorful. Its bright red body is scattered with black flecks. Red salamanders do not have developed lungs and they acquire oxygen through their skin and mucus membranes.

Year round springs, both on the surface and in caves, provide cool, stable environments for many salamander species. Some are specifically adapted to these habitats and are found nowhere else.

NORTHERN SPRING SALAMANDER
Gyrinophilus porphyriticus duryi



The northern spring salamander is a member of the family Plethodontidae, the lungless salamanders. In fact, the northern spring is one of the largest of these salamanders whose respiration occurs through thin, moist skin rather than lungs.

Northern spring salamanders are semi-aquatic, spending the majority of their time in springs, cool and clear mountain brooks, and wet caves. They are limited to areas were adequate oxygen can be obtained through the skin. It has been noted that in a nighttime downpour, northern spring salamanders will leave their aquatic habitats and venture onto land in search of food. A known cannibal, the northern spring salamander will feed on smaller versions of its own species as well a variety of other salamanders. Terrestrial and aquatic insects are also part of the diet.

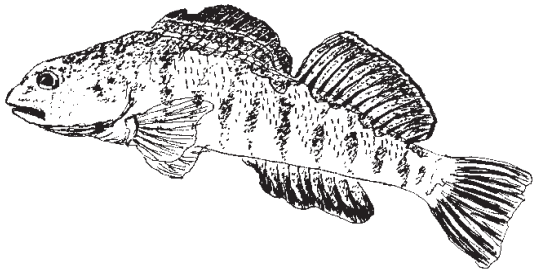
During the warmer months of the year, northern spring salamanders will lay 11-100 eggs one at a time, attaching them under stones in cool, clear water. Larvae hatched in late summer and fall are often found in the water deep among rocks. Transformation into the adult stage may take two to three years. The other two species of Gyrinophilus, the Tennessee cave salamander and the West Virginia spring salamander are both troglodytic, meaning they dwell in or near caves. They are active throughout the year and in winter may be found in the unfrozen water of springs. Little variance in their habitat temperature is noticed throughout the year.

INTRODUCING THE TENNESSEE STATE AMPHIBIAN

Do you have any idea what the official Tennessee state amphibian is? If that question were posed prior to May of 1995, the correct answer would have been, " There is not one!" However, on May 18, 1995, the Tennessee cave salamander (*Gyrinophilus palleucus*) was officially designated as such. The Tennessee cave salamander is a neotenic member of the spring salamander family. Neotenic refers to its retention of the larval form, appearance, and habits even after it is mature and capable of breeding. With its red appearance and feathery gills, the Tennessee cave salamander is often difficult to distinguish from the larval stage of the northern spring salamander.

As of early 1996, the Tennessee cave salamander was a candidate for listing under the Federal Endangered Species Act. Its distribution presently includes a mere 34 sites in southeastern Tennessee, northeastern Alabama and northwestern Georgia. A population survey of this species is included in the Tennessee Aquarium's list of research projects. This species requires unpolluted underground cave systems for its survival and thus serves as an excellent indicator of the well being of these habitats. These underground aquifers are the same sources that provide our drinking water.

Darter Exhibit



RAINBOW DARTER *Etheostoma caeruleum*
REDLINE DARTER *Etheostoma rufilineatum*
TANGERINE DARTER *Percina aurantiaca*
GREENSIDE DARTER *Etheostoma blennioides*
SNUBNOSE DARTER *Etheostoma simoterum*

Darters are a group of tiny, colorful freshwater fish that belong to the perch family. They are often mistaken for the fry of their better known relatives, the walleye and the sauger. The perch family is one of the largest groups of freshwater fish on this continent and is made up of about one hundred named species of darters and several comparitively larger, popular sport fish.

Darters are native only to North America and with the exception of one species, are all found east of the Continental Divide. They are most prolific in swift-flowing sections of clear rocky streams and flock to shallow riffles because these areas are essentially free from large predators. Riffles also serve as a trap for leaves, blades of grass, and other organic material which stimulates bacteria growth on which insect larvae feed. Darters' diets consist primarily of insect larvae. These fish are suited to life in the riffles because of their reduced swim bladder. The reduction of this bladder allows the darter to sink like a rock when it stops swimming. Its enlarged pectoral fins allow resistance against the current so that a stationary position can be maintained. The darter also seeks protection from direct current action by slipping between or beneath rocks.

WHAT'S IN A NAME?

Darters are colorful fish that come in a rainbow of colors -- bright oranges, yellows, greens, browns, and blues. Their common names are interesting and often tell something about the fish: Amber, Freckled, Bluestripe, Yazbo, Slackwater, Bayou, Cherry, Watercress, Okaloosa, Emerald, Tangerine, and Waccamaw are all types of darters!

Some species of male darters are quite beautiful during the spawning season when they are adorned in brilliant colors on fins and body. This coloration is an advertisement to other fish of the same species.

CONSERVATION NOTE

In 1973 a newly discovered fish, the tiny snail darter (*Percina tanasi*), caused a major controversy between conservationists and state and federal agencies. This 3-inch fish was discovered in the Tennessee River near the Tellico Dam construction site. The darter was listed as endangered, and a 2-year court battle began when the Environmental Defense Fund and other conservation groups attempted to halt the construction. In 1978 the Supreme Court ruled that the dam be closed. At the end of that same year congress passed amendments to the Endangered Species Act that required all future proposed species be accompanied by "critical habitat requirements," including exact geographical limits of the species. These new criteria were very difficult to meet for newly discovered animals and migratory species. The Tellico Dam was allowed to re-open, and a water projects bill passed through congress that specifically exempted Tellico Dam from environmental laws -- including the Endangered Species Act. The beleagured snail darter survived. It was transplanted into other parts of the river and has also been found at a new site on the South Chickamauga Creek.