

Ohio Brook Trout

An Aquatic Conservation Challenge

A precious gem of a fish swims in a handful of Northeast Ohio streams. It is a relatively small creature with a large and incredibly engaging story. A story with as many facets as a cut jewel. Aside from the remarkable beauty and rarity of Ohio's native brook trout, this fish has been the subject of both academic studies, applied research, consternation, joy, and hope. It sparkles with the glimmer of what could be concerning urban and suburban water quality, and it holds intrigue in what once might have been.

What remains to be seen is what will be the fate of this strain of brook trout? Is there the collective will to bring the societal and technical resources together to ensure the existence of this fish, or will their presence become yet another footnote in the history of what once was one of the most widespread cold water fish in North America?

Ohio brook trout are rare, beautiful and their population numbers continue to decline. This situation begs the question, will these fish become a lost relic of Ohio's natural history, like the passenger pigeon that once darkened Ohio skies, or will they become a carefully managed natural resource under the care and stewardship of a broad coalition of private, public and not-for-profit conservation-minded individuals and organizations?

As a species, brook trout have a large presence in the long history of America's fishing and angling heritage. While naturally occurring in the eastern United States and Canada, the native range of brook trout has been drastically altered. These fish have also occupied a unique place in the practice of aquaculture in North America. Brook trout have been stocked all across this continent and introduced to nearly every country with suitable aquatic habitats. However, with fairly specific habitat requirements, they can be adversely affected by changes in water quality brought about by pollution and, or climate change.

The fact that a population of native brook trout has survived in Ohio is something of a miracle. A basic understanding of the life history of brook trout and the history of land use in Ohio illustrates why their presence in the Buckeye State is so remarkable.

Salvelinus fontinalis are not trout at all but are actually in the same family as Arctic char and lake trout. It is generally accepted that their natural distribution is associated with the last ice age. As the glaciers advanced south across North America, it is presumed that these fish thrived in the streams formed by glacial meltwaters. As the glaciers receded northward, populations of brook trout remained in the more southern streams with suitable habitats. In his book *Brook Trout*, Nick Karras does an excellent job explaining the native distribution of these fish in North America, and the generally accepted convention of their association with the geographic limits of

glaciation. At the time of European settlement, there were confirmed populations of brook trout existing from northern Canada, south to Georgia, and from the eastern seaboard to the western tributaries of Lake Superior.

Since that time brook trout populations have been under duress and some biologists estimate that this native range has been reduced by as much as 85%. The clearing of the forests in Canada and the Eastern United States, agricultural land use, as well as industrial and residential development have severely impacted aquatic habitats in this region. It is extremely difficult to comprehend the radical changes that occurred to the landscape from the time of European settlement to the present. *American Canopy: Trees Forests and the Making of a Nation* provides a great overview of these changes and quantifies the exploitation of timber resources in the United States. Several other historical publications provide insight into the decimation of the eastern hardwoods and the loss of native wildlife.

In Ohio, it is widely accepted that by 1915, over 85% of Ohio had been cleared of trees. What land could be tilled was being farmed, what could not be tilled was in pasture or developed for residential or industrial purposes. This land-use resulted in increased storm runoff and associated erosion and siltation. Clearcutting the forests also resulted in elevated water temperatures. The damming of streams for logging, flood control, and hydropower production also had significant impacts. These impacts across the eastern United States and Canada were exacerbated by pollution from industrial and residential development and chemicals associated with agricultural land use.

There are few early historical references to brook trout in Ohio. Perhaps they were never widespread, but due to their relatively diminutive size versus other native Ohio fishes, it is plausible that they may have simply been irrelevant as there is numerous historical reference to the incredible numbers of larger food-producing fish like walleye, muskellunge, and sturgeon.

It is well documented, however, that one of the first fish hatcheries, if not the very first hatchery in the United States was developed in Cleveland, Ohio. Thaddeus Garlic and Horace Ackley refined fish propagation techniques and developed a hatchery in 1853 to raise brook trout for aquacultural purposes. The hatchery location has been documented in the area of E 105 and Ackley Road.

Milton Trautman's book, *Fishes of Ohio* was regarded as the definitive work on fish populations in Ohio for several decades. This book was printed in 1957 and Trautman identified several general locations in Northeast Ohio where brook trout were reported and indicated several other possible locations in Southwestern Ohio. The Ohio State record brook trout was caught in 1955 and weighed 2 pounds and eleven ounces. It was caught in the East Branch of the Chagrin River.

There are a few other known written records of brook trout, and a comprehensive literature search might yield additional references. There are, however, many verbal accounts of their presence in several streams in the Chagrin River watershed. Credible sources include Dick Munson, former director of the Holden Arboretum, who maintains that he caught them while fishing in Stebbins Gulch in the early '60s. Bob Faber, a local self-employed environmental

educator, also reported catching one in the stream that drains out of the Walter C Best Wildlife Preserve south of Chardon. The late Fritz Neubauer, who owned and operated a hunting and fishing club in Geauga County shared that brook trout were in the “Moccasin Falls” tributary to the East Branch of the Chagrin River and this was the population that Terry Harmon became aware of in the early 1980s’.

Harmon has had a lifelong affinity for brook trout and has played an important role in their study, propagation, and efforts related to the conservation of these fish. He recalls as a boy seeing his uncle catch one at the mouth of a small Lake Erie tributary. He also began rearing brook trout in a spring-fed pond on his family farm in Lake County.

Terry began working as an environmental educator at the University School in Hunting Valley in 1972. Four years into his tenure, Terry began using fertilized brook trout eggs to illustrate cellular division in a high school biology class. With his commitment to education and the support of the University School administration, parents, and the Cleveland Museum of Natural History Trout Club, he developed a small fish hatchery at the Upper School, located on SOM Center Road.

After a few years of successful operation, Terry began working with Tom Stanley who was at that time the director of natural resources for Cleveland Metroparks, to introduce brook trout into Sulphur Springs. This is a tributary to the main branch of the Chagrin River which flows through the South Chagrin Reservation.

With the Metroparks' support, in 1976 Terry and his students installed several “hatchery boxes” into the stream. Water from a spring was piped into these boxes which were partially filled with gravel. The physical design of the box was such that it created an upwelling of water through the gravel, in effect replicating ideal conditions found in a brook trout spawning redd.

A redd is a depression and a subsequent downstream “hump” of gravel created by brook trout, where a female deposits her eggs. A male brook trout swims beside her and as she releases her eggs, the male releases sperm. The fertilized eggs adhere to gravel at the downstream section of the redd and begin to go through the processes of development.

Terry and his students would place thousands of fertilized eggs into these hatchery boxes where the eggs would develop into juvenile brook trout. At a certain point of development, they would leave the box and swim out into the stream.

There are many predators for small fry in a stream, but after successive years of stocking with the hatchery boxes, an adult population of brook trout was established in Sulphur Springs. Terry and his students suspected that there may have been occasional natural reproduction occurring in the stream, and in 1998 concluded that brook trout were indeed successfully reproducing in Sulphur Springs.

Terry initially worked with fertilized eggs he obtained from a hatchery in Burry Brook, Quebec. He subsequently developed a broodstock and he worked with this strain for many years until he became aware of populations of wild brook trout in a handful of nearby streams.

In 1983, a young man on a motorcycle stopped by the school asking for Terry. He was interested in buying a small quantity of trout food and had been referred to Mr. Harmon. In the course of the conversation, Sean Schubert told Terry that he had a few brook trout in a pond at his parents' house. He said he had got the fish out of one of the headwaters streams forming the East Branch of the Chagrin. He went on to tell Terry he knew of several other streams where they existed. He subsequently showed Terry where he caught them at his parents' property and took him to two other streams south of Chardon, Ohio, Woodie Brook, and Spring Brook.

The presence of trout in the two streams outside of Chardon had been confirmed by Ph.D. Andrew White in 1972. Trautman was preparing the second edition of his book and asked his friend Andy White to look and see if brook trout were still in the two streams he had referenced in the 1957 Edition.

Unfortunately, White did not know about the population in the stream beside Schubert's house so their presence was not confirmed and included in Trautman's updated publication. Shortly after Terry met Shubert, this population of trout was destroyed. Fritz Neubauer maintained that run-off from a rainstorm had flushed a chemical into the stream, perhaps from an upstream golf course. Neubauer said that he had walked the stream and found where trout had jumped out of the water and died on the stream bank.

After becoming aware of the trout in Woodie Brook and Spring Brook, Terry secured permission from the property caretaker and incorporated the study of these two streams into his University School environmental education classes. Ultimately this led to the propagation of Ohio brook trout at the University School hatchery.

While it was clear these two populations were wild and self-sustaining, Terry began to ponder where they came from, and if they could be "native" fish wild. As previously mentioned, brook trout had been propagated and stocked for over one hundred years by the time Terry and his students began to monitor these streams. It was quite probable that these fish had been stocked. Terry thought the genetic evaluation of these fish would be an excellent educational/academic exercise.

Harmon discovered that Professor Roy Danzmann from the University of Guelph in Ontario was involved with a research project to create a genetic map of brook trout across their native range. Danzmann's work had illustrated that a clear difference existed between native and stocked strains of brook trout. In 1993 the professor agreed to evaluate the Ohio fish and advised Terry on how to prepare and transport the fish for his analysis.

University School students collected adult fish from both streams and as a school outing, they drove the samples to Ontario and delivered them to the university. Danzmann demonstrated the process of creating a genetic profile from the sample fish to Terry and his students.

By sampling populations of fish from all across the brook trout's native range, Professor Danzmann was able to not only able to identify unique genetic markers that illustrated differences between stocked and wild populations, but his work also illustrated a broad diversity within wild populations. His efforts to map genetic diversity throughout the original range of

native fish identified long-standing, isolated clone groups. He concluded that the brook trout from the Geauga County streams were two unique but closely related strains. He also tied these Ohio fish to strains in Ontario and West Virginia. This genetic connectivity between geographically separated strains supported the notion that the distribution of native brook trout was indeed tied to glaciation and could imply that brook trout may have been more widely distributed across Ohio before the alternation of the pre-settlement landscape.

Threats To Ohio's Native Wild Brook Trout

The ownership of the property where both Woodie Brook and Spring Brook are located changed in the mid-1990s'. Collectively the two waterways represented less than one-half mile of suitable brook trout habitat. Subdivision plans were being developed for the land surrounding Bass Lake and these plans included several large lots on both sides of Spring Brook. In addition, the landowner was planning to dam and create a pond in the short section of Woodie Brook that held brook trout.

At this time, Lake Metroparks was in the process of developing a comprehensive natural resource inventory of all Lake County parklands. These inventories were being reviewed by a natural resource advisory council consisting of established scientists and biologists from Northeast Ohio. This included Ph.D. Andrew White and Bill Hudson. White was a recognized ichthyologist and Hudson later served as the Director of the Geauga Park District. One stream in Girdled Road Reservation appeared to be suitable for brook trout and with growing concern for adverse impacts of the development on Woodie Brook and Spring Brook, a plan was created to relocate brook trout from the Chardon streams.

In the fall of 1991 and spring of 1992, Lake Metropark Staff and Ohio Division of Wildlife staff relocated 129 adult fish from the native streams to Aylworth Creek at Girdle Road Reservation. A spring electroshocking survey in 1993 yielded five adults and no juvenile fish. White expressed concerns about adequate breeding substrate and excessive predation due to the large numbers of creek chub that were noted in the spring survey.

As plans for the impoundment on Woodie Brook continued, several conservation organizations requested a meeting with the landowners. Representatives from the Ohio Department of Natural Resources Division of Wildlife, Geauga County Soil and Water, Ohio EPA, and Lake Metroparks met on-site with a representative from the development corporation. The landowner was committed to building a pond but agreed to build a pond adjacent to the stream. This construction project severely altered the stream and more than likely eliminated any Woodie Brook trout.

With the uncertain future of the two known brook trout streams, the Ohio Department of Natural Resources began a ten-year brook trout reintroduction program. This involved building and maintaining a broodstock of native fish, evaluating several streams across Ohio, selecting a few to work with, and stocking fry into these streams. In this process, the state also commissioned another genetic evaluation of both the Spring Brook and Woodie Brook populations which concluded that these fish were most likely native fish with unique genetic markers.

Before the construction of the Woodie Brook pond, ODNR staff collected as many of the remaining trout out of Woodie Brook as possible and moved them to the Hebron Fish Hatchery. ODNR also collected adult fish from Spring Brook. These populations were maintained separately to develop brook stock for the two different genetic strains. Unfortunately, an accident at the hatchery resulted in the loss of the Woodie Brook strain. This accident along with the construction of the Woodie Brook pond more than likely eliminated this genetic strain.

Although plans to develop several large residential building lots along Spring Brook were filed with the Geauga County Planning Commission the proposal was withdrawn as a consortium of conservation organizations approached the developers and proposed buying the property for preservation purposes.

A subdivision north of Chardon was being constructed that required wetland mitigation and a proposal had been developed to use the mitigation fees to buy Spring Brook. This mitigation project provided the initial funds for the Geauga Park District to buy Bass Lake, including the section of Spring Brook that was threatened with development.

With the elimination of the Woodie Brook habitat and the acquisition of Spring Brook, the Geauga Park District established a “Brook Trout Advisory Council” in 1998 and hosted the first meeting in 1999. In creating this advisory council a forum was created bringing together a host of organizations interested in the long-term disposition of the Ohio Brook Trout. This included: Geauga Park District, the ODNR Division of Wildlife, Ohio EPA, the Cleveland Museum of Natural History Trout Club, University School, Cleveland Metroparks, and US Fish and Wildlife Service.

Notes from these meetings indicate a great deal of discussion regarding the ecological impacts of introducing brook into small head-water streams, concerns with the Quebec, Bury Brook strain of fish Terry had established in Sulphur Springs, and general parameters for success. Ultimately the state chose to eliminate the Sulphur Springs population and required University schools to work exclusively with the native Ohio fish.

Fifteen streams were selected for the state's re-introduction and monitoring efforts and the majority were located on Geauga or Cleveland Metroparks properties. Woodie Brook and Spring Brook were included in this total. The others were selected primarily based on water flow, temperature, and substrate. The reintroduction protocol involved releasing several thousand fry into each stream, for several years and monitoring the populations for several years after the stockings.

This reintroduction project was technically concluded in 2008, however, Division of Wildlife and Metropark staff have continued to monitor these streams. Of the fifteen streams involved in the study, three have “stable populations” and this includes the two source streams, Woodie Brook and Spring Brook, the third stream is located on private property.

Problems identified in the study indicate problems associated with habitat degradation. Increased stormwater run-off associated with large rain events. Ongoing development has resulted in the

scouring of spawning beds, stream bank erosion, and increased water temperatures.

New Developments and Future Opportunities

Both Cleveland Metroparks and the Geauga Park District have continued to apply for grants to minimize the impact of stormwater events on the streams that have been stocked. In addition, Geauga Park District has acquired a defunct golf course that has a small headwater stream that may be suitable for restoration as a brook trout stream. They are currently attempting to secure funds to enhance the habitat of this small stream

On the state front, the Ohio Division of Wildlife is monitoring federal funding sources that might be available for resuming the brook trout reintroduction program. Division administrators realize that simply duplicating past efforts may not be a viable path. Unfortunately at this time, there is not a comprehensive multi-organizational plan on how to move forward.

The current situation begs the question: "What will become of Ohio's Brook Trout?", and of course this prompts a series of additional questions.

There is a need to resolve the question of the State of Ohio's, and other governmental agencies' capacity to re-engage another re-introduction effort. Does the ODNR, Division of Wildlife staff have the ability to provide oversight and direction as well as hatchery space staff to resume this project, or could roles and relationships be redefined?

What would renewed effort look like? Would this effort resemble or replicate the past project or will a new model be developed with a broader coalition of partners and re-allocation of labor?

Should additional streams be added to this reintroduction effort? The initial streams surveyed and included in the 1998-2008 efforts were selected based on water temperatures and substrate. It appears that having and relatively small headwater streams with minimal watershed may be advantageous to minimize stormwater impacts.

A stream inventory based on such criteria may yield a large number of small streams located on private property, ideally under one ownership. Interestingly, University School conducted such a study using students to build a GIS inventory of all headwater streams in the East Branch of the Chagrin that might meet these criteria.

Should the geographic region be expanded beyond NE Ohio for potential re-introduction streams? There are a few historical references that indicate that brook trout occurred in Ashtabula County and in southwestern Ohio.

Should new partners be solicited into the effort?

How would stream landowners be approached and who would invite them into this program? Would the state orchestrate such an effort or could this be coordinated by local conservation groups?

There has been no study on predatory impacts from existing fish populations on the stocked fry in the past, but anecdotal observations seem to consistently include large numbers of creek chubs in the study streams. Should potential re-introduction stream evaluations include inventories of potential predatory species, and mitigation be considered to address that issue? Who would conduct those evaluations and implement any related actions?

Should the same approach be attempted with the introduction of hatchery-produced fry into additional streams or should alternative techniques. Should consideration be given to the “Sulphur Springs approach” or other in-stream propagation techniques?

Each one of these questions may have a subset of different challenges and resolutions. But it appears for the Ohio brook trout to have a stable future a new approach needs to be employed, perhaps this involves a much broader utilization of private funds and resources, volunteers, and citizen stewardship under the coordinated auspices of the State of Ohio and Metroparks. Maybe utilizing the University School fish hatchery (which is currently being renovated) and students to manage brook stock. Perhaps an adopt-a-stream program could be developed with other educational or conservation-minded organizations.

Although this was stated earlier, this is the issue at hand:

What will be the fate of the Ohio brook trout? A unique strain of brook trout that somehow has managed to survive for centuries and is now on the very edge of its existence. We live in a time of human history where technological advances have re-defined possibilities on so many fronts, and yet we must ask the question:

Is there the collective will to ensure the continued existence of these fish, or will their presence become yet another footnote in the history of what once was one of the most widespread cold water game fish in North America?