

A PROGRAM FOR THE MANAGEMENT OF FISH RESOURCES IN GREAT SMOKY MOUNTAINS NATIONAL PARK

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ABSTRACT

Ideal natural stream conditions exist over the greater part of Great Smoky Mountains National Park, and carefully planned management measures are in operation. Fishes taken for sport and food are the eastern brook trout, rainbow trout, smallmouth black bass and rock bass. Rainbow trout are used to fill the gap between the waters capable of supporting eastern brook trout and those in which smallmouth bass are native. Native species are stocked in virgin waters, in research areas, and in streams where rainbow trout are not well established.

A modern trout hatchery, operated by the U. S. Bureau of Fisheries, and thirty-five concrete rearing pools make up the physical plant. More rearing pools are planned. All stocking has been done in the fall, but later at least part of the fish may be planted in the spring prior to the opening of the fishing season.

The prohibition of natural baits insures the preservation of native stream organisms and prevents the introduction of undesirable exotic species. A creel census on representative watersheds promises to give accurate information on the yield of the streams.

INTRODUCTION

The portions of eastern Tennessee and western North Carolina which fall within the Great Smoky Mountains National Park are becoming increasingly popular both for recreation and for the scientific study of plant and animal life. The attractions of the area scarcely need description. The rugged mountain mass, extending in a general east-west direction, follows the Tennessee-North Carolina State Line for nearly 60 miles, and varies in width from 10 to 30 miles. It ranges in elevation from 850 feet at the mouth of Abrams Creek to 6,642 feet at the top of Clingman's Dome. The major portion of this mountainous country lies in Great Smoky Mountains National Park, and is thereby preserved for all time as an area for study and recreation. Charmed by its scenic grandeur, its wonderful forests, its extremely varied and abundant plant life, and its beautiful streams of rapidly flowing clear water, the casual visitor usually seeks to return and explore its natural features in more leisurely manner.

CHARACTER OF STREAMS

To those who love pure running water, the streams in the Great Smoky Mountains present a picture of ideal natural conditions that is not surpassed in eastern United States. The proper protection and management of these streams are considered one of the most important administrative and technical problems dealt with by the officials of the National Park Service. Fishing in season is not only permitted

but encouraged. Eastern brook trout, rainbow trout, smallmouth black bass, and rock bass are the species taken. These so-called "game" fishes are of primary importance, but there are other aquatic resources to be considered. These other forms of life, frequently ignored in a fisheries program, hold the key to a balanced stream fauna and merit the same protection as that afforded the fishes utilized for food and sport. These other forms include about fifty species of non-food fishes, at least four species of turtles, two snakes, and several species of frogs, toads, and salamanders. Besides these vertebrates there are a multitude of snails, worms, crustaceans, insects, and spiders, all of which are important in the economy of the streams. All must be preserved as examples of native stream life. To insure the preservation of the native stream life in a near natural status, and at the same time permit the taking of certain species, requires careful study and management.

The boundaries of the Great Smoky Mountains National Park will soon include approximately 440,000 acres of land. In this area are twenty-two major watersheds, all of which eventually contribute their run-off to the Tennessee River. All of these streams are permanent and free from industrial and organic pollution. The streams descend in a continuous series of pools and cascades, broken only at lower elevations by occasional shallows and longer pools of quieter water. The gradient may be as abrupt as 20 per cent, and is less than 5 per cent only in the lower portions of the streams. The water is generally clear, but becomes amber colored after heavy rainfall. On recently cut-over areas, or in streams along fresh road cuts and fills, there is noticeable silting. This condition will be only temporary in the Great Smoky Mountains National Park.

DISTRIBUTION AND MANAGEMENT OF GAME FISHES

The fish-supporting streams may be classified as smallmouth-bass, rainbow-trout, or brook-trout waters. Each type of stream requires a different form of management. The bass-inhabited waters are found on the fringes of the park, in the lower reaches of the streams. On at least two major streams, Abrams Creek and Little River, falls of 12 to 20 feet limit the upstream distribution of the bass at elevations between 1,500 and 1,600 feet (Figures 1 and 2). In the absence of such natural barriers bass may range to an elevation of 2,000 feet. Inasmuch as the smallmouth bass is a native fish and one popular with many anglers, it is desirable that it be favored in its natural habitat.

Our management program for the smallmouth bass and the rock bass, which usually have the same distribution, is not yet clearly defined. It is likely that the increasing popularity of the former species will make necessary the establishment of rearing ponds and the initiation of systematic stocking. There are approximately 50 miles of

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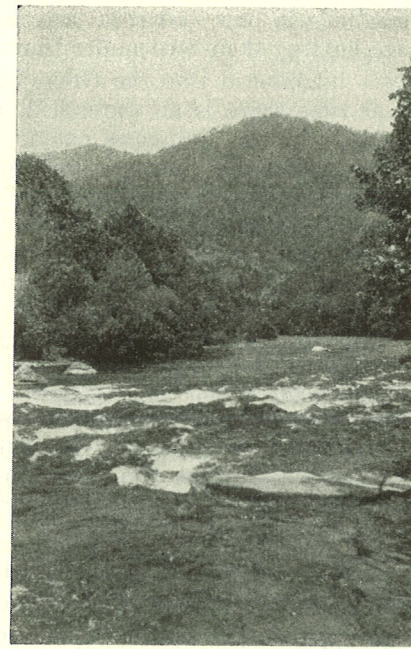


Figure 1.—The Oconaluftee River, between Cherokee and Smokemont, North Carolina, is unsurpassed for smallmouth bass.



Figure 2.—Abrams Falls, at 1,400 feet elevation, limits the upstream distribution of smallmouth bass in Abrams Creek. A light cloud is hanging over the creek above the falls.

streams in which smallmouth bass and rock bass are native. At the present time both are holding their own under limited fishing.

Rainbow trout were introduced into the Great Smokies soon after 1900. At the present time there is no watershed in the park which does not harbor rainbow trout. Rainbows extend downstream as a breeding population to the upper limits of the range of the smallmouth bass, and large individuals frequently are taken well into bass water. The presence of the bass is partly responsible for the scarcity of rainbow trout in the lower portions of the streams, but is not the only factor involved. Records indicate that the temperature of the water below about 1,500 feet elevation, unless the streams are very well shaded and located on a heavily forested northerly slope, may exceed 80° F. during the warmest days of summer. This high water temperature limits the penetration of rainbows into these lower waters. The upstream limit of distribution of rainbow trout is less definite than the downstream, and varies from 3,000 to 4,500 feet. The factors that determine the upper limits of rainbow trout distribution as reported by King (1937) are:

- (1) Decreasing volume of water.
- (2) Unfavorable chemical conditions such as high acidity.
- (3) The presence of falls which act as barriers.

The rainbow trout has usurped much of the territory formerly occupied by the native brook trout. That invasion was to be expected since rainbow trout grow larger and appear to be the more aggressive feeders. Inasmuch as rainbows are well established in the streams in Great Smoky Mountains National Park and are popular with many anglers, they are being propagated and stocked in streams which are most suited to them, and in which the preservation of the natural stream fauna can be partially sacrificed in favor of increased recreation in the form of rainbow fishing (Figures 3 and 4). In the park's research areas, where a special effort is made to preserve natural conditions an attempt is being made to eliminate the rainbow trout. At the present time the method employed consists of intensive fishing with no restocking. In one stream, the Middle Prong of the Little Pigeon River, a 9-foot dam was constructed as a barrier to the migration of rainbow trout into the research area. Only large boulders found in the streams were used in the construction. Rainbow are not stocked in streams in which they do not already occur, or in streams inhabited by brook trout or smallmouth bass.

The eastern brook trout originally occupied the territory that it now holds and much of that occupied by the rainbow. In the larger streams the brook trout rarely existed as a breeding population below 2,000 feet elevation, but large individuals ranged as low as the upper limits of the smallmouth bass waters. Factors in the decline of brook trout have been: (1) increased water temperatures and

Most of the smaller side tributaries and the headwater streams are closed to fishing. On some of the larger watersheds it is possible to open the largest tributaries one year in three or four. The value of such streams as rearing grounds and in the production of fish foods is recognized. On the other hand, if it is found that any one of the small streams is becoming overpopulated with trout of legal size, the stream will be opened to fishing for one season or more.

Management plans include a creel census on representative streams. Beginning with the current season (1938), C. C. C. enrollees were stationed at points of entrance and exit to the streams, where they interviewed all persons fishing in the stream above the "checking stations." The census blanks have been made as simple as was possible without the sacrifice of necessary information. The fisherman is not required to sign the form, and the catch is reported in convenient size groups. The creel censuses in conjunction with the accurate stocking records that are kept for all streams should yield a clear picture of the results of our plantings. The complete census is being conducted on only three streams this season, but we are attempting to obtain representative samples of fishing returns on other streams whenever possible.

SUMMARY

1. The Great Smoky Mountains National Park, embracing nearly half a million acres in the heart of the Southern Appalachians, is becoming increasingly famous as an area for recreation and study of natural history.
2. Within the park are twenty-two major watersheds, including at least 600 miles of streams capable of supporting trout, and at least 50 miles of smallmouth-bass waters.
3. Rainbow trout, which have been introduced, occupy the streams at elevations of between approximately 1,500 feet and 3,000 to 4,500 feet. The smallmouth bass occupy the lower and the eastern brook trout the upper portions of the streams.
4. The distribution of the native smallmouth bass and brook trout is encouraged in waters which are adapted to them. Rainbow trout are stocked in the remaining waters.
5. Present plans call for an annual stocking of 400,000 4- to 6-inch trout per year. Fall stocking should be supplemented with spring stocking, in order to avoid the losses attributed to winter and early spring floods.
6. Fishing regulations prohibit the use of natural fish foods as bait.
7. The protection and preservation of the native stream fauna are considered paramount in the program for the management of fish resources in the Great Smoky Mountains National Park.

streams and head tributaries. In the past, stocking has been confined largely to the water open to fishing, and has been done at the rate of 500 to 1,000 fish per mile, depending on the volume of the stream, the fishing intensity, and the density of the fish population known to be present.

The plantings of brook trout, which have been increased in recent years, now approximately equal and eventually should exceed the plantings of rainbow. As a general rule, rainbow trout are not stocked above 3,000 feet elevation, in streams in virgin forests, in research areas, or in streams where brook trout or smallmouth bass occur or where rainbow trout are not already present.

To date, all plantings have been made in September and October. Although fishing has improved, it is likely that greater success would be attained if at least a part of the fingerlings available for stocking were held until the next spring and planted in April, just before the opening of the fishing season. We expect to undertake spring plantings as soon as facilities and funds allow. Nearly every year most of the streams are subjected to one or more periods of flood, when the volume and force of the water are sufficient to roll boulders as large as 3 feet in diameter. These floods are not only very harmful to the fish population but they also destroy many aquatic organisms which otherwise would serve as natural foods. The floods last only a day or two, but they are probably one of the most important of the natural forces that affect trout populations in the Great Smokies.

REGULATIONS PERTAINING TO FISHING

Fishing regulations in the Great Smoky Mountains National Park are carefully drawn. State licenses, issued by Tennessee or North Carolina according to the area fished, are required of the anglers. The season opens May 15, at the close of the park's spring fire season, and closes August 31. Fishing is permitted only between the hours of 5:00 a.m. and 6:30 p.m. central standard time. This period corresponds to the average number of hours of daylight during the open season. The most important regulation is that prohibiting the use of natural bait. Only one hook is allowed on the artificial lures. The Service firmly believes that to permit the use of natural fish foods as bait would not be in keeping with its policy for the protection of all native organisms that form a natural biotic balance. In addition, there is the very serious danger of the accidental introduction of exotic species of fishes or other organisms which might react adversely upon the natural environment.

The fisherman is permitted a total of ten fishes of one or all species taken, including undersized fish kept because of serious injury. During the present season the size limits are: smallmouth bass, 10 inches; rainbow trout, 8 inches; brook trout and rock bass, 6 inches. Details of the regulations undoubtedly will be altered in the future, in keeping with the development of the management program.

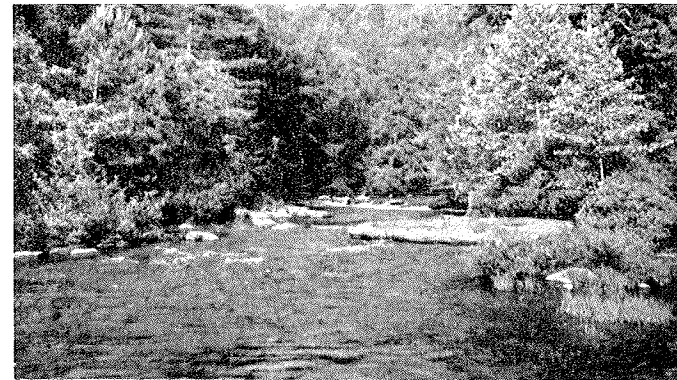


Figure 3.—Little River, at 1,700 feet elevation, is an ideal rainbow trout stream. Cascades and deep pools are more representative of the stream than this photograph indicates.

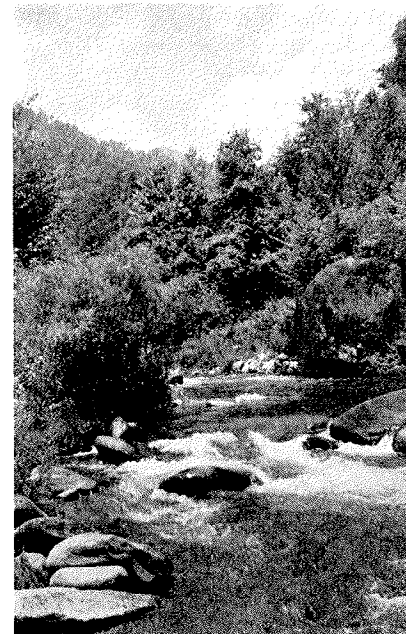


Figure 4.—Straight Fork is an average sized trout stream which supports both rainbow and brook trout.

flooding that followed the removal of the natural forest, (2) intensive fishing, including seining and dynamiting, and (3) the lack of plantings of hatchery fish. The adverse factors were so great that the brook trout almost disappeared except in the more remote virgin forests and the headwater streams. Because of the general popularity of the brook trout the National Park Service favors the reestablishment of this native species in streams where environmental conditions are now favorable (Figures 5 and 6). In local streams the natural reproduction of brook trout seems to be more effective than that of rainbow trout. The brook trout has also been found easier to propagate in our hatchery and rearing pools.

TROUT REARING AND STOCKING PROGRAM

A modern trout hatchery, completed in 1936 under the supervision of the U. S. Bureau of Fisheries, supplies facilities for the production of about 600,000 trout fry annually. This hatchery is located in the park on Kephart Prong, a tributary of the Oconaluftee River. In connection with the hatchery the National Park Service has built twenty-two standard concrete rearing pools. Eighteen of these are of the circular type, 25 feet in diameter, and four are rectangular, approximately 5 by 40 feet in dimensions. The pools are operated by the Bureau of Fisheries in cooperation with the National Park Service. Their annual output is conservatively estimated at 250,000 fingerlings 4 to 6 inches in length.

The National Park Service also operates a group of thirteen concrete rearing pools at the Chimneys Camp Ground on the West Prong of Little Pigeon River. These pools have a capacity of about 75,000 4-inch fingerlings per season. Most of the pools are comparatively small, and of the rectangular design. Brook trout have been found to thrive better than rainbow at this particular location, and in this type of rearing pool. The elevation is 2,700 feet, and the water supply comes from a well shaded and slightly acid stream.

The National Park Service plans to construct two more sets of rearing pools, one in Cades Cove in the west end of the park and one in Cataloochee in the east end. These ponds will provide for the rearing of trout in the portions of the park where present or proposed road developments do not offer sufficiently easy access to the hatchery and rearing pools at Kephart Prong to make for efficient transportation of fingerling trout. Labor and materials are to be obtained through the facilities of the Civilian Conservation Corps.

At the present time 400,000 trout, about half eastern brook and half rainbow, from 4 to 6 inches in length, are available annually for distribution in park streams. This number appears adequate to maintain good fishing. About 200 miles of the best trout-supporting water in the park will be open each season to anglers. At least three times that mileage exists as trout-supporting water, largely as side

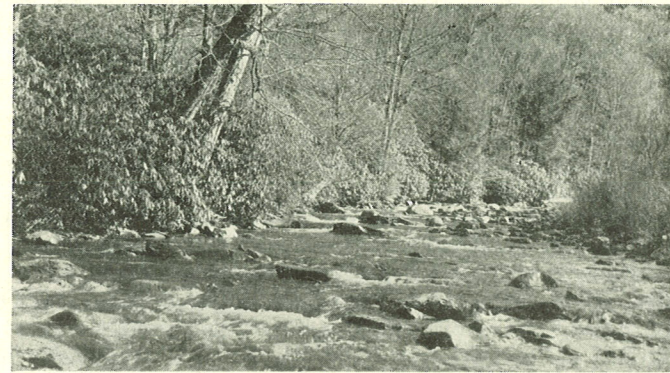


Figure 5.—The West Prong of Little Pigeon River offers excellent habitat for brook trout above 3,500 feet. Virgin forests crowd to the water's edge, providing ample shade.

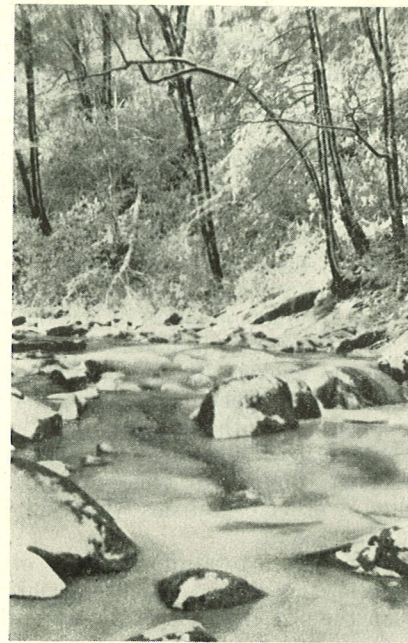


Figure 6.—The West Prong of Little Pigeon River in January, 1938. The stream bed is severely frozen, but trout find sufficient pockets of water to enable them to exist.