

BROOK TROUT

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OF THEIR RANGE IN GREAT SMOKY MOUN-

TAINS NATIONAL PARK DUE TO LOGGING IN

PRE-PARK DAYS, COMPETITION FROM NON-NATIVE

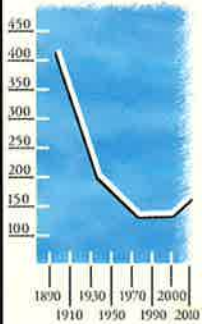


FISH, AND ACID PRECIPITATION. THE NATIONAL

PARK SERVICE IS WORKING TO RESTORE

BROOK TROUT AND PROVIDE RECREATIONAL

OPPORTUNITIES FOR ANGLERS. ♡



Miles of brook trout stream in the Smoky Mountains from 1870 to present.



The historical range of southern brook trout.

THE BROOK TROUT

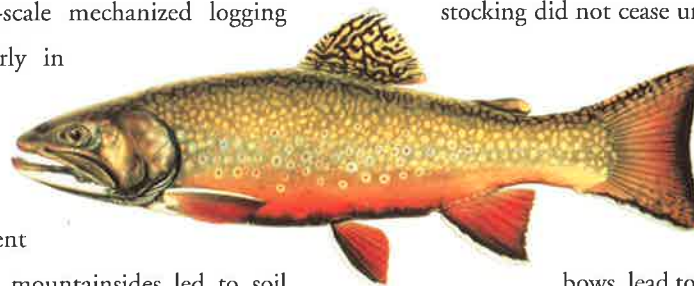
(*Salvelinus fontinalis*) is the only trout native to the southern Appalachian Mountains. It was once widespread in the Great Smokies, occupying small, swift, high elevation mountain streams as well as larger rivers down to elevations of 1,600 feet.

Since 1900, the brook trout has vanished from about 75% of its historical range in the Great Smoky Mountains. The initial loss was due to large-scale mechanized logging operations early in the 20th century.

Clearcuts and subsequent fires on steep mountainsides led to soil run-off and stream siltation. In addition, trees were cut from streambanks, allowing more sunlight to reach the waterways and raising water temperatures. The brook trout is even less tolerant of warm water than other trout species—it can not survive temperatures above 68° F. (20° C.). As a result of these environmental changes, the brook trout disappeared from all streams in

the Smokies below elevations of 3,000 feet.

The decline of the brook trout caused displeasure among anglers who longed to trout fish in the mountains. In response, around 1910, logging companies and other entities began stocking streams with non-native rainbow trout from the western United States, brown trout from Europe, and brook trout from the northern United States. Stocking of northern brook trout continued into the 1950s; rainbow trout stocking did not cease until 1975.



Competition from the non-native trout, especially rain-

bows, lead to further declines in the brook trout population. Rainbow trout are larger, more aggressive fish which dominate the prime habitats in streams and eat small brook trout. Biologists believe brook trout range in the Smokies has declined dramatically due to rainbow competition. Most surviving brook trout have become confined to marginal streams above 3,500 feet in elevation.

Brook trout foods



terrestrial insect



mayfly



larvae

THE SMOKIES SUFFER FROM SOME OF THE WORST AIR POLLUTION IN THE U.S.

WHEN POLLUTANTS FALL TO THE GROUND THEY AFFECT PARK STREAMS.

**GSMNP
Brook Trout Distribution**



rainbow trout



brown trout



Native brook trout have been eliminated from most of their historic range in the Smokies. The surviving brookies are mainly confined to the higher elevations.

The brook trout's species name, fontinalis, means "of springs" and refers to the fish's preference for cold, clean waters.

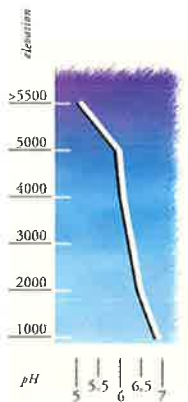
ACIDIC STREAMS

An increasingly serious threat to the survival of the brook trout is stream acidification. Streams in the Great Smoky Mountains naturally become more acidic at higher elevations. However, research shows that areas in the park above 4,800 feet in elevation are receiving some of the highest amounts of acid rain, acid fog, and dry deposition of any monitored site in North America. Consequently, many high elevation streams are becoming increasingly acidic. In 2008, twelve GRSM streams were listed for not meeting Tennessee state water quality standards due to low pH (<6.0). Streams with an average pH of less than 6.0 indicate they are unsafe for fish and other aquatic life. If current air and water quality trends continue, all GRSM streams above 3,000 feet will be at or below pH=6.0 within 30 years.

SOUTHERN BROOK TROUT

In 1996, genetic research conducted by the University of Tennessee confirmed long-held beliefs that the southern Appalachian brook trout is a distinct subspecies, differing in several ways from the stocked fish native to the north-eastern United States and Canada. Only about 15% of park streams are believed to harbor pure strains of truly native fish, undiluted by hybridization with northern brook trout.

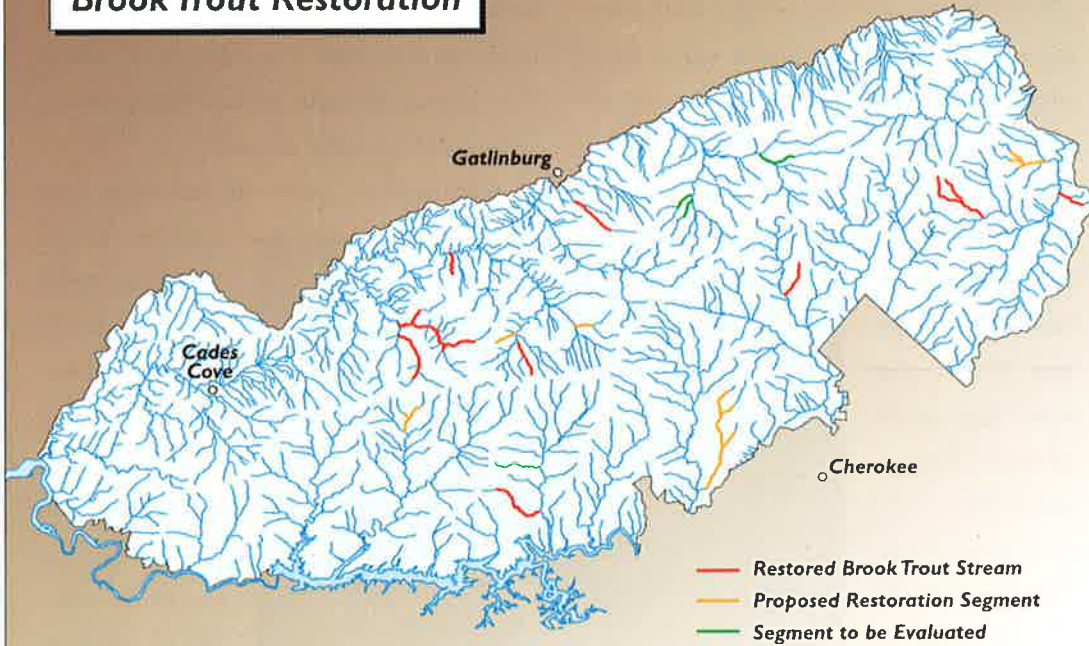
Since the southern subspecies has such a limited range, and because that range has been diminished drastically in the last 100 years, the southern brook trout is considered a species of special concern. The Park Service is especially watchful of acidification and competition from rainbow trout in streams where the subspecies currently survives.



Streams are more acidic at the higher elevations.

AT LEAST 50 SPECIES OF FISH ARE KNOWN TO LIVE IN THE STREAMS
OF GREAT SMOKY MOUNTAINS NATIONAL PARK.

**GSMNP
Brook Trout Restoration**



Brook trout are largely confined to the higher elevation streams where acidification is worst.



NATURAL HISTORY

Native southern Appalachian brook trout are relatively small, short-lived fish. Their maximum size in the Smokies is about 10 inches and few native brook trout live longer than four years. Their diet consists mostly of insects and occasionally small fish. They spawn in the fall in areas with small gravel where females lay 50-100 eggs.

In the North, brook trout occupy lakes and ponds as well as streams and attain much larger size. The largest brook trout caught by an angler was 14.5 pounds, and came from Nipigon River, Ontario. Brook trout reach the southern edge of their natural range in extreme northern Georgia.

RESTORATION EFFORTS

A primary mission of the National Park Service is to preserve native species on the lands it manages.

To this end, Park Service fisheries biologists have made it a priority to restore native brook trout to as much of their original range as possible.

During the 1980s and 1990s, park biologists focused their efforts on identifying waterfalls on historical brook trout streams that are tall enough to act as barriers against upstream migrations. Once these barriers were identified, biologists looked for ways to restore healthy populations of brook trout upstream while leaving waters below the barriers to rainbow and brown trout. Crews systematically electroshocked waters above the waterfalls using portable, backpack generators. While the fish were temporarily stunned by the electrical current, the non-native rainbow and brown trout were removed. The process was repeated several times on each stream that was under rehabilitation.

Eliminating non-native fishes from rugged mountain streams is labor-intensive and time-consuming. Only small sections can be restored at a time.



During restoration efforts, park fisheries staff remove non-native trout upstream from waterfalls so brook trout can reclaim part of their historic range.



FOR MORE INFORMATION ON THE PARK'S FISHERIES PROGRAM,

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Recent research conducted on the long-term effects of fish removal using portable electroshocking equipment shows the process can be highly effective on small streams. Unfortunately, the process is extremely labor intensive, and with limited resources, park fisheries crews are only able to treat a few miles of stream each year. In large streams (wider than 15 feet with many deep pools) electroshocking is ineffective.

Because of these limitations, and the pressing need to expand brook trout range to lower elevation streams where acidification is not so acute, the Park Service has begun to experiment with antimycin to chemically remove non-native fish. Antimycin is an antibiotic approved by the Environmental Protection Agency (EPA) for fisheries use. When administered to streams it quickly kills all fish and most aquatic insects. It does not pose a threat to plants, most amphibians, or humans.

Prior to chemically treating a stream, fisheries crews use electroshocking equipment to stun and transfer as many brook trout as possible to safe areas. Special permits may be issued to anglers which allow them to fish the soon-to-be-treated waters. The permits require anglers to keep all rainbow trout caught.

Fisheries crews treat only a small section of stream with antimycin at a time, usually 500 yards

or less. Below the waterfall barrier, potassium permanganate is added to neutralize the antimycin and render it harmless. Even without the additive, antimycin breaks down quickly in well-aerated mountain streams.

After treatment, native fish and insects from

upstream of the treated area gradually repopulate the waterway. Non-natives that still exist downstream are prevented from recolonizing the area by the waterfall. If necessary, biologists augment the brook trout population with native fish from

elsewhere in the park. Within three years of treatment, streams are predicted to host full complements of native fish, aquatic insects, and other fauna—without the rainbow trout. Park crews have restored over 24 miles of brook trout stream thus far.

RECREATIONAL ANGLING

Following a three year study to evaluate the effects of fishing and harvest on brook trout populations, all park streams were opened to fishing after being closed for nearly 30 years. Biologists determined that fishing and harvest of brook trout using current regulations posed no threat to populations. Only recently restored streams remain closed, allowing reintroduced brook trout to reach carrying capacity. ♣



National Park Service fisheries crews use backpack electroshocking equipment to stun fish and remove non-natives from brook trout habitat.



Well over 10,000 "angler days" are logged on park trout streams each year.



Trout fishing in the Smoky Mountains was popular even before the park was established in 1934.



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