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A creel survey of the Tellico and North Rivers : comparisons between a stocked and a wild trout stream in Tennessee

Brian Neal Bates

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To the Graduate Council:

I am submitting herewith a thesis written by Brian Neal Bates entitled "A creel survey of the Tellico and North Rivers : comparisons between a stocked and a wild trout stream in Tennessee." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Wildlife and Fisheries Science.

Richard J. Strange, Major Professor

We have read this thesis and recommend its acceptance:

Arnold Saxton, Mark Fly

Accepted for the Council:

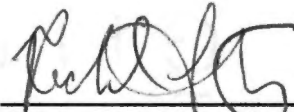
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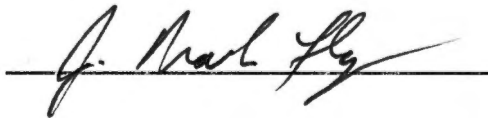
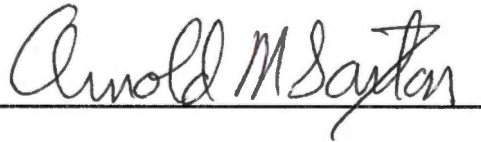
To the Graduate Council:

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Richard J. Strange, Major Professor

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and recommend its acceptance:



Accepted for the Council:



Associate Vice Chancellor and
Dean of the Graduate School

**A Creel Survey of the Tellico and North Rivers:
Comparisons Between a Stocked and a Wild Trout Stream in
Tennessee**

**A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville**

**Brian Neal Bates
August 1997**

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Thesis

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Abstract

The Tellico and North Rivers, located in Tennessee's Cherokee National Forest, represent a heavily stocked trout stream with wild rainbow (*Oncorhynchus mykiss*), and brown trout (*Salmo trutta*) present, and a purely wild trout stream. Tellico River receives between 60,000 and 100,000 catchable rainbow trout from late March to early September of each year. It is open for fishing under general Tennessee trout regulations. The North River has received no stocked trout of catchable size in the last decade. It is open for fishing under special trout regulations. This study was implemented to compare pressure, catch, harvest, fishing methods, and distance traveled between the two rivers, and determine the return to creel for stocked trout.

A roving creel survey of both rivers was conducted during the 1995 and 1996 stocking seasons. Sample areas of 6.44 kilometers (km) in length were selected for each river. There were 1036 angler interviews conducted over 59 creel periods for the Tellico River, and 154 angler interviews conducted over 62 creel periods for the North River. Within the Tellico River sample area, fishermen averaged 28,824 angler-hours per season. North River fishermen averaged 3,168 angler-hours. Tellico anglers caught 20,299 stocked trout, and 15,355 wild trout per season. North anglers caught 4,658 wild trout per season. The release rate was 95% for Tellico River wild trout, 8% for stocked trout, and 96% for North River wild trout. Catch per unit effort was 1.24 for the Tellico, 1.47 for the North. Widely varying fishing methods were used on the two rivers.

Harvested wild trout for the Tellico River sample area average 768, and accounted for a 12% harvest induced mortality of wild trout greater than 90 millimeters in length. Total angler induced mortality for Tellico River wild trout greater than 90 mm is estimated to be from 12 to 20%. The 186 wild trout harvested from North River accounted for a 5% harvest induced mortality of wild trout greater than 90 mm. Total angler induced mortality for North River wild trout greater than 90 mm is estimated to be from 5 to 10%. Tellico River anglers harvested 18,675 of 19,591 stocked trout per season from the sample area for a 95% return rate. Monroe county anglers were the most numerous, with local anglers (those having traveled 80 km or less) accounting for 40% of all fishermen on both rivers. Less than 15% of anglers on either river were non-residents of Tennessee.

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Chapter I

Introduction

The Blue Ridge province of eastern Tennessee contains no less than 1795 km (1113 mi) of free-flowing (non tailwater) coldwater streams capable of supporting trout (Strange and Habera 1993). According to the Tennessee Wildlife Resource Agency (TWRA) (1994) there are an additional 370 km (230 mi) of trout streams found in the Cumberland Mountain, and Highland Rim provinces of the state. The cumulative total of approximately 2,165 km (1,342 mi) of free-flowing trout streams in the state represents a substantial aquatic resource. Self-sustaining populations of wild rainbow (*Oncorhynchus mykiss*), brown (*Salmo trutta*), and brook (*Salvelinus fontinalis*) trout currently inhabit 1,353 km (839 mi), approximately 63% of the total (Strange and Habera 1995). This leaves 812 km (503 mi), or 37% of streams supported solely by stocking of hatchery trout. Many of Tennessee's wild trout streams are also stocked with hatchery trout. Although there are doubtless many thousands of anglers utilizing the state's free-flowing, wild and stocked trout streams every year, there is virtually no recent documentation of angler use, success, and harvest outside the Great Smoky Mountains National Park (GSMNP) (Strange and Habera 1995).

Before 1900, Tennessee's Tellico and North Rivers, located in the southern Cherokee National Forest, contained only native brook trout populations. Nearly the entire Tellico River watershed was intensively

logged between 1909 and 1928, severely silting streams and raising water temperatures. By 1928 a regional observer from the U.S. Forest Service stated that he believed the main stream of the Tellico River to be the only stream in the area with fishable trout populations. To replace lost brook trout stocks, more than 120,700 hatchery-reared rainbow, brook, and possibly brown trout were released into area streams between 1928 and 1935 by the U.S. Forest Service, the Civilian Conservation Corps (CCC), and other unknown sources. Fishing, nevertheless, improved very little (Shields 1952). It was during this time that the CCC constructed the first known trout rearing pools on Pheasant Branch, the current site of the Tellico Trout Hatchery (Wilkins, personal communication). According to Wilkins (1955), the CCC was also responsible for a great deal of streambed improvement, and riparian revegetation on the Tellico and North Rivers and surrounding streams during the 1930's.

In 1936 the Tellico Wildlife Management Area was established, with jurisdiction being shared by the U.S. Forest Service and the Tennessee Conservation Department (Shields 1952). Although records are spotty, it appears that approximately 350,000 rainbow, brown and brook trout were stocked into the streams of the management area from 1936 to 1951. Most trout were reared at the Pheasant Field Rearing facilities. Limited creel data was also collected on the management area during this time period. In 1939, the average angler brought home seven trout per trip averaging eleven and one half inches long (Brandt 1940). During this time period, stream-reared trout were believed to comprise almost 50% of the catch.

During the 1940's, the Tellico Wildlife Management Area began to

receive national acclaim for the quality of trout fishing found there. Many popular articles of the day referred to the Tellico River, and its tributaries, as the best trout streams east of the Rocky Mountains (Brandt 1940; King 1952; anonymous 1942). Stocking of catchable trout increased steadily on area streams throughout the 1950's and 1960's, and although catch rates were believed to be good, return rates on stocked trout were thought to be usually less than 70% (Wilkins, personal communication). It was during the early 1970's that management strategies on most of the Tellico River tributaries began to place emphasis on wild trout fisheries. The focus on the Tellico River itself continued to be on massive stockings of hatchery trout, with rainbow trout slowly supplanting brook and brown trout as the primary species stocked.

Today, the Tellico and North Rivers offer a variety of trout fishing opportunities. The Tellico River is an intensively managed put-and-take fishery receiving between 2,400 and 3,000 rainbow trout of catchable size on a weekly basis from late March through early September (Dayhuff, personal communication). This intensive stocking effort makes the Tellico River one of the most popular stocked trout streams in Southern Appalachian region (Jacobs 1994). The Tellico is open under general Tennessee trout regulations. There are no bait, hook, or lure restrictions and seven trout of any size may be kept each day. The stocked portion of the river is closed on Thursdays and Fridays to facilitate the stocking of fish. A Tellico/Citico permit must also be purchased for each day of fishing during the stocking season.

According to Strange and Habera (1995), the Tellico River also

supports populations of naturally reproducing rainbow and brown trout. The combined species standing crop of the Tellico does not differ significantly from the 30 kg/ha average that Strange and Habera (1995) found to be typical of freestone streams in East Tennessee. The total length of trout supporting water of the Tellico River in Tennessee includes approximately 19 km (12 mi) from the North Carolina state line to the mouth of Turkey Creek. The lower portion of this stretch, from Turkey Creek up to the mouth of North River, receives greater numbers of stocked trout than the upper portion due to its larger size. The portion of the Tellico River supporting wild trout probably does not extend below the confluence with Bald River. There are about 16 km (10 mi) of wild trout water contained within the Tennessee portion of the Tellico River (Habera, personal communication).

The North River, a tributary of the Tellico River, is considered to be one of the most popular streams in Tennessee for anglers seeking wild rainbow and brown trout (Jacobs 1994). Although once an intensively stocked stream, the North River has received no stockings of catchable-sized trout in at least 12 years (Akins, personal communication). Current fishing regulations on the North River include single-hook-artificial lures only. A minimum size limit of 229 mm (9 in), and a creel limit of three rainbow and brown trout in any combination is also imposed. There is a three fish, six inch limit on brook trout, although these fish are rarely caught in the main stem of the North River. According to Strange and Habera (1995), the wild trout standing crop of the North River is typical of a Southern Appalachian freestone trout stream: approximately 30 kg/ha. There are approximately 12 km of trout water from the mouth of North River up to the confluence of

Meadow Branch and Sugar Cove Branch, which combine to form the river.

As would be expected, the contrasting management strategies, and corresponding regulations, have created a diversity of fishing opportunities on the Tellico and North Rivers. Consequently, a great deal of angler specialization has been observed on both of these streams. Angler specialization often determines success and shapes attitudes in trout fishing (McGurrin 1986). There are at least four legal fishing strategies employed on the Tellico River. They include: bait fishing with spinning or spincast tackle, spin or spincast fishing with artificial lures, fly fishing with artificial lures, and bait fishing with a flyrod. Since single-hook-artificial only regulations apply to the North River, spin or spincast fishing with artificial lures, and fly fishing with artificial lures are the only two methods practiced. The percentages of anglers employing these various methods, and their success rates are undocumented for free-flowing trout streams in Tennessee outside the GSMNP.

Fatora (1970) found a decrease in angler pressure when regulations were changed from general to “artificial only” on Noontootla Creek in North Georgia. Similarly, Anderson and Nehring (1984) found greater fishing pressure on trout streams where bait fishing was allowed, and catchable trout were stocked, than on nearby wild trout streams. It is generally believed that the Tellico River receives significantly greater fishing pressure than the North River.

Moore and Kulp, in GSMNP (1994), found that local anglers (those having traveled 80 km or less) made up only 40% of the total on the Little River, located on the Tennessee side of the GSMNP. Anglers from states

other than Tennessee and North Carolina made up 45% of the total. In contrast, Fatora (1970) found that only 4% of anglers on Noontootla Creek were not Georgia residents. However, the majority of anglers who fished the stream during the “special regulations” years were from the Atlanta metropolitan area. On the heavily stocked Clinch River tailwater in Tennessee, well over half of all fishermen in both the general regulations, and in the quality regulations sections were from the nearby Knoxville metropolitan area (Fraser 1995). As early as 1942, anglers from ten states, in addition to Tennessee, were represented in Tellico creel surveys, but in undetermined percentages (anonymous 1942).

With the cost to raise a single catchable rainbow trout at about \$.68 according to Wiley et al. (1993), the state of Tennessee is making a considerable investment in the Tellico River trout stocking program each year. The principal objective of stocking programs is to maximize the return of stocked trout to the angler (Helfrich and Kendall 1982). The TWRA requires at least a 50% return on stocked trout by weight in order to justify current stocking levels (Bivens and Strange 1987). It is generally accepted that the return rate for the Tellico River is very high.

In order to evaluate success rates in terms of catch per unit effort, total harvest, relative harvest of a particular species or angler satisfaction, a creel survey must be conducted (Brown 1970; Moring 1986). The two basic components of the creel survey are counts to estimate fishing pressure and angler interviews (Rohrer 1986).

The purpose of this study was to evaluate angler use on the Tellico and North Rivers as a comparison of a heavily stocked, and a wild trout stream

from the same area with similar access. The six major objectives were:

1. To establish catch per unit effort and percentages of kept and released, stocked and wild trout on both the Tellico, and North Rivers.
2. To determine fishing effort on both rivers.
3. To obtain approximate return rates on trout stocked into the Tellico River.
4. To document the percentages of anglers employing the four fishing methods used on the Tellico River, and the two fishing methods used on the North River.
5. To compare distances traveled to fish the Tellico and North Rivers.
6. To obtain harvest rates for wild trout on the Tellico and North Rivers, and their implications for the fishery.

Chapter II

Methods

1995 Roving Creel Survey

An angler creel survey was conducted in the spring and summer of 1995 on the Tellico and North Rivers. The survey was initially designed to coincide with the stocking season on the Tellico River, which traditionally takes place from late March through early September. However, due to the severe flooding that took place during March 1994, road access to the upper Tellico and entire North River was seriously impaired. Forest Service road 210 (the Tellico River road) was rendered impassible at a point just below Bald River falls. The road was not fully repaired until Memorial Day weekend 1995. Prior to the repair of Tellico River road, both rivers could still be reached via the North River road, after a detour of approximately 32 km (20 mi). A check of the Tellico/Citico permit sales from the Green Cove store in early April 1995 revealed that, even with limited road access, permit sales for the Tellico River were comparable to those of previous years. The creel survey began on April 18, and ended August 19.

The two basic components of a creel survey are counts to estimate pressure and angler interviews (Rohrer 1986). For this study a roving creel survey was deemed the most practical method due to the good road access along the lengths of both rivers. Large volumes of non angler and angler traffic ruled out the possibility of an access point survey. Any check points

would have made an already serious weekend traffic flow problem worse.

The roving creel survey has the advantage of interviewing types of anglers in proportion to their abundance as well as increasing sample size by seeking out individual anglers (Mackenzie 1991). Since the results from a roving creel survey are based on unfinished trips, some have voiced concerns that catch and harvest rates could be biased. However, Malvestuto et al. (1978) did not find significant differences in harvest rates determined from completed and uncompleted trip interviews.

A formal protocol for a roving creel survey demands a prescribed route through the fishery that brings every potential location of target anglers under the scrutiny of the roving clerk. Starting points and directions of travel along the route are randomized on each sample day, and the starting time of the clerk's workday is randomized so that it depends on the relative lengths of the workday and the fishing day. A common scheme is to fix the length of the workday at half the fishing day and randomize starting time at either the beginning or the midpoint of the fishing day (Robson 1991). A similar model was used for this study.

Carlander and DiCostanzo (1958) concluded that sampling programs must be "tailor made" or designed for each specific situation. In addition to the steps detailed above, two pressure counts were conducted each creel day at randomly generated times. Also, since fishing pressure was deemed greatest on weekends for both rivers, weight was given to weekend periods when selecting the creel days as put forth by Brown (1970).

A 6.5 km (4 mi) stretch of both the Tellico and North Rivers were selected as sample areas for the creel survey. The sample area on the Tellico

River extended from the North Carolina state boundary 6.5 km downstream to a point just above the Green Cove community, and encompassed about 8.2 hectares (ha) of surface area. The sample area on the North River began 0.8 km (0.5 mi) upstream from the river's confluence with Tellico River, and extended upstream 6.5 km to a point about 100 m above the confluence of Laurel Creek. The North River sample area constituted about 5.9 ha of surface area. The sample areas on the two rivers were selected to correspond as closely as possible in length, size, and accessibility.

Both sample areas were divided into four equal parts measuring 1.6 km (1 mi) in length. Mile marker zero denoted the beginning of each sample area. Each subsequent mile marker, or section boundary, was numbered in ascending order one through four going upstream. This scheme of demarcation allowed for random starting points to be chosen for the creel schedule, and allowed the clerk to spend equal amounts of time interviewing anglers in all parts of the sample areas.

The creel schedule (Appendix 2) listed the date, the river to be creeled, the day of the week, the direction of travel (up or downstream), the starting point (mile marker), the shift (morning or evening), and the two times during the shift that pressure counts would be made. The river, direction of travel, section, shift, and pressure count times were randomly selected. Creel dates were also randomly chosen, except that weight was given to weekend periods (Saturday and Sunday for the Tellico River, Thursday through Sunday for the North River). As a result, there was a higher probability of weekend sampling.

After obtaining starting point, and direction from the creel schedule for

a given date, the creel clerk would begin traveling in the designated direction from the prescribed starting point by automobile. The clerk would stop and interview every angler spotted, and would continue seeking out anglers in that section until he had exhausted one fourth of the daylight hours of that shift (excluding approximately one hour set aside for the two pressure counts). This usually amounted to about one and one half hours, depending on daylight. At the end of the allotted time, the clerk would repeat the process in the next section until a complete circuit had been made. This scheme insured that even on days with very heavy fishing pressure, the clerk would interview anglers from all sections equally.

Angler interviews were accomplished by approaching the angler, extending a friendly greeting, and asking the angler if he or she would mind answering a few questions. If the angler agreed, a series of questions taken from the creel instrument (Appendix 1) were asked. The angler was asked the time at which he or she began fishing that day. Method of fishing was noted. The angler was then asked if any trout had been creeled. If there were trout in the possession of the angler, they were measured to the nearest millimeter and weighed to the nearest gram with a spring loaded scale. The kept trout were also counted and identified according to species. The creel clerk determined whether kept trout were wild or stocked. If the angler had creeled trout that were not on his person at the time, he was asked to recall the number and species of the kept trout, and whether they were stocked or wild trout. Any trout measuring 229 mm or less was generally considered to be a wild fish since nearly all trout stocked into the Tellico River were 254 mm in length, or greater. Wild trout larger than 229 mm turned up in the

creel only infrequently, and were easily distinguished by the average angler according to color and girth. The angler was then asked if any trout had been caught and released. The number was noted, and the angler was asked to differentiate between wild and stocked trout based on the aforementioned criteria. Time of the interview was noted, and the angler was asked to provide his zipcode. The angler was then thanked for his cooperation, thus completing the interview.

At the two designated times during the creel shift, the clerk would cease seeking or interviewing anglers, and begin the pressure counts. The clerk would note the exact point at which interviewing had stopped and begin traveling from that point in the same direction counting every angler visible. Except for two short bends on each river that required a short hike to view the river, all anglers could be seen from the road. The clerk would make a complete circuit of the sample area, and resume angler interviews at the previous point of cessation as if no time had expired. Thirty minutes were allotted for each pressure count. Anyone with a line in the water, changing tackle, or walking to a fishing destination was considered to be fishing (Phippen and Bergerson 1987). The same process was repeated for the second daily pressure count.

1996 Roving Creel Survey

The 1996 survey was also designed to coincide with the stocking season for the Tellico River, and came closer to doing so than in 1995 (Appendix 3). The survey started on March 23 and continued through

September 2. There was more complete road access to both rivers in 1996. After receiving preliminary results from the 1995 creel data, it was felt that the number of angler interviews from North River (43) was too low to insure statistical reliability. It was also apparent that the bulk of the fishing pressure on the North River occurred on Saturdays and Sundays. It was initially assumed that Thursdays and Fridays would have pressure equal to traditional weekend days, because the Tellico River was closed to fishing on those two days. Several changes were made for the 1996 survey.

The number of creel days on the North River was increased from 22 to 40 for 1996. Saturdays and Sundays were the only days considered as weekend days for both rivers and had a higher probability of selection for the creel schedule. Due to the more than adequate sample size from the Tellico River in 1995, the number of creel days was decreased from 32 to 27. Although the angler interview scheme for the Tellico River remained the same, it was modified slightly for the North River for 1996.

The sample area and section divisions remained the same for the North River, but the interview time schedule was changed. Instead of dividing the amount of daylight into fourths to spend in each section, fifteen minutes were allotted for angler interviews in each section before moving on to the next section. In this manner several complete circuits of the sample area could be made in a single shift allowing the clerk to interview many anglers that would have been missed under the previous scheme. Pressure counts, and all other parameters remained the same as for the previous season.

Another component was also added to the survey for the 1996 season. If an angler interviewed indicated that he had caught and released wild trout,

he was asked his reason for doing so. Responses were grouped into twelve generic categories. This aspect of the survey was incorporated beginning in May 1996.

Estimation of the fishing effort for a given creel day was derived by dividing the total number of anglers counted in the two daily pressure counts by the number of daily pressure counts (2), and multiplying this number by the number of hours in the creel period (7). The average daily creel rate (CPUE) was determined from anglers interviewed that day by dividing the sum of all trout caught by the sum of all of the hours fished until the time of interview. The daily catch was estimated by multiplying the total daily fishing effort by average daily creel rate. The estimated total angling effort for an entire stratum (weekend/weekday and morning/evening) was determined by adding all of the daily fishing effort estimates for a particular stratum and dividing this by the number of days sampled in that stratum over the season. This value was multiplied by the number of possible days for that stratum for the season. The estimated angling effort for each of the four stratum were then added to give the total angling effort for the entire season. Total catch and CPUE were also determined by stratum for the season in the same manner and expanded to include the entire season (Phippen and Bergensen 1991). Estimates for percent release were expressed as means from anglers interviewed only and were considered as representative of the entire population. Harvest estimates were determined by multiplying the total seasonal catch by the percentage kept of wild and stocked trout. Estimates for percent of anglers using various fishing methods and place of residence were based on angler interviews.

The University of Tennessee Agricultural Experiment Station, Statistical and Computing Services Department generated the creel schedule for 1995 and 1996, programmed the above calculations, and conducted statistical analysis of the data with SAS (1989). Student t tests were used to determine statistical significance. Chi-square tests were used to compare place of residence between rivers.

Chapter III

Results

The 1995 and 1996 creel seasons on the Tellico River consisted of 59 creel periods out of a possible 524 for both seasons. A total of 1036 anglers were interviewed. Sixty two out of a possible 664 creel periods were spent on the North River. A total of 154 anglers were interviewed. All estimates for effort, catch, and catch per unit effort are expressed as an average value from expanded data from both creel seasons, with a pooled standard error. Estimates for release percentage, percent using a certain fishing method, and place of residence are simply average values of the sample populations from the 1995 and 1996 creel seasons. Estimates for harvest are derived from expanded catch data and release percentage from the sample populations. Responses to the question “Why did you release the wild trout that you caught?” are for a portion of the 1996 creel season only. Unless stated, no significant differences existed between years.

An estimated 28,824 angler-hours per season were spent by anglers within the Tellico River sample area. An estimated 3,168 angler-hours were spent in the North River sample area (Figure 1). Tellico River anglers caught an estimated 35,880 total trout per season. Stocked trout made up 20,299 of this total. Wild trout comprised 15,355 of the total. North River anglers caught an estimated 4,658 wild trout per season (Figure 2). There was a significant difference between the 1995 estimate of 2,607 and the 1996

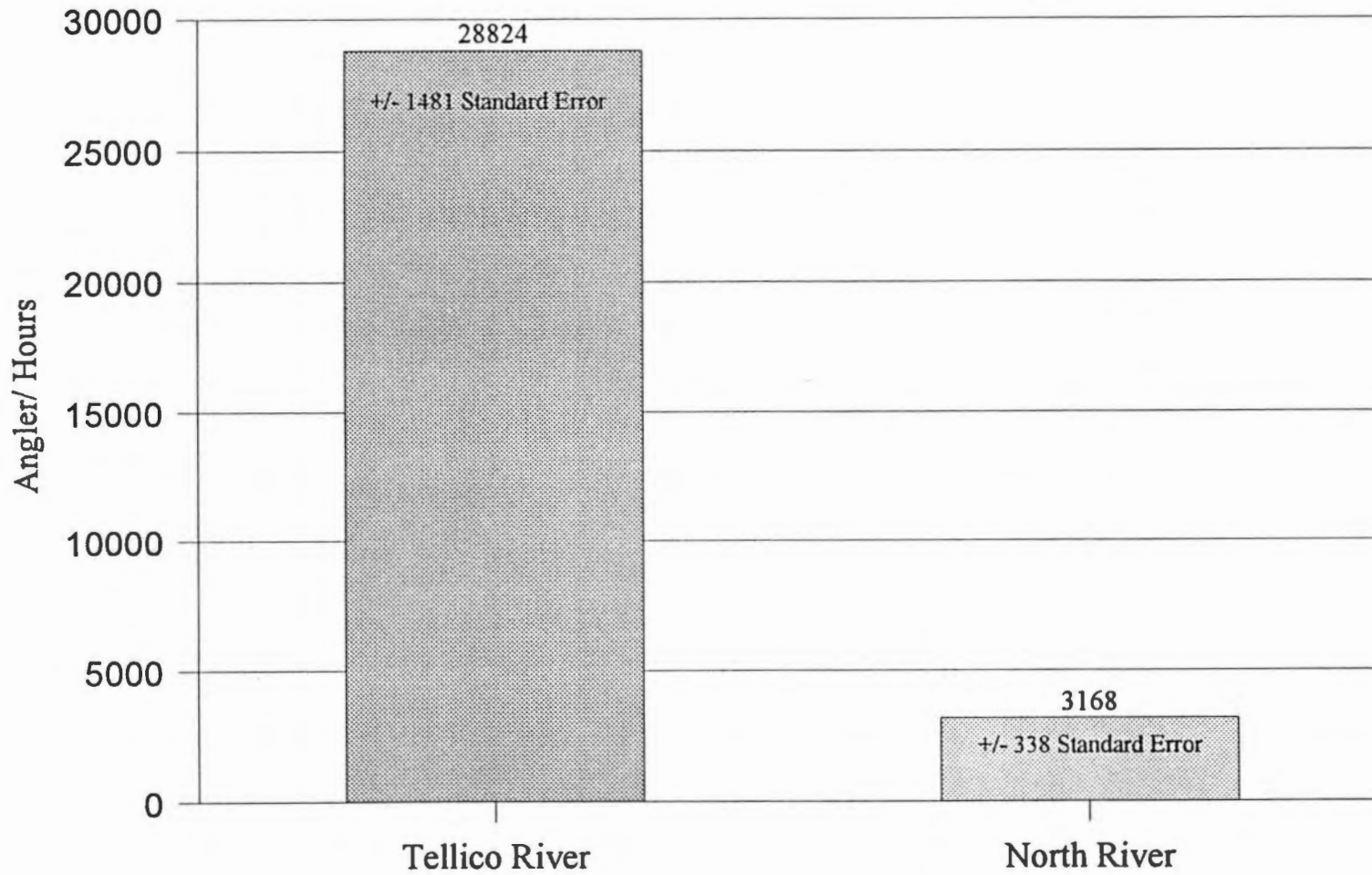


Figure 1. Estimate of total fishing pressure in angler/hours for Tellico and North River sample areas for averaged 1995 and 1996 creel seasons.

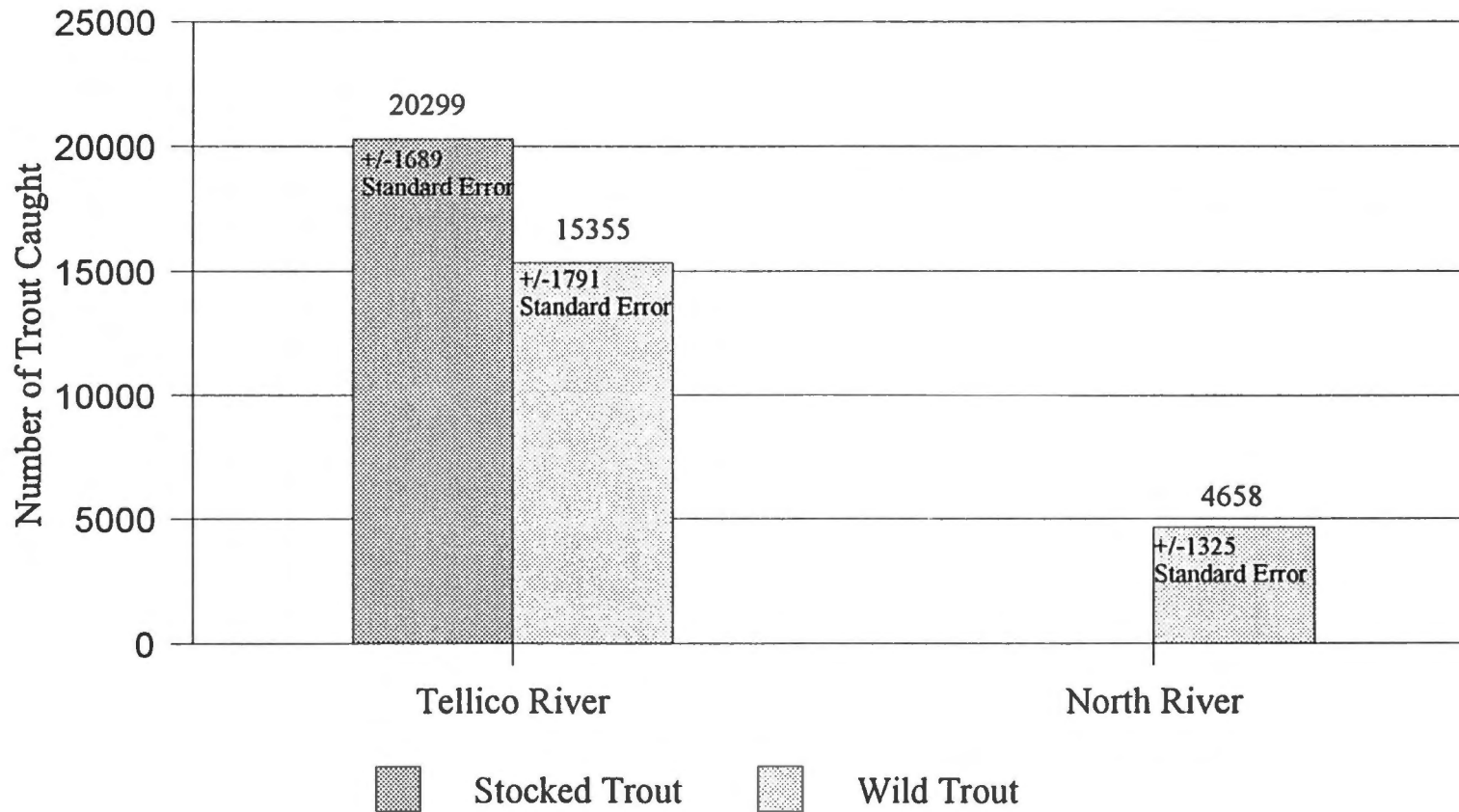


Figure 2. Estimated numbers of stocked and wild trout caught from the sample areas of the Tellico and North Rivers for averaged 1995 and 1996 creel seasons.

estimate of 5,942 from the North River. There was also a significant difference between the wild trout catch estimates for the Tellico and North Rivers.

With an estimated release rate of 8% for stocked trout, and 95% for wild trout, anglers harvested 18,675 stocked trout, and 768 wild trout per season within the Tellico River sample area. There was a significant difference between the estimates for wild trout caught in 1995 (555) , and in 1996 (1,046). With an estimated release rate of 96% for wild trout within the North River sample area, anglers harvested 186 wild trout per season. There was a slight increase in the release rate on the North River from 1995 (88%) to 1996 (98%), and an even more significant difference between the harvest estimates for wild trout in 1995 (313) and 1996 (119). Although there was no significant difference in the release rate of wild trout between the Tellico and North Rivers, there was a significant difference in harvest estimates between rivers.

CPUE for Tellico River anglers averaged 1.24 trout/angler/hour. CPUE for North River anglers averaged 1.47 trout/angler/hour (Figure 3). There was a significant difference between the CPUE estimates from the North River in 1995 (0.79), and in 1996 (1.96). There was no significant difference between CPUE estimates for the Tellico and North Rivers.

Bait fishermen using spinning, or spincast tackle accounted for an

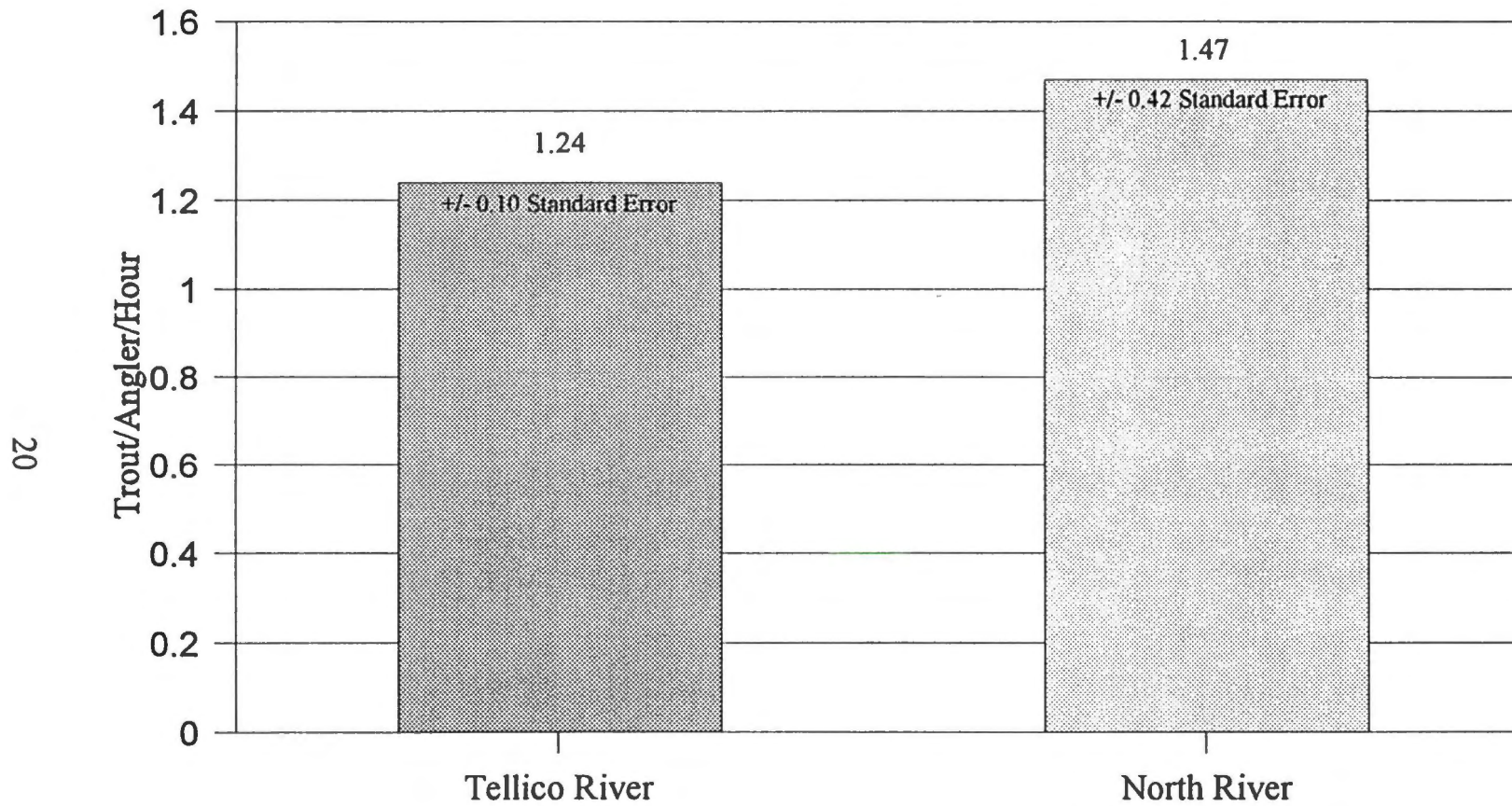


Figure 3. Estimated catch per unit effort for averaged 1995 and 1996 creel seasons on the Tellico and North Rivers.

average of 54.5% of Tellico River anglers interviewed, but the percentage was down significantly from 69% in 1995 to 40% in 1996. Anglers using spinning or spincast tackle with artificial lures averaged 25.5% of fishermen interviewed, with little difference between years. An average of 20% of Tellico River anglers interviewed were using fly fishing gear with artificial flies, with a big jump from 1995 (9%) to 1996 (31%). Less than 1% of Tellico anglers used fly fishing gear with natural bait in either year (Figure 4). Fly fishermen made up an average of 66.5% of North River anglers interviewed, with a significant increase from 58% in 1995 to 75% in 1996. Anglers using spinning or spincast gear comprised an average of 33.5% of fishermen interviewed (Figure 4). There was a significant decrease from 1995 (42%) to 1996 (25%). There were significant differences between gear types employed on the Tellico and North Rivers.

Monroe county anglers comprised 24.2% of all Tellico River anglers interviewed in 1995 and 1996. Hamilton county anglers were next at 9.2%, followed by McMinn county 8.1%, and Bradley, and Knox counties at 7.9%. Knox county anglers dropped from 10% in 1995 to 5.3% in 1996. Blount county was next with 7.7%, followed by Loudon county with 6.2% ,and Georgia with 6.1%. Georgians made up 7.2% in 1995, and only 4.6% in 1996. Anglers from Polk county comprised 4.3%, but jumped from 3.3% in 1995 to 5.5% in 1996. Fishermen residing in the Nashville metropolitan area made up 3%, followed by Alabama 2.6%, Anderson county 2.5%, states other than Tennessee, Georgia, or Alabama 1.6%, Roane County 1.5%, Meigs and Rhea counties 1.4%, and Middle and Northeast Tennessee at 1.3%. Northeast Tennessee anglers were absent in 1995 but made up 2.2% in

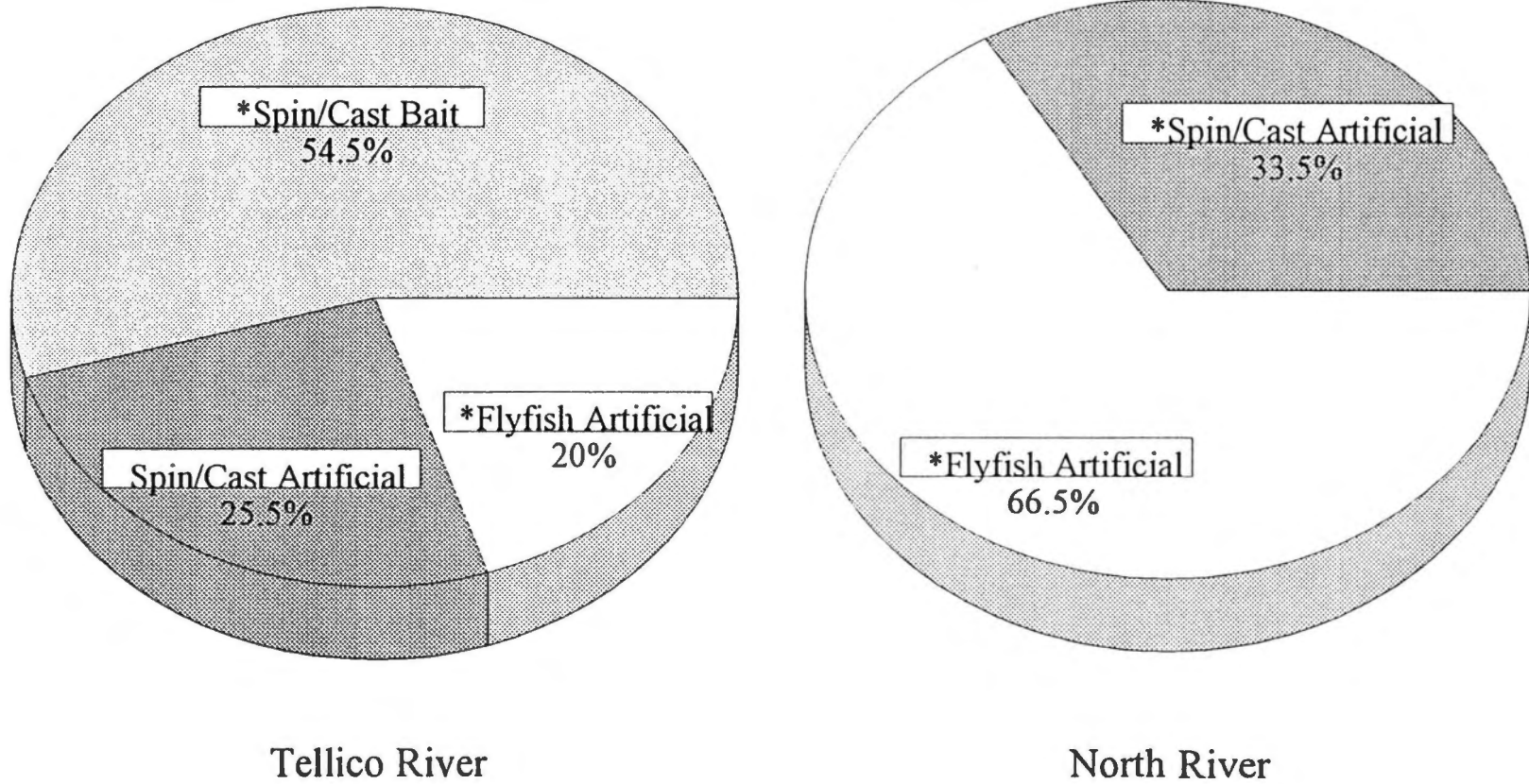


Figure 4. Fishing methods defined by gear and bait type for Tellico and North River anglers during 1995 and 1996 combined creel seasons..

* Indicates significant differences between years.

1996. Anglers from Sevier county and West Tennessee made up less than 1% (Table 1).

Monroe county was also the most common place of residence for North River anglers interviewed at 20.8%. In 1995 anglers from Monroe county made up only 14% of the total, but in 1996 they made up 23.4%. Knox county came next with 13%. Knox county went from 18.6% in 1995 to 10.8% in 1996. Fishermen residing in Blount county comprised 12.3% of anglers interviewed, followed by Hamilton county with 11%. Hamilton county decreased from 18.6% in 1995 to 8.1% in 1996. Middle Tennesseans comprised 7.8%, jumping from 4.7% in 1995 to 9% in 1996. Fishermen from the Nashville metropolitan area averaged 7.1%, from 4.7% in 1995 to 8.1% in 1996. Anglers from Alabama were next at 6.5%, followed by states other than Tennessee, Alabama or Georgia at 5.2%, and McMinn county at 4.5%. McMinn county decreased from 7% in 1995 to 3.6% in 1996. Loudon county anglers made up 2.6%, dropping from 4.7% in 1995 to 1.8% in 1996. Fishermen from Bradley county, and Georgia comprised 1.9% each, both showing significant differences from 1995 to 1996. Anglers residing in Anderson county, Polk county, Northeast Tennessee, and West Tennessee made up 1.3% each. All four changed from 1995 to 1996 (Table 2). There was little differences between place of residence for Tellico, and North River anglers.

Starting in May 1996, a supplemental question was added to the creel instrument. If an angler indicated that he had caught wild trout, and released them, he was asked his reason for doing so. Eleven different responses were recorded from 89 Tellico River anglers. Five responses were recorded from

Table 1. Place of residence for Tellico River anglers from combined 1995 and 1996 creel seasons.

Place of Residence	Number of Anglers	Percent of All Anglers
Monroe County	251	24.2
Hamilton County	95	9.2
McMinn County	84	8.1
Bradley County	82	7.9
*Knox County	82	7.9
Blount County	80	7.7
Loudon County	64	6.2
*Georgia	63	6.1
*Polk County	44	4.3
Nashville Metropolitan	31	3
Alabama	27	2.6
Anderson County	26	2.5
State Other Than TN, AL or GA	17	1.6
Roane County	15	1.5
Meigs County	14	1.4
Rhea County	14	1.4
Middle Tennessee	13	1.3
*Northeast Tennessee	13	1.3
*Sevier County	8	0.8
*West Tennessee	5	0.5
Total	1036	100

* Indicates significant change from 1995 to 1996 season

Table 2. Place of residence for North River anglers from combined 1995 and 1996 creel seasons

Place of Residence	Number of Anglers	Percent of All Anglers
*Monroe County	32	20.8
*Knox County	20	13
Blount County	19	12.3
*Hamilton County	17	11
*Middle Tennessee	12	7.8
*Nashville Metropolitan	11	7.1
Alabama *	10	6.5
State Ohter Than TN,AL, or GA	8	5.2
*Mcminn County	7	4.5
*Loudon County	4	2.6
*Bradley County	3	1.9
*Georgia	3	1.9
*Anderson County	2	1.3
*Polk County	2	1.3
*Northeast Tennessee	2	1.3
*West Tennessee	2	1.3
Total	154	100

*Indicates a significant change in percentage from 1995 to 1996 creel seasons

49 North River anglers. Thirty eight percent of Tellico River anglers responding said they released wild trout because they were too small to keep, although legal. Another 32% said they practiced catch and release for wild trout. Slightly less than five percent said they did not want to bother with cleaning and transporting fish. Anglers who “only keep a few”, had no means of transporting fish, or were “too far from home” accounted for 3.4% each. Fishermen who “don’t eat trout, were undecided, or who did not know if they could keep wild trout comprised 2.3% each. Another 1.1% said they had no means of cooking the fish they caught (Table 3). Fifty three percent of North River anglers responding indicated that they practiced catch and release. Another 20.4% said that the wild trout they released were below the legal size limit. Slightly over sixteen percent said that they did not want to bother with cleaning and transporting trout. Those that said the wild trout they had caught were too small to keep though legal made up 8.1%. Two percent indicated that they had no means of cooking fish (Table 4). There were significant differences between Tellico and North River angler responses.

Table 3. Responses of anglers who released wild trout to question: “Why did you release the wild trout you caught?” on Tellico River for a portion of the 1996 creel season.

Response	Number of Anglers Responding	Percent of Anglers Responding
Too small to keep	34	38.2
Practice catch and release	32	36
Didn't want to bother with	4	4.5
Didn't think would catch enough	3	3.4
Only keep a few	3	3.4
No means of transporting	3	3.4
Too far from home	3	3.4
Don't eat trout	2	2.3
Undecided	2	2.3
Didn't know if it was legal to keep wild trout	2	2.3
No means to cook	1	1.1
Total	89	100

Table 4. Response of anglers who released wild trout to the question: “Why did you release the wild trout you caught?” on the North River for a portion of the 1996 creel season.

Response	Number of Anglers Responding	Percent of Anglers Responding
Practice catch and release	26	53
Below legal size limit	10	20.4
Didn't want to bother with	8	16.3
Legal but still too small to keep	4	8.1
No means to cook	1	2
Total	49	100

Chapter IV

Discussion

The 6.44 km, 8.2 ha sample area of the Tellico River had an average estimate of 28,824 angler-hours for the 1995 and 1996 creel seasons. This amount was more than nine times greater than the estimated 3,168 angler-hours received by the 6.44 km, 5.9 ha North River sample area (Figure 1). Fatora (1970) concluded over a sixteen year creel survey of North Georgia's Noontootla Creek that fishing effort was much greater during years when the stream was open under general fishing regulations, than years when it was under special regulations. Similarly, Anderson and Nehring (1984) discovered that sections of Colorado's South Platte River that received regular plantings of hatchery trout had higher fishing pressure than sections where little or no stocking took place. The difference in angling effort between the Tellico and North Rivers is a function of the contrasting regulations and management strategies employed on the two rivers.

With an estimated 3,519 angler-hours/ha, or 4,480 angler-hours/km for each of two 131 day creel seasons, the Tellico River eclipses one of Tennessee's most popular tailwater rivers, the Clinch, in terms of fishing pressure. According to Fraser (1995), over a 90 day creel period a 10.4 km general regulations section of the Clinch River received 10,980 angler-hours. This translates into 1,055 angler-hours/km for a creel season 41 days shorter than the creel seasons conducted on the Tellico River. Even after being expanded to fit a 131 day season, the total effort of 1536 angler-hours/km for

the Clinch River is only about one third that of the Tellico River. It should be noted that Clinch River averages several times the width, and surface area of the Tellico River, although access is not as good on the Clinch River. The fact that angler effort did not differ significantly from 1995 to 1996 on the Tellico River is a testament to its popularity, considering that road access was poor for much of the 1995 creel season.

Between 60,000 and 100,000 rainbow trout of larger than average size (280-355 mm) are released into the Tellico River between late March, and early September of each year. Fishing pressure has been shown to correlate with the number of fished stocked (Moring 1985). The Tellico River receives more catchable size trout from late March through Labor Day, for its size, than any other body of water in Tennessee. Furthermore, the river has a seventy-year tradition as a put-and-take trout fishery, with several generations of some families having fished it from the late 1920's until present. Taking into consideration that the river also has excellent road access throughout its length, it is easy to see how Tellico River could be the most heavily fished trout stream in Tennessee during the stocking season.

Although the North River received only a fraction of the fishing pressure that the Tellico River sustained, it may still be the most heavily fished purely wild trout stream in the state, for its size. With an estimated 535 angler-hours/ha North River exceeds the estimated 356 angler-hours/ha received by Tennessee's Little River (GSMNP 1993). Little River is believed to be the most heavily fished trout stream in the GSMNP. North River owes much of its popularity to excellent road access along its entire length, and proximity to the Tellico River.

Fishing methods varied greatly from the Tellico River to the North River. Bait fishermen using spinning or spincast tackle comprised an average of 54.5% of Tellico River anglers interviewed. The reason for a significant drop from 69% in 1995 to 40% in 1996 is unknown, unless an upward trend in the percentage of fly fishermen among trout fishermen is responsible. Anglers using spinning or spincast tackle, with artificial lures made up an average of 25.5%, and fly fishermen using artificial flies made up an average of 20% of Tellico River fishermen interviewed (Figure 4). The significant jump in the percentage of fly fishermen from 1995 (9%) to 1996 (31%) may be attributable to the perceived trend mentioned before. It would appear that fly fishermen increased by the same proportion that bait fishermen decreased by. North River anglers interviewed were comprised of 66.5% fly fishermen, and 33.5% spin fishermen (Figure 4). There was a significant increase in the percentage of fly fishermen among anglers interviewed on the North River from 1995 (58%) to 1996 (75%). Whether this increase is a trend, or the result of a small 1995 sample size is unknown. Fishing methods for both rivers are driven by regulations, and the presence or absence of stocked trout. The tradition of bait fishing for stocked trout, and fly fishing for wild trout certainly plays a role in fishing method used. Also, fishing methods affect catch for wild and stocked trout as evidenced by the fact that fly fishermen caught proportionately fewer stocked trout than bait fishermen, and bait fishermen caught proportionally fewer wild trout than fly fishermen. Spin fishermen using artificial lures were intermediate between the two.

An estimated 15,355 wild trout were caught from the Tellico River sample area for each season. Fewer than one third as many (4,658) were

estimated to have been caught from the sample area of the North River (Figure 2). The 1995 estimate for catch from the North River (2,607) is probably artificially low because of the small sample size of anglers interviewed (43). Although the disparity in wild catch between rivers is not as pronounced as the disparity in effort, the difference is still significant. The proportion of wild catch is closer because, although fishing pressure is many times greater on the Tellico River, a majority of anglers are bait fishermen targeting stocked trout. Whereas, North River anglers are predominantly fly fishermen seeking wild trout.

Of the wild trout caught from the Tellico River, an estimated 95% were released. Similarly, an estimated 96% of wild trout caught from North River were released. These values are similar to the 82 - 85% that were found from the Little River (GSMNP 1994). Angler's reasons for releasing wild trout differed significantly for the two rivers. Of Tellico River anglers questioned from May through September 1996, 38% released the wild trout they caught because they were deemed to be too small to keep, 36% practiced catch-and-release, another 26% released the wild trout they caught for various logistical reasons (Table 3). Of North River anglers questioned, 53% practiced catch-and-release, 29% released wild trout because they were below the legal size limit or were deemed to be too small to keep, another 18% released their wild trout for various logistical reasons (Table 4).

There were an estimated 768 wild trout, greater than 90 mm in length, harvested from the Tellico River sample area per season. From stream sampling data included in Strange and Habera (1993) and (1995), it was estimated that there were an average of 6,244 wild trout, greater than 90 mm,

present within the sample area of the Tellico River, after September. When the estimated number of trout harvested was added to the post creel season estimate, the pre creel season total of wild trout, greater than 90 mm, would have averaged 7,012. This translates to a harvest induced mortality of approximately 12.3%. This value is similar to the 3-7% angler induced mortality that Masterson (1991) estimated for Little River. However, doubtless many wild trout released on the Tellico had been caught with natural bait. Pauley and Thomas (1993) found that trout caught with natural bait had a higher mortality rate after release than trout caught with artificial lures. Consequently, a moderate number of released trout from the Tellico River probably died shortly thereafter. With this knowledge, it is safe to say that the estimated 12.3% harvest induced mortality is somewhat lower than the total angler induced mortality of wild trout from the Tellico River. Even if the angler induced mortality were to approach 20%, it would still be insignificant compared to the greater than 70% natural mortality experienced by wild rainbow and brown trout in Tennessee streams (Strange and Habera 1995). And, although angler induced mortality of wild trout is probably higher from the Tellico River than any other wild trout stream in Tennessee, it is not adversely impacting the wild trout population as a whole. There is the possibility that anglers are impacting the segment of the population greater than 229 mm in length.

Perhaps of greater interest is the fact that the estimated 15,355 wild trout caught from the sample area of the Tellico River represents twice the average number of wild trout, greater than 90 mm, believed to be present in the area before the season (7,012). There is obvious recycling of wild trout

occurring on the Tellico River, with some trout probably being caught and released several times a season. Since there is no minimum size limit, the smaller than acceptable keeping size of most of the river's wild trout population could be responsible for their release. It is also possible that most of the recycling is occurring in the smaller size classes of rainbow trout in particular. The author personally caught several wild rainbow, and brown trout in the 300 mm size class in 1995 and 1996, and witnessed a wild brown trout of over 600 mm being caught. An even larger specimen, over 635 mm, was caught during Tennessee Wild Trout Project's 1996 Fall sampling trip (Habera, personal communication). It stands to reason that in the Tellico River's catch-and-cook oriented fishery, most trout, over 229 mm, caught by bait fishermen would be kept. However, very few wild trout over 229 mm were observed in the possession of anglers by the creel clerk during the 1995 and 1996 creel seasons. A small percentage of fly and spin fishermen interviewed indicated that they had released "large" wild trout. The presence of a very few large fish probably represents a segment of the population that eludes most attempts at capture. There is the occasional wild trout over 300 mm are caught by fly and spin fishermen, who are more inclined to release them. Bait fishing tactics simply are not very effective for catching large wild trout from the Tellico River.

From the North River sample area, there were an estimated 186 wild trout, greater than 90 mm, harvested per season. An estimated 3,771 were present after September, and 3,957 before late March. The mortality caused by harvest would, therefore, have been approximately 4.7%. This value is probably closer to the actual angler induced mortality than that from the

Tellico River. Only single-hook artificial lures were used to catch trout from the North River. The great majority would certainly have survived after being released. Angler induced mortality for the North River is no higher than 10%.

Wild trout are probably being recycled on the North River as well. The estimated 4,658 wild trout caught from the North River sample section represents 117% of the total number of wild trout greater than 90 mm believed to be present before late March (3,957). Angler attitudes, predominantly oriented toward catch-and-release, are probably responsible for the recycling of wild trout on the North River. The author spoke to several anglers over the course of the creel survey, who had released rainbow and brown trout in excess of 300 mm. Still, most of the recycling of wild trout on the North River probably occurs within the smaller size classes.

An estimated 8% of the 20,299 stocked trout caught per season from the Tellico River sample area were released. An average of 65,304 rainbow trout were stocked into the entire Tellico River for 1995 and 1996. The sample area, which constitutes roughly one-third of length of the Tellico River that is stocked, receives about 30% of seasonal load of trout.. For each of the two seasons, the sample area received an estimated 19,591 stocked trout. The estimated harvest of was 18,675 stocked trout per season. This amounts to a phenomenal 95% return rate on trout stocked into the sample area. These results are consistent with the theory that return rate depends on fishing effort (Wiley et al. 1993). TWRA requires only an approximate 50% return rate to justify stocking at current levels (Bivens and Strange 1987). Anderson and Nehring (1984) found that 75% of stocked trout were harvested with 5 days after being planted. Helfrich and Kendall (1982)

surmised that 90% of stocked trout were usually caught within 10 days of being stocked. It would probably be safe to say that 90% of trout stocked in Tellico River are caught within 4 days of being stocked. By far the most crowded fishing conditions, and easily the most productive fishing times occurred on Saturday mornings when the river was opened to fishing after having been stocked on Thursdays.

Although the exact number of anglers who fished within the sample area of the Tellico River is not known, it can be roughly estimated from the total fishing effort. If the average trip length for Tellico River anglers was 6 hours, then an average of 4,804 anglers fished within the sample area each year. If each angler, who fished within the sample area, bought a \$3.00 Tellico/Citico daily permit, then revenue from permits would be \$14,412.00. If the average rainbow trout costs \$.68 to raise to catchable size, as suggested by Wiley et al (1993), then \$13,367.00 was spent to raise the 19,658 rainbow trout stocked into the sample area of the Tellico River each year. Since 6 hours for an average trip is a fairly liberal estimate, the revenue from permit sales could be much higher. Additional revenue associated with the Tellico and North River trout fishery direct to TWRA would be the sale of trout stamps and fishing license. Other economic benefits to the surrounding communities and the state would be equipment sales and travel cost, such as food, lodging, and gasoline, particularly for those traveling more than 50 miles. It appears that the Tellico River trout stocking program is almost certainly paying for itself ,and is justified financially.

Even with the heavy stocking of trout on Tellico River, the average CPUE for stocked trout is only 0.70 trout/angler/hour. Wiley et al. (1993)

found that fishermen required a catch rate of 0.75 for a fishery to be termed “good”. However, thanks to an estimated 0.54 trout/angler/hour for wild trout, fishermen enjoy a cumulative CPUE of 1.24 for stocked and wild trout. Similarly, the North River had an average CPUE of 1.47 trout/angler/hour for wild trout. These values compare favorably with the CPUE 0.80 to 1.30 that Fatora (1970) found for Noontootla Creek, the 0.96 to 2.03 that Lindbom (1992) found for the Hiwassee River, and the 1.1 that Fraser (1995) found for the Clinch River. The values are considerably higher than the 0.76 found for Little River (GSMNP 1994). All are considered excellent fisheries. The Tellico, and North Rivers are excellent places to catch trout as well.

Despite the good overall catch rate from Tellico River, it is often appears overcrowded. Due to the huge numbers of anglers traveling to fish the Tellico River each weekend, competition for trout is fierce. Before daylight on Saturday mornings, anglers begin “staking out” the best fishing spots, usually the places where the trout were stocked, and remain bunched together. This process usually begins several hours before daylight, with poachers frequently being escorted off the river by TWRA. By daylight, numerous fishermen are usually crowded into the larger pools. Fishing etiquette is usually nonexistent, and tempers often flare due to crossed fishing lines, intrusions on personal space, and traffic or parking congestion. While Tellico River does offer an excellent quality of fishing, peace and solitude are not usually part of the angling experience. Huge numbers of freshly stocked trout are what bring the majority of weekend anglers to the Tellico River, not the prospect of solitude.

Fraser (1995) found that over 75% of anglers fishing the Clinch River

had traveled 80.5 km (50 mi) from home to fish, the majority being from the nearby Knoxville metropolitan area. There did not appear to be a difference in place of residence for anglers fishing the general regulations, and quality regulations sections of the Clinch River. Fatora (1970) determined that the vast majority of anglers fishing Noontootla Creek were local in all years of the survey. Conversely, Moore and Kulp concluded in GSMNP (1994) that 45% of anglers interviewed from Little River were from out of state. Only 40% of anglers were local. Tellico and North River anglers did not differ significantly in place of residence. Roughly 40% of anglers from both rivers were local, with 24% of Tellico River and 21% of North River residing in Monroe county. Non residents comprised about 10% of Tellico River, and 14% of North River anglers. There was, however, a slight difference in the percent of anglers from urban areas fishing the two rivers. Twenty percent of Tellico River anglers were from urban areas, while 31% of North River anglers were from urban areas. This difference is not pronounced enough to draw definitive conclusions of any kind.

Conclusions

1. Tellico River receives more than nine times the angling effort that North River receives. Tellico River is probably the most heavily fished trout stream in Tennessee during the stocking season. North River is probably the most heavily fished wild trout stream, for its size, in Tennessee.
2. Tellico River anglers catch over three times as many wild trout per season as North River anglers. The wild catch from the Tellico

River sample area accounts for twice the number of wild trout (> 90 mm) believed to be present before the stocking season. The wild catch from North River accounts for 117% of the wild trout (> 90 mm) believed to be present within its sample area. Recycling of wild trout undoubtedly occurs on both rivers, probably within the smaller size classes.

3. Fishing methods differ significantly between the Tellico and North Rivers, and are dictated by contrasting management strategies.
4. Angler induced mortality for Tellico River wild trout is between 12 and 20%. It is 5 to 10% for North River wild trout. It does not appear that the increased pressure on wild trout, brought by anglers seeking stocked trout, is affecting the Tellico River's wild trout population seriously.
5. A 95% return rate is achieved for trout stocked into Tellico River, easily justifying current stocking levels.
6. The Tellico and North Rivers both have excellent catch rates, but the Tellico River offers very crowded fishing conditions, especially on weekends.
7. There was no readily discernable difference in place of residence for Tellico and North River anglers. Local anglers comprised about 40% of all fishermen for both rivers. Non-resident anglers made up less than 15% for both rivers.
8. The Tellico and North Rivers offer two very different types of fishing experiences for anglers. Since neither management strategy appears to be having a serious effect on the wild trout populations

present, no new regulations are required for the protection of the resource. The management strategy for the Tellico River has remained essentially unchanged for seventy years, and its wild trout population compares favorably with the North Rivers.

9. A reduction in the number of trout stocked into the Tellico River would undoubtedly alleviate crowded fishing conditions, but would negatively impact the local economy which relies heavily on fishermen. Increased stocking levels would make overcrowding worse and probably would not increase the catch rate.

List of References

List of References

- Anderson, R.M., and R.B. Nehring. 1984. Effects of a catch-and-release regulation on wild trout populations in Colorado and its acceptance by anglers. *North Am. J. Fish. Manage.* 4:257-265.
- Anonymous. 1942. Tennessee's trout fishing is best east of Rocky Mountains. *Tennessee Conservationist.* 6:6-7.
- Bivens, R.D., and R.J. Strange. 1987. Evaluation of a Southeastern, two-story rainbow trout fishery. *Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies.* 41:187-196.
- Brandt, G.F.. 1940. Fisherman tells joy of trout casting in Tellico area. *Tennessee Conservationist.* 2:13-15.
- Brown, B.E. 1970. Implications from the Oklahoma state lake creel survey to improve creel survey design. *Proc. Annu. Conf. Southeast. Assoc. Game and Fish Comm.* 24:577-589.
- Carlander, K.D., and C.J. DiCostanzo. 1958. Sampling problems in creel census. *Prog. Fish-Cult.* 20:73-81.
- Fatora, J.R. 1970. Noontootla-a sixteen-year creel and use history of a Southern Appalachian trout stream under changing management regulations. *Proc. Annu. Conf. Game and Fish Comm.* 24:622-637.
- Fraser, W.C. 1995. Norris tailwater creel survey: fishermen responses to quality regulations. MS Thesis, University of Tennessee., Knoxville. 66pp.
- Great Smoky Mountains National Park. 1994. 1993 Annual aquatic resources summary report. Rep. No. GRSM-INTFM-02. Great Smoky Mountains National Park, Resource Management and Science Div., Gatlinburg, Tennessee.

- Great Smoky Mountains National Park. 1995. 1994 Annual aquatic resources summary report. Rep. No. GRSM-INTFM-03. Great Smoky Mountains National Park, Resource Management and Science Div., Gatlinburg, Tennessee.
- Helfrich, L.A., and W.T. Kendall. 1982. Movements of hatchery-reared rainbow, brook, and brown trout stocked in a Virginia mountain stream. *Prog. Fish-Cult.* 44:3-7.
- Jacobs, J. 1994. *Trout Streams of Southern Appalachia*. Backcountry Publications, Woodstock, VT.
- King, W. 1952. What fishermen can do to provide better fishing. *Tennessee Conservationist* 8:10-12.
- Lindbom, D.R. 1992. Special regulations increase angler success on the Hiwassee River Tennessee. MS Thesis, University of Tennessee., Knoxville. 61pp.
- MacKenzie, C. 1991. Comparison of northern pike catch and harvest rates estimated from uncompleted and completed fishing trips. *American Fisheries Society Symposium* 12:47-50.
- Malvestuto, S.P., W.D. Davies, and W.L. Shelton. 1978. An evaluation of the roving creel survey with nonuniform probability sampling. *Trans. Amer. Fish. Society.* 107:255-262.
- Masterson, S. 1991. Age and growth characteristics of rainbow trout (*Oncorhynchus mykiss*) in Little River watershed, Great Smoky Mountains National Park. MS Thesis, Tennessee Technological University., Cookeville. 82pp.
- McGurrin, J.M. 1986. Diversity in Gunpowder River trout anglers and implications for management. *Proc. Annu. Southeast. Assoc. Fish and Wildl. Agencies.* 40:111-116.

- Moring, J.R. 1985. Relation of angler catch rates and effort to reductions in numbers of trout stocked in five Oregon streams. *North Am. J. Fish. Manage.* 5:575-579.
- Pauley, G.B., and G.L. Thomas. 1993. Mortality of anadromous coastal cutthroat trout caught with artificial and natural bait. *North Am. J. Fish. Manage.* 13:337-345.
- Phippen, K.W., and E.P. Bergensen. 1987. Angling definitions and their effects on the accuracy of count-interview creel survey harvest estimates. *North Am. J. Fish. Manage.* 7:488-492.
- Phippen, K.W., and E.P. Bergensen. 1991. Accuracy of a roving creel survey's harvest estimate and evaluation of possible sources of bias. *American Fisheries Society Symposium.* 12:51-60.
- Robson, D.S. 1991. Roving creel surveys: the roving creel survey. *American Fisheries Society Symposium.* 12:19-24.
- Rohrer, R.L. 1986. Creel surveys from a kayak on the Henry's Fork of the Snake River, Idaho. *North Am. J. Fish. Manage.* 6:294-295.
- SAS Institute, Inc. 1989. *SAS/STAT Users Guide, Version 6.* Cary, NC.
- Shields, A.R. 1952. Half century cycle takes place in the trout streams of the Cherokee National Forest. *Tennessee Conservationist.* 2:6-15.
- Strange, R.J., and J.W. Habera. 1994. Wild trout project: 1993 annual report. Cooperators: Tennessee Wildlife Resources Agency and the University of Tennessee, Knoxville. Pub No. R11-2217-18-001-94. 153pp.
- Strange, R.J., and J.W. Habera. 1996. Wild trout project: 1995 annual report. Cooperators: Tennessee Wildlife Resources Agency and the University of Tennessee, Knoxville. Pub. No. R11-2217-18-001-96. 223pp.

- Tennessee Wildlife Resources Agency. 1994. Tennessee trout anglers guide. Department of Tennessee Wildlife Resources, Authorization No. 328423. 17pp.
- Wiley, R.W., R.A. Whaley, J.B. Satake, and M. Fowden. 1993. Assessment of stocking hatchery trout: a Wyoming perspective. *North Am. J. Fish. Manage.* 13:160-170.
- Wiley, R.W., R.A. Whaley, J.B. Satake, and M. Fowden. 1993. An evaluation of the potential for training trout in hatcheries to increase poststocking survival in streams. *North Am. J. Fish. Manage.* 13:171-177.
- Wilkins, L.P. 1955. Developing new homes for trout improves fishing. *Tennessee Conservationist.* 4:25.

Appendixes

Appendix 1
Creel Instrument

Interview sheet for Tellico and North River Creel Survey

Interview # _____

Area: Tellico or North
 Time: Date _____
 Start of Fishing Time _____
 Methods: Flyfishing _____
 Artificial _____

Zipcode _____
 Day of Week _____
 End Fishing Time _____
 (or Time of Interview)
 Cast/Spin _____
 Bait _____

Species	Length (mm)	Weight (g)	Wild / Stocked

Number of fish released (Wild) _____ Number of fish released (Stocked) _____

Interview sheet for Tellico and North River Creel Survey

Interview # _____

Area: Tellico or North
 Time: Date _____
 Start of Fishing Time _____
 Methods: Flyfishing _____
 Artificial _____

Zipcode _____
 Day of Week _____
 End Fishing Time _____
 (or Time of Interview)
 Cast/Spin _____
 Bait _____

Species	Length (mm)	Weight (g)	Wild / Stocked

Number of fish released (Wild) _____ Number of fish released (Stocked) _____

Appendix 2
1995 Creel Schedule

Roving Creel Survey - Tellico & North River

CBS	LOCATE	DATE	DOWEEK	DIRECT	START	RAND	TIME	RAND1	PRESS1	PRESS2
1	Stock	04/18/95	Tuesday	Up	1	500	Evening	25	1407	1925
2	Wild	04/21/95	Friday	Up	2	300	Morning	13	822	101
3	Stock	04/22/95	Saturday	Dn	4	500	Morning	-64	814	1130
4	Stock	04/23/95	Sunday	Up	0	500	Evening	17	1422	1917
5	Stock	04/24/95	Monday	Up	3	300	Morning	-78	702	922
6	Stock	04/29/95	Saturday	Dn	0	500	Morning	-85	639	1115
7	Wild	04/30/95	Sunday	Dn	1	500	Morning	-71	911	1129
8	Stock	05/01/95	Monday	Dn	4	400	Evening	-68	1425	1732
9	Wild	05/04/95	Thursday	Dn	1	300	Evening	-84	1537	1616
10	Wild	05/05/95	Friday	Up	1	500	Evening	-73	1426	1827
11	Stock	05/06/95	Saturday	Dn	2	500	Morning	21	737	1221
12	Stock	05/07/95	Sunday	Dn	3	500	Evening	0	1339	1900
13	Stock	05/09/95	Tuesday	Up	2	400	Evening	-77	1317	1723
14	Stock	05/13/95	Saturday	Dn	2	300	Evening	-62	1609	1638
15	Wild	05/19/95	Friday	Up	3	400	Morning	-66	802	1034
16	Stock	05/20/95	Saturday	Dn	3	300	Morning	9	632	1009
17	Wild	05/21/95	Sunday	Up	1	300	Evening	29	1327	1729
18	Stock	05/27/95	Saturday	Up	2	500	Morning	20	640	1220
19	Wild	05/31/95	Wednesday	Dn	3	300	Evening	9	1334	1709
20	Wild	06/01/95	Thursday	Dn	3	400	Morning	25	926	1125
21	Stock	06/03/95	Saturday	Dn	4	400	Evening	23	1627	1823
22	Stock	06/04/95	Sunday	Up	3	500	Morning	-81	826	1119
23	Stock	06/06/95	Tuesday	Up	4	500	Evening	-74	1519	1826
24	Wild	06/09/95	Friday	Up	3	400	Evening	14	1335	1814
25	Wild	06/10/95	Saturday	Up	4	300	Evening	-84	1529	1616
26	Stock	06/11/95	Sunday	Dn	4	500	Morning	24	816	1224
27	Wild	06/12/95	Monday	Dn	3	300	Morning	-79	622	921
28	Wild	06/13/95	Tuesday	Dn	4	300	Morning	-72	719	928
29	Wild	06/15/95	Thursday	Up	0	300	Morning	-81	635	919
30	Stock	06/18/95	Sunday	Up	0	500	Morning	-72	924	1128
31	Stock	06/20/95	Tuesday	Dn	4	400	Morning	-77	907	1023
32	Stock	06/21/95	Wednesday	Up	2	400	Evening	-75	1533	1725
33	Wild	06/22/95	Thursday	Up	3	300	Morning	-68	806	932
34	Stock	06/24/95	Saturday	Dn	2	400	Morning	-86	840	1014
35	Stock	06/25/95	Sunday	Up	3	300	Evening	23	1534	1723
36	Stock	07/04/95	Tuesday	Up	3	500	Evening	-65	1412	1835
37	Stock	07/05/95	Wednesday	Up	3	400	Morning	5	715	1105
38	Stock	07/08/95	Saturday	Up	3	500	Morning	-74	816	1126
39	Stock	07/09/95	Sunday	Dn	0	500	Morning	24	728	1224
40	Stock	07/15/95	Saturday	Up	2	500	Morning	-59	824	1141
41	Wild	07/16/95	Sunday	Up	4	300	Evening	6	1434	1706
42	Wild	07/20/95	Thursday	Up	0	400	Morning	-73	623	1027
43	Stock	07/23/95	Sunday	Up	1	400	Morning	1	629	1101
44	Wild	07/26/95	Wednesday	Dn	2	300	Evening	28	1426	1728
45	Stock	07/29/95	Saturday	Dn	2	300	Evening	-62	1514	1638
46	Wild	07/30/95	Sunday	Up	0	500	Evening	15	1536	1915
47	Wild	07/31/95	Monday	Dn	2	400	Evening	-67	1606	1733
48	Stock	08/06/95	Sunday	Dn	3	400	Evening	13	1510	1813
49	Stock	08/08/95	Tuesday	Up	1	400	Morning	-76	833	1024
50	Stock	08/09/95	Wednesday	Up	2	400	Morning	-85	806	1015
51	Wild	08/10/95	Thursday	Up	2	400	Morning	-86	829	1014
52	Wild	08/15/95	Tuesday	Dn	3	300	Morning	-84	628	916
53	Wild	08/18/95	Friday	Up	0	300	Evening	23	1426	1723
54	Stock	08/19/95	Saturday	Up	4	500	Evening	-60	1420	1840

Appendix 3
1996 Creel Schedule

1996 Roving Creel Survey - Tellico & North River

OBS	STRAT	LOCATE	DATE	DOWEEK	DIRECT	STRTIME	PRESS1	PRESS2	SUNRISE	SUNSET	MIDDAY
1	Nend-1	North	03/23/96	Saturday	Up	1 Evening	13:28	15:52	6:36	19:52	12:44
2	Tend-1	Tellico	03/24/96	Sunday	Up	3 Evening	14:00	17:45	6:34	19:53	12:44
3	Tend-1	Tellico	03/30/96	Saturday	Dn	0 Evening	14:47	16:04	6:26	18:58	12:42
4	Nend-1	North	03/31/96	Sunday	Up	1 Morning	8:11	10:25	6:24	18:59	12:41
5	Tday-1	Tellico	04/03/96	Wednesday	Dn	3 Morning	6:58	12:32	6:20	19:01	13:41
6	Tend-1	Tellico	04/06/96	Saturday	Up	1 Morning	6:35	11:30	6:16	19:03	13:40
7	Nend-1	North	04/07/96	Sunday	Dn	2 Evening	13:50	17:20	7:15	20:04	13:39
8	Nend-1	North	04/13/96	Saturday	Dn	3 Evening	15:40	19:25	7:07	20:09	13:38
9	Tend-1	Tellico	04/14/96	Sunday	Up	0 Morning	8:03	11:35	7:05	20:10	13:38
10	Nend-1	North	04/20/96	Saturday	Dn	1 Morning	8:37	10:50	6:58	20:15	13:36
11	Nend-1	North	04/21/96	Sunday	Up	2 Morning	8:29	12:28	6:57	20:15	13:36
12	Nday-1	North	04/22/96	Monday	Dn	4 Morning	9:50	12:52	6:55	20:16	13:36
13	Nday-1	North	04/23/96	Tuesday	Up	3 Morning	8:11	10:23	6:54	20:17	13:36
14	Tday-1	Tellico	04/24/96	Wednesday	Up	0 Evening	16:53	19:23	6:53	20:19	13:35
15	Nend-1	North	04/27/96	Saturday	Dn	1 Evening	14:40	19:58	6:50	20:20	13:35
16	Tend-1	Tellico	04/28/96	Sunday	Dn	0 Morning	10:07	10:15	6:49	20:21	13:35
17	Nday-1	North	04/29/96	Monday	Dn	1 Evening	15:41	17:19	6:48	20:22	13:35
18	Nend-2	North	05/04/96	Saturday	Up	2 Evening	16:33	18:58	6:43	20:26	13:34
19	Nend-2	North	05/05/96	Sunday	Dn	1 Evening	16:01	17:55	6:42	20:26	13:34
20	Nend-2	North	05/11/96	Saturday	Dn	4 Evening	16:08	17:54	6:37	20:31	13:34
21	Tend-2	Tellico	05/12/96	Sunday	Dn	1 Evening	14:55	20:27	6:36	20:32	13:34
22	Nday-2	North	05/14/96	Tuesday	Up	0 Evening	13:43	19:03	6:34	20:33	13:34
23	Nday-2	North	05/17/96	Friday	Up	2 Morning	7:14	10:41	6:32	20:35	13:34
24	Nend-2	North	05/25/96	Saturday	Up	4 Morning	9:52	12:13	6:28	20:41	13:34
25	Tend-2	Tellico	05/26/96	Sunday	Up	3 Morning	6:31	13:22	6:27	20:42	13:34
26	Nend-2	North	05/27/96	Monday	Dn	0 Evening	16:19	19:25	6:27	20:42	13:35
27	Nday-2	North	05/30/96	Thursday	Up	0 Morning	8:09	11:28	6:26	20:44	13:35
28	Nend-2	North	06/01/96	Saturday	Up	3 Morning	8:42	10:11	6:25	20:45	13:35
29	Tend-2	Tellico	06/02/96	Sunday	Dn	4 Morning	8:26	13:12	6:25	20:46	13:35
30	Tday-2	Tellico	06/03/96	Monday	Up	1 Evening	16:11	18:06	6:25	20:46	13:36
31	Tday-2	Tellico	06/04/96	Tuesday	Up	3 Morning	7:03	13:14	6:25	20:47	13:36
32	Tend-2	Tellico	06/08/96	Saturday	Dn	2 Morning	6:49	10:26	6:24	20:49	13:36
33	Nend-2	North	06/09/96	Sunday	Up	2 Morning	7:43	10:58	6:24	20:49	13:37
34	Nend-3	North	06/15/96	Saturday	Up	3 Morning	6:36	13:23	6:24	20:52	13:38
35	Nend-3	North	06/16/96	Sunday	Up	4 Evening	15:56	19:41	6:24	20:52	13:38
36	Tday-3	Tellico	06/17/96	Monday	Up	0 Evening	14:09	17:31	6:24	20:52	13:38
37	Tend-3	Tellico	06/22/96	Saturday	Up	2 Morning	8:19	13:17	6:25	20:53	13:39
38	Nend-3	North	06/23/96	Sunday	Dn	3 Evening	17:04	18:08	6:26	20:53	13:40
39	Tday-3	Tellico	06/24/96	Monday	Up	4 Morning	9:44	11:58	6:26	20:54	13:40
40	Nday-3	North	06/25/96	Tuesday	Up	3 Morning	7:18	13:38	6:26	20:54	13:40
41	Tend-3	Tellico	06/29/96	Saturday	Dn	2 Evening	15:42	18:07	6:28	20:54	13:41
42	Tend-3	Tellico	06/30/96	Sunday	Dn	4 Morning	9:20	11:26	6:28	20:54	13:41
43	Nend-3	North	07/04/96	Thursday	Up	2 Morning	7:44	13:33	6:30	20:53	13:42
44	Nday-3	North	07/05/96	Friday	Up	2 Evening	17:15	18:51	6:30	20:53	13:42
45	Nend-3	North	07/06/96	Saturday	Dn	2 Evening	16:33	19:02	6:31	20:53	13:42
46	Nend-3	North	07/07/96	Sunday	Dn	2 Morning	8:25	11:00	6:31	20:53	13:42
47	Nday-3	North	07/08/96	Monday	Dn	2 Morning	7:24	12:04	6:32	20:53	13:42
48	Tend-3	Tellico	07/13/96	Saturday	Dn	2 Morning	9:11	13:41	6:35	20:51	13:43
49	Tend-3	Tellico	07/14/96	Sunday	Dn	4 Evening	14:23	17:44	6:35	20:51	13:43
50	Nend-3	North	07/20/96	Saturday	Up	4 Evening	14:11	20:42	6:39	20:48	13:43
51	Nend-4	North	07/21/96	Sunday	Dn	1 Evening	14:56	18:07	6:40	20:47	13:43
52	Nend-4	North	07/28/96	Sunday	Up	3 Evening	14:50	17:16	6:45	20:42	13:43
53	Tend-4	Tellico	08/04/96	Sunday	Dn	3 Morning	7:02	11:17	6:50	20:36	13:43
54	Nday-4	North	08/08/96	Thursday	Dn	2 Evening	15:09	18:47	6:53	20:32	13:42
55	Tend-4	Tellico	08/10/96	Saturday	Up	2 Evening	16:54	19:50	6:54	20:30	13:42
56	Tend-4	Tellico	08/11/96	Sunday	Dn	0 Morning	7:41	10:23	6:55	20:29	13:42
57	Tday-4	Tellico	08/14/96	Wednesday	Up	2 Morning	8:29	13:14	6:57	20:26	13:41
58	Nday-4	North	08/16/96	Friday	Up	1 Morning	9:04	13:17	6:58	20:24	13:41
59	Tend-4	Tellico	08/17/96	Saturday	Up	1 Evening	16:01	19:47	6:59	20:22	13:41
60	Nend-4	North	08/18/96	Sunday	Up	4 Evening	15:58	18:09	7:00	20:21	13:41
61	Tday-4	Tellico	08/19/96	Monday	Up	4 Evening	15:35	19:48	7:01	20:20	13:40
62	Nend-4	North	08/24/96	Saturday	Dn	2 Morning	8:29	11:10	7:04	20:14	13:39
63	Nend-4	North	08/25/96	Sunday	Up	4 Morning	10:14	11:31	7:05	20:12	13:39
64	Nday-4	North	08/26/96	Monday	Up	1 Morning	8:49	12:42	7:06	20:11	13:38
65	Nend-4	North	08/31/96	Saturday	Up	1 Evening	15:31	18:32	7:09	20:04	13:37
66	Tend-4	Tellico	09/01/96	Sunday	Up	3 Morning	8:49	12:01	7:10	20:03	13:37
67	Nend-4	North	09/02/96	Monday	Up	1 Morning	10:10	11:27	7:11	20:02	13:36

Vita

Brian Neal Bates was born on April 17, 1970 in Florence, Alabama. He spent the better part of his first eighteen years of life exploring the waters and woodlands of North Alabama. After graduating from Coffee High School in 1988, he attended Oglethorpe University in Atlanta, Georgia on a basketball scholarship until 1990. In the fall of 1990 he enrolled at the University of Tennessee, Knoxville, where he received a B.S. in Wildlife and Fisheries Science in 1993. It was during these undergraduate years that he developed what is hoped will be a lifelong involvement with the regions coldwater fisheries. In 1995 he was accepted into graduate school at UTK and continues upon completion of this thesis with a Masters Degree in Wildlife and Fisheries Science. He was married on May 18, 1996 to Cherry Schmid of Birmingham, Alabama. They currently reside in Maryville, Tennessee. He hopes to pursue a career as a coldwater fisheries biologist, and freelance outdoor writer.

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03/26/98 *sz* MFB

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