



YOUNG
NATURALISTS

Hundreds
and
Thousands
and
Millions



of
Fish

What makes a lake good for fish and fishing? Biologists look for answers and tell us what they discover.

PHOTOGRAPHS BY ERIC ENGBRETSON

Minnesota is home to millions of fish. From a darter the size of your pinky finger to a lake sturgeon as big as a high-school linebacker, every fish in the water is part of a food chain. Small fish eat plants and bugs in the lake or river, and then bigger fish eat smaller fish. Anglers cast their bait to catch a fish. The lake or river where you fish is called a *fishery*.

Scientists called *fisheries biologists* work for the Department of Natural Resources. They study how all the fish in the food chain connect to one another. They try to figure out which fish species live in a lake or river and how many fish make up the *population* there.

To count how many people live in the United States, the government conducts a census, or survey, every 10 years. To estimate how many fish are in a lake, DNR fisheries biologists do a *fish survey* about every five years. Surveys can also show how fast the fish are growing, how many new fish survive after hatching, and how many fish anglers are catching. All of this information, or *data*, helps fisheries biologists decide how many fish anglers can catch without harm to a fishery.

Biologists look for answers to other questions such as these: Should anglers be allowed to keep fish of only a certain size? When is the best time, or *season*, to keep fish?

The rules for catching a fish on a lake are called *regulations*. This story tells how biologists decide what kind of regulations fit best for different lakes or rivers.





Where Trout Hide

Below the rocky cliffs of southeastern Minnesota, you can find clear, cold streams cascading through the valleys, running toward the Mississippi River. If you are quiet and look carefully in a stream, you might see a dark green fish with a bright red belly and white-edged fins hugging the edge of a fallen log. The native brook trout (*Salvelinus fontinalis*) is waiting for a passing insect larva for lunch.

How many brook trout are living in these waters? To find out, a DNR crew of four fisheries biologists goes electrofishing. Wearing waterproof rubber hip boots or chest waders, they wade into the

stream. One person wears a backpack electrofisher. The electrofisher is made up of a large battery, a control box, a long rod, and a trailing cable. A biologist moves the positively charged (*anode*) rod near good fish habitat such as a fallen log, rocks, and plants, while the negatively charged (*cathode*) cable trails behind in the water. The right amount of electric current in the water causes the fish to swim toward the anode. Once fish reach the anode, they are stunned by the strong electric current and stop swimming. Someone then scoops up the fish with a dip net.

The fisheries crew makes two passes down a 1,000-foot stretch of the stream

BROOK TROUT BY JOSEPH TOMELLERI



DEBORAH ROSE, DNR



DEBORAH ROSE, DNR

Fish move away from the negative charge of a cathode (left) and move toward the positive charge of an anode. Fisheries biologists (above) move the anode into spots where fish like to hide. When the fish swim near the anode, they are temporarily stunned, so the biologists can net them for their survey. Watch electrofishing on a Minnesota trout stream at <http://goo.gl/Hvqom>.

with the electrofisher. Each time they catch fish, they put them in a *live box*, which is like a large cage placed underwater to keep the trout alive.

Next they identify, count, measure, and weigh each fish. They do a simple calculation comparing the number of fish caught on the first pass to the number caught on the second pass. Using this ratio, they estimate the number of fish living in that part of the stream.

Information on the number and the size of trout in the stream helps biologists decide how habitat could be improved to

support more or bigger trout. It also helps them determine how many fish anglers may catch without threatening this trout population. The fishing regulation allows each angler to catch and keep a certain number and size of trout.

Because it requires anglers to release fish of other sizes, the fishing regulation also helps make sure more anglers have a chance to catch trophy-size trout.

Catching brook trout is fun, but we need to return some of them to the stream if we hope to someday catch a big trout.



BROOK TROUT BY MIKE DVORAK



Where are **walleye,**



northern pike,



bluegill,



yellow perch,



largemouth bass,



and **black crappie?**

Minnesota's state fish is the walleye (*Sander vitreus*). The walleye is the most popular *game fish* with Minnesota anglers, because it is a challenge to catch and is tasty to eat. Game fish are species that most people like to catch. Each year Minnesota anglers keep about 3.5 million walleyes. That comes out to around 4 million pounds of fish!

ILLUSTRATIONS BY JOSEPH TOMELLERI

Fish Hook Lake is a typical walleye lake. This fishery also has northern pike, bluegill, yellow perch, bass, and black crappie. To estimate the populations of each of these game fish, DNR fisheries crews will fish for samples. A sample is a small catch of fish that shows what the whole fishery is like. Instead of rods and reels, fisheries biologists use electrofishers, trap nets, and gill nets.



DEBORAH ROSE, DNR

A DNR fisheries biologist prepares to anchor the basket of a trap net. He places the net in shallow water to catch fish such as sunfish and crappies. After 24 hours, he will return to count, measure, and release the trapped fish.

Trap Net. The fish survey crew uses trap nets to catch bluegills, crappies, and bullheads. The standard trap net is actually a group of interconnected nets that together funnel fish into a basket where they become trapped.

The trap-net opening, called the *mouth*, is 4 feet tall by 6 feet wide. Running out from the mouth is a 40-foot *lead* that acts as a fence. Fish bump into the lead and follow it through the mouth toward a series of funnels or *throats*. As they swim through each throat toward the *cod end*, or collecting basket, the fish find it harder and harder to escape.

A trap-net crew usually has two people. They first tie the lead to a tree, a stake, or a heavy weight near shore. Then, using a boat, they stretch the net out and secure the other end to a weight. They place nets

in habitat such as bulrushes, lily pads, or other aquatic plants where shallow-water species of fish are found.

After 24 hours, the crew members pull the net back into the boat by hand, a task that takes only about five minutes. The net weighs about 50 pounds without any fish in it, but could hold more than 100 pounds of fish. The crew members open the cod end of the net and slide the fish into a *stock tank*. Next they count each fish, measure its length, weigh it, and remove several fish scales that they will study to determine the fish's age. You can tell how old a fish is by counting the scale rings, similar to aging a tree by counting its trunk rings. As soon as they finish recording this data, the crew members return the fish to the lake unharmed.

Gill nets catch fish such as northern pike, walleye, and yellow perch. Each year that DNR fisheries crews survey a lake, they put the gill net in the same place. By studying the same spot, biologists can compare catches from year to year to see if the population of a fish species is decreasing or increasing.



DEBORAH ROSE, DNR

Gill Net. To sample walleye, northern pike, and yellow perch populations, the survey crew usually uses a gill net. The standard gill net is 6 feet tall by 250 feet long and looks like a giant curtain of small squares of knotted string. The top of the net has floats and the bottom has weights so it hangs in one place. These nets are used to sample fish in the middle of the lake at different depths.

As they do with trap nets, fisheries crews always leave gill nets for 24 hours so they can compare the number of fish

caught in each sample from year to year.

Fish are captured when they swim into the net and become entangled, usually by their gills, in one of the squares. When fisheries crews pull up the net, they record the same data they do when using a trap net. Most of the fish tangled in a gill net die, but fisheries biologists can study fish ear bones, or *otoliths*, instead of scales to more accurately determine a fish's age. Because only a small portion of the lake's fish population is caught, the sampling does not harm the overall population.

DNR PHOTO



Creel Survey

How many hours did you fish? What did you catch? May I measure the fish you kept? A DNR creel clerk asks these questions and writes down the anglers' answers. The creel clerk also counts boats or fish houses on the lake. This information helps fisheries biologists understand what species are being caught and released or taken out of the lake.



TAINA LITWAK

One Lake's **Story**

In the spring of 2011, people reported seeing dead fish floating near the shore of Lake Henry in central Minnesota. Around 300 game fish were found as the ice began to leave the lake. Fisheries biologists went out to investigate, but the actual cause remains a mystery.

An electrofishing survey later that spring didn't find very many fish in Lake Henry. So DNR crews caught adult fish from a nearby lake with plenty of game

fish. They put those fish into Lake Henry. They stocked 30 adult largemouth bass (*Micropterus salmoides*), 30 bluegills (*Lepomis macrochirus*), and 30 black crappies (*Pomoxis nigromaculatus*). They hoped the fish would lay eggs and get the population growing again.

In June, the fisheries crews returned to Lake Henry to do a survey. Largemouth bass avoid trap and gill nets, so to sample the population of largemouth bass, fisher-

ies crews used electrofishing. In this case, they used a boat with an electrical generator and anodes off the front of the boat. This way they could search a much larger area than they could with the backpack electrofisher. They did not find any largemouth bass. Later that summer, crews set trap nets in shallow water and caught young largemouth bass, sunfish, and crappie. This catch showed that adult bass had laid eggs and their young survived.

Fisheries biologists wanted to make sure the lake would have enough adult bass to raise young bass and keep the fishing good. They had to find an answer to this question: How many bass of a certain size could Minnesota anglers catch and keep without causing the bass population to drop?

The answer helped support a *special regulation* that tells each angler how many bass of a defined length they may catch and keep and which fish they must release.



FLATHEAD CATFISH (TOP) AND CHANNEL CATFISH BY JOSEPH TOMELLERI

Catfish Count

To learn about flathead catfish (*Pylodictis olivaris*) and channel catfish (*Ictalurus punctatus*) populations on big rivers such as the Mississippi, Minnesota, St. Croix, and Red River of the North, fisheries biologists use a trotline. A trotline is a rope 100 feet long with hooks tied on every 10 feet. The DNR fish survey crews bait the hooks with other fish that catfish eat. For flathead catfish, they use bullheads. For channel catfish, they use cut-up pieces of suckers.

The crews take samples of the catfish populations during the summer months when catfish are most actively searching for food. A crew of three biologists heads out in a boat to set the trotlines. The crew ties each trotline to a tree or a post on shore and stretches the other end out into the river and anchors it on the river bottom.

The next day the fisheries biologists go back to the trotline and pull it slowly into the boat. As a fish comes out of the water, someone removes the hook and places the fish in a stock tank. The biologists continue pulling up the line until they have removed all of the fish. Sometimes the line catches other species, such as a lake sturgeon or a snapping turtle. Then the survey crew puts new bait on the trotline and places it back in the river to fish again. The crew will set the line in the same location for two or three days to get as many fish as possible for the sample. Sometimes they get many fish, sometimes none.

The crew measures each fish and weighs it. Because catfish do not have scales, crew members collect one of the spines, or barbs, from the *pectoral fin* on the fish's side to study. They determine the fish's



DEBORAH ROSE, DNR

Fish surveyors use a net to gather the channel and flathead catfish they caught on a trotline in the river. Fish took the bait from hooks strung along the trotline, which is tied to an anchor in the water and a tree on shore.

age by slicing a thin piece off the barb and counting the rings under a microscope. After measuring and weighing the catfish, the crew returns all the fish and turtles to the river.

So how many catfish can anglers keep each year? Fishing regulations allow an angler to keep two flathead catfish, which don't reproduce as quickly as channel catfish so rivers have fewer of them. An angler may keep only one catfish over 24 inches, because a catfish takes a long time to grow that big. Biologists have figured out that if most anglers on the river catch and keep five or fewer catfish, then the catfish population will stay about the same because new fish will keep hatching and growing. With these regulations, fisheries biologists

say catfish populations will be *sustainable* through *natural reproduction*. They do not need to add, or stock, new catfish.

Sampling fish populations and deciding how to best protect them is a full-time job for many people in the DNR. Dedicated fish survey crews sometimes work long days in hot sun, rain, or cold wind. By counting, measuring, weighing, and aging fish, they gather the data they need to protect fish populations and provide fun, exciting fishing for anglers in Minnesota. ①

TEACHERS RESOURCES:

Teachers guide: www.mndnr.gov/young_naturalists. Lake Finder: www.mndnr.gov/lakefind. Electrofishing Trout Run Creek on YouTube: <http://goo.gl/Hvqom>.