ANGLING ON LITTLE PIGEON RIVER, GREAT SMOKY MOUNTAINS NATIONAL PARK, 1953

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ANGLING ON LITTLE PIGEON RIVER, GREAT SMOKY MOUNTAINS NATIONAL PARK, 1953

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The growing importance of trout fishing in the Great Smoky Mountains National Park has made it necessary for the National Park Service to maintain constant appraisal of the quantity and quality of fishing in streams under its jurisdiction. The Fish and Wildlife Service has been called upon to conduct a thorough investigation of the fishery resources of the Park and to make recommendations for their management. The investigation has been in progress for 1 year, and this creel census project on the Little Pigeon River was undertaken as a necessary part of the research program.

There is no previous record of creel-survey work on the Little Pigeon River watershed, although measurements of productivity have been made on other Park streams by previous observers. King and Currier (1950) reported on angling returns from Little River in 1950, the first such study in the Park since 1940 (King 1942). The last general survey of the Park fishery was performed by Smith (1947). Since that time there have been a number of changes in the fishing situation: regulations pertaining to angling have been altered; fishing pressure has undoubtedly increased; shifts in fish species densities and distribution have occurred owing to natural and man-made factors.

The Little Pigeon River was chosen for a creel census because the mainstream and its tributaries (table 1) have a history of good fishing and they have long been subjected to a heavy fishing pressure. The watershed contains about 20 miles of fishable waters, both large and small, each with its individual potentialities. The largest tributary, Porters Creek, suffered severe flood damage in September 1951, and it was generally assumed that its fish population was destroyed; hence it was a matter of interest and importance to determine the recovery of this stream in terms of angling results. Parts of the drainage are planted with legal-size brook and rainbow trout each year, and the contribution these fish make to the creel could be estimated and compared with the yields of wild trout from the same and adjacent waters. Finally, some of the best waters in the Little Pigeon area are available only to those fishermen who are willing to walk considerable distances, thereby making possible an analysis of the distribution of fishing pressure in terms of stream accessibility.

The creel-checking station consisted of a small shelter and appropriate sign. It was located at the junction of the Porters Creek and Middle Prong truck roads at Greenbrier Cove , close to the mouth of Porters Creek and the Greenbrier Ranger Station (fig. 1). This point is about 3 miles from the Park boundary line where the truck road meets Tennessee Highway 73. Whereas it would appear desirable to have established the creel station at or near the Park boundary, no entirely suitable sites were available. Further, a boundary site would have been too distant from the campground, 2 miles upstream, to ensure complete daily reports from the

Table 1.--Distribution of fishing pressure and fish caught per mile on those waters of the Little Pigeon River watershed which were open to fishing during the 1953 angling season.

Stream	Total miles in park[1]	Estimated fishable miles	All anglers per fishable mile	Successful anglers per fishable mile	Trout caught per fishable mile	Catch per hour by successful anglers
Little Pigeon R.						
Lower section	3.0	3.0	66	27	122	1.4
Middle Prong	5.5	3.0	156	93	470	1.4
Ramsey Prong	5.2	3.5	19	16	100	1.3
Injun Creek	2.0	1.5	4	4	39	1.5
Porters Creek	6.5	3.0	142	77	368	1.4
Long Branch	2.4	1.5	10	10	45	1.0
False Gap Prong	4.6	2.0	7	7	38	1.5
Cannon Creek	3.0	1.5	9	9	16	1.0
Lowes Creek	3.0	1.5	1	1	3	4.0
Totals	35.0	20.5	59	33	168	1.4

[1] Stream lengths as listed by Burrows (1935).

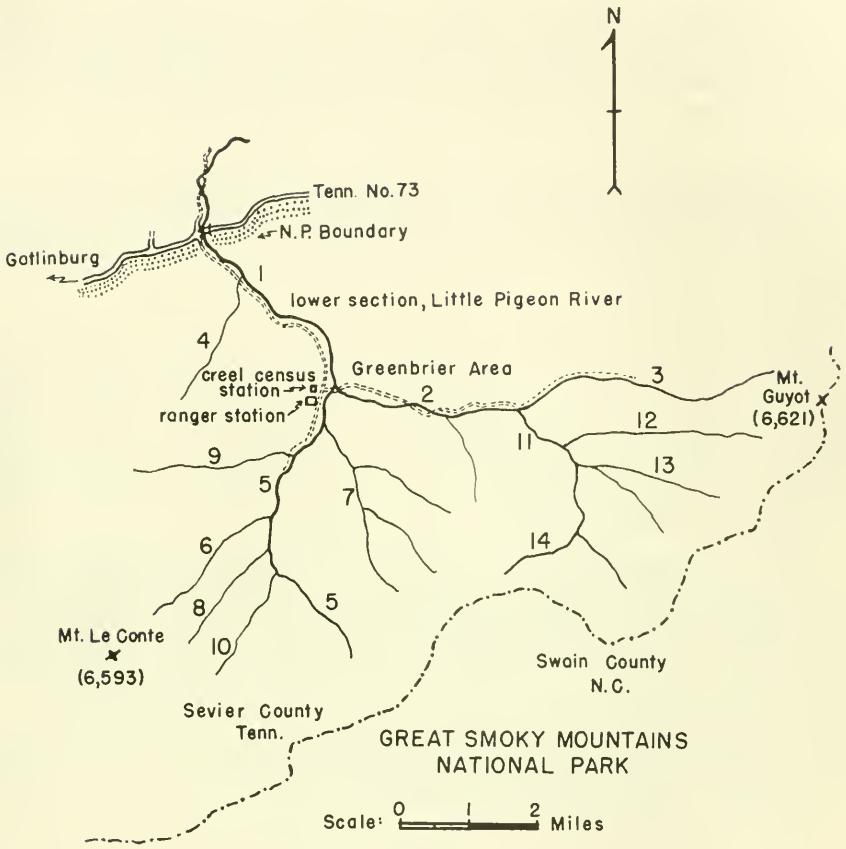

Figure 1.--Location of the Little Pigeon River creel census station and the principal streams of the watershed from which creel data was obtained during the 1953 fishing season.

Legend

Streams open to fishing

1. lower section, Little Pigeon R.
2. Middle Prong
3. Ramsey Prong
4. Injun Creek
5. Porters Creek
6. Cannon Creek
7. False Gap Prong
8. Lowes Creek
9. Long Branch
10. Boulevard Prong

Streams closed to fishing

11. upper Middle Prong
12. Buck Fork
13. Chapman Prong
14. Eagle Rocks Branch

many angler-campers. The site chosen offered the most advantages: parking space was available; the campground was less than 1 mile away; the confluence of Porters Creek and the Middle Prong within a few yards of the checking station represented the downstream limits of most anglers' efforts; and proximity to the Ranger Station made it possible for the warden to assist us in many ways.

The checking station was manned by John A. Fowler, temporary Fishery Aid, Fish and Wildlife Service, who has had long experience in the Park and in meeting the public in his job as a seasonal fire guard for the National Park Service. Mr. Fowler was thoroughly interested in the creel census, and he contributed much extra time and effort to secure the greatest possible amount of creel data.

There were some disadvantages encountered in the creel survey and in the location of the station. No means were employed to ensure cooperation on the part of the fishermen; the reporting of catches was voluntary. Some anglers who fished in the lower 3 miles of the main stream and in Injun Creek escaped contact and left the Park without registering their catches. Some individuals drove by the checking post, in spite of its advertised and well-marked position; others fished past the station and did not return. Most of the fishermen, however, were entirely cooperative.

It was unfortunate that we were unable to operate the station each day of the open season. Mr. Fowler was responsible for 40 hours of duty per week, with duty days scattered to adequately sample each week and weekend day. His working day was from 9 to 5, but he usually chose to exceed this by remaining on duty until 7 in order to contact more anglers. Additional records from fishermen were obtained on Mr. Fowler's off-duty days by District Warden El Ogle and by the writer. In spite of the disadvantages mentioned, Mr. Fowler and Mr. Ogle have very carefully estimated that the returns received represent two-thirds of the actual number of trout removed from the Little Pigeon River watershed during the 1953 season.

The Little Pigeon River Watershed

The Little Pigeon River and its tributaries drain one of the larger watersheds in the Great Smoky Mountains National Park. The drainage area contains about 50 miles of trout water and lies on the northeast side of the Park, in Tennessee. Its streams originate at elevations up to 5,000 feet or more on the steep slopes of a high ridge running eastward from Mount Le Conte (6,593 feet) to Mount Guyot (6,621 feet) and fall sharply to the valley floor. The Little Pigeon flows about 8.5 miles, with an average gradient of 470 feet per mile, and leaves the Park at an elevation of 1,400 feet.

Splendid virgin forests of mixed softwoods and hardwoods stand on much of the headwater portions of the area. Old mountain farms at lower elevations have now reverted to forest in the 23 or 24 years since the

National Park Service acquired the properties. Access to the greater part of the area is limited to foot travel; private motor vehicles are restricted to the one road, 4 miles long which connects Greenbrier Cove with Tennessee Route 73 at the Park boundary line.

The waters of the Little Pigeon and its tributaries are rapid and shallow, cool, clear, and colorless. The stream beds are composed mostly of boulders and rubble. Pools are grade A, but riffles and bottom food rate about grade B. The streams are not easy to fish; the steep gradients, the rough bottoms, and the dense streamside vegetation makes angling a rather difficult sport.

King (1937) reported that native brook trout once thrived in this watershed as low as Greenbrier, at an elevation of 1,600 feet. He thought that heavy fishing pressure and the introduction of rainbow trout were important factors in the subsequent decline of brook trout in all but remote headwaters. Fire and flood also affected the distribution of brook trout in a part of the drainage area. In September 1925, a severe fire swept through the virgin forests on the headwaters of Porters Creek. Local residents informed King that brook trout were present in the headwaters before the fire, but he reported the upper stream was barren in 1937. Indeed, District Warden El Ogle states that Porters Creek, upstream from the mouth of Boulevard Prong has remained fishless to date. Fire ash and sliding earth brought down by subsequent flood were thought to be the responsible agents in killing the trout. Porters Creek and its tributaries were ravaged by an unusually severe flash flood in 1951. Members of the Park staff have remarked that the flood resembled a tidal wave of black, foul-smelling water, and it its wake many dead trout were found.

Fishes known to be present in the Little Pigeon River watershed include the eastern brook trout (Salvelinus fontinalis), rainbow trout (Salmo gairdneri), Hog sucker (Hypentelium nigricans), blacknose dace (Rhinichthys atratulus obtusus), longnose dace (Rhinichthys cataractae), stoneroller (Campostoma anomalum) warpaint shiner (Notropis coccogenis), greenside darter (Etheostoma blennioides) rock bass (Ambloplites r. rupestris), smallmouth bass (Micropterus d. dolomieui), banded sculpin (Cottus carolinae). Other species may be present, but they have not been observed to date. The rainbow trout is the only game fish species widely distributed throughout the watershed. Trout have been stocked annually in these waters for many years; in 1953 there were 875, 7-inch to 12-inch rainbow trout distributed in the lower Little Pigeon and 875 brook trout of the same size in the lower section of Porters Creek.

The 1953 fishing regulations for the Park permitted angling for brook and rainbow trout and smallmouth bass in all except designated closed waters between sunrise and sunset each day from May 16 to August 31. Lures with more than one hook were prohibited. The use of natural bait was allowed, except minnows, dead or alive. Two changes were made in the regulations before the opening of the season: the minimum size restriction of 7 inches was restored, and the daily possession limit was reduced from 10 to 7 fish per person.

Methods

The establishment of the checking station on the Little Pigeon River area was publicized by the staff of the Great Smoky Mountains National Park. All anglers in the district were urged to present their catches at the station where such information as we desired could be obtained and recorded. The standard Fish and Wildlife Service Creel Census Report form was used, and a separate record was made on each fisherman. The fish caught were sorted by species, weighed, and measured to the nearest inch. An attempt was made to segregate the planted brook and rainbow trout from the wild fish even though the stocked specimens were not marked in any way. The hatchery brook trout were at first distinguishable by their color and size; the rainbow trout proved to be more difficult to sort into wild and planted groups and efforts to do so were soon dropped.

The home county or State of the fisherman, the hours spent on the stream, and the type of lure used in fishing were also noted. When time permitted, the comments of each person were solicited and recorded with respect to his preferences for general lures or artificial-lures-only regulations. In addition, daily entries were made on those anglers who caught no fish.

Fish and Fishing Returns

A total of 3,443 legal trout were removed from the streams of the Little Pigeon River watershed by anglers who spent 1,200 fishing days during the 1953 season (table 2). The catch per fisherman day was 2.9 trout, 7 or more inches in length. King and Currier (1950) reported an average catch of 4.9 trout per fisherman day in Little River in 1950. At the time, there were no size restrictions in effect on this well-known Park stream, and 52 percent of the total catch approximated only 6 inches in length.

Averages and other expressions based on the total number of fishermen are misleading since many anglers catch no trout. Of the 1,200 individual fishing trips recorded, 57 percent resulted in a catch of fish, and 43 percent resulted in none at all. The average creel per successful fisherman was 5.0 trout, or 71 percent of the legal limit of 7 fish. The average catch per successful angler on Little River during 1950 was 7.3 trout, or 73 percent of the possession limit of 10 trout.

It was to be expected that a relatively large percentage of the data on fish and fishing pressure would be accumulated during the early part of the open season. The records were tabulated by half-month periods (table 2) and show that 37 percent of the season's successful trips and 36 percent of the season's total catch were registered during the first half-month of the 15-week season. By the end of the first full month of the fishing season, 55 percent of the total successful trips and 54 percent of the total

Table 2.--Angling efforts and returns on the Little Pigeon River watershed in 1953 divided by half-month periods.

Period	Total number of anglers	Successful anglers		Total numbers of trout	Number of brook trout	Number of rainbow trout	Average catch	
		Number	Percentage of total				All anglers	Successful anglers
May 16-31	365	256	70	1,249	535	714	3.4	4.9
June 1-15	208	119	57	616	21	595	3.0	5.2
June 16-30	131	74	57	385	11	374	2.9	5.2
July 1-15	141	69	49	345	1	344	2.4	5.0
July 16-31	153	72	47	376	0	376	2.5	5.2
August 1-15	88	41	47	204	0	204	2.3	5.0
August 16-31	114	53	47	268	0	268	2.4	5.1
Total or averages	1,200	684	57	3,443	568	2,875	2.9	5.0

catch for the 1953 season had been reported. Thereafter, for the remaining 11 weeks, fishing pressure and creel totals declined, but the average catch per successful fisherman continued to be 5 trout.

There are two reasons which explain the good angling reported in the first half-month when 70 percent of the large number of fishermen caught trout. Hatchery fish were common and easy to catch; wild trout were hungry and relatively unwary. The planted fish were largely removed during this period, as indicated by returns on the stocked brook trout. It was assumed, after careful examination of each specimen, that very few of the brook trout reported during the entire season were wild fish. An estimated 98 percent of the 568 brook trout taillied were stocked in the stream before the opening of the season. Of these, 535 specimens (96 percent) were creeled in the first half-month. Investigators have reported that stocked rainbow trout are less rapidly exploited than brook trout. However, observations on the catches presented at the checking station indicate that most of the hatchery rainbows were removed from the stream within the first full month of the open season.

The wild rainbow trout became increasingly wary and difficult to catch as the season progressed. After the first month the average creel of all fishermen declined from 3 or more fish to less than 3 per day, and slightly less than half (45 percent) of the anglers then achieved success.

The quality of trout fishing in the Little Pigeon River watershed can best be expressed for comparative purposes in terms of catch per fisherman hour. The average catch per hour for the successful fisherman was 1.4 trout. The mean catch per hour for all anglers on the Little Pigeon was 0.8 legal fish, a figure which compares favorably with the average of 0.78 fish caught per hour on the intensively managed and heavily stocked Pisgah Preserve in North Carolina in 1952 (Ratledge 1952). A fisherman day on the Little Pigeon averaged 3.6 hours in duration and earned 2.9 fish, whereas the average angler on the Pisgah Preserve spent 4.6 hours and caught 3.6 fish in 1952. The mean catch of trout per hour on two managed trout streams in Michigan in 1951 were Rifle River area 0.17; and on the Hunt Creek area 0.40 trout (Michigan Dept. of Conservation, Biennial Report, 1952).

The size distribution of rainbow trout and brook trout over the minimum 7-inch size which were caught in the Little Pigeon area is shown in table 3. The largest single percentage (38.4 percent) of rainbow trout fell in the 7-inch group, owing to the relatively small size of the wild fish. The largest single percentage (49.6 percent) of brook trout was in the 9-inch group.

The average size of all rainbow trout was 8.3 inches; the average size of wild specimens was about 8.0 inches. The mean length of brook trout captured was 9.1 inches, owing to the predominance of stocked fish. The mean weight of all trout caught was 3.6 ounces, and the total weight of 5 fish creeled by the average successful angler was 18 ounces (table 4).

Table 3.--Size distribution of rainbow trout and brook trout caught in the Little Pigeon River watershed during 1953.

Stream	Size (to the nearest inch)							Totals
	7	8	9	10	12	14	16	
				Rainbow trout				
Little Pigeon R. Lower section	89	68	80	56	3	1	1	298
Middle Prong	502	368	266	184	18	6	1	1,345
Ramsey Prong	167	95	57	29	0	0	0	348
Injun Creek	21	10	6	2	0	0	0	39
Porters Creek	243	175	175	83	11	1	0	688
Long Branch	42	17	9	0	0	0	0	68
False Gap Prong	24	16	13	10	0	0	0	63
Cannon Creek	17	6	1	0	0	0	0	24
Lowes Creek	0	1	0	1	0	0	0	2
Totals	1,105	756	607	365	32	8	2	2,875
Percentages	38.4	26.3	21.1	12.7	1.1	0.3	0.1	100.0
				Brook trout				
Little Pigeon R. Lower section	1	25	23	16	4	0	0	69
Middle Prong	9	7	34	16	0	0	0	66
Ramsey Prong	0	2	0	0	0	0	0	2
Porters Creek	2	70	214	122	9	0	0	417
False Gap Prong	0	0	9	3	0	0	0	12
Lowes Creek	0	0	2	0	0	0	0	2
Totals	12	104	282	157	13	0	0	568
Percentages	2.1	18.4	49.6	27.6	2.3	0	0	100.0
Grand totals	1,117	860	889	552	45	8	2	3,443
Grand percentages	32.4	25.0	25.8	15.2	1.3	0.2	0.1	100.0

Table 4.--Length and weight data recorded on rainbow trout and brook trout caught in the Little Pigeon River watershed in 1953.

Stream	Rainbow trout[1]		Brook trout[2]		Total weight of fish (pounds)	Average weight per fish (ounces)	Average creel per successful angler	
	Number	Av. length (inches)	Number	Av. length (inches)			Number of fish	Weight (ounces)
Little Pigeon R. Lower section	298	8.4	69	9.0	87.6	3.8	4.5	17.1
Middle Prong	1,345	8.2	66	8.9	301.0	3.4	5.1	17.3
Ramseys Prong	348	7.9	2	8.0	70.1	3.2	6.4	20.5
Injun Creek	39	7.7	..	...	7.9	3.2	6.5	20.8
Porters Creek	688	8.2	417	9.2	276.8	4.0	4.8	19.2
Long Branch	68	7.5	..	...	11.7	2.8	4.5	12.6
False Gap Prong	63	8.1	12	9.3	16.8	3.5	5.8	20.3
Cannon Creek	24	7.3	..	...	4.1	2.7	1.7	4.6
Lowes Creek	2	9.0	2	9.0	0.7	2.8	4.0	11.2
Totals or averages	2,875	8.3	568	9.1	776.7	3.6	5.0	18.0

1/ 875 rainbow trout (7-12 inches long) stocked in lower section of Little Pigeon River on April 21, 1953.

2/ 875 brook trout (7-12 inches long) stocked in Porters Creek on April 17, 1953.

Of the 2,875 rainbow trout registered at the creel checking station, 14 percent exceeded 10 inches in length. Two specimens were 15.5 inches long, and these with 7 other fish over 14 inches were through to be wild fish, although there is a possibility that these included some carry-over fish from previous plantings in the river.

An unknown fraction of the 2,875 rainbows caught was contributed by the 875 unmarked fish planted in the lower 3 miles of the Little Pigeon River 1 month before the season opened. A recovery of 67 percent of marked rainbow and brook trout (King 1942) and a return of 61 percent of marked brook trout (King and Currier 1950) have been reported in the Park on Little River. These returns of hatchery reared fish were considered not unusual for Southern Appalachian streams. If we assume that 65 percent of the rainbows planted in the Little Pigeon in 1953 were recovered, it follows that at least 80 percent of the 2,875 rainbows registered during the season were resident fish.

Heavy fishing pressures were exerted and good catches of rainbow trout were made on the Middle Prong and in Porters Creek, neither of which was stocked with this species. There were 448 rainbows captured per mile of fishable water in the Middle Prong and 229 per mile in Porters Creek. The average number of trout creeled per mile of fishable water in the entire Little Pigeon watershed was 169, whereas Little River produced a catch of 1,010 trout per mile in 1950, at which time no minimum size restrictions were in effect (King and Currier 1950).

On April 17, 1953, 875 brook trout were stocked in Porters Creek, the largest tributary of the Little Pigeon in the Greenbrier area. A number of them moved into connecting waters; some went into False Gap Prong, others moved into the Middle Prong and the lower section of the main stream. Some may have gone downstream beyond the Park boundary. These stocked fish made a very temporary contribution to the quality of fishing; most of them were caught or had disappeared within a short time after the season opened. It is interesting to note that 688 rainbow trout were caught in Porters Creek, as compared with 417 stocked brook trout.

The 568 brook trout caught during the 1953 season included 30 percent which were 10 inches or more in length. None were over 13 inches long. It is estimated that not more than 2 percent of the brook trout captured were wild fish; the remainder were hatchery-reared, and their survival to the creel was about 64 percent of the number planted. Post-season population surveys at 11 sites have demonstrated the scarcity of brook trout in the waters open to angling; no survivors of the stocked trout were recovered; and no wild fish, either fingerling or adults were taken.

Fishing Efforts and Success of Resident and Nonresident Anglers

A great deal of concern is continually expressed in the vicinity of the Great Smoky Mountains National Park about maintaining good fishing quality for the benefit of the tourist angler. Under existing circumstances, the nonlocal fisherman catches very few fish (table 5). The stocked trout are largely removed by resident anglers before the tourist season commences. In fact, the creel-census records show that throughout the summer few but the local fishermen have sufficient proficiency to catch the very wary wild fish.

Nonresident anglers did make a considerable effort to catch trout in the Little Pigeon during 1953; 250 (21 percent) of the 1,200 fishermen recorded at the checking station were out-of-State persons. Their total catch was 43 trout, or a mere 1.25 percent of the total 3,443 fish registered. The few successful anglers among them caught 1.2 fish per hour of angling effort (table 6).

Of the tourist fishermen interviewed, a majority of fish strictly for sport, not for the pan. They wanted to see fish and to catch fish, but possession was of minor consequence since few had facilities to store or cook fish. Many expressed keen disappointment over the fishing. They questioned the practice of fish stocking in a National Park; and they found fault with the State-license requirements on Federally controlled waters, especially since the high fee charged by the State of North Carolina discouraged a day or two of casual fishing on that side of the Park.

Unfortunately not all nonresident fishermen were identified by their home states. Most of them caught no fish, and at first only this fact plus the hours spent on the stream and their nonresident status were noted. Later they were listed according to their home State. Fourteen States were represented in 94 of the total 250 nonresident fisherman-days.

Residents of Tennessee, of whom 90 percent were from Sevier and Cocke Counties, logged 950 fishing trips, or 79 percent of the total. They caught 3,400 trout, which amounted to 98.75 percent of the total number of fish reported. The successful residents averaged 1.4 fish per hour of effort.

Distribution of Fish and Fishing Pressure on the Little Pigeon Watershed

Fishing pressure on the Little Pigeon was not uniformly distributed because of the lack of easy access to certain waters. Anglers reported the locations of their efforts to the creel census clerk, and it was therefore possible to compute the season total of fishermen per mile on various sections of the streams.

Table 5.--The residence and creel returns of anglers on the Little Pigeon River watershed in 1953.

State	Number of fishermen	Number of trout creeled
Residents		
Tennessee	950	3,400
Nonresidents		
Alabama	13	0
Florida	20	4
Georgia	8	10
Illinois	16	14
Kentucky	6	3
Maryland	3	0
Massachusetts	3	0
Michigan	2	0
Mississippi	2	0
North Carolina	2	10
Ohio	10	0
Oklahoma	4	0
Texas	4	0
Virginia	1	2
Not identified by State	156	0
Nonresident totals	250	43
Grand total	1,200	3,443
Percentage residents	79	98.75
Nonresidents	21	1.25

Table 6.--Fishing effort and returns obtained by resident and nonresident anglers on the Little Pigeon River watershed in 1953.

Stream	Total number of trout caught	Successful resident anglers				Successful non-resident anglers			
		Number of men	Number of trout caught	Percentage of total trout	Catch per hour	Number of men	Number of trout caught	Percentage of total trout	Catch per hour
Little Pigeon R. Lower section	367	79	360	98.1	1.4	3	7	1.9	0.7
Middle Prong	1,411	275	1,406	99.6	1.4	3	5	0.4	0.6
Ramsey Prong	350	53	336	96.0	1.3	2	14	4.0	1.4
Injun Creek	39	6	39	100.0	1.5	..	..	...	...
Porters Creek	1,105	225	1,088	98.5	1.4	5	17	1.5	1.9
Long Branch	68	15	68	100.0	1.0	..	..	...	...
False Gap Prong	75	13	75	100.0	1.5	..	..	...	...
Cannon Creek	24	4	24	100.0	1.0	..	..	...	...
Lowes Creek	4	1	4	100.0	4.0	..	..	...	...
Totals	3,443	671	3,400	98.75	1.4	13	43	1.25	1.2

The unequal spread of fishing efforts was also indicated by the results of fish population estimates made on the streams following the close of the 1953 fishing season (table 7). As might be expected, fewer trout were found in the waters subjected to the heaviest angling loads.

The population estimates were based on fishes collected with cresol (phenol coefficient 30). Applications of this compound were made in sufficient strength to insure a maximum effect on the fishes within a test area. The test areas ranged from 75 to 300 yards in length, depending on the size of the stream and the amount of help available to insure a rapid pickup of fish before the anesthetizing effects of the cresol were dissipated. Usually a minnow seine was stretched across the stream at the downstream limit of a measured area to prevent the escape of fish. All species were enumerated, and game fishes were measured as well; estimates of the residual fish populations per acre, or per mile of water were formulated from the figures obtained. These estimates must be considered as conservative; in spite of our every precaution, some fish within the test areas were perhaps unaffected by the cresol, and others, although affected, may have been missed during the pickup.

The lower section of the Little Pigeon River, extending from the confluence of the Middle Prong and Porters Creek to the Park boundary, was easily reached from the adjacent truck road and it was fished heavily throughout its 3-mile length in the Park. As stated previously, returns from this piece of water were fractional since the anglers did not have to pass the creel checking station before leaving the Park. The records show that there were 66 anglers, and 122 trout caught per mile, on this water during the season (table 1). On October 27, 1953, a survey was made on 100 yards of stream at a point one-half mile upstream from the Park boundary line. Numerous minnows of 5 species and one darter were captured, but no bass or trout were taken or observed (table 7). Another survey was made on 100 yards of stream at a point 1.9 miles upstream from the boundary on October 28. A total of 146 fish were netted, which included 5 species of minnows and one muddler species. Again no trout or bass were taken. The application of cresol in this instance remained in effective concentration for 25 to 30 yards downstream past the check net. Pools and riffles in the test areas were grade A in number and quantity. These results by no means prove that trout are completely lacking in the lower Little Pigeon, but they do show that stocked or wild rainbows and brook trout are scarce. The failure to capture any fingerling trout denotes a scarcity of spawning fish. This section of stream has been stocked annually with legal-size rainbow trout, but the effects of these plantings are not apparent in the population surveys.

The Middle Prong of the Little Pigeon offered 3 miles of fishing water to hikers who approached the upstream waters by way of the adjacent but restricted truck road. No stocking has been done in this prong in recent years, but there were 156 anglers and 470 trout reported per mile for the season; we estimate that these figures represent about 80 percent of the actual totals for the Middle Prong. The heaviest fishing loads were

Table 7.--Estimations of fish populations present per mile in the Little Pigeon River watershed based on surveys made with cresol in September, October, and November 1953.

Stream	Station elevation (in feet)	Rainbow trout		Brook trout		Other fishes			
		Sublegals	Legals	Sublegals	Legals	Suckers	Minnows	Darters	Muddlers
Little Pigeon R.	1,375	...	...	...	...	18	...1/	18	...
	1,500	...	...	...	...	...	2,482	...	88
Middle Prong	1,900	389	41	...	...	....	...1/	...1/	...
	2,000	117	47	...	...	...	842	...	...
	2,700 2/	1,170	493	26	...	...	...1/	...	...
Ramsey Prong	2,800	702	117	...	...	...	...	...	...
	2,900	445	47	...	...	...	...	...	...
Porters Creek	1,750	106	18	...	...	...	2,306	18	53
	2,000	308	27	...	...	...	...1/	...	...
	2,200	70	18	...	...	...	634	...	...

1/ Present, but not enumerated

2/ Station in Wilderness Area; waters closed to fishing

concentrated on the lower 2 miles of water, from the High Bridge on downstream; the upper mile is very steep and rough,and fishing pressure on it was considerably less. Cresol was applied to 300 yards of water at Twin Bridges on September 10, 1953, and 74 rainbow trout, ranging from 3.2 to 10.6 inches long, were captured. The estimate of the residual trout population includes 41 legal-size and 389 fingerling rainbows per mile of stream in this immediate vicinity. The great majority of trout in the sample were young of the year, ranging from 3.0 to 4.9 inches in length.

Another cresol survey was made on 75 yards of test water at a point one-half mile upstream from the previous site on November 5, 1953. The population in this steep and rough area just below the High Bridge was estimated at 47 legal size and 117 fingerling rainbow trout per mile. Several species of Cyprinidae were abundant at this and the Twin Bridge stations.

The upper waters of the Middle Prong, above the mouth of Ramsey Prong, lie in the Wilderness Area and are closed to fishing. On September 10,1953, a population of 493 legal size and 1,170 fingerling rainbow trout and 26 fingerling brook trout per mile, was estimated from the results obtained in 250 yards of test water at a point one-half mile upstream of the Wilderness Area boundary line. Some illegal fishing does occur in the Area and one of the captured brook trout had a snelled hook imbedded in its esophagus. The rainbow trout ranged from 2.7 to 10.9 inches in length; 33 specimens were sexed, and the smallest mature male was 4.2 inches long and the smallest maturing female was 8.9 inches.

An excellent population of Appalachian brook trout was found in Eagle Rocks Branch above a series of barrier falls. This stream lies entirely in the Wilderness Area and is tributary to the Middle Prong. Brook trout from 5 to 9 inches long were easily captured on small flies, and a few individuals of about 10 inches in length were observed.

Ramsey Prong is a large tributary of the Middle Prong and offers about 3.5 miles of fishable water which averages 20 feet in width. It is one of the more remote streams of the watershed which is open to fishing, and access to its lower reaches is achieved by a 3.5-mile walk on the Middle Prong truck road. There were 19 anglers and 100 legal trout recorded per mile during the 1953 season.

A series of barrier falls, known as Ramsey Cascades, are about 2 miles upstream from the mouth of the stream. Native brook trout are said to be common above the cascades, and rainbow trout occur below. Two surveys were made on the lower section of this stream and the results differed considerably. The first, a trial run in the use of cresol, was made on September 9, 1953, at a point one-third mile above the mouth. Rainbow trout were the only species taken or observed, and they were estimated to occur at 117 legals and 702 fingerlings per mile. The effective range of the cresol was conservatively listed as 75 yards.

The second test was made on a measured 75 yards of water at two-thirds mile above the mouth. The results of this survey indicated a rainbow trout population of 47 legals and 445 fingerlings per mile. The fish ranged in size from 3.2 to 13.7 inches; the smallest mature male was 3.8 inches and the smallest mature female was 8.7 inches long. This stream has not been stocked with trout in recent years; reproduction of the wild fish is adequate and fishing pressure is relatively light.

Porters Creek is the largest tributary of the Little Pigeon River within the Park and joins the mainstream close to the place where the creel-checking station was located. It has about 3 miles of readily fishable water which averages 24 feet in width (Burrows 1935). There were 142 anglers and 368 trout reported per fishable mile during the 1953 season, a pressure and catch which approaches that recorded for the Middle Prong. Records were obtained from approximately 75 percent of the fishermen on this stream.

On September 9, 1953, a trial run with cresol was made at a site 1.6 miles above the mouth of Porters Creek. Partial effects were obtained in 200 yards of stream, and the estimate of the rainbow trout population was roughly 27 legal fish and 308 fingerlings per mile. A careful survey was made on October 28 at a point 0.3 mile upstream from the mouth. Cresol was applied in a measured 100-yard stretch of water, and the rainbow trout collected indicated a population of 18 legals and 106 sublegals per mile. Several species of forage fishes were numerous at this location.

Another survey was made on the stream on October 31 about 2 miles upstream from the mouth, at a site within the limits subjected to a heavy fishing load. The estimate obtained from the 100-yard test area included 18 legals and 70 fingerling rainbow trout per mile. Longnose dace were the most numerous among the forage fish species.

Adult brook trout were planted in Porters Creek by the National Park Service during the two spring seasons following the disastrous flood of 1951 which largely destroyed the resident fish populations. It was hoped that the species would reestablish itself here in its former range. The attempts failed because most of the trout were quickly removed by anglers, and the survivors, if any, failed to reproduce successfully. No brook trout, fingerlings or adults, were taken or observed during the population surveys. In spite of the brook trout stocking, wild rainbow trout contributed more than half the total catch in this stream during 1953 and afforded fair quality fishing throughout the season (table 3).

The cresol surveys were inadequate in number, and their results cannot stand alone as reliable indicators of the population densities of trout in the Little Pigeon watershed. However, the estimates are supported somewhat by the recent history of fishing in the district, by the catch records obtained at the creel checking station, and by the results of cresol surveys made on other streams in the Park during the same period.

Wild female rainbow trout in the Little Pigeon mature on the average in their third year (King 1942). The smallest ripening female examined during the 1953 population studies was 8.7 inches long; mature males were frequently younger and of much smaller size. The combination of increased fishing pressure and the lack of minimum size restrictions during recent years has permitted progressively fewer maiden fish to reach sexual maturity.

During the period 1948 through 1952, not only was each year class of rainbows exploited by fishermen in its second, third, and subsequent summers, but many of the larger fingerlings were taken in their first summer. Rangers and wardens in the Park have reported that creel limits of 10 4-inch to 5-inch rainbows were commonly checked in those years. The heavy drain of immature fish by anglers and the high over-winter mortality suffered by stream trout, which is reported to be between 60 and 80 percent of the populationsin some areas (Needham, Moffett and Slater 1945; Allen 1952), tended to preclude any but a small number of mature trout in these recent years. In 1953, a 7-inch minimum size restriction on brook and rainbow trout was made a part of the Park fishing regulations to afford additional protection to young fish, yet a large percentage of the fish creeled on the Little Pigeon were immature. Of the 2,875 wild and stocked rainbow trout registered at the checking station, 65 percent were under 8.5 inches in length (table 3), and most of the females were unquestionably immature. If the stocked trout could have been excluded from this tabulation, the percentage of wild trout under 8.5 inches caught and recorded would be considerably greater.

The data on the size distribution of 393 rainbows collected with cresol in the open and closed waters of the Little Pigeon were compared, and they show that 47 percent of the 201 trout collected in closed waters and 74 percent of the 192 rainbows captured in open waters were included in the 2.0-4.9-inch size range (table 8). Rainbows of this size were mostly young of the year (fig.2). Both groups of fish were subject to natural mortality and some poaching; the fish in the closed waters may have been reduced in numbers by some emigration downstream and out of the Wilderness Area; the trout in open waters were subjected to some hooking and handling losses since bait fishing was allowed and fishermen were permitted by regulations to retain as a part of their creel limit those sublegal fish which were badly injured in catching. The size group from 5.0 to 6.9 inches included 21 percent of the Wildnerness Area fish and 15 percent of the open-water fish; of these, most were in their second year of growth. Rainbows of this age in open waters were subjected to some harvest in their first summer (1952), when no size restrictions were in effect; additional losses to anglers occurred in their second summer (1953) because of the retention loophole in the new minimum size law; a part of the second-year fish reached legal size and were caught out.

Fishing quality in the Little Pigeon watershed in 1954 will continue to show the effects of the close cropping which took place on the streams from 1948 through 1952 when fishing regulations were liberal. The 1952 year class of rainbows should consist entirely of legal size fish in 1954

Table 8.—Size distribution of 393 rainbow trout captured and examined during the population studies made on the Little Pigeon River watershed, September-November 1953.

Stream	Length groups (inches)											Line totals
	2-2.9	3-3.9	4-4.9	5-5.9	6-6.9	7-7.9	8-8.9	9-9.9	10-10.9	11-12.9	13-13.9	
Little Pigeon R.	...	...	...	...	...	...	...	...	...	...	...	...
Middle Prong	...	31	25	7	11	7	1	...	1	...	...	83
Wilderness Area	12	65	17	16	27	21	17	24	2	...	...	201
Ramsey Prong	2	20	25	2	...	1	2	2	1	...	1	56
Porters Creek	3	11	26	7	1	4	...	1	...	...	...	53
Totals	17	127	93	32	39	33	20	27	4	...	1	393

Figure 2.--The length distribution of rainbow trout captured during population studies on the Little Pigeon River watershed in September, October and November 1953. The solid line represents 392 of the 393 trout collected with cresol; the total includes 192 fish from open waters and 201 from closed waters. The broken line represents those 201 trout from the closed stream.

(their third summer), but it has been reduced in numbers by natural losses and captures by anglers during its first and second summers; it faces another fishing season before its average members reach sexual maturity and spawn. It is unlikely that the survivors will constitute an adequate parent stock.

A comparison of the 1953 population figures with those listed by investigators on other trout waters implies that the densities in the Little Pigeon watershed may be very low indeed. King and Currier (1950) made estimates of the residual populations of rainbows in Little River watershed, Great Smoky Mountains National Park, following the termination of their creel census. Cresol was employed, and the numbers of trout of all sizes captured indicated densities of 690 fish per mile in the most heavily fished portion of the main stream, 1,056 per mile in Fish Camp Prong, and 2,106 per mile in Three Forks Prong. The authors concluded that sufficient trout remained in the streams to afford good-quality fishing in the following season. Relatively good populations were found by us in Bradley Fork on November 4,1953. This stream is about the size of Porters Creek and is open to angling. In an upstream section, which averaged 20 feet in width, there were an estimated 70 legal and 510 sublegal rainbows and 18 fingerling brook trout per mile. Another survey was made in the lower section where the stream averaged 25 feet in width and the estimate included 140 legal and 1,240 sublegal rainbow trout per mile. The trout examined by us at these stations ranged from 2.8 to 17.4 inches in length.

In spite of the appreciable differences in the postseason trout populations in certain streams of the Park which were open to fishing, the few ratios available on fingerling and legal-size trout seem to show a consistency. In the open waters of the Little Pigeon area, 11.0 percent of the estimated population of rainbow trout were 7 inches or more in length. In Bradley Fork, a heavier concentration of this species was found, and again 11.0 percent were legal size. In an upper section of Little River 12.5 percent of the rainbows collected with cresol in November 1953 were over 7 inches long. In contrast, 32.0 percent of the specimens samples in the closed waters of the upper Little Pigeon River in the Wilderness Area were of legal size. It appears from these few data on rainbow trout in the Great Smoky Mountains National Park that angling may reduce the percentage of legal fish in a population by nearly two-thirds, but as a certain ratio of sublegal to legal fish is approached the population as a whole declines and the ratio remains fairly constant.

Survey of Opinion Among Fishermen

For at least 10 years before 1948, certain regulations governing the trout fishing in the Great Smoky Mountains National Park were in effect: Fishing season, May 16 to August 31 inclusive; minimum size, ranging from 6 to 10 inches; possession limit, 10 trout per day; and lures, artificial, with one hook only. Angling pressure was heavy, but fish stocks were in

fine shape and public pressure began to mount to have the Park Service ease the fishing regulations to permit a greater harvest. In 1948, the minimum size restriction was dropped, and the use of natural bait, except minnows, was permitted.

It is generally conceded that the relaxation of the fishing regulations in the Park was accompanied by a decline in fishing quality. Rangers and wardens reported that as most of the larger fish disappeared creel limits of 4-inch to 6-inch trout became common; fishermen confessed that high mortalities of small trout were occurring due to the use of tiny hooks (sizes 14 to 18) baited with bits of bread, wasp larvae, caddisworms, or crickets. It was soon charged by some that the Park had lost the respect of the fishermen, that enforcement of regulations was inadequate in face of increasing violations, and that the streams were being stripped of trout of all sizes by the bait and bread fishermen.

Staff members of the Park conducted a fisherman's opinion survey in 1949. Anglers were contacted on the streams and asked to record their opinions on several questions dealing with the current fishing regulations. At that time 232 expressed themselves on the question of bait fishing versus artificial lures. Only 37 percent approved the retention of the bait fishing regulation; 63 percent of them recommended the restoration of the artificial-lures-only restriction. Coincidentally, 37 percent of the respondents disapproved a minimum-size restriction while 68 percent were in favor.

The opinion of fishermen appears to be growing stronger on the matter of restoring the artificial-lures-only restriction. Whenever possible, the fishermen who recorded catches at the creel checking station on the Little Pigeon River in 1953 were asked to state their preference for lures; otherwise, the type of lure they used to catch their fish were determined from information on the creel register form. The statements of 447 respondents, all successful in catching fish were recorded (table 9). Those in favor of general fishing, including bait, numbered 26 percent, whereas those in favor of artificial lures numbered 74 percent.

The proponents of general fishing argue that restricting fishing lures to artificial types discriminates against the nonresident fisherman. Such is not the case. Only a small number of nonresidents caught fish in the Little Pigeon this summer, yet information obtained from these persons showed them to be almost entirely in favor of artificial lures. My observations and interviews with nonresident anglers indicate that few of them use bait in any form while fishing in Park streams. Opinion among nonlocal fishermen from Tennessee, that is, living in counties other than Sevier, Cocke, and Blount, was largely in favor of artificial-type lures.

There were 237 successful anglers who were not questioned on bait preferences. Artificial lures were used by 51 percent of them, and some form of natural bait was employed by the other 49 percent. Most of these

Table 9.--Lure preferences as stated or exhibited by anglers on the Little Pigeon River watershed during the 1953 fishing season.

Successful anglers	Artificial lures		General (including bait)		Total
	Number	Percentage	Number	Percentage	
Non-residents:					
Questioned	10	100	0	0	10
Not questioned	2	67	1	33	3
Non-local residents[1]					
Questioned	29	78	8	22	37
Not questioned	11	46	13	54	24
Local residents[2]					
Questioned	293	73	107	27	400
Not questioned	107	51	103	49	210
Totals					
Questioned	332	74	115	26	447
Not questioned	120	51	117	49	237
Grand totals	452	66	232	34	684

1/ Tennessee residents of counties other than Blount, Sevier, and Cocke.

2/ Tennessee residents of Blount, Sevier, and Cocke Counties.

anglers, however, reported their catches within the first few days after the season opened, a time when Mr. Fowler was too busy to do more than record catch data. It is presumed that natural bait was more commonly used at this time of the season because the water was high and stocked trout were common.

A unique criticism was voiced by many of the local fishermen who were so apt in catching trout all season. They felt that fishing quality in the Little Pigeon has declined to a point where it takes too much time to obtain a limit catch. Each said, in effect, "There's plenty of fish left, but not like there was a few years ago. Then I could catch my limit in 30 minutes or an hour or so and get on home. Now it takes me an hour and one-half to three hours to do it and it isn't hardly worth it to waste such time for 7 trout. I vote for a fly fishing law so the fish will come back like they were; then I can lay off a bit from chores now and then, come catch my limit in a few minutes and get on out of here."

Many of the local fishermen are unusually skillful in using very small flies and tiny bait lures, yet at the same time the concepts of sport or recreation in trout fishing may be lacking in them. They want a catch of fish more than sport and with only a very small expenditure of time. Time and again this season, some would be in the Park less than one hour and leave with their limits of wild trout. On the other hand, the desire of the local anglers to see fishing conditions improve is very real. Their reaction to this creel census demonstrated a keen interest and a willingness to cooperate in matters concerned with the study, improvement, and conservation of the fishery resource.

Conclusions

The streams of the Little Pigeon River watershed continued to provide fair quality trout fishing during the 1953 season. According to our creel census data, there were 59 anglers per mile of fishable water, 33 of whom were successful and caught 168 legal trout per mile at a rate of 1.4 fish per hour. These figures compare well with those reported for managed trout waters in other areas.

A total of 1,200 fishermen reported at the creel checking station, and 3,443 trout were tallied. The mean hourly catch rate for all anglers was 0.8 fish; the average creel was 2.9 trout and weighed 10 ounces. The station attendant estimated that our records include two-thirds of the actual numbers of fishermen and trout captured, that there were actually about 1,800 anglers on the watershed and about 5,000 trout caught during 1953.

Few large trout were taken in the Little Pigeon this season; two 15.5-inch rainbows were the largest registered by fishermen. A 13.7-inch male

rainbow was the best fish examined during the postseason population surveys on these waters.

Most of the stocked rainbow and brook trout were removed from the streams shortly after the season opened. The estimated recovery for both species was 65 and 64 percent respectively. Wild rainbow trout provided the bulk of fishing throughout the summer, whereas wild brook trout made an insignificant contribution to the total catch.

A very limited number of population surveys were made on fishable streams in the watershed during September, October, and November, 1953. They disclosed that trout stocks of all sizes were low. There were fewer trout in the waters subjected to the heaviest fishing loads than in those more lightly fished. No survivors were found of the 875 hatchery-reared, legal rainbow trout which were stocked in the Little Pigeon River in April 1953; not one specimen of the 875 brook trout planted in Porters Creek during the spring was taken or observed in 3 survey collections (anglers, however, harvested some of these planted fish).

The 192 rainbow trout collected in the open waters included 11 percent which were of legal length; in contrast, the 201 rainbows taken with cresol in the closed waters of the Wilderness Area included 32 percent which were 7 or more inches long. The smallest mature female trout examined was 8.7 inches long; mature males were often younger and of smaller size. Only 5 percent of the fish from open waters were large enough to include mature females, as compared with 21 percent from the Wilderness Area.

The combination of liberal fishing regulations in effect from 1948 through 1952 and a heavy fishing pressure has contributed to a lack of parent stock and a decline in trout numbers. The population surveys showed less than 500 rainbow trout per mile in the Little Pigeon, Middle Prong, and Porters Creek. There were more trout per mile in Ramsey Prong where the angling pressure is less heavy. Results obtained in the Wilderness Area on the Middle Prong indicated about 1,600 rainbows per mile.

The records obtained from 684 successful anglers indicated a 2:1 preference for artificial lures over bait. Of the 447 fishermen specifically questioned, 74 percent favored a change in the fishing regulations to allow only artificial lures on Park streams; 26 percent of the respondents were opposed to any change.

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