

# Habitat and the Brook Trout

*by Walt Dietz*

**This article is the second in a series of articles on the major topics of concern in the Commission's theme, "Conserve 2000." This feature explains the global, regional and local aspects of the topic of fish habitat with the state fish, the brook trout, as the focal point. Because the brook trout is a Pennsylvania native, we can readily see the effects of human activity on this species and its habitat over several hundred years.**

Have you ever caught a wild brook trout? If you have, you were probably awed by its orange belly, red spots and the green markings on its back. It's one of Pennsylvania's most colorful fish. But you probably didn't catch it just anywhere. Wild brook trout need the coldest and cleanest water, like that which flows in a small stream beneath a shady forest. Today, most of these shaded streams can be found only in the forested mountains. That's because much of our landscape has been opened up to agriculture and development. Can you imagine what the state might have been like 400 years ago? Pennsylvania was entirely forested then and nearly every stream had a wild brook trout in it.

Before the 1600s, wild brook trout were widely distributed throughout the state. They could be found in just about every watershed, including the Ohio, Allegheny, Susquehanna and Delaware. Pennsylvania provided the perfect habitat for the native brook trout because of the forests.

The area that became Pennsylvania includes nearly 29 million acres. Very few clearings could be found before the 1600s, except for those made by natural events or Native Americans. No wonder it was named Pennsylvania. "Penn," for William Penn, the Quaker leader who purchased the land from the Indians, and sylvania, which is Latin for "woods."

This blanket of forest was important to the health of streams and rivers. Tall hemlocks, white pine and a variety of deciduous trees shaded the valleys. Shade kept the water temperatures cold. Trees protected the banks from erosion. Gravel stream bottoms were clean and unsilted. There was plenty of food and shelter among the submerged tree roots. The conditions were perfect for brook trout survival and reproduction.

## **Changing landscape**

The landscape changed when European settlers arrived and began to cut the forests in the 1600s and 1700s. This activity changed the habitat of the native brook trout. There seemed to be an endless supply of trees at that time. There were so many trees that the first settlers looked at the forests as a hindrance. They cut timber for fuel, homes, furniture and tools. Still, the early settlers hardly had an effect on the state's endless forest.

Large amounts of timber were not really cut until the early 1700s. Europeans had already overexploited their own resources. They sought to develop the New World and use its abundant resources. Pennsylvania timber became a valuable commodity. It fed a growing country and a global economy, but not without consequences to our local forests and waters.

Shipbuilding was the first industry to take advantage of the state's trees. England needed timber to build ships, so the White Pine Act of 1722 was created. It reserved all the white pines for the British Navy. Lumber was used to make hulls. "Spars," long white pine logs, were used for masts. Can you imagine the size of a tree needed for the main ship mast? The minimum size was 96 feet tall and 15 inches in diameter at the top. A spar's size made it hard to transport. That's why the first trees to be cut

were those closest to major riverbanks-not good for the health of aquatic habitats. The banks of eastern rivers like the Delaware and the Susquehanna became the first targets. Trees were felled by hand and the logs were pulled to the water by oxen. Logs were then floated to Baltimore and Philadelphia. Lumber and spars were shipped back to England and made into ships. Those ships were later used against America during the revolutionary war and for exploration of new frontiers. Imagine the importance that Pennsylvania trees had in the world's economy and history!

### **Industrial heritage**

The new country's population was growing in the early 1800s. And forest resources were needed to meet its demands. This is when large-scale timbering began. Wood became an important part of America's industrial heritage. The iron, tanning and lumber industries all relied on forests.

In the early 1800s, Pennsylvania became an important source of iron. Making iron required wood for charcoal. It was the fuel used to melt iron ore. Most of the forests had already been cut near the river valleys for the shipbuilding industry. So the mountainsides of central Pennsylvania became the next focus. Iron ore was present and trees were abundant. Iron furnaces were established and entire communities would be built up around them.

By 1860, there were 150 iron furnaces in Pennsylvania. They required over 1.5 million acres of trees per year. That's a lot of trees cut down to produce a lot of iron. This iron fed a growing nation and a growing world. That's right: Pennsylvania iron was an important part of the global economy. Take the small town of Axemann in Centre County, for example. It once produced iron ax heads that were shipped all over the world.

The landscape around iron furnaces was eventually stripped bare of trees. Only open clear cuts were left.

The tanning industry also relied heavily on the use of trees. Tree bark provided the tannin that was used to "tan" animal hides. The best source for tannin was the bark of eastern hemlocks. The best place to find plenty of hemlocks was northeast Pennsylvania. Counties like Monroe and Pike became the location of several important tanneries. Buffalo hides were brought from the West to these tanneries. By the mid-1800s, the Pocono region became the second largest leather producer in America. That's how places like Tannersville, in Monroe County, got its name. Eventually the areas around the tanneries also ran out of trees. By the 1800s, much of the landscape in northeastern Pennsylvania was deforested.

The lumber industry took advantage of the central portion of the state. This area was still heavily forested. But transporting large logs from these remote areas was a problem. The solution was splash dams. They were built on small mountain streams to impound and stop the flow of water. Trees were pulled to the empty streambed, the dam was opened and water pushed the trees to the next dam. Can you imagine the effect that splash dams had on brook trout habitat? The trees could be transported from remote areas to major rivers, like the Susquehanna and Allegheny.

Booms were constructed on the rivers to catch and hold the logs. Logs were then formed into huge "rafts" and floated downriver to Williamsport, Philadelphia, Harrisburg and even as far away as New Orleans.

Pennsylvania's lumber industry also had an important place in history. Take, for instance, Williamsport, which had many sawmills. It became the world's largest lumber producer by 1880.

### **Stream and river habitats**

By the late 1800 to early 1900s, almost all areas of Pennsylvania had been cut at least once. Forest cutting up to this time was not really managed with sustainability in

mind. Environmental effects were not considered. The effect of logging on streams and rivers was not even considered. Loggers would move on to a new area once the trees were cut. The result was that our stream and river habitats were degraded. So was the water quality. Without trees for shade, water temperatures rose. The higher temperatures became too stressful for brook trout. There was no vegetation to hold the soil. Erosion washed silt into prime spawning habitat. The silt covered the gravel and made it impossible for brook trout to reproduce. The aquatic insects that brook trout feed on could not survive. Shelter in the form of tree roots was lost. The result was that native brook trout populations were depleted from much of their original range.

Depleted fish populations brought about concern. The aristocracy of the New World enjoyed sport fishing, but there were no fish! Their solution to the problem was to stock new fish. There was little thought about restoring or improving habitat. They believed that stocking fish would bring back good populations. It also gave them an opportunity to duplicate the species that they once caught in their homeland -- Europe. So they brought in carp during the mid-1800s. Smallmouth bass were introduced from the Potomac River. They were released into the Delaware and Susquehanna rivers during the 1870s. Brown trout from Europe were introduced in the late 1800s. Rainbow trout were eventually transferred from western North America to the East Coast. Brown, rainbow and brook trout were raised in hatcheries and then released into the wild.

Little did they know that they were providing a source of competition for the native brook trout. When they co-exist in the same habitat, brown trout compete with brook trout for resources.

### **Lessons from the past**

Today things are much different. We have learned many lessons from the past. The way we go about managing and protecting Pennsylvania's forests and waters has improved. Forestry practices have changed and many important habitat management methods have been learned over the years. Landscape ecology is evaluated before cutting forests. In most cases, forests are no longer clear-cut. Cutting rotations are ecologically based and managed more carefully. Timbered areas are replanted after trees are removed. Some mature trees are left standing to act as a seed stock for new trees. Vegetation buffers are left along streambanks and roads. Buffers minimize the effects of logging operations. These techniques result in healthier forests. They also result in better water quality.

The way in which we manage fisheries in Pennsylvania has also changed. The Fish & Boat Commission follows a plan for streams and rivers that are cold enough to hold trout. Waters are grouped as "wild" or "hatchery-supported." There are several criteria that fisheries biologist use. A wild trout fishery must also be able to sustain a naturally reproducing population of wild trout. It must provide adequate habitat. These waters are labeled "Class A Wild Trout Waters" and are not stocked. In this way, wild brook trout are managed more like a renewable natural resource.

Streams that cannot support wild trout are stocked with hatchery-raised trout. Stocking provides the opportunity for anglers to catch a trout, in a stream that would normally not allow them to reproduce on their own. Chances are there is a hatchery-supported trout stream only minutes from your home.

### **Riparian buffers**

Habitat protection and enhancement play an important support role in fisheries management. A focal point for protecting and enhancing aquatic habitats is riparian buffers. A riparian buffer is a zone of trees and vegetation between water and an upland area. Riparian buffers are important to the health of a stream. They shade the water, stabilize banks and intercept surface runoff. Studies show that water temperature is 10 degrees cooler in streams that are lined with buffers. They purify runoff by trapping sediment, fertilizers and pollution. They even provide food in the

form of leaf litter for aquatic insects. The insects in turn are food for forage fish and trout. Ultimately, we can improve fish populations if we protect and enhance riparian buffers.

The Commission, along with other agencies, also protects habitat through laws and regulations. People who want to alter a stream or river in any way must apply for a special permit. The request is reviewed to make sure that the habitat will not be degraded. The Commission enforces habitat protection laws that are broken. The Commission is also involved with many stream and river enhancement projects through its Adopt-a-Stream Program. This program is one of the ways in which individuals and organizations can help. It's a cooperative effort that improves and protects aquatic and riparian habitats. The program provides assistance for those willing to donate time and effort toward waterway protection and enhancement. Projects might include fish habitat restoration, stream corridor management and stabilization projects.

Environmental conditions in Pennsylvania are much improved. Our forests and waters have rebounded thanks to the efforts of many agencies, organizations and individuals. Hardwood forests now cover nearly 60 percent of the Commonwealth. These forests protect more than 25,000 miles of streams and provide clean water for aquatic animals. Around 13,000 miles of streams are clear and cold enough to support trout. Wild brook trout populations have also improved. Their numbers and dispersal in watersheds isn't what it was before the 1600s. Nevertheless, they can once again be found over much of the terrain they once inhabited.