

# HARVEST OF FISH FROM TAILWATERS OF THREE LARGE IMPOUNDMENTS IN MISSOURI<sup>1</sup>

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## ABSTRACT

Quantitative creel census techniques were employed on Missouri tailwaters for the first time during 1961. Specific areas below Table Rock and Taneycomo Reservoirs on White River and below Clearwater Reservoir on Black River were censused using a stratified sampling technique throughout the year.

Estimated fishing pressure on Table Rock tailwater was 608 hours per acre and the rate of catch amounted to 0.62 fish per hour. The yield per acre was about 380 fish, weighing 192 pounds. Hatchery reared rainbow trout comprised nearly 90 percent of the yield by number.

Taneycomo tailwater supported an estimated 609 hours of fishing per acre. Rate of catch amounted to 0.55 fish per hour; the yield per acre was 343 fish weighing 408 pounds. White bass made up more than 37 percent of the total creel, followed by drum, crappie, channel catfish, and bluegill.

Estimated fishing pressure on Clearwater tailwater was 1,607 hours per acre, with a catch rate of 0.55 per hour. The yield per acre was 930 fish weighing 845 pounds. Numerically, crappie comprised about 35 percent of the total catch, followed by carp, bluegill, channel catfish, and buffalo. Carp provided about one-third of the total weight.

The tailwaters of Table Rock, Taneycomo and Clearwater reservoirs received 7, 10 and 16 times more fishing pressure per acre than the reservoirs themselves. Taneycomo tailwater had more fishermen than Lake Taneycomo. Taneycomo and Clearwater tailwaters provided greater total harvests by weight than did their respective reservoirs.

## INTRODUCTION

Although the tailwaters of large impoundments in Missouri vary greatly in physical character, all are used extensively by sport fishermen. Heavy angler use of tailwaters has been reported in several other states. Miller and Chance (1954) reported that 35 percent of the estimated 2 million fishing trips and 52 percent of the estimated 7-million pound harvest from all TVA waters may be attributed to tailwater fishing. Unpublished reports<sup>2</sup> indicate that some TVA tailwaters now support as many as 735 fishing trips per acre per year, yielding fish at an average annual rate of 1,152 pounds per acre.

This study was undertaken to quantitatively measure the fishing pressure and catch in tailwaters of Missouri reservoirs. The tailwaters selected were Table Rock and Taneycomo on White River in southwestern Missouri, and Clearwater on Black River in southeastern Missouri.

## METHODS

Two job-trained creel census clerks conducted the tailwater censuses in conjunction with censuses on the associated reservoirs. Each worked 25 days a month with days off scheduled on a stratified basis. One clerk rotated his work days among Table Rock tailwater, Lake Taneycomo, and Taneycomo tailwater, while the other alternated his work days on Clearwater Lake and Clearwater tailwater. The clerks' principal duties were to count, twice daily, the number of boat and bank fishermen and to interview fishermen. Counts were made by boat on Table Rock and Taneycomo tailwaters and by automobile on Clearwater tailwater. The counts were begun at opposite ends of the census area each work day, and the starting point of the afternoon count was reversed from that of the morning count. Counting times were stratified so that each workable hour would be sampled an equal number of times in a season.

Fishermen were interviewed at fishing docks, by boat, and on shore. Information obtained included: the date; number, residence and sex of fishermen; hours fished; boat or shore fishing; fishing method and bait; number successful

<sup>1</sup> This work was financed in part with federal-aid in fish restoration funds under Missouri's Dingell-Johnson Project F-1-R

<sup>2</sup> Sport Fishing Institute Bulletin No. 116 (July 1961).

in party; and the number and estimated average length of each kind of fish. Only data collected by the clerks were used in this study.

Calculations and extrapolation of data were the same as described by Kathrein (1953).

### PHYSICAL CHARACTERISTICS

The discharge from Table Rock Dam is cold, since it normally originates from a depth of about 140 feet in the Reservoir. In 1961, surface temperatures a short distance below the dam ranged from 41° F. in January to 63° F. in August. Thermal effects of this discharge have been discernable at least 39 miles below the dam, which includes Lake Taneycomo, Taneycomo tailwater and the upper reaches of Bull Shoals Reservoir (Figure 1). The daily average

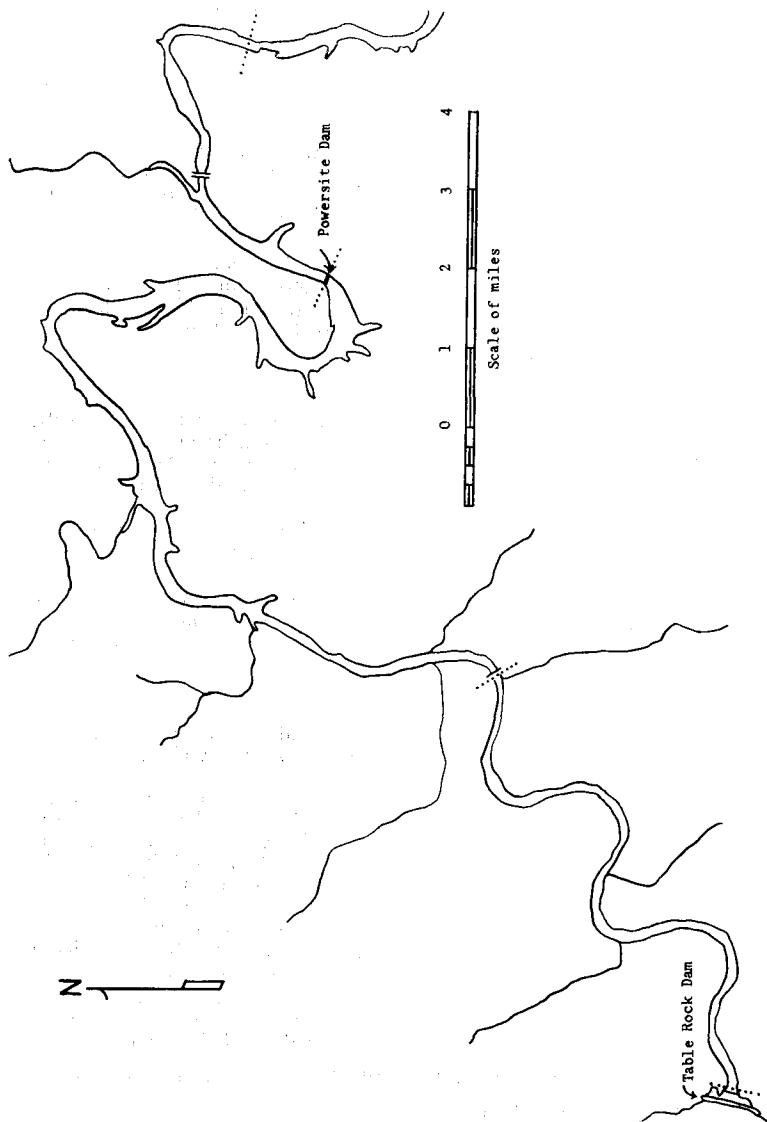


Figure 1. Relative size and location of Table Rock tailwater, Lake Taneycomo, and Taneycomo tailwater creel census areas. Dotted lines denote boundaries of areas.

penstock discharge from Table Rock Dam varied up to more than 10,000 c.f.s., and flood releases through sluices and over spillways supplemented this in May and June, so that the maximum total release was about 33,000 c.f.s in May. The discharged water generally was clear. Dense beds of algae were present in shallow areas immediately below the dam. An arbitrary line at the town of Branson was used to distinguish the lower limit of the census area. This included, in addition to about 2½ miles of river, a portion of Lake Taneycomo that is river-like. This area included 8.11 miles of channel, and covered 320 acres. Tailwater acreages were determined from USDA aerial photographs. Rainbow trout have been stocked in her since 1959. No natural reproduction of trout has been observed.

Powersite Dam, which impounds Lake Taneycomo, discharges water through

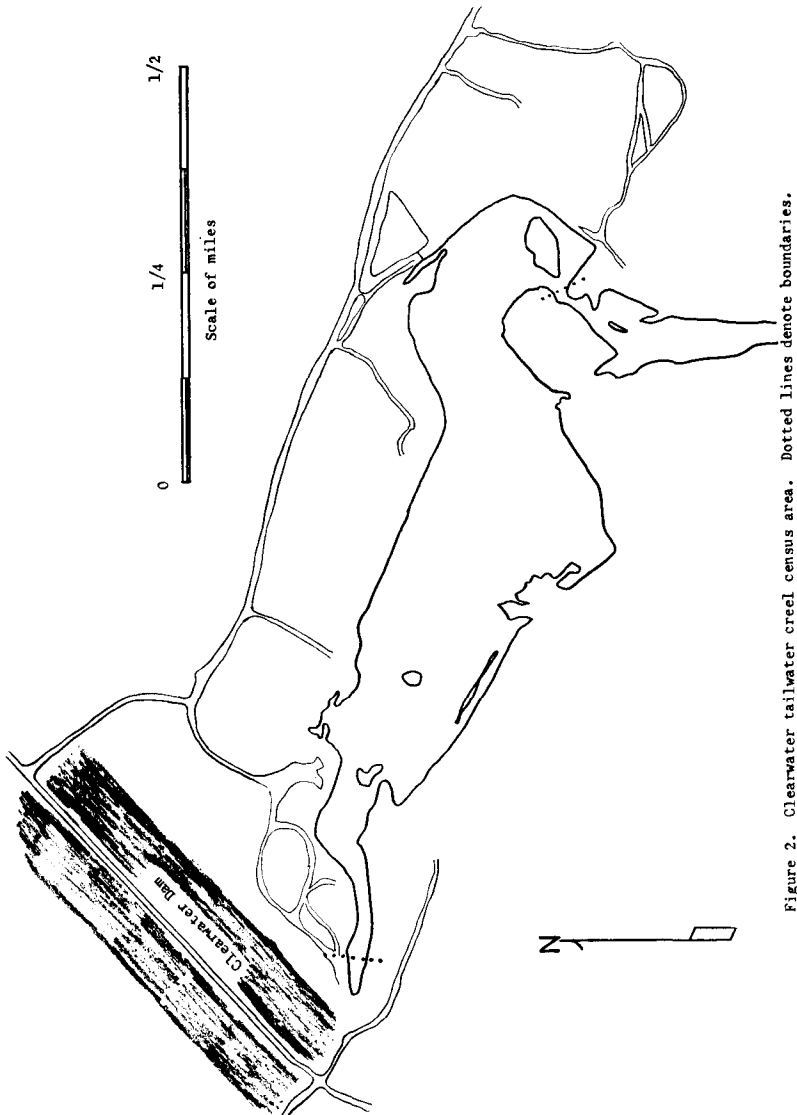


Figure 2. Clearwater tailwater creel census area. Dotted lines denote boundaries.

penstocks that are 5 to 10 feet below the surface at normal reservoir levels. The dam is equipped with flashboards, designed to wash away during flood periods such as occurred in May and June, 1961. Surface temperatures in Taneycomo tailwater ranged from 45° F. in February to 85° F. in July. During June and July, Bull Shoals Reservoir backed up nearly to Powersite Dam, and the portion included within the census boundaries became thermally stratified. The lower boundary was located at the last shoal that normally had a noticeable effect on the flow. The area included 5.05 miles of channel and covered 320 surface acres. A few rainbow trout have been stocked, and others have entered through or over Powersite Dam.

The discharge from Clearwater Dam is drawn from a depth of about 30 feet at normal reservoir level. Surface temperatures in the creel census area (Figure 2) ranged from 32° F. in January (when there was some ice cover) to 78° F. in August. The discharge varied up to about 3,600 c.f.s., all of which was through the outlet tunnel. The census area was confined to a 0.95-mile-long "borrow" area immediately below the dam, and covered 80 acres during normal flow periods.

The three tailwaters, except immediately below the dams, were open to year-round fishing. The use of set-lines was restricted to certain areas. The only particularly restrictive creel limit was on trout, a daily limit of five fish.

## RESULTS

### *Table Rock Tailwater*

The creel census clerk interviewed 1,560 anglers, about 3 percent of the estimated total of 45,600 fishermen. Estimated fishing pressure was 608.4 hours (142.4 trips) per acre and the yield per acre, 379.9 fish weighing 192.3 pounds. An estimated total of 121,600 fish, weighing 61,500 pounds were taken. Anglers caught fish at the rate of 0.62 per hour, and 75.2 percent of those interviewed were successful.

Table I summarizes the seasonal values for fishing pressure, success, yield, and totals for the year. Fishing pressure was greatest during the summer (50.2 percent of the total) and least in winter (8.6 percent of the total). The rate of fishing success and the percentage of successful fishermen were nearly the same in spring, summer, and winter, but both were somewhat lower in fall. About 53.8 percent of the total catch was taken in summer, and 9.3 percent in winter.

TABLE I

THE ESTIMATED TOTAL NUMBER OF FISHERMEN; AVERAGE TIME FISHED; PERCENT SUCCESSFUL ANGLERS; RATE OF CATCH; FISH CAUGHT; AND PERCENT OF TOTAL CATCH BY SEASON FOR THREE TAILWATERS IN 1961

|                              | <i>Esti. Total Fishermen</i> | <i>Average Time Fished (Hrs.)</i> | <i>% Successful Anglers</i> | <i>Rate of Catch (Fish Per Hr.)</i> | <i>Esti. Total Fish Caught</i> | <i>% Total Catch</i> |
|------------------------------|------------------------------|-----------------------------------|-----------------------------|-------------------------------------|--------------------------------|----------------------|
| <i>Table Rock Tailwater:</i> |                              |                                   |                             |                                     |                                |                      |
| Dec.-Feb. ....               | 4,800                        | 3.39                              | 75.1                        | 0.70                                | 11,300                         | 9.3                  |
| March-May ....               | 9,100                        | 4.19                              | 80.6                        | 0.69                                | 26,800                         | 22.1                 |
| June-August ....             | 22,500                       | 4.35                              | 79.0                        | 0.67                                | 65,800                         | 53.8                 |
| Sept.-Nov. ....              | 9,200                        | 4.56                              | 64.9                        | 0.43                                | 18,000                         | 14.8                 |
| <i>Taneycomo Tailwater:</i>  |                              |                                   |                             |                                     |                                |                      |
| Dec.-Feb. ....               | 2,900                        | 4.90                              | 45.5                        | 0.38                                | 5,400                          | 4.9                  |
| March-May ....               | 14,300                       | 5.77                              | 67.3                        | 0.56                                | 46,200                         | 42.1                 |
| June-August ....             | 10,700                       | 5.70                              | 72.7                        | 0.64                                | 40,800                         | 37.2                 |
| Sept.-Nov. ....              | 7,000                        | 5.08                              | 57.7                        | 0.47                                | 17,300                         | 15.8                 |
| <i>Clearwater Tailwater:</i> |                              |                                   |                             |                                     |                                |                      |
| Dec.-Feb. ....               | 800                          | 2.67                              | 14.6                        | 0.07                                | 100                            | 0.2                  |
| March-May ....               | 7,600                        | 3.30                              | 53.9                        | 0.50                                | 12,800                         | 17.1                 |
| June-August ....             | 16,300                       | 4.58                              | 68.5                        | 0.58                                | 47,000                         | 63.2                 |
| Sept.-Nov. ....              | 6,400                        | 3.57                              | 79.8                        | 0.58                                | 14,500                         | 19.5                 |
| 1961 TOTALS                  |                              |                                   |                             |                                     |                                |                      |
| Table Rock Tailwater ..      | 45,600                       | 4.27                              | 75.2                        | 0.62                                | 121,600                        |                      |
| Taneycomo Tailwater ..       | 34,900                       | 5.60                              | 64.2                        | 0.55                                | 109,700                        |                      |
| Clearwater Tailwater ..      | 31,100                       | 4.13                              | 68.5                        | 0.55                                | 74,400                         |                      |

The species composition of the creels and the estimated total catch for the year appear in Table II.<sup>3</sup> By number, rainbow trout made up 89.9 percent of the total catch. Drum (6.1 percent), white bass (1.4 percent), and bluegill (1.4 percent) made up most of the remainder.

TABLE II  
SPECIES COMPOSITION AND ESTIMATED NUMBERS OF FISH TAKEN FROM THREE  
TAILWATERS IN 1961. NUMBERS IN PARENTHESES ARE PERCENTAGES

| Species          | Table Rock<br>Tailwater | Taneycomo<br>Tailwater | Clearwater<br>Tailwater |
|------------------|-------------------------|------------------------|-------------------------|
| Paddlefish       |                         |                        | 400 ( 0.5)              |
| Gar *            |                         | 20 (trace)             | 100 ( 0.1)              |
| Bowfin           |                         |                        | T (trace)               |
| Gizzard shad     |                         |                        | 1,000 ( 1.4)            |
| Rainbow trout    | 109,300 (89.9)          | 2,100 ( 1.9)           |                         |
| Goldfish         |                         |                        | T (trace)               |
| Carp             | 50 (trace)              | 1,200 ( 1.0)           | 12,600 (16.9)           |
| Quillback        |                         | 200 ( 0.2)             |                         |
| Buffalo *        |                         |                        | 4,500 ( 6.0)            |
| Sucker *         |                         | 40 (trace)             | 400 ( 0.5)              |
| Redhorse *       |                         |                        | 100 ( 0.1)              |
| Flathead catfish |                         | 200 ( 0.2)             | 400 ( 0.6)              |
| Channel catfish  | 100 ( 0.1)              | 9,000 ( 8.2)           | 10,700 (14.3)           |
| Bullhead *       |                         | 200 ( 0.2)             | 400 ( 0.6)              |
| White bass       | 1,700 ( 1.4)            | 41,000 (37.3)          | 2,900 ( 3.9)            |
| Bluegill         | 1,700 ( 1.4)            | 8,400 ( 7.7)           | 11,000 (14.8)           |
| Longear sunfish  |                         | 500 ( 0.4)             |                         |
| Green sunfish    |                         | 3,500 ( 3.2)           | 2,600 ( 3.4)            |
| Rock bass        |                         | 40 (trace)             |                         |
| Warmouth         |                         |                        | 50 (trace)              |
| Largemouth bass  | 200 ( 0.1)              | 2,600 ( 2.3)           | 400 ( 0.6)              |
| Spotted bass     | 100 ( 0.1)              | 400 ( 0.4)             | 200 ( 0.3)              |
| Smallmouth bass  | 50 (trace)              | 400 ( 0.4)             | 50 (trace)              |
| Crappie *        | 900 ( 0.7)              | 12,000 (11.0)          | 25,700 (34.5)           |
| Walleye          | 100 ( 0.1)              | 3,500 ( 3.2)           | 200 ( 0.3)              |
| Freshwater drum  | 7,400 ( 6.1)            | 24,700 (22.6)          | 700 ( 0.9)              |
| <b>TOTALS</b>    | <b>121,600</b>          | <b>109,700</b>         | <b>74,400</b>           |

\* Species not determined.

A unique situation on May 13 resulted in unusual creel returns on this day. During the spring, heavy rainfall caused flood conditions in Table Rock Reservoir. Water poured through the flood-gates most of the month, with cool water also being drawn through sluices in the base of the dam. On this particular day, the sluices were closed, resulting in a rapid increase in water temperature of about 10 degrees in the upper Taneycomo census area. There was no observed adverse effect on trout. However, smallmouth bass, white bass, walleye and spotted bass were taken immediately below the dam at this time, whereas normally only trout are taken here.

Nearly 52 percent of the fishing in this area was by boat and 78 percent was "still" fishing. Prepared baits (39 percent) were favored over live baits (28 percent) and artificial baits (15 percent). Cheese is a popular prepared bait for trout in this area. Rate of catch for artificial baits was 0.56 fish per hour. Shore fishermen caught fish at about the same rate as boat fishermen, but they caught most of the crappie, bluegill, and white bass taken.

The 1,560 anglers interviewed by the census clerk came from 29 Missouri counties and 20 other states. Local (Taney County) anglers amounted to 31.0 percent of the Missouri anglers, and Green County (includes Springfield, Missouri) made up 31.6 percent. Of those interviewed, 30.4 percent were from out-of-state, 32.8 percent being from Kansas, and 14.9 percent from Oklahoma, and Iowa, Illinois, and Nebraska each contributing more than 9 percent.

<sup>3</sup> Common names of fishes follow American Fisheries Society Special Publication No. 2, "A List of Common and Scientific Names of Fishes From the United States and Canada."

### *Taneycomo Tailwater*

The creel census clerk interviewed 1,493 anglers or about 4 percent of the estimated total of 34,900 in 1961 (Table I). Estimated fishing pressure was 609.0 hours (108.9 trips) per acre. The yield per acre amounted to 342.7 fish weighing 407.5 pounds. The estimated total yield was 109,700 fish, weighing 130,400 pounds. Anglers caught fish at the rate of 0.55 fish per hour. The percentage of successful anglers (64.2) was well below that in Table Rock tailwater.

Fishing pressure was greatest during the spring (42.4 percent of the total) and lowest in winter (7.3 percent). The rate of fishing success was greatest in summer (0.64 fish per hour) and lowest in winter (0.38 fish per hour). About 42.1 percent of the total catch was taken in spring, and only 4.9 percent in winter.

White bass (37.3 percent) predominated in the creel (Table II), followed by drum (22.6 percent). Nearly all of the drum were caught during their spawning season (May-August). Crappie (11.0 percent), channel catfish (8.2 percent), bluegill (7.7 percent) and walleye (3.2 percent) followed in abundance, with channel catfish and walleye contributing greatly to the total weight of the catch. Green sunfish (3.2 percent), largemouth bass (2.3 percent), rainbow trout (1.9 percent), and carp (1.0 percent) comprised most of the remainder of the catch.

About 54 percent of the anglers counted were fishing from boats. Sixty-five percent of those interviewed were "still" fishing and 53 percent used live baits. Artificial bait fishermen (28 percent) caught fish at the rate of 0.61 fish per hour. They caught 65.2 percent of the white bass and 53.4 percent of the walleye taken in this area. Shore fishermen caught fish at nearly the same rate as boat fishermen, and took 76.7 percent of the green sunfish and 58.4 percent of the bluegill taken from this area. Trotliners (2.1 percent) caught fish at the rate of 0.28 fish per hour, almost all catfish.

The 1,493 interviewed anglers came from 26 Missouri counties and 12 other states. Local (Taney County) anglers amounted to 18.6 percent of the Missouri anglers, and those from Greene County made up 40.3 percent. Out-of-state anglers amounted to 14.8 percent of those interviewed, with those from Kansas comprising 61.7 percent. Illinois contributed 10.8 percent and Oklahoma added 9.5 percent to the out-of-state contingent.

### *Clearwater Tailwater*

The creel census clerk interviewed 2,790 fishermen or about 9 percent of the estimated total of 31,100 anglers (Table I). The fishing pressure was 1,607 hours (388.7 trips) per acre, and the yield per acre amounted to 930.1 fish, weighing 845.2 pounds. The total yield was estimated at 74,400 fish, weighing 67,700 pounds. Anglers caught fish at the rate of 0.55 fish per hour, and 68.5 percent of those interviewed were successful.

Fishing pressure was greatest during the summer (60.2 percent of the total) and lowest in winter (1.7 percent). About 63.2 percent of the total catch was taken in summer, but only 0.2 percent was taken in winter. Rate of fishing success was about equal in summer and fall, somewhat lower in spring, and very low in winter.

Crappie (34.5 percent) were most abundant of the 23 species (Table II) in the creel. However, carp (16.9 percent) contributed four times as many pounds as crappie, and about one-third of the total weight of fish harvested. Bluegill (14.8 percent), channel catfish (14.3 percent), and buffalo (6.0 percent) were next in abundance, with channel catfish and buffalo each contributing about one-eighth of the total weight of catch. Paddlefish and flathead catfish each amounted to less than 1 percent of the catch, but together furnished about one-sixth of the total weight.

Only about 10 percent of the anglers counted were fishing from boats. About 81 percent of those interviewed were "still" fishing and 58 percent used live baits. Trotliners made up 5 percent of the anglers interviewed. Their rate of catch, which was quite uniform all year, was 0.26 fish per hour. They caught mostly carp, buffalo, channel catfish, and paddlefish. "Accidental" snagging on trotlines and by "still" fishermen accounted for the majority of the catch of paddlefish. A few anglers were observed snagging or "grabbing". Rate of

catch for shore fishermen (0.46 fish per hour) was below the rate for all fishermen (0.55 fish per hour).

Interviewed anglers came from 24 Missouri counties and 4 other states. Local anglers (Wayne County) provided 29 percent of the Missouri anglers, and St. Louis County furnished 30 percent. Out-of-state anglers (2 percent of those interviewed) were predominantly from Illinois.

#### DISCUSSION

Table Rock, Taneycomo and Clearwater tailwaters received 7, 10, and 16 times more fishing pressure, per acre, than their respective reservoirs. The total number of fishermen trips was greater on Taneycomo tailwater (320 acres) than on the reservoir (1,410 acres), and was nearly as great on Clearwater tailwater (80 acres) as on the reservoir (1,990 acres). Table Rock tailwater (320 acres) supported only a small fraction of the total fisherman trips compared to those on Table Rock Reservoir (43,100 acres). Considering these reservoirs and tailwaters together, about 10 percent of the fisherman trips were on the tailwaters, which comprise 1.5 percent of the combined areas.

Both Taneycomo and Clearwater tailwaters provided a greater weight of harvest than the respective reservoirs, and the Taneycomo tailwater also provided more fish numerically. In all three cases the rate of catch was lower on the tailwater than on the reservoir.

By coincidence the areas of Table Rock tailwater and Taneycomo tailwater were nearly equal. It is interesting to note that fishing pressure on the two areas was almost identical, though one is a trout fishery made possible by stocking and the other is a "natural" warmer water fishery. Rate of catch and percent of successful anglers was greater on Table Rock tailwater, resulting in a greater harvest of fish. Fish in Taneycomo tailwater averaged much larger, however, which resulted in a harvest there of more than twice the total weight of fish taken in Table Rock tailwater. Out-of-state anglers were attracted more to the trout fishery in Table Rock tailwater than to the warm water fishery of Taneycomo tailwater.

#### LITERATURE CITED

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## FISH POPULATION DYNAMICS FOLLOWING A SELECTIVE SHAD KILL

By HERBERT N. WYATT and HOWARD D. ZELLER

#### ABSTRACT

Data is presented over a four-year period on population changes and dynamics in an 8,500-acre reservoir following rotenone treatment for selective shad reduction. Population data for four years prior to the shad kill is also discussed and analyzed.

An analysis of the operation including methods, techniques, and results is presented. Records of fish stocking, creel census, age and growth and population studies after treatment is discussed and evaluated.

Particular emphasis is directed toward two introduced species, white bass and threadfin shad. Data on the expansion and establishment of these introductions and the rapid growth rates encountered are presented. Year class dominance, reproduction, and fisherman success are compared, and the overall effect of selective shad kills on fish population changes is discussed and summarized.