



ESTIMATING RECREATIONAL USE OF A UNIQUE TROUT STREAM
IN THE COASTAL PLAINS OF SOUTH CAROLINA

Abstract. --A sampling technique for estimating fishing use was pilot tested on a small trout stream on the Santee Ranger District, Francis Marion National Forest in South Carolina during fall and winter 1969-70. A short questionnaire, completed by fishermen using the stream, provided information relating to the variables of interest. Reliable estimates of fishing use were obtained at low cost.

If you fish, you very likely have caught bream, bass, catfish, and other species in the fresh-water lakes and rivers of the Coastal Plains of South Carolina. But have you ever caught a trout while fishing in the Coastal Plains? Chances are that you have not, yet several hundred fishermen did just that during fall and winter 1968-69 and 1969-70. This is unique in that trout fishing is normally limited to mountain streams.

Approximately 4,000 keeper-sized rainbow trout have been stocked during each of the past 2 years in a small, fresh-water stream called Broad Axe Canal. It is located near Moncks Corner at the Canal Recreation Area, Santee Ranger District, Francis Marion National Forest. The Broad Axe Canal is suitable habitat because the water temperature between October and April is cool enough for rainbow trout to survive during the fall and winter months.

The stream was first stocked and opened to public use during fall and winter 1968-69. The project is featured primarily for youngsters and women, but others are also permitted to fish. Broad Axe Canal is $\frac{1}{2}$ mile long and only 20 feet at its widest point (fig. 1). It is located next to a high-speed highway, and access by fishermen and the trout-stocking truck is easy. The daily bag limit is five fish per person, and a special trout stamp is not required. Artificial and live bait are permitted.

The trout stream project has been made possible by the USDA Forest Service and the South Carolina Public Service Authority (Santee-Cooper). The trout were reared by the Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, USDI, at the National Fish Hatchery in Walhalla, South Carolina.



Figure 1.--Broad Axe Canal--a rainbow trout stream in the Coastal Plains of South Carolina.

Because of the success of the stocking program and the popularity of the stream during the first year of operation, the Forest Service initiated a sampling study to answer several questions important to resource managers. Answers were needed to such questions as: How many fishermen use the stream? How long do they fish? How far do they travel to reach the stream? What is the effect, if any, of the stocking program on the local economy? To answer these questions, a sampling study was designed and initiated during fall and winter 1969-70 by personnel of the Francis Marion and Sumter National Forests and the Southeastern Forest Experiment Station Recreation Research Project.

Use of the stream for fishing was cyclic because of weather conditions and nature of the stocking program. Heavy use was expected immediately following and for several days after stocking. Use was then expected to fall off until the next stocking. The use period of November 1, 1969, to March 15, 1970, was stratified, based on stocking dates, to account for this cyclic nature of use. Twenty sample days were randomly selected within the 135-day use period; 12 days from the low-expected-use stratum and 8 from the high-expected-use stratum. A short questionnaire, completed by fishermen using the stream, provided information relating to the variables of interest. The questionnaire took about 1 minute to complete.

On each of the 20 sample days, a Forest Service observer placed a questionnaire on the windshield of each vehicle parked in the vicinity of the stream each hour during the period 8 a. m. to 5 p. m. The driver of each vehicle was requested, by printed instructions, to complete the questionnaire for all persons in the group. A well-marked box was

provided in a prominent location at the stream for depositing completed questionnaires. These were collected at 5 p. m. on each sample day and again at 8 a. m. the following day, at which time the sign and deposit box were removed until the next sample day. Questionnaires were distributed only on sample days. Because few homes were located within walking distance of the stream, it was assumed that most persons using the stream would arrive by vehicle. Vehicle license numbers were recorded on questionnaires by the observer to determine place of residence of visitors. License numbers were also recorded on a separate form to determine the percentage of visitors who completed and deposited a questionnaire on each sample day.

An indicator variable was also tested for purposes of updating use estimates in future years. A pneumatic-tube, direct-reading traffic counter was installed at each end of the parking lot to determine the number of vehicles using the area. Counters were read at 8 a. m. each sample day and again at 8 a. m. the following day to determine relationships between fishing use and traffic flow. In addition, a season-long record of traffic flow was obtained.

The 4,000 trout, weighing 1,347 pounds, were stocked 1,000 each on October 29 and December 18, 1969, and on February 4 and March 4, 1970. The first stocking date was announced by newspaper and radio; the other dates were not announced. The stream was opened to fishing on November 1, 1969. The last sampling date was March 15, 1970.

Sampling progressed according to plan, and 66 completed questionnaires were obtained during the 20 sample days. Seventy-seven percent of all groups who had received a questionnaire completed and returned the questionnaire.

ANALYSIS AND RESULTS

Sample linear regression analyses were run to obtain estimates of use and to determine relationships between use and the traffic-flow pattern at the parking area. Relationships between fishing use and the traffic-flow pattern were weak, and error terms for all use estimates were unacceptably high. This finding was expected because the parking lot and trout stream are located adjacent to a high-speed highway. The results indicate that the parking lot received heavy vehicular use not associated with the trout stream.

The data were next analyzed with simple random sampling estimation procedures. Use estimates¹ and other interesting and useful information about fishermen who used the trout stream are discussed below.

¹Confidence intervals for the key variables of interest are expressed as percentage of the estimates at the 67-percent level of probability. Example: If estimated season-long number of fishermen is 2,000 for a given sample, and the confidence interval is ± 20 percent at the 67-percent level of probability, we construct the interval 1,600 to 2,400 fishermen. On the average, 67 percent of such intervals will include the true value if we sample an unlimited number of times.

Use estimates are for the period November 1, 1969, through March 15, 1970. Because questionnaires were distributed only from 8 a.m. to 5 p.m. on sample days, estimates do not include early-morning or late-evening fishing use.

Number of Fishermen

The estimated number of persons who fished the stream was 1,025, with a confidence interval of ± 24.9 percent. In addition, 205 nonfishing spectators accompanied the fishermen. These estimates can be increased to approximately 1,261 fishermen and 253 spectators, to adjust for a response rate of 77 percent. Mean size of fishing group was 2.3 persons. The greatest number of fishermen on any sample day was 33. Less than five people fished on half the sample days.

Total Fishing Use

Estimated total fishing use was 1,457 hours (121 visitor-days), with a confidence interval of ± 24.4 percent. This estimate can be increased to approximately 1,792 hours (148 visitor-days) to adjust for the response rate. Mean length of fishing visit per person per trip was 1.4 hours.

Number of Trout Caught and Fishermen Success

Estimated number of trout caught during the 135-day season was 1,682, with a confidence interval of ± 32.6 percent. This estimate can be increased to approximately 2,069 to adjust for the response rate. Mean number of trout caught per person per trip was 1.6. The greatest number of fish caught on any sample day was 89; no fish were caught on 8 sample days.

Nineteen percent of the fishermen succeeded in catching their limit of five fish each. Seventy percent of all groups who fished caught one or more trout. Approximately 93 percent of fish caught were kept.

Fishermen were apparently not aware of the times that trout were stocked, other than the October 28 stocking which was announced. Two sample days occurred on two of the days that trout were stocked (December 18 and February 4). No fishermen were observed using the stream on one day, and only four persons on the other of these days. Only four persons fished on the sample day following the other stocking date (March 4).

Residence of Fishermen

The stream is used primarily by fishermen residing 25 miles or less from the stream, as shown below:

<u>Distance</u>	<u>Percent</u>
Moncks Corner (2 miles from stream)	41
Within 25 miles (including residents of Moncks Corner)	89
Greater than 25 miles	11
Total from South Carolina	98

General Enjoyment

The questionnaire contained two questions relating to general enjoyment of the trout stocking and fishing program. These questions were: Did the majority of your group enjoy fishing here? Would the majority of your group like to see this trout-stocking project continued?

Replies indicated that fishermen were very pleased with the stocking project. Sixty-five of the 66 groups who completed questionnaires stated they had thoroughly enjoyed the fishing experience. Only one person reported negatively.

All groups stated they would like to see the stocking program continued in future years.

Other Comments

There were a few reports of illegal catching of trout. One fisherman reported on his questionnaire that he had observed illegal netting of stocked trout. Although the Forest Service Ranger Station was located less than 1 mile from the Broad Axe Canal, no violations were observed by Forest Service officers.

Considerable unexplained trout mortality occurred immediately following the last stocking on March 4, 1970.

Cost

Cost of the trout-stocking operation is shown below:

<u>Item</u>	<u>Amount</u>
Raising trout (4,000)	\$ 678
Truck and gas	156
Salaries and overtime	239
	<hr/>
	\$1,073

Cost for developing study plan, all field sampling phases, supplies, study administration, data analysis, and report preparation was approximately \$950.

DISCUSSION

Trout have been successfully stocked in the Broad Axe Canal for 2 years. Other than the unexplained mortality following the March 4, 1970, stocking, this project has been accomplished without problems. It is reasonable to expect that future stockings will be as successful as the first two. Keeper-sized trout, each weighing approximately 1/3 pound, have been produced and stocked for 27¢ each.

The sampling phase of the project produced acceptable "ball park" estimates of use which will be of considerable value if the trout-stocking project is continued in future years. In addition, valuable information was obtained concerning changes in sampling design and methodology for improving the precision of use estimates in future sampling efforts of this nature.

Almost all recreational use of the trout stream was by local residents living 25 miles or less from the stream. Expenditures for gas, oil, bait, and other related supplies were small and likely contributed very little to the local economy. Because most local fishermen use fresh-water lakes and rivers of South Carolina year round, the trout project did not likely increase the sale of state fishing licenses. Larger, more highly publicized trout-stocking projects might well be expected to contribute to local economies and to the sale of fishing licenses.

The recreational benefits to those who fished the stream is another story. As already shown, of those parties who fished the stream and completed questionnaires, more than 98 percent enjoyed the fishing experience and all wished to see the project continued. Total fishing use, in hours, was relatively small, but the recreational benefits reached a considerable number of fishermen. The sample estimate of 1,261 fishermen was undoubtedly low because early-morning and late-evening fishermen were not included in the sample. For many, the fishing trip to the Broad Axe Canal was likely the first trout they had fished for, seen, or caught. Total annual cost of stocking 4,000 keeper-sized trout, including Forest Service administrative and supervisory costs, is approximately \$1,500. Prorated over all fishermen who fished the stream over the 135-day period, cost per "fishing occasion" was approximately \$1 to sponsors of the project.

The intangible benefits derived from public goodwill to agencies--public or private--contributing to the project is also an important consideration.

The conclusions reached by interviewed fishermen and all persons associated with the study were that the recreational benefits far outweigh the small costs involved and that the stocking project should be continued in future years.

George A. James
Principal Recreation Specialist

Nelson W. Taylor, District Ranger
Santee Ranger District
Francis Marion National Forest
Moncks Corner, South Carolina

Melvin L. Hopkins, Wildlife Assistant
Francis Marion and Sumter National Forests
Columbia, South Carolina