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SURVIVAL, YIELD, GROWTH AND COEFFICIENT OF CONDITION OF
HATCHERY-REARED TROUT STOCKED IN WISCONSIN WATERS

by

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INTRODUCTION

Studies on survival, yield, growth, and coefficient of condition of hatchery-reared trout stocked in Wisconsin waters have been conducted in the past as part of Area investigation programs. More recently additional data have been collected by fishery research personnel incidental to the studies on trout habitat development. Coordination of earlier studies was limited and methods employed and intensity of effort varied widely from one Area to another and even within the same Area. This diversity has also been reflected in the several methods of presenting the results, from Area Investigational Reports and Annual Research Reports, both of which have had only limited distribution, to memoranda and raw data in the Area files.

The objectives of this report covering research and Area investigations in Wisconsin through 1960 are to: (1) Summarize the scattered information gathered from various investigations in Wisconsin; (2) Evaluate the results on a generalized basis; (3) Present a limited literature review for comparison; and (4) Determine the needs for further study in this field.

METHODS

Most of the early studies on stocked hatchery-reared trout were conducted in other states, and the primary method for evaluation of survival of these trout was the creel census. In recent years, electro-fishing has replaced creel census as the primary method of determining survival of trout in other states as well as Wisconsin. The electro-fishing gear is powered by either AC or DC generators of varying voltage and amperage. The most common units are powered by 115-volt, 8.7-ampere AC or 230-volt, 11.6-ampere DC generators.

Generally, the earlier studies in Wisconsin were confined to "opening week-end" creel censuses to determine relative survival and yield of fall- and spring-stocked trout, or relative catchability of stocked brown, brook, and rainbow trout. Later these investigations included sampling of the trout populations with electric shocker units, although generally only one run was made and only limited sections of the streams were covered.

In recent years, the procedures for study of stocked hatchery-reared trout have been refined. The most reliable estimates of trout populations in streams are now made by employing the mark and recapture method. A recent innovation is the employment of two shocker units to minimize the effect of possible mortality and known movement of trout between the first and second runs. The second unit is operated 0.5- mile or more behind the first, depending upon the degree of turbidity created by the first crew. Study areas in the streams are from 1 to 12 miles in length and usually end at the upper sections of the streams where they are too small to be worked with the electrical gear now employed. Sampling is continuous from the lower to the upper end of the study areas.

Seines were employed to conduct a trout population estimate on Rock Lake, Kenosha County, in April, 1960.

Creel censuses approximately 80 per cent complete have been conducted during the trout fishing season on streams where trout habitat development is being evaluated (Black Earth, Mt. Vernon, Big Roche-a-Cri, and McKenzie Creeks).

Before trout that were to be studied for growth characteristics were stocked, total lengths to the nearest 0.1 inch and weights in grams were taken on 100 or more trout, depending upon extent of variability of each group stocked. Standard lengths in millimeters were also taken on some of the groups stocked in order to calculate the coefficient of condition (K) in addition to the coefficient of condition (R) which is calculated on the basis of total length in inches and weight in grams. During the electro-fishing operations, lengths and weights were again taken on all or a representative sample of the various trout groups. All references to lengths of trout that follow are total length.

SURVIVAL

Studies on the survival of stocked trout in Wisconsin have been virtually confined to near legal- or legal-sized trout (6 inches) stocked in streams. Population estimates of some of these individual stocks have been made over periods of years after their release. Most of these have been made in conjunction with studies of trout habitat development, mainly on southern and central Wisconsin streams. In some instances, fall- and spring-stocked trout from the same hatchery lots have been released in the same stream and survival of these stocks has been compared within the limits of the study areas.

Survival as Determined by Population Estimates

The estimated number of trout, as determined by the mark and recapture method, was probably in most instances close to the actual numbers of trout present at a given time in the areas studied because the efficiency of the electrical gear in the relatively small streams was high. However, because movement of stocked trout out of the study areas has been demonstrated in some investigations, the survival rates presented must be considered minimum figures. Movement downstream of fall-stocked trout was less apparent than that of trout released in the spring; hence, survival figures on fall-stocked trout appear to be more reliable.

All references to trout survival and mortality in this section of the paper refer to estimates within the study areas, based on the mark and recapture method of estimating populations.

Fall- and Winter-Stocked Trout (Table 1)

Brown Trout. Population estimates in March and April demonstrated that in Wisconsin streams 9- to 11-month-old brown trout stocked as 5- to 8-inch fish the previous fall generally had, when compared to earlier published information, high survival. The number in spring varied from 27 to 74 per cent of the number originally released. However, brown trout stocked as 2- to 3-inch fingerlings in August and September in the Lower Willow River, St. Croix County (Frankenberger, 1959, 1960) had only an 18 to 25 per cent survival to April of the following year.

The highest overwinter survival of fall-stocked brown trout was 74 per cent in Milner ranch, Grant County, (C. Brynildson, 1956) and 71 per cent in Mt. Vernon Creek, Dane County (O. Brynildson, 1959a). Both of these southern Wisconsin streams had moderate winter water temperatures, numerous deep pools, and relatively low populations of resident trout, but contained large populations of the white sucker (Catostomus c. commersonii). Overwinter survival of fall-stocked brown trout was approximately 57 per cent in Brewer Creek, Juneau County (Klick, 1959), Big Roche-a-Cri Creek, Adams County (White, 1959b), and McKenzie Creek, Polk County (White, 1959a). The sections where the trout were released in these streams contained deep pools that were ice-covered during the cold days of winter, but here stocks of resident trout and white suckers were comparatively low. Survival of fall-stocked brown trout to the following spring in Peterson Creek, Waupaca County, was 27 per cent and in Willow Creek, Waushara County, 33 per cent (Primising, 1960a, b). In both Peterson and Willow Creeks, populations of wild brown trout were high in the sections where the stocked trout were released. Ice-free Peterson Creek has less deep pools than is partly ice-bound Willow Creek.

With the exception of Big Roche-a-Cri Creek, Adams-Waushara Counties, only a small percentage of the originally stocked brown trout was present in the study areas after the first fishing season.

Survival of the original stock of 9-month-old brown trout was 65 and 66 per cent in Mt. Vernon and Black Earth Creeks, respectively, 3 weeks after the release date (O. Brynildson, 1959a).

Brook Trout. Of the brook trout stocked at the age of 10 months in Dent Creek, Shawano County, early in October, 25 per cent survived to April (Klingbiel and Jones, 1955), whereas 39 and 57 per cent of two lots of brook trout of the same age released in Big Roche-a-Cri Creek in October survived to April. Dent and Big Roche-a-Cri Creeks were ice-covered in various sections during these investigations. In Big Roche-a-Cri Creek, two sections contained different densities of wild brook trout. In the Adams County section of the study area, where survival was 57 per cent over the winter of 1958-59, the deep-running water was covered with ice and populations of wild trout and other fish species were low. In the Waushara County section, where overwinter survival was 39 per cent, the water was free of ice during most of the winters of 1957-1959 and the wild brook trout population was dense and deep water was relatively scarce.

In both Dent and Big Roche-a-Cri Creeks, only a small percentage of the original stocks were present in the study area after the first fishing season, even less than that of the stocked brown trout discussed earlier.

Fish population estimates conducted in Mt. Vernon Creek in late September and early October, 1959, showed that survival of two lots of 10-month-old brook trout from two different hatcheries was 50 and 63 per cent (Mason, 1959b) after 3 weeks in the stream. These two lots were stocked at the same point approximately 5 miles above the lower end and 1 mile below the upper end of the study area. Only a negligible number of these trout were collected more than 0.5 mile below and above the stocking sites during the electro-fishing operations. Migration of these trout, therefore, cannot account for their loss from the 6.4-mile study area within the 3-week period. Fish population estimates conducted on Mt. Vernon Creek in April, 1960, revealed that only 16 and 17 per cent of these two lots of brook trout were present in the study area. During the April electro-fishing operations, these trout were uniformly scattered throughout the lower two-thirds of the study area (none was collected in the upper one-third of the study area) which indicated that some fish from these lots were present below the study area as well. Thus, downstream movement may account for part of the loss from the study area between dates of the October and April estimates. After the close of the 1960 trout fishing season, none of one lot and only four fish from the other lot were collected during a population estimate made in September, 1960. At least 50 per cent of the estimated April, 1960, stock comprising these two lots was creelied by July, 1960 (Table 4).

Rainbow Trout. There have been three studies of overwinter survival of fall-stocked rainbow trout in Wisconsin streams. In addition, three studies on rainbow trout stocked in Wisconsin lakes in the fall or winter have been reported.

Of the rainbow trout stocked at the age of 10 months during September in Milner Branch, 62 per cent survived to March (C. Brynildson, 1957a). The two lots of 10-month-old rainbow trout stocked in Black Earth Creek in September had a survival of 59 and 76 per cent through the first 4 weeks and 42 and 60 per cent to the following April (Mason, 1959b). The survival through the 3-week period following an October release of 11-month-old rainbow trout in the Little Brule River fish refuge was 80 per cent; however, survival to April was only 10 per cent (Mason, 1959a).

This great range in overwinter survival of rainbow trout in Milner Branch, Black Earth Creek, and the Little Brule fish refuge probably reflects differences in extent of competition and, possibly, predation. Although the three streams remained virtually ice-free during most of the winter where the trout were stocked, competition from wild trout was much higher in the Little Brule River fish refuge than it was in Milner Branch and Black Earth Creek. Moreover, the abundance of fish-eating birds (mainly great blue herons) was considerably higher in the wild and forested watershed of the Little Brule River than in the grazed, agricultural watershed of Milner Branch and Black Earth Creek.

None of the fall-stocked rainbow trout was found in the study area of Milner Branch and less than one per cent was found in the study area of Black Earth Creek after the first fishing season.

Schmitz (1956) reported that rainbow trout fingerlings (average length of 4.1 inches) stocked during early November, 1954, in Cather Lake, Chippewa County, suffered nearly 100 per cent natural mortality by the following summer. Cather Lake at the time the fingerling trout were stocked contained approximately 30 adult rainbow trout per acre and a standing crop of largemouth bass in excess of 45 pounds per acre. A similar stock of fingerling rainbow trout released in early November, 1955, suffered over 95 per cent natural mortality from time of release to May, 1956. Rainbow trout fingerlings (average length of 4.1 inches) stocked in Turk Lake, Chippewa County, during early November, 1954, had a survival of 62 per cent from time of release to April, 1955. Turk Lake at the time of stocking contained a resident population of approximately 85 two-year-old rainbow trout per acre but no other predator fishes (Schmitz, 1956).

Rainbow trout yearlings (8 to 10 inches) stocked in Rock Lake, Kenosha County, in February, 1960, had a survival of approximately 92 per cent to late April, 1960 (O. Brynildson, 1960d). Rock Lake contained a resident population of largemouth bass and panfish plus approximately three 2-year-old rainbow trout per acre (carry-over from 1959) when this study was conducted.

Spring- and Summer-Stocked Trout (Table 2)

Brown Trout. Population estimates were made on several streams in March and April from one to four weeks after the release of legal-sized (6 to 9 inches) 15- to 16-month-old brown trout. The results indicated that there were, in most cases, losses of these fish from the study areas. Some of the losses were due partly to movement out of the study area, chiefly downstream drift, as shown by electro-fishing (McKenzie and Big Roche-a-Cri Creeks) and creel censuses (Black Earth Creek) below the study areas, soon after the trout were stocked in early spring when the water was still cold in most streams. However, movement out of the study area could not account for the loss in the Little Brule River fish refuge where passage of fish was blocked by a grate at the lower end and by the Brule hatchery at the upper end. Degurse and Mason (1958) reported a 60 per cent loss of 7- to 10-inch brown trout (15-month-old) in the refuge within 2 months of the April release. This refuge contained a large population of wild brown trout as well as small populations of wild brook and rainbow trout. Observations indicated that predation by herons may have contributed significantly to the loss.

Like the fall-stocked brown trout only a small percentage of the spring-stocked brown trout was present in the study areas of the streams after the first fishing season, but the survival of such fish through the following winter was high.

Fingerling brown trout (2 to 3 inches in length) stocked in Trout Creek, Iowa County, in June, 1960, had a survival of 22 per cent to September, 1960. The population of resident brown trout during September in this stream was relatively high for a southern Wisconsin stream (O. Brynildson, 1960g).

Brook Trout. Information on survival of spring-stocked brook trout is extremely limited. In Big Roche-a-Cri Creek, White (1959b) reported a 56 per cent survival of legal-sized, 16-month-old brook trout over a 2-week period following a March release. This particular 1959 spring stock was superimposed upon a group of fingerlings stocked the previous fall (Table 1) and upon a dense wild yearling brook trout population. Less than 3 per cent of the original stock was present in the 11.6-mile study area after the trout fishing season closed.

Rainbow Trout. Population estimates in March and April demonstrated that spring-stocked rainbow trout, 16 months of age and 6 to 10 inches in length, suffered mortality

within one to four weeks after release in three of the four Wisconsin streams investigated. In Milner Branch, however, there was no evidence that a group of rainbow trout stocked in March had suffered any mortality after three weeks in this stream (C. Brynildson, 1956). Survival through periods of 1 to 4 weeks after release was 70 per cent in Mt. Vernon Creek and 95 per cent in Black Earth Creek (O. Brynildson, 1957). In Elk Creek, Chippewa County, apparent survival was only 26 per cent within the 3-week period following release (Dunham, 1955). However, a high percentage of the loss may have been due to movement out of the relatively short 1-mile study area in Elk Creek before the population estimate began.

After the close of first fishing season, only a negligible number of rainbow trout from a particular stock was found in the study areas of Mt. Vernon and Black Earth Creeks and Milner Branch.

Results of Single-Run Electro-Fishing

Single runs with an electric shocker unit were made in many of the earlier studies to estimate survival, especially relative survival of trout stocked in the fall and spring. In the latter case, a particular stream was stocked with legal- or near legal-sized trout in the fall and again in the spring with legal-sized trout. Single-run electro-fishing was conducted prior to the opening of the trout fishing season, and the relative number of fall- and spring-stocked trout collected was assumed to be the relative survival of the original stocks to the dates sampling was conducted.

Brown Trout. Whenever the original stocks had not been exposed to fishing pressure, more spring-stocked than fall-stocked trout were recovered during electro-fishing operations, with the exception of the brown trout stocked during the fall of 1954 and spring of 1955 in Brewer Creek, Juneau County (Table 3). Part of the 1955 spring-stock in Brewer Creek was known to have moved downstream, since trout of this release were observed below the study area during the sampling period (Klick, 1959).

The ratio of fall- to spring-stocked brown trout in April or early May was approximately 1:2 in Sawyer Creek, Washburn County (Brasch and Niemuth, 1951), Willow Creek, Waushara County (Hacker, 1954), and Rocky Run Creek, Columbia County (O. Brynildson, 1954b). The ratio of fall- to spring-stocked trout was approximately 1:1 in Brewer Creek in both 1955 and 1956 (Klick, 1959). After the trout in Rocky Run Creek had been exposed to a season of fishing, the ratio of fall- to spring-stocked fish was approximately 1:1.

An estimate of the relative survival of these fall- and spring-stocked brown trout by an "opening week-end" creel census did not give the same results as electro-fishing. The ratio of recorded returns to the anglers of fall- and spring-stocked brown trout was 1:7 on Willow Creek and 1:5 on Rocky Run Creek. It is apparent that the fall-stocked brown trout were not caught in proportion to their pre-season abundance.

Brook Trout. When sampling fall and spring releases of brook trout in Tank Creek and the North Branch of the Trempealeau River, Jackson County, a substantially higher percentage of the spring-stocked trout was collected (Table 3). In Tank Creek, Jackson County, the ratio of fall- to spring-stocked trout collected was 1:13, while in the North Branch of the Trempealeau River the ratio was 1:4 (Christenson, Hacker, and Brynildson, 1954; Klick, 1956a, 1956b). Tank Creek is a comparatively small, shallow stream and winter mortality was probably higher there than in the larger North Branch of the Trempealeau River in the same watershed.

An estimate of the comparative survival of these fall- and spring-stocked brook trout by an "opening week-end" creel census did not give the same results as electro-fishing. The ratio of recorded returns to the angler of fall- and spring-stocked brook trout was 1:9 on Tank Creek and 1:3 on the North Branch of the Trempealeau River.

Rainbow Trout. No information available.

Results From Other States

The early attempts at making estimates on survival of stocked trout in other states were based on yield to the angler from a particular stock. To determine the relative survival of a fall- and spring-stock or a stock of legal-sized trout and fingerling trout, relative yield figures were used. It was assumed that the higher the yield the higher was the apparent survival. Studies cited in the previous section indicate that this assumption is not valid when only a short-term census is conducted. Most of the investigators concluded from their studies that higher yields (reflecting higher survival) were attained whenever legal-sized (usually a minimum of 6 to 7 inches in length) trout were stocked in streams just prior to and during the trout fishing season. Further, because the yield to the angler was low, fingerling trout (1 to 5 inches in length) stocked in streams had low survival rates regardless of the season stocked (Shetter, 1939, 1950; Holloway and Chamberlain, 1942; Chamberlain, 1943; and Needham and Slater, 1944).

Shetter (1947) wrote an extensive review of the findings of other investigators regarding the yield and apparent survival of trout stocked (based on the yield) at various times of the year. The results regarding trout survival obtained by these investigators were varied, and depended on the spring-water supply of a particular stream and the populations of wild trout it contained.

Because these survival rates were estimated from subsequent yield figures they will be discussed further in this report in the section on "Yield".

By employing electro-fishing gear to estimate fish populations and survival, Minnesota researchers estimated that brown trout (ranging in total length from 5 to 13 inches) stocked in Watson Creek during September had an overwinter survival of 43 per cent (Hale and Smith, 1955). Schumacher (1958) estimated that 70 and 44 per cent of the brown and rainbow trout, respectively, (20 months of age and weighing approximately 4 per pound) stocked during September in Duschee Creek survived the first winter.

Discussion

From the results of the studies conducted in Wisconsin and other states pertaining to survival of stocked hatchery-reared trout, certain environmental characteristics of streams appear to indicate whether survival of trout stocked in a particular stream will be high or low.

Streams in Wisconsin that carried fall stocks of trout through the winter with the highest survival (above 60 per cent) had moderate to high winter water temperatures, numerous deep pools, and low populations of wild trout (Mt. Vernon Creek and Milner Branch). Those streams in which overwinter survival was relatively high (approximately 45 to 55 per cent) were characterized by the presence of limited sections with moderate to high winter water temperatures, but contained numerous deep pools, and low populations of resident trout (Black Earth, Harker Lee, Brewer, Big Roche-a-Cri, Adams County section, and McKenzie Creeks). The major characteristic of the streams in which the lowest overwinter survival occurred (less than 40 per cent) (Big Roche-a-Cri Creek,

Waushara County section, Little Brule River fish refuge, Peterson Creek, Willow Creek, and Dent Creek) was the presence of high populations of wild trout. In the sections of the Big Roche-a-Cri and the Little Brule River where the trout were stocked, open water prevailed throughout the winter of the investigation and yet survival of the stocked trout was low. These observations lend support to the contention that competition from resident trout is the major factor contributing to mortality of stocked trout. Moreover, deep water undoubtedly is an important obstacle to fish-eating birds and mammals and may also be conducive to high survival of stocked trout.

Miller (1958) concluded that competition from resident wild trout played an important role in the early mortality of stocked hatchery-reared trout in streams. This competition was mainly for space, and when this was occupied by resident trout the stocked trout exhausted themselves in searching for escape cover.

Competition for space probably caused most of the heavy early mortality on spring-stocked (1958) brown trout in the Little Brule River fish refuge and spring-stocked (1959) brook trout in Big Roche-a-Cri Creek, Waushara County. There was also evidence of predation by great blue herons during this period in both streams. While the extent of this predation is unknown, it is undoubtedly greater in streams where escape cover is held by resident trout or where such cover is lacking.

Competition for fish food in the Wisconsin streams studied did not appear to be an important factor in the survival of the stocked trout. Results of studies on the growth and the coefficient of condition of the wild and stocked trout, to be presented in another section of this report, demonstrated that the condition factor (R) was maintained at a relatively high level and that growth in length was evident even in winter; hence mortalities of the various lots studied could not be attributed to lack of food.

Perhaps the major factor responsible for higher survival rates of fall-stocked trout in recent years, compared to those demonstrated in early studies, is the improved hatchery product itself. Within the past 10 to 15 years, trout diets and feeding procedures have been greatly modified and production of fingerling trout of much larger size by the fall of the year is now generally achieved. Expanded research efforts on many phases of trout culture and on trout habitat requirements to provide even better quality trout and to permit better utilization of the hatchery product, respectively, are now in progress.

Hatchery-reared trout are not uniform in vigor and growth. That is probably the main reason why survival of the stocked trout varies between lots the same year and from year to year in the same body of water. Miller, Sinclair, and Hochachka (1959) concluded that diets can materially affect the ability of the fish to survive. Research personnel in Wisconsin are studying the effects of various diets and rearing procedures on the survival of trout in the wild environment.

Movement of stocked trout out of the study areas has been frequently demonstrated. Fall-stocked brown trout have often been observed to move upstream, while those stocked in the spring when the water temperature was low moved downstream. Less information on movement of stocked brook and rainbow trout is available. Both fall- and spring-stocked brook trout in Big Roche-a-Cri Creek showed a tendency to stay near the stocking sites. Fall- and spring-stocked rainbow trout in Milner Branch and spring-stocked rainbow trout in Black Earth and Mt. Vernon Creeks were found mainly near the stocking sites when the electro-fishing was conducted. More recent information also indicated that movement patterns differed between lots of brook trout of the same origin and between lots of rainbow trout of the same origin, 9 and 10 months of age, respectively, that had been reared at different hatcheries under different conditions (indoor and outdoor concrete raceways and outdoor dirt ponds) but stocked together at the same sites.

YIELD

Studies on the yield of stocked trout in Wisconsin have been made on trout released into lakes as well as streams. Most of these creel censuses have been incomplete and were conducted on opening week-ends of the trout fishing season. Some creel censuses have been conducted throughout the entire trout fishing season but, except for complete records of the catch on a few isolated lakes, they have not exceeded an estimated 80 per cent coverage. The yield of various stocks of trout are presented in Table 4.

Fall- and Winter-Stocked Trout (Table 4)

Brown Trout. The only waters in Wisconsin where an intensive (60 to 80 per cent complete) and extended creel census was conducted on fall-stocked brown trout were Big Roche-a-Cri Creek, Adams and Waushara Counties, and Black Earth and Mt. Vernon Creeks, Dane County. In 1959, the recorded catch (estimated 60 per cent census coverage) of the fingerling brown trout released in Big Roche-a-Cri Creek October, 1958, was 6 per cent of the number originally stocked and 11 per cent of the number surviving to April, 1959, (White, 1959c). There was an estimated 22 per cent of the available April stock remaining (White, 1959c) in the 11.6 mile study section after the close of the 1959 trout fishing season (Table 1). During May and June of 1960, the recorded catch (estimated 80 per cent census coverage) of the fingerling brown trout stocked in Black Earth and Mt. Vernon Creeks during September, 1959, was 15 and 21 per cent of the original numbers stocked and 34 and 43 per cent of the numbers surviving to April, 1960, respectively.

Brook Trout. Intensive and extended creel censuses concerning fall- or winter-stocked brook trout were conducted on three Wisconsin waters: Deerskin River, Vilas County, in 1943, Big Roche-a-Cri Creek, Adams and Waushara Counties, in 1958 and 1959, and Mt. Vernon Creek in 1960.

The creel census on the Deerskin River was conducted during the first 3 months of the trout fishing season and accounted for 28 per cent of 7- to 13-inch brook trout stocked during the previous December (Schneberger and Williamson, 1943).

In the Big Roche-a-Cri Creek, 17 per cent of the original lot of fall-stocked fingerlings and 40 per cent of this lot's estimated number surviving to April were recorded in the 1958 census (estimated 60 per cent coverage) (White, 1959a). In 1959, under the same degree of coverage, two lots of fall-stocked fingerling brook trout in Big Roche-a-Cri Creek yielded 14 and 18 per cent of the original numbers stocked and 32 and 36 per cent of the estimated numbers which survived the winter, respectively (White, 1959c). A negligible number of these trout remained in the 11.6-mile study area of Big Roche-a-Cri Creek after the trout fishing season closed in early September (Table 1).

On West Petenwell Ditch, Juneau County, 12 per cent of the original September stock of 9-month-old brook trout were recorded in the catch on the first day of the trout fishing season (Wis. Cons. Dept., 1957). Of the fingerling brook trout (5-7 inches) released in Mt. Vernon Creek in September, 1959, only 8 per cent of the original number stocked and 50 per cent of the number surviving to April, 1960, were recorded during the following May and June creel census (estimated 70 per cent coverage during the 2-month period) (White, 1960b).

Catch records of fall-stocked fingerling brook trout are available from three other streams in Wisconsin, but these records were obtained from census coverage on only 1 to 4 days during early May.

Rainbow Trout. Only on the Deerskin River, Vilas County, and Black Earth Creek, Dane County, have there been intensive and extended creel censuses on rainbow trout stocked in streams during the fall or winter.

The census on the Deerskin River was conducted during the first 3 months of the trout fishing season in 1943, during which period 48 per cent of the trout stocked in December, 1942, (7-15 inches) were recorded in the catch (Schneberger and Williamson, 1943).

Fingerling rainbow trout (6-9 inches) released in Black Earth Creek in September, 1959, yielded 28 per cent of the original stock and 54 per cent of the number surviving to April, 1960, during May and June of 1960 (estimated 90 per cent coverage). Approximately 67 per cent of this yield was recorded during May (White, 1960b).

On only two lakes in Wisconsin has an intensive creel census been conducted on rainbow trout stocked in the fall or winter. Rainbow trout fingerlings (6-8 inches) stocked in Pallette Lake, Vilas County, in October, 1959, yielded 40 per cent of the number stocked through August 18, 1960 (complete census coverage). Approximately 38 per cent of this yield was recorded from mid-February to mid-April (O. Brynildson, 1960f).

Rainbow trout yearlings (7-10 inches) stocked in Fish Lake, Dane County, in mid-February, 1960, yielded approximately 5 per cent (estimated 80 per cent coverage) of the original stock from May 1, 1960, through July 9, 1960 (O. Brynildson, 1960e).

Spring- and Summer-Stocked Trout

Brown Trout. The yield (estimated 80 per cent coverage) of yearling brown trout released during March in Mt. Vernon and Black Earth Creeks, Dane County, was 42 per cent during the following trout fishing season (Brynildson and Snow, 1957a). With approximately 80 per cent census coverage, 18 and 44 per cent of the yearling brown trout stocked in March and May, respectively, were recorded in the catch within 6 months after their release in McKenzie Creek, Polk County (White, Brynildson, and Skowronski, 1958). Of the 2,871 yearling brown trout stocked in Mt. Vernon Creek during March, 1955, only 65 were estimated to be present in April, 1956; during the 1956 trout fishing season, 55 per cent of these trout were recorded creeled under an estimated 80 per cent census coverage. Under an estimated 60 per cent creel census coverage, 17 per cent of a group of spring-stocked brown trout were recorded creeled on Big Roche-a-Cri Creek during 1959 (White, 1959c).

Brook Trout. The creel census on the Deerskin River, which was referred to under fall-stocked brook trout, also covered May-stocked brook trout (7 to 13 inches in length). The yield to anglers from these trout during the first 3 months of the trout fishing season was 82 per cent (Schneberger and Williamson, 1943). Other intensive creel censuses for extended periods showed that 43 per cent (White *et al.*, 1958) and 55 per cent (Christenson, 1955b) of the spring-stocked yearling brook trout were recorded in the catch from Big Roche-a-Cri Creek, Waushara County, and Sabin Pond, Richland County, respectively.

Rainbow Trout. In a 3-month creel census on the Deerskin River, 30 per cent of the rainbow trout stocked in May (7 to 15 inches in length) were recorded in the catch (Schneberger and Williamson, 1943). Yearling rainbow trout stocked during March in Mt. Vernon and Black Earth Creeks each yielded (80 per cent census coverage) from 34 to 47 per cent of the original stock to anglers the following fishing season (O. Brynildson and Snow, 1957a).

Yearling rainbow trout stocked during May, 1951, in two bog lakes, Turk and Cather, Chippewa County, yielded (complete census coverage) 46 per cent from Turk and 58 per cent from Cather Lake whereas the recorded catch of two-year-old rainbow trout stocked with the yearling trout was 70 per cent (O. Brynildson, 1958). Fishing pressure on these lakes was restricted in 1952 and consequently the catch was relatively low. Yearling rainbow trout stocked during April in Rock and Moose Lakes in southeastern Wisconsin yielded (80 per cent census coverage) from 4 to 9 per cent of the original stock during the following May and June (O. Brynildson, 1959c). From Fish Lake, Dane County, 14 per cent of the 1960 April stock of yearling rainbow trout was recorded creel during May, June, and early July, 1960 (O. Brynildson, 1960e).

Results From Other States

Researchers in other states have concluded that higher yields to anglers resulted whenever legal-sized trout were stocked just prior to and during the trout fishing season. Moreover, whenever fingerling trout (1 to 5 inches in length) were stocked in streams, regardless of the season stocked, yields to anglers from these stocks were low (Shetter, 1939, 1950; Holloway and Chamberlain, 1942; Chamberlain, 1943; and Needham and Slater, 1944).

In his extensive review of the results of creel censuses in Michigan and in other states, Shetter (1947) concluded that the highest percentages of survival to the creel of legal-sized brown, brook and rainbow trout in streams have been mainly from spring and open-season releases. The reported exceptions are limited (Tremblay, 1945; Smith and Smith, 1945; Hale and Smith, 1945). Generally, whenever abundant spring water was lacking, resulting in low winter water temperatures and extensive ice-cover, or where competition from wild trout populations was high, yields of fall-stocked trout during the following fishing season were lower than yields from trout stocked in spring prior to and during the trout fishing season (Shetter and Hazzard, 1941; Smith, 1941; Shetter, 1947).

Of the legal-sized brook trout stocked in Bear Brook, New Hampshire, during June, 70 per cent were creel by anglers within three weeks (Hoover and Johnson, 1938). Average yields from 3 years of spring and summer stocking of legal-sized brown, brook, and rainbow trout in the Pigeon River, Michigan, were 33, 43, and 58 per cent, respectively (Cooper, 1953c). The yield of stocked trout from streams in other states was generally not as high as the yield of such fish from lakes.

Legal-sized (7 inches and longer) rainbow trout stocked in "pot-hole" lakes in Michigan during the fall yielded up to 66 per cent of the original stocks to anglers the following fishing season (Shetter and Hazzard, 1941). Up to 88 per cent of the legal-sized brook trout stocked in Michigan lakes during the fall were creel the first two months of the following fishing season (Shetter, 1947).

Whenever legal-sized brook, brown, and rainbow trout were stocked just before or during the trout fishing season, returns to the angler were generally better from lakes than from streams. Returns to the angler of legal-sized brook trout stocked during the spring in Michigan lakes have been as high as 80 per cent (Shetter, 1947). The estimated yield from legal-sized brown and rainbow trout stocked in small lakes in Minnesota during May was 60 and 90 per cent, respectively (Kelley, 1953).

The practice of stocking hatchery-reared fingerling trout in lakes generally has been successful whenever competition from larger trout or other predator fish was lacking or nearly absent. Good yields to anglers have resulted from stocking of hatchery-reared

fingerling brook trout (approximately 2 inches in length) during the summer in "pot-hole" lakes in Michigan where predator fish were absent. Of 200 brook trout fingerlings stocked in Lost Lake (Michigan) 84 per cent were subsequently creeled by anglers (Eschmeyer, 1938). During May, 1953, Chickado Lake, a 50-acre Alberta "pot-hole" lake, was stocked with 5,300 rainbow trout fingerlings (approximately 2 inches in length). The recorded yield to anglers the same summer and the two following summers was 21 per cent of the original number stocked. Competition for the young trout in this lake consisted of only sticklebacks and minnows (Miller and Thomas, 1957).

Relative Catchability (Table 5)

The relative catchability of stocked legal-sized brown, brook, and rainbow trout in the midwest has been evaluated in Michigan (Cooper, 1953c) and Minnesota (Kelley, 1953) as well as in Wisconsin. Results of these studies, most of which were short-term in Wisconsin indicated that the catchability was lowest for the brown trout but approximately the same for brook and rainbow trout.

On Black Earth Creek, a higher percentage of the stocked rainbow trout than brown trout was recorded creeled during the period of the creel censuses, whereas on Mt. Vernon Creek the percentage of stocked brown and rainbow trout creeled was approximately the same (O. Brynildson and Snow, 1957a). Electro-fishing operations in September, 1956, after the trout fishing season closed on Black Earth and Mt. Vernon Creeks, revealed that approximately 3 per cent of the brown trout remained in the study sections but only a negligible number of the rainbow trout remained (O. Brynildson, 1957) (Table 2).

From a short-term creel census on the South Fork of the Willow River, St. Croix County, Christenson (1955) reported the return to anglers to be approximately 1 brown trout for every 6 rainbow trout during one census period and 1 brown trout for every 10 rainbow trout during another census period. Other short-term creel censuses conducted in the West Central Area during 1955 on other streams--the Lower Willow and Race, St. Croix County, Ten Mile Creek, Wood County, Stockwell Creek, Jackson County, Bohemian Valley Creek, La Crosse County, and Germantown Creek, Richland County--showed that the differential catchability of rainbow and brown trout was not as great as was found on the South Fork of the Willow River. Results from short-term censuses on the latter streams indicated that on an average approximately 3 brown trout were caught for every 5 rainbow trout (Wis. Cons. Dept., 1955).

During the fishing season on Turk Lake, Chippewa County, the ratio of catch was 3 rainbow trout to 1 brown trout, but treatment of this lake with a fish toxicant the following April disclosed the presence of 1 rainbow to 3 brown trout (O. Brynildson, 1949).

Studies on the relative catchability of brown and brook trout and brook and rainbow trout were conducted mainly on West Central Area streams (Table 5). Results of these short-term censuses indicate that on an average 1 brown trout was caught for every 3 brook trout, and 2 brook trout for every 1 rainbow trout.

Discussion

Results of studies in other states indicated that legal-sized trout stocked during the spring and summer in streams usually had higher yields in number to anglers than did legal- or near legal-sized trout stocked during the fall. Only limited information on comparative yield of fall- and spring-stocked trout throughout the entire fishing season on any Wisconsin water is presently available.

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The recorded yield (60 per cent census coverage) of fall-stocked brown trout during 1959 from Big Roche-a-Cri Creek was only 11 per cent of the available pre-fishing season stock, and 6 per cent of the original number released. Whereas the recorded yield of spring-stocked brown trout was 17 per cent of the number released (Table 4). However, after the season closed in 1959, 22 per cent of the fall-stocked trout which had been present just prior to the fishing season was still present in the 11.6 mile study area compared to 18 per cent of the spring-stocked trout (Tables 1 and 2).

When the comparative yields during 1959 of fall- and spring-stocked brook trout from Big Roche-a-Cri Creek are examined (Table 4) it is evident that the trout released in Waushara County in October, 1958, yielded as many fish to anglers as did the trout released in the spring of 1959 at the same sites. Moreover, there was a higher yield to anglers in 1959 from the brook trout released in October, 1958 in the Adams County section than from either of the stocks released during October, 1958, and March, 1959, in the Waushara County section (Table 4). The carry-over of a residue stock of all three lots to the close of the trout fishing season in September, 1959, was negligible (Table 1), hence none of the lots was significant in the 1960 catch.

In a stream where the trout grow during the winter and the increase in weight of the survivors compensates for loss in numbers, fall stocking is a practical management procedure in supplying anglers with stream-grown and wild-appearing trout in the fishing seasons that follow. Many anglers maintain that trout which have been residents of a stream for several months and have grown in that stream are more desirable trophies than recently stocked trout.

Three streams with moderate winter water temperatures and low populations of resident trout were Milner Branch, Grant County, and Mt. Vernon and Black Earth Creeks, Dane County. In Milner Branch and Mt. Vernon Creek, there was an average increase of 39 per cent in the total weight of the fall-stocked fingerling brown trout from September, 1955, to April, 1956, in spite of an average 28 per cent loss in numbers of trout. Another lot of fingerling brown trout released in Mt. Vernon Creek October, 1958, lost 29 per cent in numbers but gained 51 per cent in total weight by April, 1959. A group of fall-stocked fingerling rainbow trout in Milner Branch gained 14 per cent in total weight but lost 38 per cent in number from September, 1955, to April, 1956. Two lots of fingerling rainbow trout stocked in Black Earth Creek lost 58 and 40 per cent in numbers of trout but gained 65 and 63 per cent in total poundage of trout, respectively, from September, 1959, to April, 1960 (O. Brynildson, 1960c).

GROWTH AND COEFFICIENT OF CONDITION

Growth rate and coefficient of condition of stocked trout were investigated on a small number of streams in Wisconsin. Because angling and natural mortality was high on these groups of trout, only small numbers were available for growth study after one or more trout fishing seasons. The small number measured and weighed on a particular date in some cases was nearly as large or as large as the estimated population for that particular group on a specific date (see Tables 1 and 2 for survival rates and compare these with number of trout measured and weighed as presented in Tables 6 and 7).

Growth of stocked trout was generally rapid during the warm months in the streams studied, and in most southern Wisconsin streams growth was relatively rapid during the cold months as well. High stream fertility and lack of competition from resident trout appear to be directly correlated with rapid growth of trout in the southern Wisconsin streams studied.

Growth in length and coefficient of condition of various groups of fall-stocked trout are presented in Table 6 and of spring-stocked trout in Table 7.

Fall- and Winter-Stocked Trout (Table 6)

Brown Trout. The most rapid growth in length of fall- and winter-stocked brown trout during the cold months was attained by those released in Mt. Vernon Creek (O. Brynildson, 1956b, 1959a; O. Brynildson and Snow, 1957b), Brewer Creek (Klick, 1956c and 1959), and Timber Coulee Pond (Christenson, 1957). These growth increases ranged from 1 to nearly 2 inches. In fertile streams with low populations of resident trout (Mt. Vernon and Black Earth Creeks and Milner Branch), growth in length of various groups of fall-stocked brown trout from April to October was 2 to 3 inches. In McKenzie Creek, a northern Wisconsin stream, growth in length from the latter part of March to mid-October in 1958 averaged 2.6 inches for a group of fall-stocked brown trout that were residents of a section that lacked wild trout (White et al., 1958). Growth in length during the winter was poor for a group of brown trout stocked in October, 1958, in the Adams County section of the Big Roche-a-Cri Creek (which lacked wild trout); however, these trout grew rapidly during the summer of 1959 (White, 1959a).

The coefficient of condition decreased for most groups of brown trout from the time they were stocked in the fall to the time of collection in the spring. There was a rapid increase in the condition factor of the brown trout stocked October, 1958, in the Big Roche-a-Cri after the water temperatures began to rise during May, 1959 (White, 1959c).

The average coefficient of condition of the fall-stocked brown trout was good by September and October after a year of growth in the streams. After residence in Black Earth and Mt. Vernon Creeks a second winter, two groups of brown trout stocked in September, 1957, had a higher average coefficient of condition in April, 1959, than did two groups, stocked during October, 1958, after only one winter in these streams (O. Brynildson, 1959a). Fingerling brown trout stocked during September, 1959, in Mt. Vernon and Black Earth Creeks increased slightly in average length but their average coefficient of condition dropped during the three weeks these trout were residents of these streams. By April, 1960, these trout had regained their original average coefficient of condition and had grown on an average of approximately 2 inches in length (O. Brynildson, 1959a).

Brook Trout. Two groups of fingerling brook trout stocked in October, 1958, in Big Roche-a-Cri Creek increased in length on an average of more than an inch by late March and early April of 1959 (White, 1959c). Their average condition factors had dropped sharply from what it was when the trout were stocked, but by mid-May, six weeks later, the average condition factors regained the original level.

The two groups of fingerling brook trout stocked during September, 1959, in Mt. Vernon Creek, like the brown trout fingerlings stocked during the same period, increased slightly in average length but their average condition factors dropped during the three weeks these trout were residents in the stream (Mason, 1959a). By April, 1960, these two groups of brook trout more than regained their original average coefficient of condition plus adding approximately two and a half inches to their original average length.

Fingerling brook trout, stocked at the high rate of 1,000 per acre in Valley Lake, Forest County, increased in length from November, 1958, to May, 1959, but their average condition factor dropped sharply during that period (O. Brynildson, 1959b).

Rainbow Trout. Fingerling rainbow trout, stocked during September, 1955 and 1956, in Cataract Pond, Monroe County, had average increases in length ranging from 2.5 to 5.7 inches during the period from mid-September to the following May (Apelgren, 1956). In contrast to this excellent pond growth, fingerling rainbow trout stocked during October, 1958, in the Little Brule River fish refuge, Douglas County, grew very little in length and their average coefficient of condition dropped after three weeks residence in this stream. In late April, 1959, these trout had gained little in length and their average coefficient of condition was low (Mason, 1958).

The two groups of fingerling rainbow trout stocked during September, 1959, in Black Earth Creek (like the brown trout fingerlings stocked in this stream and the brown and brook trout fingerlings stocked in Mt. Vernon Creek during September, 1959) increased somewhat in average length during the three weeks these trout were residents in the stream (Mason, 1959a). However, in contrast to the brown and brook trout, the average coefficient of condition of these rainbow trout did not drop appreciably during this period. By April, 1960, these two groups of rainbow trout had gained an average of approximately 3 inches in length and their average coefficient of condition was higher than it was when the trout were stocked in September, 1959 (O. Brynildson, 1960c).

Spring- and Summer-Stocked Trout (Table 7)

Brown Trout. There are considerably more growth data available on spring-stocked brown trout in Wisconsin streams than on fall-stocked brown trout. For example, there are as many as 3 years of growth data available on a group of brown trout stocked in Black Earth Creek April 20, 1953. The growth data collected after a particular trout group had been subjected to two fishing seasons lost some significance because only a small number of any group of trout was available for measurement (see Table 2).

Growth in length was best in Milner Branch, Grant County, and Mt. Vernon and Black Earth Creeks, Dane County. Yearling brown trout stocked in April during a particular year in these streams grew on an average of 4 and 5 inches by the time they were again measured a year later (C. Brynildson, 1956, 1957a; O. Brynildson, 1956b; O. Brynildson and Snow, 1957b).

The average coefficient of condition decreased on some groups of brown trout one to three weeks after their release into the streams; however, the average condition factor of other groups remained nearly constant or actually increased during this time.

Brook Trout. The only growth data available on spring-stocked brook trout are from Roche-a-Cri Creek and on summer-stocked (July, 1953) brook trout from Mt. Vernon Creek. The brook trout in Mt. Vernon Creek had excellent winter growth. Their average length in September, 1953, was 7.2 inches. In April, 1954, their average length was 10.1 inches (O. Brynildson, 1955a). Their average condition factor had also increased during the same period.

Rainbow Trout. There is relatively more information on spring-stocked than on fall-stocked rainbow trout. Most of the growth data, however, were collected from different

trout groups stocked in lakes rather than in streams. Moreover, most of these data are limited to three acid bog lakes in northern Wisconsin and three lakes in southern Wisconsin. Because only one or two rainbow trout were collected from any particular group stocked no significant measurements of a particular group could be made in September after the fishing season closed (Table 2).

Two groups of yearling rainbow trout stocked during March in Mt. Vernon and Black Earth Creeks grew in length but their average condition factor dropped after two to four weeks residence in these streams (O. Brynildson and Snow, 1957b). This growth in length was observed to result mainly from growth and repair of the caudal fins which had eroded during the period the trout were tank-reared in the hatchery. Such growth did not substantially increase the average weight, and hence the average coefficient of condition (R) dropped below what it was when the trout were stocked.

Yearling rainbow trout stocked during the spring in the bog lakes (Turk, Cather, and Riley, Chippewa County) exhibited varied growth patterns in different years. For example, growth in length of trout in Turk Lake during the summer of 1951 was poor and the average condition factor was low due to high summer water temperatures and low densities of large planktonic Crustacea such as *Daphnia* (O. Brynildson, 1951, 1958). During both the summer of 1952 and winter of 1952-53, poor growth and low average condition factors of the trout was attributed to competition for food and space as a result of the high density of the trout stock (O. Brynildson, 1958).

The average coefficient of condition of the trout in the bog lakes was relatively high during late spring and early summer during the period of investigation. Although the average coefficient of condition dropped during late summer, they generally showed an increase by early autumn. Growth in length of a group of rainbow trout 2 years of age (length 10 to 12 inches) was less and the average coefficient of condition was lower than that of yearling trout stocked in Turk Lake on May 4, 1951. These observations on growth patterns parallel those on the growth of rainbow trout 1 and 2 years of age stocked in bog lakes in Vilas County, Wisconsin (Johnson, 1954; Johnson and Hasler, 1954). The growth rate of rainbow trout (Burdick and Cooper, 1956), stocked as fingerlings, was more rapid in Weber Lake, Vilas County, than that of the yearling and 2-year-old trout in the bog lakes.

In two southern Wisconsin lakes, Rock and Moose, the average growth in length of the trout was approximately equal from the first of May through mid-June of 1959, but growth in weight was better in Rock Lake, as reflected by the higher average condition factor, than that in Moose Lake (O. Brynildson, 1959c). In Fish Lake, another southern Wisconsin lake yearling rainbow trout stocked April 22, 1960, gained an average of 0.2 inch by May 1, but the average coefficient of condition dropped slightly during this short period.

Results From Other States

Little has been published on the results of studies on growth and coefficient of condition of stocked hatchery-reared trout. Like Wisconsin, considerable investigation on growth patterns of stocked trout may have been conducted in other states but little is available in the fishery literature.

The coefficient of condition (K) of hatchery-reared brook and rainbow trout (7 to 10 inches in length) decreased after the trout were released in Virginia streams during February and April. These (K) values never attained the higher (K) values of wild trout in the same streams (Klak, 1941). The coefficient of condition (R) of hatchery-reared brook brown (7 to 13 inches in length), and rainbow trout (7 to 14 inches in length) stocked during the fishing season, decreased only slightly after the first week in the Pigeon River, Michigan (Cooper and Benson, 1951). Hatchery-reared cutthroat trout, 2 and 3 years old, that were stocked in an enclosed section of an Alberta stream where wild trout were present, lost weight and suffered high mortality during the summer. Within the same period the

wild trout gained weight and their average coefficient of condition was equal to that of wild trout not in competition with the stocked trout (Miller, 1952).

Discussion

Growth and average coefficient of condition of stocked trout were generally good after such trout had resided for several months in the Wisconsin streams investigated. This good growth can probably be attributed mainly to lack of competition for food and space in the particular streams in which the trout were released. Streams which had sections containing good wild trout populations, as McKenzie and Big Roche-a-Cri Creeks, were stocked with hatchery-reared brown trout in sections with low concentrations of wild trout. These sections were subjected to heavy fishing pressure which resulted in high yields of stocked trout and a reduction in their density. Competition among the remaining trout was accordingly reduced, and hence growth in length and weight of the remaining trout was generally good during the warm months. The low average coefficient of condition of the stocked brown trout collected from McKenzie Creek in October, 1959, was probably a reflection of the high summer water temperatures in this stream in 1959.

The rapid growth in length and the high coefficient of condition of brown trout after release into fertile southern Wisconsin streams is attributed to an adequate food supply and a relatively long growing season. Moreover, growth of trout during the winter was good in southern Wisconsin streams, especially in those with moderate winter water temperatures (Mt. Vernon, Milner, Brewer, and Black Earth Creeks).

The rapid growth of brook trout in Mt. Vernon Creek during the winter months was also attributed to the availability of adequate food and space in a temperate environment (O. Brynildson, 1955a). Slow winter growth of brook trout in two different sections of Big Roche-a-Cri Creek was probably a reflection of low winter water temperatures, although lack of competition from resident trout, in one section (Adams County) and moderate winter water temperatures but severe competition from wild trout in the other (Waushara County). Fish-food organisms are considerably less dense in a sand county stream such as the Big Roche-a-Cri than in a southern Wisconsin stream such as Mt. Vernon Creek and severe competition for the available aquatic fish-food may be an important factor limiting growth of the trout especially during the cold months when no terrestrial food is available.

The progressive drop of the average coefficient of condition of the brook trout fingerlings stocked in September, 1959, in Valley Lake, Forest County, probably reflected severe competition for food as a result of the high standing crop of trout.

Slow growth rate in length and the low average coefficient of condition of the rainbow trout in the bog lakes of Chippewa County and Vilas County were associated with the age (older than 1 year) of the trout stocked, high density of the trout stock, high summer water temperatures, and low density of available fish-food organisms, especially *Daphnia* (Johnson, 1954; Johnson and Hasler, 1954; O. Brynildson, 1951, 1958). Except in Riley Lake, where competition was low, growth rate in length and weight of rainbow trout was not as rapid in the bog lakes as they were for rainbow trout stocked in Weber Lake, Vilas County (Burdick and Cooper, 1956), where water temperatures and living space were more suitable for rainbow trout.

The relatively low average coefficient of condition of the rainbow trout collected from Moose Lake, Waukesha County, as compared to that of rainbow trout from Rock Lake, Kenosha County, is probably a direct reflection of the composition of the zooplankton crop in Moose Lake during the spring of 1959. The majority of the species of planktonic Crustacea in plankton samples collected in early May, 1959, in Moose Lake appeared to be too small for the legal-sized trout to utilize as food. This observation was supported by the near-empty trout stomachs collected during the period the zooplankton was collected.

During the study in which data on growth of stocked hatchery-reared trout was collected, parallel information was also obtained on wild trout. In the streams that were extensively studied (Black Earth, Mt. Vernon, McKenzie, and Big Roche-a-Cri Creeks) the stocked brown trout grew as fast or faster and generally maintained a higher average coefficient of condition than the wild brown trout of the same age in the same sections of stream. Fall-stocked brook trout (10 months old) in Big Roche-a-Cri Creek grew as rapidly as their wild counterparts from October, 1957, to April, 1958. No data are available on relative growth of wild and stocked hatchery-reared rainbow trout.

The high coefficient of condition and rapid growth in length of the stocked brown trout may be a result of selective breeding in the trout hatcheries; e.g., this may result in hatchery-reared trout with better food conversion rates than wild strains would have. The rapid growth of stocked brook trout in Mt. Vernon Creek may have been partly due to selective breeding as well as to an excellent stream environment for this species.

The Pathology and Nutrition Research Group is studying the growth and coefficient of condition of stocked hatchery-reared trout and their relationship to nutrition and environmental factors in hatcheries along with field studies on survival. These are extremely important studies that could lead to a better understanding of the survival and growth potential of stocked hatchery-reared trout of different species and of the same species from different lots.

NEEDS FOR FURTHER STUDY

Considerable variation in findings of separate studies concerning stocked trout is evident in the foregoing presentation. Also apparent is the inability to fully explain the causes of such variation on the basis of information presently available. Therefore, further improvement in utilization of the hatchery product is dependent upon acquisition of additional information.

The most immediate need is to more adequately determine the extent of survival and return to the angler of hatchery-reared trout stocked at different ages and sizes, at different times of the year, and under various habitat conditions. It is particularly urgent that more data be obtained in the central and northern areas. Under present circumstances, it is suggested that such information be collected primarily under the area investigational program of the Fish Management Division with assistance and coordinated direction from the Fishery Research Section of the Research and Planning Division. The latter unit will also undertake such studies as an adjunct to other research in progress.

While the foregoing is applicable to both lakes and streams, the lack of well-documented information on lakes is the more acute. Stocking rates in lakes, which should be closely related to the carrying capacity and fishing pressure, need further study. The knowledge of such rates in relation to carrying capacity of northern soft-water lakes is especially important, since fishing intensity is not apt to be as great on those lakes as on southern Wisconsin lakes.

Additional studies should be conducted on movement of different species of trout stocked in streams at various times of the year so that releases can be made at sites to ensure optimum distribution of stocked trout.

Research on factors which affect mortality of trout must be continued. Biologists suspect that several environmental factors are working together and others separately in reducing population levels of stocked trout. The factors chiefly responsible for mortality are probably intra- and interspecific competition, predation, low vigor of stocked trout, lack of suitable habitat conditions, and in streams of low fertility, possibly limited fish-food production in winter which may have a direct effect or which may indirectly expose trout to environmental hazards while foraging for food.

Studies outlined above chiefly concern improved utilization of the current hatchery product. Concurrently, research on improvement of the hatchery product itself must be continued. Such work, involving experimental diets and selective breeding is now in progress at the Westfield station.

SUMMARY AND MANAGEMENT IMPLICATIONS

The data presented in this report support the following generalizations of significance to fish management:

1. To achieve maximum survival, trout should not be stocked during the fall in sections of streams that contain high populations of resident trout. Over-winter survival of fall-stocked trout was lowest (less than 30 per cent) under these conditions. Moreover, survival was relatively lower, other conditions being equal, where the entire stream quota was stocked at one time. Heavy stocking in the fall probably tends to create competition similar to that operating when trout are superimposed on high resident populations. Therefore, only partial quotas should be stocked in the fall in those streams where the normal quota is high.
2. Relatively good over-winter survival (40 to 55 per cent) of fall-stocked trout was obtained in stream sections with near- or freezing water temperatures (partial to complete ice cover) if water depth and instream cover was adequate and wild and stocked trout population densities were low. However, streams of this type, if stocked in the fall, should be stocked only with legal or near-legal sized trout because winter growth will be limited.
3. The best over-winter survival (above 60 per cent) and growth of fall-stocked trout in streams was achieved where the following conditions were met: (1) moderate winter water temperatures (ice cover rare), (2) adequate water depth and instream cover, and (3) low populations of resident trout. To permit general attainment of the minimum legal size of 6 inches by the opening of the angling season, trout stocked in the fall in such streams should be at least 5 inches in length.
4. Results of population estimates conducted from one to four weeks after the release of spring- or fall-stocked trout show that early mortality occurs soon after stocking. This mortality was greater on stocks of brown and rainbow trout stocked during September in Black Earth Creek and brown trout stocked in September in Mt. Vernon Creek than was that during the winter on these fish. Accordingly, consideration should be given in the spring stocking program to release of fish as close to the opening date as possible and during the early part of the angling season. Under such a plan more trout would be available to anglers and the loss due to natural mortality would be reduced.
5. Brown trout stocked in the fall tended to move upstream while those stocked in early spring generally drifted downstream. This fact should be considered when stocking sites are selected.
6. Brook trout stocked in the fall scattered themselves quite evenly above and below the stocking site, although population density was greatest at the stocking site. No evidence on movement of early spring-stocked brook trout is available.
7. Rainbow trout stocked in the fall moved only a short distance up and down from the release point. Those stocked in early spring moved farther downstream than upstream but not as far down as the brown trout stocked with them. Therefore, scatter-planting in the fall is apt to be more effective for rainbow than for brown trout.
8. Carry-over of trout stocked in streams during the spring or the previous fall to the end of the first angling season was limited, but carry-over of brown trout (especially fall-stocked) was the highest and this fish provided the most extended opportunity for

angler satisfaction. Over-winter survival of the stocked brown trout which survived an angling season was high.

9. Because stocked trout generally moved at least a mile above or below where they were released, stocking sites should be located a mile from posted land through which the stream flows.
10. Under an estimated 60 per cent creel census coverage, 14 to 18 per cent of the fall-stocked brook trout and 14 to 43 per cent of the spring-stocked brook trout were recorded creeled during the following trout fishing season on Big Roche-a-Cri Creek. Under an estimated 80 per cent creel census coverage, from 18 to 42 per cent of the spring-stocked brown trout and 34 to 47 per cent of the spring-stocked rainbow trout were recorded creeled during the following trout fishing season on Wisconsin streams investigated. Under a 100 per cent creel census coverage, 46 to 70 per cent of the spring-stocked rainbow trout were recorded creeled the following trout fishing season on small bog lakes.
11. The relative catchability of stocked brook and rainbow trout was approximately the same. Brown trout were the most difficult to catch. For put-and-take stocking, brook and rainbow trout would generally provide higher immediate yield in numbers to the angler.
12. Recent evidence indicates that fingerling and yearling rainbow trout stocked during fall or winter in lakes containing dense populations of competing fishes have lower survival and growth rates than yearling trout stocked in the same lakes during the spring when food supply is higher.
13. Growth of stocked trout during the warm months in central and northern streams was nearly as good as in southern streams, but growth of these trout during the cold months was better in the southern streams.
14. There was evidence that slow growth in length and low condition factors of rainbow and brook trout, stocked in Wisconsin lakes, were associated with either warm water temperatures, low density of available fish-food, high levels of standing crop of trout, or with a combination of these factors.
15. Further improvement in utilization of the current hatchery product and refinement of the generalizations presented above are dependent upon acquisition of additional information. It is suggested that this information be collected primarily under the area investigational program of the Fish Management Division, with assistance and coordinated direction from the Fishery Research Section of the Research and Planning Division. The lack of documented information on trout lakes is more acute than on streams and the need can best be met by initiation of a separate research project as proposed in the past and recently reiterated. Current research on improvement of the hatchery product itself must be continued, to develop a product better able to survive in a wild environment.

TABLE 1

Population Estimates of Fall- and Winter-stocked
Hatchery-reared Trout in Various Wisconsin Waters

Streams Stocked	County	Length of Study Area (Miles)	Number Stocked	Length (TL Inches) Range of Trout When Stocked	Date Stocked	Date of Estimate	Estimated Population in Percentage of Original Stock
BROWN TROUT							
Dell	Sauk	8.0	1,000	5-7	Oct. 15, 1958	Apr. 4-8, 1960	11.5
Dell	Sauk	8.0	4,500	4-6	Sep. 9, 1959	Apr. 4-8, 1960	36.3
Mt. Vernon	Dane	3.1	400 ^{a/}	6-8	Jan. 27, 1955	Apr. 4-13, 1955	60.2
Mt. Vernon	Dane	6.3	400 ^{a/}	5-7	Oct. 11, 1955	Apr. 4-19, 1956	68.0
Mt. Vernon	Dane	6.4	1,000	5-7	Sep. 27, 1957	Apr. 7-15, 1959	2.6
		6.4				Sep. 25--Oct. 6, 1959	0.2
		6.4				Apr. 18-22, 1960	0.0
Mt. Vernon	Dane	6.4	1,000	5-7	Oct. 24, 1958	Apr. 7-15, 1959	71.3
		6.4				Sep. 25--Oct. 6, 1959	7.1
		6.4				Apr. 18-22, 1960	5.0
Mt. Vernon	Dane	6.4	1,371	4-6	Sep. 8, 1959	Sep. 25--Oct. 6, 1959	66.0
		6.4				Apr. 18-22, 1960	49.2

Table 1. Population Estimates ... continued

Streams Stocked	County	Length of Study Area (Miles)	Number Stocked	Length (TL Inches) Range of Trout When Stocked	Date Stocked	Date of Estimate	Estimated Population in Percentage of Original Stock
Black Earth	Dane	4.3	400 ^{a/}	6-8	Jan. 25, 1955	Apr. 14-28, 1955	67.5
Black Earth	Dane	4.3	400 ^{a/}	5-7	Oct. 11, 1955	Mar. 19--Apr. 3, 1956	58.3
Black Earth	Dane	4.7	1,000	6-8	Oct. 23, 1956	Apr. 22-29, 1957	40.1
Black Earth	Dane	4.7	1,000	5-7	Sep. 14, 1957	Apr. 14-20, 1959	1.1
		4.7				Sep. 28--Oct. 8, 1959	0.1
Black Earth	Dane	4.7	1,000	5-7	Oct. 24, 1958	Apr. 14-20, 1959	56.2
		4.7				Sep. 28--Oct. 8, 1959	7.2
		5.4				Apr. 11-15, 1960	6.1
Black Earth	Dane	4.7	1,125	4-6	Sep. 8, 1959	Sep. 28--Oct. 8, 1959	63.0
		5.4				Apr. 11-15, 1960	54.2
Harker-Lee	Iowa	2.0	618	6-8	Oct. 31, 1956	Mar. 27--Apr. 1, 1957	52.4
		2.0				Sep. 10-13, 1957	4.0
Milner	Grant	2.8	300	5-7	Sep. 21, 1955	Mar. 20-24, 1956	73.7
		2.8				Sep. 10-14, 1956	7.7
Citron	Crawford	0.3	500	5-7	Nov. 20, 1957	Mar. 25-27, 1958	40.2
Camp	Richland	2.0	500	5-6	Oct. 31, 1958	Apr. 21-23, 1959	38.4

Table 1. Population Estimates ... continued

Streams Stocked	County	Length of Study Area (Miles)	Number Stocked	Length (TL Inches) Range of Trout When Stocked	Date Stocked	Date of Estimate	Estimated Population in Percentage of Original Stock
Brewer	Juneau	4.0	1,092	3-6	Oct. 11, 1955	Apr. 8-18, 1957	3.5
Brewer	Juneau	4.0	1,163	5-7	Oct. 3, 1956	Apr. 8-18, 1957	57.2
Big Roche-a-Cri	Adams- ^{b/}	11.6	500	4-6	Oct. 16, 1958	Mar. 26--Apr. 3, 1959	55.6
	Waushara	11.6				Sep. 19--Oct. 1, 1959	21.4
Willow	Waushara	11.8	3,000	4-6	Sep. 9, 1959	Sep. 14--Oct. 13, 1960	60.9
						Apr. 4-13, 1960	32.9
Peterson	Waupaca	3.7	2,080	4-6	Sep. 9, 1959	Sep. 21--Oct. 2, 1960	55.5
						Mar. 21-25, 1960	26.9
McKenzie	Polk	3.4	1,125	6-7	Oct. 14, 1957	Mar. 24-29, 1958	57.2
		3.4				Oct. 6-16, 1958	3.3
		3.6				Oct. 5-9, 1959	0.8
Lower Willow	St. Croix	4.0	77,000	2-3	Aug.--Sep., 1957	Apr., 1958	18.2
Lower Willow	St. Croix	4.0	60,157	2-3	Aug.--Sep., 1959	Apr., 1960	24.9

Table 1. Population Estimates ... continued

Streams Stocked	County	Length of Study Area (Miles)	Number Stocked	Length (TL Inches) Range of Trout When Stocked	Date Stocked	Date of Estimate	Estimated Population in Percentage of Original Stock
BROOK TROUT							
Mt. Vernon	Dane	6.4 6.4 6.4	660	4-6	Sep. 9, 1959	Sep. 25--Oct. 6, 1959 Apr. 18-22, 1960 Sep. 28--Oct. 4, 1960	63.2 15.8 0.0
Mt. Vernon	Dane	6.4 6.4 6.4	660	5-7	Sep. 9, 1959	Sep. 25--Oct. 6, 1959 Apr. 18-22, 1960 Sep. 28--Oct. 4, 1960	50.3 17.1 0.6
Dent	Shawano	3.0 3.0	1,400	5-6	Oct. 1, 1953	Apr. 22-23, 1954 Sep. 16-17, 1954	25.4 0.9
Big Roche-a-Cri	Adams-Waushara <u>c/</u>	11.6 11.6 11.6 11.6	1,200	5-7	Sep. 26, 1957	Mar. 31--Apr. 24, 1958 Sep. 16-30, 1958 Mar. 26--Apr. 3, 1959 Sep. 19--Oct. 1, 1959	41.7 0.7 0.2 0.3
Big Roche-a-Cri	Adams-Waushara <u>c/</u>	11.6 11.6	500	5-7	Oct. 13, 1958	Mar. 26--Apr. 3, 1959 Sep. 19--Oct. 1, 1959	39.4 0.0
Big Roche-a-Cri	Adams-Waushara <u>b/</u>	11.6 11.6	500	5-7	Oct. 14, 1958	Mar. 26--Apr. 3, 1959 Sep. 19--Oct. 1, 1959	56.8 0.4

Table 1. Population Estimates ... continued

Streams Stocked	County	Length of Study Area (Miles)	Number Stocked	Length (TL Inches) Range of Trout When Stocked	Date Stocked	Date of Estimate	Estimated Population in Percentage of Original Stock
RAINEOW TROUT							
Black Earth	Dane	4.7 5.4 5.0	750	7-9	Sep. 10, 1959	Sep. 28--Oct. 8, 1959 Apr. 11-15, 1960 Sep. 20-27, 1960	75.9 60.3 0.3
Black Earth	Dane	4.7 5.4 5.0	750	6-8	Sep. 10, 1959	Sep. 28--Oct. 8, 1959 Apr. 11-15, 1960 Sep. 20-27, 1960	58.9 42.3 1.1
Milner	Grant	2.8 2.8	300	5-8	Sep. 21, 1955	Mar. 20-24, 1956 Sep. 10-14, 1956	61.7 0.0
Little Brule (Fish Refuge)	Douglas	1.2 1.2	500	5-7	Oct. 22, 1958	Nov. 11-13, 1958 Apr. 21-22, 1959	86.6 10.4
<u>Lake Stocked</u>							
Rock Lake (46 acres)	Kenosha	--	3,050	8-10	Feb. 17, 1960	Apr. 23, 1960	92.5

a/ These trout were stocked and subsequently removed for food habits studies.

b/ These groups of trout were stocked in Adams County.

c/ These groups of trout were stocked in Waushara County.

TABLE 2

Population Estimates of Spring- and Summer-stocked
Hatchery-reared Trout in Various Wisconsin Waters

Streams Stocked	County	Length of Study Area (Miles)	Number Stocked	Length (TL Inches) Range of Trout When Stocked	Date Stocked	Date of Estimate	Estimated Population in Percentage of Original Stock
BROWN TROUT							
Mt. Vernon	Dane	3.1	2,871	6-9	Apr. 5, 1954	Apr. 19-28, 1954	68.4
		3.1				Sep. 15-20, 1954	2.8
		3.1				Apr. 4-13, 1955	2.3
		3.1				Sep. 8-16, 1955	0.5
		6.1				Apr. 4-19, 1956	0.2
		3.1				Sep. 8-14, 1956	0.0
Mt. Vernon	Dane	3.1	2,871	6-9	Mar. 15, 1955	Apr. 4-13, 1955	46.4
		3.1				Sep. 8-16, 1955	2.4
		6.1				Apr. 4-19, 1956	2.2
		3.1				Sep. 8-14, 1956	0.1
Mt. Vernon	Dane	6.1	1,436	6-9	Mar. 15, 1956	Apr. 4-19, 1956	82.0
		3.1				Sep. 8-14, 1956	2.7
Mt. Vernon	Dane	6.4	1,872	6-9	Mar. 28, 1958	Apr. 7-15, 1959	2.0
		6.4				Sep. 25--Oct. 6, 1959	0.2

Table 2. Population Estimates ... continued

Streams Stocked	County	Length of Study Area (Miles)	Number Stocked	Length (TL Inches) Range of Trout When Stocked	Date Stocked	Date of Estimate	Estimated Population in Percentage of Original Stock
Mt. Vernon	Dane	6.4	1,872	7-9	Apr. 17, 1959	Sep. 25--Oct. 6, 1959	1.9
		6.4				Apr. 18-22, 1960	1.4
Black Earth	Dane	4.3	2,625	6-9	Apr. 20, 1953	Apr. 6-16, 1954	2.6
		4.3				Sep. 21--Oct. 5, 1954	0.3
		4.3				Apr. 14-28, 1955	0.1
Black Earth	Dane	4.3	2,625	7-9	Apr. 1, 1954	Apr. 6-16, 1954	68.4
		4.3				Sep. 21--Oct. 5, 1954	3.6
		4.3				Apr. 14-28, 1955	3.0
		4.3				Sep. 19-28, 1955	0.6
		4.3				Mar. 19--Apr. 3, 1956	0.2
Black Earth	Dane	4.3	2,625	6-9	Mar. 16, 1955	Apr. 14-28, 1955	65.8
		4.3				Sep. 19-28, 1955	2.9
		4.3				Mar. 19--Apr. 3, 1956	2.7
		4.3				Sep. 15-21, 1956	0.2
		4.7				Apr. 22-29, 1957	0.4
		4.7				Sep. 28--Oct. 8, 1959	(one fish)
		5.4				Apr. 11-15, 1960	0.0
Black Earth	Dane	4.3	1,312	6-9	Mar. 15, 1956	Mar. 19--Apr. 3, 1956	97.4
		4.3				Sep. 15-21, 1956	3.4
		4.7				Apr. 22-29, 1957	1.3
		4.7				Sep. 28--Oct. 8, 1959	0.2
		5.4				Apr. 11-15, 1960	0.0

Table 2. Population Estimates ... continued

Streams Stocked	County	Length of Study Area (Miles)	Number Stocked	Length (TL Inches) Range of Trout When Stocked	Date Stocked	Date of Estimate	Estimated Population in Percentage of Original Stock
Black Earth	Dane	4.7	1,628	6-9	Mar. 28, 1958	Apr. 14-20, 1959	1.1
Black Earth	Dane	4.7 5.4	1,225	7-9	Apr. 27, 1959	Sep. 28--Oct. 8, 1959 Apr. 11-15, 1960	2.0 2.0
Harker-Lee	Iowa	2.0	716	7-11	Apr. 22, 1957	Sep. 10-13, 1957	3.1
Trout	Iowa	5.5	12,440	2-3	Jun. 16, 1960	Sep. 12-17, 1960	22.1
Milner	Grant	2.8 2.8 2.8 2.8	500	5-8	Mar. 16, 1955	Mar. 29--Apr. 6, 1955 Sep. 12-15, 1955 Mar. 20-24, 1956 Sep. 10-14, 1956	49.4 11.2 4.6 0.4
Citron	Crawford	0.3	250	6-8	Mar. 10, 1958	Mar. 25-27, 1958	79.2
Brewer	Juneau	4.0	1,092	6-10	Apr. 13, 1956	Apr. 8-18, 1957	5.7
Brewer	Juneau	4.0	1,160	5-8	Apr. 4, 1957	Apr. 8-18, 1957	68.3
Big Roche-a-Cri	Adams-Waushara	11.6	500	6-9	Mar. 23, 1959	Sep. 19--Oct. 1, 1959	18.2
Clam	Burnett	1.0	800	6-8	Apr. 2, 1954	Apr. 22-23, 1954	48.3

Table 2. Population Estimates ... continued

Streams Stocked	County	Length of Study Area (Miles)	Number Stocked	Length (TL Inches) Range of Trout When Stocked	Date Stocked	Date of Estimate	Estimated Population in Percentage of Original Stock
McKenzie	Polk	3.4	4,500	6-9	Apr.--Jun. 1956	Mar. 26-30, 1957	2.7
McKenzie	Polk	3.4	1,000	6-8	Mar. 19, 1957	Mar. 26-30, 1957	72.7
		3.4				Oct. 7-11, 1957	2.8
		3.4				Mar. 24-29, 1958	5.2
		3.4				Oct. 6-16, 1958	1.2
		3.6				Oct. 5-9, 1959	0.0
McKenzie	Polk	3.4	2,250	7-8	May 28, 1957	Oct. 7-11, 1957	7.4
		3.4				Mar. 24-29, 1958	7.6
		3.4				Oct. 6-16, 1958	0.4
		3.6				Oct. 5-9, 1959	0.0
McKenzie	Polk	3.4	2,500	6-8	Mar. 20, 1958	Mar. 24-29, 1958	100.0
		3.4				Oct. 6-16, 1958	3.2
		3.6				Oct. 5-9, 1959	0.4
McKenzie	Polk	3.4	3,500	6-10	Apr. 15, 1959	Oct. 5-9, 1959	3.6
Little Brule (Fish Refuge)	Douglas	1.2	800	7-10	Apr. 17, 1958	May 20-21, 1958	39.5
						Oct. 1-2, 1958	1.8

Table 2. Population Estimates ... continued

Streams Stocked	County	Length of Study Area (Miles)	Number Stocked	Length (TL Inches) Range of Trout When Stocked	Date Stocked	Date of Estimate	Estimated Population in Percentage of Original Stock
BROOK TROUT							
Mt. Vernon	Dane	3.1	1,700	4-8	Jul. 21, 1953	Apr. 19-28, 1954	9.5
Big Roche-a-Cri	Adams-Waushara ^{a/}	6.1	1,000	6-8	May 3, 1957	Sep. 9-23, 1957	0.2
		11.6				Mar. 31--Apr. 24, 1958	0.0
Big Roche-a-Cri	Adams-Waushara ^{a/}	11.6	500	7-10	Mar. 18, 1959	Mar. 26--Apr. 3, 1959	56.2
		11.6				Sep. 19--Oct. 1, 1959	0.1
RAINBOW TROUT							
Mt. Vernon	Dane	6.3	1,436	7-10	Mar. 15, 1956	Apr. 4-19, 1956	70.1
		3.1				Sep. 8-14, 1956	0.3
Black Earth	Dane	4.3	1,312	7-10	Mar. 15, 1956	Mar. 19--Apr. 3, 1956	94.6
		4.3				Sep. 15-21, 1956	0.1
		4.7				Apr. 22-29, 1957	0.0
Milner	Grant	2.8	500	6-10	Mar. 16, 1955	Mar. 29--Apr. 6, 1955	100.0
		2.8				Sep. 12-15, 1955	0.4
Elk	Chippewa	1.0	1,000	7-11	Apr. 6, 1954	Apr. 29-30, 1954	25.7

^{a/} These groups of trout were stocked in Waushara County.

Table 3. Relative Number ... continued

Streams Stocked	County	Length of Study Area (Miles)	Number Stocked	Length (TL Inches) Range of Trout When Stocked	Date Stocked	Date of Collection	Percentage of the Original Stocks Collected	Relative Number of the Original Stocks Collected	
								Fall	Spring
Brewer	Juneau	3.7	1,178	6-8	Dec. 3, 1954	Apr. 11-16, 1955	42	1 : 0.9	
			1,167	5-9	Apr. 7, 1955	Apr. 11-16, 1955	38		
		4.0		Dec. 3, 1954	Apr. 17-20, 1956	3	1 : 0.7		
		Apr. 7, 1955	Apr. 17-20, 1956	2					
Brewer	Juneau	4.0	1,092	3-6	Oct. 11, 1955	Apr. 17-20, 1956	9	1 : 1.1	
			1,092	6-10	Apr. 13, 1956	Apr. 17-20, 1956	10		
BROOK TROUT									
Tank	Jackson	3.8	640	6-8	Oct. 2, 1952	May 7--Jun. 2, 1953	2	1 : 13.0	
			663	6-8	Apr. 29, 1953	May 7--Jun. 2, 1953	26		
N. Branch Trempealeau	Jackson	4.3	681	6-8	Oct. 2, 1952	May 11-20, 1953	4	1 : 3.8	
			684	6-8	Apr. 29, 1953	May 11-20, 1953	15		

TABLE 4

Yield to Anglers from Stocked Hatchery-reared Trout in Wisconsin Waters

Waters Stocked	Original		Date Creeled	Estimated Number ^{a/} of Orig- inal Stock Available in April	Percentage of Original Stock Recorded in Catch	Percentage of Estimated Available April Stock Recorded in Catch	Length Range (TL Inches)	
	Number Stocked	Date Stocked					Stocked	Creeled
BROWN TROUT								
Willow Creek	4,500	Oct. 16, 1952	May 2-3, 1953	--	0.2	--	6-7	6-8
Waushara County	4,500	Apr. 29, 1953	May 2-3, 1953	--	2.3	--	6-8	6-8
Rocky Run Creek	2,887	Nov. 10, 1952	May 2-3, 1953	--	0.2	--	6-7	7-8
Columbia County	2,887	Apr. 9, 1953	May 2-3, 1953	--	1.1	--	7-8	7-8
Dell Creek	4,500	Nov. 7, 1952	May 2-3, 1953	--	0.9	--	6-7	7-9
Sauk County								
Citron Creek	500	Nov. 20, 1957	May 1, 1958	201	5.4	13.4	6-7	7-9
Crawford County	500	Mar. 10, 1958	May 1, 1958	410	8.2	20.2	7-9	7-10
Mt. Vernon Creek	2,871	Apr. 5, 1954	May 1-2, 1954	1,965	5.5	8.0	6-9	7-9
Dane County			Apr. 30--May 1, 1955	65	0.2	7.7		12-15
			Apr. 28--Sep. 7, 1956	i	--	57.1		16-18
Mt. Vernon Creek	400	Jan. 27, 1955	Apr. 30--May 1, 1955	241	3.5	5.8	6-8	7-9
Mt. Vernon Creek	2,871	Mar. 15, 1955	Apr. 30--May 1, 1955	1,333	5.5	11.9	6-9	7-9
			May 1--Sep. 7, 1956	62	1.2	54.8		10-15

le 4. Yield to Anglers ... continued

Creeks	Original Number Stocked	Date Stocked	Date Creeled	Estimated Number ^{a/} of Original Stock Available in April	Percentage of Original Stock Recorded in Catch	Percentage of Estimated Available April Stock Recorded in Catch	Length Range (TL Inches)	
							Stocked	Creeled
Vernon Creek	1,436	Mar. 15, 1956	Apr. 28--Jun. 30, 1956 Jul. 1--Sep. 7, 1956	1,183 --	36.2 5.6	43.9 6.9	6-9	7-11
Vernon Creek	1,371	Sep. 8, 1959	May 1-28, 1960 May 28--Jun. 30, 1960	675 --	18.2 3.0	37.0 6.1	4-6	7-12 7-12
Black Earth Creek Deer County	2,625	Apr. 20, 1953	May 2-3, 1953 May 1-2, 1954 Apr. 30--May 1, 1955	-- 68 3	2.0 0.5 0.0	-- 20.6 0.0	6-8	7-8 12-15 --
Black Earth Creek	2,625	Apr. 1, 1954	May 1-2, 1954 Apr. 30--May 1, 1955	1,796 78	6.9 0.2	10.1 6.4	7-9	7-9 12-15
Black Earth Creek	400	Jan. 25, 1955	Apr. 30--May 1, 1955	270	6.5	9.6	6-8	7-9
Black Earth Creek	2,625	Mar. 16, 1955	Apr. 30--May 1, 1955 Apr. 28--Sep. 7, 1956	1,727 72	8.2 0.8	12.5 27.8	6-9	7-9 12-17
Black Earth Creek	1,312	Mar. 15, 1956	Apr. 28--Jun. 30, 1956 Jul. 1--Sep. 7, 1956	1,278 --	33.4 8.6	34.8 8.3	6-9	7-10 9-11
Black Earth Creek	1,125	Sep. 8, 1959	May 1-28, 1960 May 28--Jun. 30, 1960	610 --	12.6 5.9	23.3 10.8	4-6	7-12 7-12

Table 4. Yield to Anglers ... continued

Waters Stocked	Original Number Stocked	Date Stocked	Date Creeled	Estimated Number ^{a/} of Original Stock Available in April	Percentage of Original Stock Recorded in Catch	Percentage of Estimated Available April Stock Recorded in Catch	Length Range (TL Inches)	
							Stocked	Creeled
Milner Branch Grant County	500	Mar. 16, 1955	Apr. 30--May 1, 1955	198	5.6	14.2	5-8	6-8
Big Roche-a-Cri Creek Adams County	700 ^{b/}	Apr. 22, 1958	May 1--Sep. 7, 1958	--	5.7	--	6-9	7-10
Big Roche-a-Cri Creek Adams County	500	Oct. 16, 1958	May 1--Sep. 7, 1959	286	6.2	10.8	4-6	6-11
	500	Mar. 23, 1959	May 1--Sep. 7, 1959	500	17.4	17.4	6-9	6-12
South Fork of Willow River St. Croix County	492	Apr. 2, 1953	May 2-3, 1953	--	3.0	--	6-8	6-8
			May 9-10, 1953	--	1.4	--	6-8	6-8
			May 15-17, 1953	--	1.6	--	6-8	6-9
South Fork of Willow River	500	May 15, 1953	May 15-17, 1953	--	0.8	--	6-8	6-8
McKenzie Creek Polk County	4,500	Apr.--Jun., 1956	May 1--Sep. 7, 1957	117	1.2	47.9	6-9	9-13
McKenzie Creek	1,000	Mar. 19, 1957	May 1--Jul. 2, 1957	727	16.5	22.7	6-8	7-10
			Jul. 2--Sep. 7, 1957	--	1.3	1.8		

Table 4. Yield to Anglers ... continued

Waters Stocked	Original Number Stocked	Date Stocked	Date Creeled	Estimated Number ^{a/} of Orig- inal Stock Available in April	Percentage of Original Stock Recorded in Catch	Percentage of Estimated Available April Stock Recorded in Catch	Length Range (TL Inches)	
							Stocked	Creeled
McKenzie Creek	2,250	May 28, 1957	May 28--Jul. 2, 1957 Jul. 3--Sep. 7, 1957	-- --	28.2 5.1	-- --	7-8	8-10
Turk Lake Chippewa County	400	Apr. 16, 1948	Jun. 1--Oct. 31, 1948	--	5.0	--	5-7	7-11
Timber Coulee Pond Vernon County	750	Oct. 3, 1956	May 1-4, 1957	--	12.0	--	5-6	6-9
BROOK TROUT								
Tank Creek Jackson County	640 663	Oct. 2, 1952 Apr. 29, 1953	May 2-3, 9-10, 1953 May 2-3, 9-10, 1953	-- --	1.6 10.4	-- --	6-8 6-8	-- --
N. Branch Trempealeau Jackson County	681 684	Oct. 2, 1952 Apr. 29, 1953	May 2-3, 9-10, 1953 May 2-3, 9-10, 1953	-- --	5.4 15.5	-- --	6-8 6-8	-- --
Petenwell Ditch Juneau County	2,000	Sep. 20, 1956	May 1, 1957	--	11.9	--	4-7	8-12

Table 4. Yield to Anglers ... continued

Waters Stocked	Original Number Stocked	Date Stocked	Date Creeled	Estimated Number ^{a/} of Orig- inal Stock Available in April	Percentage of Original Stock Recorded in Catch	Percentage of Estimated Available April Stock Recorded in Catch	Length Range (TL Inches)	
							Stocked	Creeled
Big Roche-a-Cri Creek Waushara County	1,200	Sep. 26, 1957	May 1--Jun. 30, 1958	500	15.8	36.7	5-7	7-10
			Jul. 1--Sep. 7, 1958	--	0.3	0.8		
Waushara County	1,000	May 3, 1957	May 3--Jul. 2, 1957	--	40.2	--	6-8	6-9
			Jul. 3--Sep. 7, 1957	--	2.7	--		
Big Roche-a-Cri Creek Waushara County	500	Oct. 13, 1958	May 1--Sep. 7, 1959	197	14.2	36.0	5-7	6-8
			Mar. 18, 1959	May 1--Sep. 7, 1959	281	13.8	24.6	7-10
Big Roche-a-Cri Creek Adams County	500	Oct. 14, 1958	May 1--Sep. 7, 1959	284	18.0	31.7	5-7	6-8
Mt. Vernon Creek Dane County	1,700	Jul. 21, 1953	May 1-2, 1954	162	1.7	17.9	4-8	9-12
Mt. Vernon Creek	1,320	Sep. 9, 1959	May 1-28, 1960	217	7.0	42.3	5-7	7-11
			May 28--Jun. 30, 1960	--	1.2	7.5		7-12
Token Creek Pond (0.4 acre) Dane County	175	Apr. 14, 1954	May 1-2, 1954	--	13.0	--	7-8	7-8

Table 4. Yield to Anglers ... continued

Waters Stocked	Original Number Stocked	Date Stocked	Date Creeled	Estimated Number ^a / of Orig- inal Stock Available in April	Percentage of Original Stock Recorded in Catch	Percentage of Estimated Available April Stock Recorded in Catch	Length Range (TL Inches)	
							Stocked	Creeled
Sabin Pond (1 acre)	705	Jun. 21, 1955						
Richland County	800	Jul. 1, 1955						
	420	Jul. 15, 1955	Jun. 22--Sep. 7, 1955	--	55.1	--	7-8	--
Cataract Pond (3 acres)	300	May 3, 1956	May 5-6, 1956	--	16.3	--	7-8	7-8
Monroe County								
Risk Creek Pond (3.5 acres)	955	Sep. 1, 1956	May 1, 1957	--	17.2	--	3-7	6-10
Adams County								
RAINBOW TROUT								
Mt. Vernon Creek Dane County	1,436	Mar. 15, 1956	Apr. 28--Jun. 30, 1956 Jul. 1--Sep. 7, 1956	1,007 --	30.2 4.2	43.7 6.1	7-10	7-11
Black Earth Creek Dane County	200	Apr. 14, 1954	May 1-2, 1954	--	11.5	--	9-11	9-11
Black Earth Creek	1,312	Mar. 15, 1956	Apr. 28--Jun. 30, 1956 Jul. 1--Sep. 7, 1956	1,241 --	43.1 3.7	45.5 4.0	7-10	7-11
Black Earth Creek	1,500	Sep. 10, 1959	May 1-28, 1960 May 28--Jun. 30, 1960	770 --	23.1 4.9	44.9 9.6	6-9	9-15 11-16

Table 4. Yield to Anglers ... continued

Waters Stocked	Original Number Stocked	Date Stocked	Date Creeled	Estimated Number ^{a/} of Orig- inal Stock Available in April	Percentage of Original Stock Recorded in Catch	Percentage of Estimated Available April Stock Recorded in Catch	Length Range (TL Inches)	
							Stocked	Creeled
Cather Lake	1,260	May 7, 1952	May 7--Oct. 31, 1952	--	11.0	--	6-8	7-11
Riley Lake (17 acres) Chippewa County	600	May 4, 1951	May 4--Oct. 31, 1951 May 1--Oct. 31, 1952	-- --	27.0 8.7	-- --	6-8	8-12 12-15
Riley Lake	600	May 7, 1952	Aug. 1--Oct. 31, 1952	--	5.6	--	6-8	10-11
Timber Coulee Pond (2 acres) Vernon County	750	Oct. 3, 1956	May 1-4, 1957	--	1.2	--	4-7	6-8
Cataract Pond (3 acres) Monroe County	2,000	Sep. 16, 1955	Apr. 28-29--May 5-6, 1957	--	3.9	--	--	6-8
Cataract Pond	1,135	Sep. 21, 1956	May 1, 1957	--	7.7	--	2-4	6-10
Token Creek Pond (0.4 acre) Dane County	825	Apr. 14, 1954	May 1-2, 1954	--	37.0	--	7-9	7-9
Rock Lake (45 acres) Kenosha County	4,600 2,110	Feb. 26, 1959 Apr. 2, 1959	May 1--Jun. 30, 1959 May 1--Jun. 30, 1959	-- --	6.1 3.8	-- --	7-10 7-10	8-12 8-12

Table 4. Yield to Anglers ... continued

Waters Stocked	Original Number Stocked	Date Stocked	Date Creeled	Estimated Number ^{a/} of Orig- inal Stock Available in April	Percentage of Original Stock Recorded in Catch	Percentage of Estimated Available April Stock Recorded in Catch	Length Range (TL Inches)	
							Stocked	Creeled
Milner Branch Grant County	500	Mar. 16, 1955	Apr. 30--May 1, 1955	500	19.8	--	6-10	7-11
South Fork of Willow River St. Croix County	486	Apr. 1, 1953	May 2-3, 1953	--	19.3	--	7-10	7-10
			May 9-10, 1953	--	2.5	--	7-10	7-10
			May 15-17, 1953	--	1.2	--	7-10	7-10
South Fork of Willow River	496	May 15, 1953	May 15-17, 1953	--	10.5	--	7-9	7-9
Turk Lake (11 acres) Chippewa County	400	Apr. 16, 1948	Jun. 1--Oct. 31, 1948	--	16.2	--	5-7	8-11
Turk Lake	880	May 4, 1951	May 4--Oct. 31, 1951	--	46.5	--	6-8	8-11
Turk Lake	352	May 4, 1951	May 4--Oct. 31, 1951	--	70.3	--	10-12	11-13
Turk Lake	2,180	May 7, 1952	May 7--Oct. 31, 1952	--	24.8	--	6-8	7-11
Cather Lake (10 acres) Chippewa County	840	May 4, 1951	May 4--Oct. 31, 1951	--	57.9	--	6-8	8-11
Cather Lake	50	May 4, 1951	May 4--Oct. 31, 1951	--	70.0	--	10-12	11-14

Table 4. Yield to Anglers ... continued

Waters Stocked	Original Number Stocked	Date Stocked	Date Creeled	Estimated Number ^{a/} of Orig- inal Stock Available in April	Percentage of Original Stock Recorded in Catch	Percentage of Estimated Available April Stock Recorded in Catch	Length Range (TL Inches)	
							Stocked	Creeled
Moose Lake (74 acres) Waukesha County	9,792	Apr. 1, 1959	May 1--Jun. 30, 1959	--	9.2	--	7-10	7-11
Fish Lake (252 acres) Dane County	10,000	Feb. 16, 1960	May 1--Jul. 9, 1960	--	5.4	--	7-10	7-12
	10,000	Apr. 22, 1960	May 1--Jul. 9, 1960	--	14.4	--	8-11	8-13
Pallette Lake (169 acres) Vilas County	8,550	Oct. 6, 1959	Oct. 6--Feb. 16, 1960	--	0.7	--	6-8	6-9
			Feb. 16--Apr. 15, 1960	--	38.4	--		7-9
	8,550	Feb. 16, 1960	Apr. 15--Aug. 18, 1960	--	1.3	--	6-9	7-10
			Feb. 16--Apr. 15, 1960	--	31.2	--		6-9
			Apr. 15--Aug. 18, 1960	--	3.9	--	7-11	

^{a/} Where no population estimate of the original stock was made, the number of trout available to anglers at the onset of the trout fishing season was unknown, and the corresponding place in the table has been left vacant.

^{b/} These trout were stocked directly below the 11.7 mile census area.

TABLE 5

Relative Catchability of Legal-sized Yearling Brown,
Rainbow, and Brook Trout in Various Wisconsin Waters ^{a/}

Species, Waters, and Period of Creel Census	Date Stocked	Estimated Number ^{b/} of Original Stock Available	Percentage of Original or Estimated Stock Recorded in Catch	Relative Catchability
BROWN TO RAINBOW				
<u>Turk Lake (11 acres), Chippewa County</u>				
Creel census Jun. 15--Oct. 31, 1948				
Brown trout (400)	Apr. 16, 1948	--	5 ^{c/}	1:3.2
Rainbow trout (400)	Apr. 16, 1948	--	16	
<u>South Fork of Willow River, St. Croix County</u>				
Creel census May 2-3, 9-10, 1953				
Brown trout (492)	Apr. 2, 1953	--	4	1:5.5
Rainbow trout (486)	Apr. 1, 1953	--	22	

Table 5. Relative Catchability ... continued

Species, Waters, and Period of Creel Census	Date Stocked	Estimated Number ^{b/} of Original Stock Available	Percentage of Original or Estimated Stock Recorded in Catch	Relative Catchability
Creel census May 15-17, 1953				
Brown trout (500)	May 15, 1953	--	1	1:10.0
Rainbow trout (496)	May 15, 1953	--	10	
<u>Lower Willow River and Race, St. Croix County</u>				
Creel census Apr. 30--May 8, 1955				
Brown trout (700)	Apr. 1955	--	8	1:2.6
Rainbow trout (700)	Apr. 1955	--	21	
<u>Ten Mile Creek, Wood County</u>				
Creel census Apr. 30--May 8, 1955				
Brown trout (1,006)	Apr. 1955	--	17	1:0.6
Rainbow trout (991)	Apr. 1955	--	10	

Table 5. Relative Catchability ... continued

Species, Waters, and Period of Creel Census	Date Stocked	Estimated Number ^{b/} of Original Stock Available	Percentage of Original or Estimated Stock Recorded in Catch	Relative Catchability
<u>Stockwell Creek</u> <u>Jackson County</u>				
Creel census Apr. 30--May 8, 1955				
Brown trout (401)	Apr. 1955	--	6	1:2.3
Rainbow trout (400)	Apr. 1955	--	14	
<u>Bohemian Valley Creek,</u> <u>La Crosse County</u>				
Creel census Apr. 30--May 8, 1955				
Brown trout (609)	Apr. 1955	--	28	1:0.9
Rainbow trout (617)	Apr. 1955	--	25	

Table 5. Relative Catchability ... continued

Species, Waters, and Period of Creel Census	Date Stocked	Estimated Number ^{b/} of Original Stock Available	Percentage of Original or Estimated Stock Recorded in Catch	Relative Catchability
<u>Germantown Creek, Richland County</u>				
Creel census Apr. 30--May 8, 1955				
Brown trout (501)	Apr. 1955	--	9	1:2.0
Rainbow trout (503)	Apr. 1955	--	18	
<u>Black Earth Creek, Dane County</u>				
Creel census May 1-2, 1954				
Brown trout (2,625)	Apr. 1, 1954	1,796	10	1:1.2
Rainbow trout (200)	Apr. 14, 1954	--	12	

Table 5. Relative Catchability ... continued

Species, Waters, and Period of Creel Census	Date Stocked	Estimated Number ^{b/} of Original Stock Available	Percentage of Original or Estimated Stock Recorded in Catch	Relative Catchability
<u>Black Earth Creek Dane County</u>				
Creel census Apr. 28--Sep. 7, 1956				
Brown trout (1,312)	Mar. 15, 1956	1,266	43	1:1.2
Rainbow trout (1,312)	Mar. 15, 1956	1,228	50	
<u>Black Earth Creek, Dane County</u>				
Creel census May 1--Jun. 30, 1960				
Brown trout (1,125)	Sep. 8, 1959	610	34	1:1.6
Rainbow trout (1,500)	Sep. 10, 1959	770	54	

Table 5. Relative Catchability ... continued

Species, Waters, and Period of Creel Census	Date Stocked	Estimated Number ^{b/} of Original Stock Available	Percentage of Original or Estimated Stock Recorded in Catch	Relative Catchability
<u>Mt. Vernon Creek, Dane County</u>				
Creel census Apr. 28--Sep. 7, 1956				
Brown trout (1,436)	Mar. 15, 1956	1,188	51	1:1.0
Rainbow trout (1,436)	Mar. 15, 1956	970	50	
<u>Milner Branch, Grant County</u>				
Creel census Apr. 30--May 1, 1955				
Brown trout (500)	Mar. 16, 1955	247	14	1:4.3
Rainbow trout (500)	Mar. 16, 1955	500	20	

Table 5. Relative Catchability ... continued

Species, Waters, and Period of Creel Census	Date Stocked	Estimated Number ^{b/} of Original Stock Available	Percentage of Original or Estimated Stock Recorded in Catch	Relative Catchability
BROWN TO BROOK				
<u>Lower Willow River and Race, St. Croix County</u>				
Creel census Apr. 30--May 8, 1955				
Brown trout (700)	Apr. 1955	--	8	1:3.8
Brook trout (700)	Apr. 1955	--	43	
<u>Gilbert Creek, Dunn County</u>				
Creel census Apr. 30--May 8, 1955				
Brown trout (500)	Apr. 1955	--	10	1:2.4
Brook trout (500)	Apr. 1955	--	24	

Table 5. Relative Catchability ... continued

Species, Waters, and Period of Creel Census	Date Stocked	Estimated Number ^{b/} of Original Stock Available	Percentage of Original or Estimated Stock Recorded in Catch	Relative Catchability
<u>Mt. Vernon Creek, Dane County</u>				
Creel census May 1-2, 1954				
Brown trout (2,871)	Apr. 5, 1954	1,965	8	1:2.2
Brook trout (1,700)	Jul. 21, 1953	162	18	
<u>Mt. Vernon Creek, Dane County</u>				
Creel census May 1--Jun. 30, 1960				
Brown trout (1,371)	Sep. 8, 1959	675	43	1:1.2
Brook trout (1,320)	Sep. 9, 1959	217	50	

Table 5. Relative Catchability ... continued

Species, Waters, and Period of Creel Census	Date Stocked	Estimated Number ^{b/} of Original Stock Available	Percentage of Original or Estimated Stock Recorded in Catch	Relative Catchability
BROOK TO RAINBOW				
<u>Lower Willow River and Race, St. Croix County</u>				
Creel census Apr. 30--May 8, 1955				
Brook trout (700)	Apr. 1955	--	43	1:0.5
Rainbow trout (700)	Apr. 1955	--	21	
<u>Stockwell Creek Jackson County</u>				
Creel census Apr. 30--May 8, 1955				
Brook trout (400)	Apr. 1955	--	14	1:0.7
Rainbow trout (400)	Apr. 1955	--	21	

Table 5. Relative Catchability ... continued

Species, Waters, and Period of Creel Census	Date Stocked	Estimated Number ^{b/} of Original Stock Available	Percentage of Original or Estimated Stock Recorded in Catch	Relative Catchability
<u>Bohemian Valley Creek, La Crosse County</u>				
Creel census Apr. 30--May 8, 1955				
Brook trout (529)	Apr. 1955	--	34	1:0.7
Rainbow trout (617)	Apr. 1955	--	25	
<u>Token Creek Pond (0.4 a.) Dane County</u>				
Creel census May 1-2, 1954				
Brook trout (175)	Apr. 14, 1954	--	13	1:2.8
Rainbow trout (825)	Apr. 14, 1954	--	37	

^{a/} Number stocked shown in parentheses.

^{b/} Where no pre-fishing season population estimate of the original stock was made, the number of trout available to anglers was assumed to be equal to the original stock for calculation purposes, and the corresponding place in the table has been left vacant.

^{c/} Post-fishing season recovery ratio with Fishtox was 3 brown to 1 rainbow trout.

TABLE 6

Growth and Coefficient of Condition $\frac{a}{}$ (K) or (R) of Fall- and Winter-Stocked
Hatchery-reared Trout in Various Wisconsin Waters

Waters Stocked	Number Stocked	Length (TL Inches) When Stocked		Av. R When Stocked	Date Stocked	Date of Collection	Number Measured and Weighed	Length (TL Inches) When Collected		Av. K or R When Collected	
		Range	Av.					Range	Av.	K	R
BROWN TROUT											
Rocky Run Creek Columbia County	2,887	6-7	--	--	Nov. 10, 1952	Apr. 14-29, 1953	638	6-9	7.1	1.73	1.67
						May 24, 1953	15	6-9	7.2	1.86	1.77
						Aug. 24--Sep. 5, 1953	223	6-10	8.1	1.72	1.61
						Jun. 8-23, 1954	43	8-12	10.6	--	--
Dell Creek Sauk County	4,500	6-7	--	--	Nov. 7, 1952	Sep. 28--Oct. 13, 1953	142	8-13	9.7	1.75	1.71
Mt. Vernon Creek Dane County	400	6-8	7.1	1.65	Jan. 27, 1955	Apr. 4-13, 1955	191	6-9	7.8	--	1.57
						Sep. 8-16, 1955	12	9-12	10.6	--	1.69
Mt. Vernon Creek	400	5-7	6.1	--	Oct. 11, 1955	Dec. 22, 1955	53	6-8	6.7	--	1.60
						Feb. 20, 1956	50	6-9	7.3	--	1.77
						Apr. 4-19, 1956	132	7-10	7.6	--	1.59
						Sep. 8-14, 1956	9	9-11	9.7	--	1.71
Mt. Vernon Creek	1,000	5-7	5.7	--	Sep. 9, 1957	Apr. 7-15, 1959	25	11-17	13.0	--	1.78

Table 6. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches) When Stocked		Av. R When Stocked	Date Stocked	Date of Collection	Number Measured and Weighed	Length (TL Inches) When Collected		Av. K or R When Collected	
		Range	Av.					Range	Av.	K	R
Mt. Vernon Creek	1,000	5-7	--	--	Oct. 24, 1958	Apr. 7-15, 1959	523	6-9	7.7	--	1.69
						Sep. 25--Oct. 6, 1959	53	9-14	11.0	--	1.76
						Apr. 18-22, 1960	46	9-15	12.8	--	1.92
Mt. Vernon Creek	1,371	4-6	5.3	1.82	Sep. 8, 1959	Sep. 25--Oct. 6, 1959	476	4-7	5.6	--	1.65
						Apr. 18-22, 1960	346	6-9	7.9	--	1.85
Black Earth Creek Dane County	400	6-8	6.9	1.61	Jan. 25, 1955	Apr. 14-25, 1955	240	6-9	7.6	--	1.57
						Sep. 19-28, 1955	9	9-12	10.4	--	1.70
Black Earth Creek	400	5-7	6.1	--	Oct. 11, 1955	Dec. 20, 1955	55	5-7	6.3	--	1.70
						Feb. 21, 1956	51	5-8	6.4	--	1.65
						Mar. 19--Apr. 3, 1956	123	6-8	6.7	--	1.64
						Sep. 15-21, 1956	13	9-11	9.9	--	1.74
Black Earth Creek	1,000	5-7	5.7	--	Sep. 14, 1957	Apr. 14-20, 1959	10	11-14	13.3	--	2.01
Black Earth Creek	1,000	5-7	--	--	Oct. 24, 1958	Apr. 14-20, 1959	398	6-9	7.2	--	1.77
						Sep. 28--Oct. 8, 1959	58	9-14	11.1	--	1.81
						Apr. 11-15, 1960	59	9-15	12.5	--	1.95

Table 6. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches)		Av. R When Stocked	Date Stocked	Date of Collection	Number Measured and Weighed	Length (TL Inches)		Av. K or R When Collected	
		When Stocked Range	Av.					When Collected Range	Av.	K	R
Black Earth Creek	1,125	4-6	5.3	1.82	Sep. 8, 1959	Sep. 28--Oct. 8, 1959	304	4-7	5.7	--	1.69
						Apr. 11-15, 1960	497	6-9	7.7	--	1.77
Harker-Lee Creek Iowa County	618	6-8	7.3	1.87	Oct. 31, 1956	Mar. 27--Apr. 1, 1957	39	7-9	7.8	--	1.97
						Sep. 10-13, 1957	18	9-11	9.7	--	1.66
Milner Branch Grant County	300	5-7	--	--	Sep. 21, 1955	Mar. 20-24, 1956	50	5-9	6.8	--	2.13
						Sep. 10-14, 1956	3	9-11	9.7	--	2.09
Citron Creek Crawford County	500	5-7	6.8	2.04	Nov. 20, 1957	Mar. 25-27, 1958	51	7-9	8.0	--	1.77
Camp Creek Richland County	500	5-6	5.8	1.95	Oct. 31, 1958	Apr. 21-23, 1959	62	5-8	6.5	--	1.77
Brewer Creek Juneau County	1,178	6-8	6.7	--	Dec. 3, 1954	Apr. 11-16, 1955	90	7-9	7.6	--	--
						Apr. 17-20, 1956	39	11-14	12.8	--	--
						Apr. 8-18, 1957	1	--	14.2	--	--
Brewer Creek	1,092	3-6	4.0	--	Oct. 11, 1955	Apr. 17-20, 1956	97	4-7	5.2	--	--
						Apr. 8-18, 1957	27	9-11	10.4	--	--
Brewer Creek	1,163	5-7	5.6	--	Oct. 3, 1956	Apr. 8-18, 1957	58	6-9	7.4	--	--

Table 6. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches)		Av. R When Stocked	Date Stocked	Date of Collection	Number Measured and Weighed	Length (TL Inches)		Av. K or R When Collected	
		When Stocked Range	Av.					When Collected Range	Av.	K	R
Big Roche-a-Cri Creek Adams County	500	4-6	5.4	1.84	Oct. 16, 1958	Mar. 26--Apr. 3, 1959	175	5-7	5.9	--	1.55
						May 11-15, 1959	127	5-8	6.5	--	1.77
						Sep. 19--Oct. 1, 1959	99	7-12	9.5	--	1.68
Willow Creek Waushara County	3,000	4-6	5.1	--	Sep. 9, 1959	Apr. 4-13, 1960	381	4-7	5.9	--	--
Peterson Creek Waupaca County	2,080	4-6	5.2	--	Sep. 9, 1959	Mar. 21-25, 1960	470	4-7	5.5	--	--
McKenzie Creek Polk County	2,250	6-7	--	--	Oct. 14, 1957	Mar. 24-29, 1958	496	7-9	7.7	--	1.77
						Oct. 6-16, 1958	49	9-12	10.3	--	1.67
						Oct. 5-9, 1959	5	10-14	12.2	--	1.67
Timber Coulee Pond (2 acres) Vernon County	750	5-6	5.5	--	Oct. 3, 1956	May 1-4, 1957	90	6-9	7.3	--	--
BROOK TROUT											
Mt. Vernon Creek Dane County	660	4-6	5.4	1.56	Sep. 9, 1959	Sep. 25--Oct. 6, 1959	229	4-7	5.5	--	1.46
						Apr. 18-22, 1960	95	7-10	8.0	--	1.74

Table 6. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches)		Av. R When Stocked	Date Stocked	Date of Collection	Number Measured and Weighed	Length (TL Inches)		Av. K or R When Collected	
		When Stocked Range	Av.					When Collected Range	Av.	K	R
Mt. Vernon Creek	660	5-7	5.8	1.76	Sep. 9, 1959	Sep. 25--Oct. 6, 1959	292	5-7	5.9	--	1.49
						Apr. 18-22, 1960	102	7-10	8.4	--	1.79
Petenwell Ditch Juneau County	2,000	4-7	5.4	--	Sep. 20, 1956	May 1, 1957	238	8-12	9.3	--	--
Big Roche-a- Cri Creek Waushara County	1,200	5-7	5.8	--	Sep. 26, 1957	Mar. 31--Apr. 24, 1958	426	6-9	7.1	--	1.65
						Sep. 16-30, 1958	5	7-9	8.2	--	1.63
Big Roche-a- Cri Creek Waushara County	500	5-7	5.8	1.72	Oct. 13, 1958	Mar. 26--Apr. 3, 1959	153	5-8	7.2	--	1.48
						May 11-15, 1959	28	7-9	7.8	--	1.72
Big Roche-a- Cri Creek Adams County	500	5-7	5.7	1.76	Oct. 14, 1958	Mar. 26--Apr. 3, 1959	223	6-8	6.8	--	1.45
						May 11-15, 1959	52	7-9	7.6	--	1.83
Risk Creek Pond (3.5 acres) Adams County	955	3-7	5.5	--	Sep. 21, 1956	May 1, 1957	164	6-10	8.2	--	--
Valley Lake (22 acres) Forest County	22,000	5-8	--	--	Sep. 11-12, 1958	Nov. 12, 1958	150	6-9	7.1	--	1.75
						Feb. 20-22, 1959	145	6-10	7.8	--	1.50
						May 1, 1959	101	7-10	8.0	--	1.41
						Apr. 23, 1960	49	9-13	11.0	--	--

Table 6. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches)		Av. R When Stocked	Date Stocked	Date of Collection	Number Measured and Weighed	Length (TL Inches)		Av. K or R When Collected	
		When Stocked Range	Av.					When Collected Range	Av.	K	R
RAINBOW TROUT											
Black Earth Creek Dane County	750	7-9	8.5	1.77	Sep. 10, 1959	Sep. 28--Oct. 8, 1959	256	7-10	8.6	--	1.71
						Apr. 11-15, 1960	366	9-14	11.3	--	1.98
Black Earth Creek	750	6-8	6.7	1.76	Sep. 10, 1959	Sep. 28--Oct. 8, 1959	189	6-8	7.1	--	1.73
						Apr. 11-15, 1960	265	8-13	10.1	--	1.97
Milner Branch Grant County	300	5-8	---	--	Sep. 21, 1955	Mar. 20-24, 1956	56	6-10	7.4	--	1.93
Little Brule River (Fish Refuge) Douglas County	500	5-7	6.3	1.87	Oct. 22, 1958	Nov. 11-13, 1958 Apr. 21-22, 1959	50 39	5-8 6-8	6.6 6.9	-- --	1.52 1.54
Timber Coulee Pond (2 acres) Vernon County	750	4-7	5.3	--	Oct. 3, 1956	May 1-4, 1957	16	6-8	6.4	--	--
Cataract Pond (3 acres) Monroe County	2,000	--	4.3	--	Sep. 16, 1955	Apr. 28--May 6, 1956 May 1, 1957	78 7	6-8 9-14	6.8 12.0	-- --	-- --

Table 6. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches)		Av. R When Stocked	Date Stocked	Date of Collection	Number Measured and Weighed	Length (TL Inches)		Av. K or R When Collected	
		When Stocked Range	Av.					When Collected Range	Av.	K	R
Cataract Pond	1,135	2-4	2.8	--	Sep. 21, 1956	May 1, 1957	87	6-10	8.5	--	--
Sabin Pond (1 acre) Richland County	1,000	6-8	7.4	1.85	Nov. 26, 1958	Apr. 3-4, 1959	69	7-9	8.0	--	1.59
Rock Lake (46 acres) Kenosha County	4,600	7-10	8.6	1.73	Feb. 26, 1959	Apr. 18, 1959 May 1-9, 1959 May 15-31, 1959 Jun. 1-13, 1959	64 56 144 79	8-11 9-11 9-12 9-12	9.6 10.0 10.5 10.6	-- -- -- --	1.72 -- 1.76 1.78
Rock Lake	3,050	8-10	9.6	1.76	Feb. 17, 1960	Apr. 23, 1960	46	9-11	10.0	--	1.62
Fish Lake (252 acres) Dane County	10,000	7-10	9.0	1.68	Feb. 16, 1960	May 1, 1960	92	8-11	9.3	--	1.37

$$a/ K = \frac{W 10^5}{L^3}$$

where W equals weight in grams and L equals standard length in millimeters.

$$R = \frac{W \times 10}{L^3}$$

where R equals weight in grams and L equals total length in inches.

TABLE 7

Growth and Coefficient of Condition ^{a/} (K) or (R) of Spring- and Summer-
Stocked Hatchery-reared Trout in Various Wisconsin Waters

Waters Stocked	Number Stocked	Length (TL Inches)		Av. R When Stocked	Date Stocked	Date Growth Data Were Collected	Number Measured and Weighed	Length (TL Inches)		Av. K or R When Collected	
		When Stocked Range	Av.					When Collected Range	Av.	K	R
BROWN TROUT											
Rocky Run Creek Columbia County	2,887	7-8	--	--	Apr. 9, 1953	Apr. 14-29, 1953	1,275	6-9	7.5	1.68	1.64
						May 24, 1953	19	7-10	8.0	1.79	1.73
						Aug. 24--Sep. 5, 1953	246	7-11	8.5	1.71	1.64
						Jun. 8-23, 1954	39	8-12	11.1	--	--
Mt. Vernon Creek Dane County	2,871	6-9	7.7	1.58	Apr. 5, 1954	Apr. 19-28, 1954	75	7-9	8.0	1.78	1.81
						Sep. 15-20, 1954	34	9-12	10.8	1.74	1.78
						Apr. 4-13, 1955	64	11-16	12.8	--	1.84
						Sep. 8-16, 1955	8	12-17	14.8	--	1.75
						Apr. 4-19, 1956	7	13-18	16.2	--	1.72
Mt. Vernon Creek	2,871	6-9	6.9	1.68	Mar. 15, 1955	Apr. 4-13, 1955	662	6-9	7.2	--	1.64
						Sep. 8-16, 1955	66	9-12	9.9	--	1.63
						Apr. 4-19, 1956	50	10-15	12.5	--	1.79
						Sep. 8-14, 1956	2	12-13	12.6	--	1.79
Mt. Vernon Creek	1,436	6-9	7.6	1.93	Mar. 15, 1956	Apr. 4-19, 1956	660	6-9	8.1	--	1.70
						Sep. 8-14, 1956	35	9-12	10.8	--	1.83
Mt. Vernon Creek	1,872	6-9	--	--	Mar. 28, 1958	Apr. 7-15, 1959	37	12-16	13.6	--	1.88

Table 7. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches) When Stocked		Av. R When Stocked	Date Stocked	Date Growth Data Were Collected	Number Measured and Weighed	Length (TL Inches) When Collected		Av. K or R When Collected	
		Range	Av.					Range	Av.	K	R
Mt. Vernon Creek	1,872	7-9	7.6	1.76	Apr. 17, 1959	Sep. 25--Oct. 6, 1959	33	8-14	11.4	--	1.88
						Apr. 18-22, 1960	22	9-15	12.1	--	1.88
Black Earth Creek Dane County	2,625	6-9	--	--	Apr. 20, 1953	May 18-20, 1953	127	6-9	7.8	--	1.75
						Sep. 10-15, 1953	53	9-11	9.2	--	1.80
						Apr. 6-16, 1954	39	10-14	11.8	1.98	2.02
						Sep. 21--Oct. 5, 1954	5	13-18	14.6	--	1.80
						Apr. 14-28, 1955	3	15-18	16.4	--	1.91
Mar. 19--Apr. 3, 1956	2	16-19	17.8	--	1.69						
Black Earth Creek	2,625	7-9	7.7	1.58	Apr. 1, 1954	Apr. 6-16, 1954	98	7-9	8.0	1.66	1.69
						Sep. 21--Oct. 5, 1954	67	9-13	11.5	1.72	1.75
						Apr. 14-28, 1955	60	12-16	13.6	--	1.88
						Sep. 19-28, 1955	7	16-17	16.5	--	1.81
						Mar. 19--Apr. 3, 1956	4	16-18	17.0	--	1.75
Black Earth Creek	2,625	6-9	7.1	1.55	Mar. 16, 1955	Apr. 14-28, 1955	665	6-9	7.5	--	1.64
						Sep. 19-28, 1955	71	8-12	10.4	--	1.62
						Mar. 19--Apr. 3, 1956	57	10-14	11.4	--	1.66
						Sep. 15-21, 1956	5	13-16	14.5	--	1.84

Table 7. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches) When Stocked		Av. R When Stocked	Date Stocked	Date Growth Data Were Collected	Number Measured and Weighed	Length (TL Inches) When Collected		Av. K or R When Collected	
		Range	Av.					Range	Av.	K	R
Black Earth Creek	1,312	6-9	7.6	1.92	Mar. 15, 1956	Mar. 19--Apr. 3, 1956	468	6-9	7.8	--	1.76
						Sep. 15-21, 1956	42	8-13	10.6	--	1.76
Black Earth Creek	1,628	6-9	--	--	Mar. 28, 1958	Apr. 14-20, 1959	16	12-15	12.9	--	1.92
Black Earth Creek	1,872	7-9	7.7	1.72	Apr. 27, 1959	Sep. 28--Oct. 8, 1959	31	8-13	10.4	--	1.68
	1,225					Apr. 18-22, 1960	24	9-15	12.8	--	1.92
Harker-Lee Creek Iowa County	716	7-11	8.1	--	Apr. 22, 1957	Sep. 10-13, 1957	21	8-12	9.6	--	1.59
Milner Branch Grant County	500	5-8	--	--	Mar. 16, 1955	Mar. 29--Apr. 6, 1955	97	6-8	6.4	--	2.00
						Sep. 9-12, 1955	17	7-11	9.3	--	1.72
						Mar. 20-24, 1956	4	10-11	10.4	--	2.20
						Sep. 10-14, 1956	2	13-15	14.1	--	--
Citron Creek Crawford County	250	6-8	8.1	--	Mar. 10, 1958	Mar. 25-27, 1958	23	7-10	8.3	--	1.81
						May 1, 1958	20	7-11	8.6	--	1.64
Brewer Creek Juneau County	1,167	5-9	7.0	--	Apr. 7, 1955	Apr. 11-16, 1955	87	6-9	7.1	--	--
						Apr. 17-20, 1956	26	10-13	11.6	--	--
Brewer Creek	1,092	6-10	7.8	--	Apr. 13, 1956	Apr. 8-18, 1957	44	9-11	10.4	--	--

Table 7. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches)		Av. R When Stocked	Date Stocked	Date Growth Data Were Collected	Number Measured and Weighed	Length (TL Inches)		Av. K or R When Collected	
		When Stocked Range	Av.					When Collected Range	Av.	K	R
Big Roche-a- Cri Creek Adams County	700	6-9	--	--	Apr. 22, 1958	Sep. 16-18, 1958	22	9-13	11.1	--	1.82
						Mar. 26--Apr. 3, 1959	28	10-13	11.7	--	1.79
Big Roche-a- Cri Creek	500	6-9	7.8	1.78	Mar. 23, 1959	Mar. 26--Apr. 3, 1959	127	6-9	8.1	--	1.64
						May 11-13, 1959	74	7-10	8.5	--	1.87
						Sep. 19--Oct. 1, 1959	84	8-13	10.9	--	1.73
South Fork of Willow River St. Croix County	492	6-8	6.6	--	Apr. 2, 1953	Sep. 23-25, 1953	7	8-10	9.2	--	--
South Fork of Willow River	500	6-8	6.5	--	May 15, 1953	Sep. 23-25, 1953	28	8-10	8.7	--	--
McKenzie Creek Polk County	4,500	6-9	--	--	Apr. 24--Jun. 19, 1956	Mar. 26-30, 1957	76	9-11	9.5	--	1.57
						Oct. 7-11, 1957	2	12-13	12.7	--	1.54
McKenzie Creek	1,000	6-8	--	--	Mar. 19, 1957	Oct. 7-11, 1957	25	8-11	9.5	--	1.61
						Mar. 24-29, 1958	36	9-12	10.0	--	1.81
						Oct. 6-16, 1958	7	10-14	12.2	--	1.74
McKenzie Creek	2,250	7-8	7.6	1.94	May 28, 1957	Oct. 7-11, 1957	94	8-10	9.2	--	1.55
						Mar. 24-29, 1958	128	9-11	9.9	--	1.80
						Oct. 6-16, 1958	8	9-15	11.9	--	1.75

Table 7. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches)		Av. R When Stocked	Date Stocked	Date Growth Data Were Collected	Number Measured and Weighed	Length (TL Inches)		Av. K or R When Collected	
		When Stocked Range	Av.					When Collected Range	Av.	K	R
McKenzie Creek	2,500	6-8	8.0	1.98	Mar. 20, 1958	Mar. 24-29, 1958	126	7-9	8.3	--	1.89
						Oct. 6-16, 1958	66	9-12	9.8	--	1.62
						Oct. 5-9, 1959	6	9-13	10.5	--	1.54
McKenzie Creek	3,500	6-10	7.5	--	Apr. 15, 1959	Oct. 5-9, 1959	94	8-11	9.3	--	1.46
Little Brule River (Fish Refuge) Douglas County	800	7-10	9.0	1.94	Apr. 17, 1958	May 20-21, 1958	121	7-10	9.1	--	1.77
						Oct. 1-2, 1958	14	8-11	9.8	--	1.64
Turk Lake (11 acres) Chippewa County	400	5-7	6.1	--	Apr. 16, 1948	Oct. 15-23, 1948	26	9-11	9.8	--	1.54
						Apr. 18, 1949	135	9-12	10.2	--	1.66
BROOK TROUT											
Mt. Vernon Creek Dane County	1,700	4-8	--	--	Jul. 21, 1953	Sep. 16-23, 1953	68	5-9	7.2	--	1.65
						Apr. 19-28, 1954	129	8-12	10.1	--	1.99
Big Roche-a-Cri Creek Waushara County	500	7-10	8.4	1.80	Mar. 18, 1959	Mar. 26--Apr. 3, 1959	121	7-10	8.6	--	1.82
						May 11-15, 1959	30	7-10	8.8	--	1.69

Table 7. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches)		Av. R When Stocked	Date Stocked	Date Growth Data Were Collected	Number Measured and Weighed	Length (TL Inches)		Av. K or R When Collected	
		When Stocked Range	Av.					When Collected Range	Av.	K	R
RAINBOW TROUT											
Mt. Vernon Creek Dane County	1,436	7-10	8.3	1.81	Mar. 15, 1956	Apr. 4-19, 1956	616	7-10	8.8	--	1.53
Black Earth Creek Dane County	1,312	7-10	8.3	1.81	Mar. 15, 1956	Mar. 19--Apr. 3, 1956	260	7-10	8.6	--	1.65
Milner Branch Grant County	500	6-10	--	--	Mar. 16, 1955	Mar. 29--Apr. 6, 1955 Sep. 12-15, 1955	191 2	7-10 10-11	8.2 10.8	--	1.78 1.68
Big Roche-a- Cri Creek Adams County	2,000	5-7	5.8	1.66	Jun. 16, 1959	Sep. 19--Oct. 1, 1959	261	6-9	7.0	--	1.57
Turk Lake (11 acres) Chippewa County	400	5-7	5.9	--	Apr. 16, 1948	Oct. 15-23, 1948 Apr. 18, 1949	48 49	9-11 10-12	9.9 10.5	--	1.60 1.63
Turk Lake	880	5-7	5.9	--	May 13, 1949	Oct. 1-15, 1949 May 6, 1950	37 29	9-11 10-13	10.0 11.4	--	1.78 1.68

Table 7. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches) When Stocked		Av. R When Stocked	Date Stocked	Date Growth Data Were Collected	Number Measured and Weighed	Length (TL Inches) When Collected		Av. K or R When Collected	
		Range	Av.					Range	Av.	K	R
Turk Lake	880	6-8	7.4	1.48	May 4, 1951	May 26-31, 1951	12	8-9	8.1	1.65	1.58
						Jun. 1-30, 1951	71	8-9	8.7	1.59	1.54
						Jul. 1-31, 1951	155	8-10	8.9	1.57	1.51
						Aug. 1-31, 1951	87	8-10	9.0	1.51	1.44
						Sep. 1-30, 1951	50	8-10	9.2	1.69	1.60
						Oct. 1-31, 1951	32	9-11	10.2	1.67	1.57
Turk Lake	352	10-12	10.7	1.63	May 4, 1951	May 26-31, 1951	27	11-12	11.3	--	1.49
						Jun. 1-30, 1951	63	11-13	11.4	1.48	1.44
						Jul. 1-31, 1951	66	11-13	11.5	1.40	1.43
						Aug. 1-31, 1951	55	11-13	11.5	1.36	1.32
						Sep. 1-30, 1951	27	11-13	11.6	1.41	1.37
						Oct. 1-31, 1951	9	11-13	12.0	1.51	1.49
Turk Lake	2,180	6-8	7.0	1.56	May 7, 1952	Jun. 1-30, 1952	31	7-9	7.9	1.62	1.57
						Jul. 1-31, 1952	197	7-10	8.2	1.52	1.47
						Aug. 1-31, 1952	97	7-10	8.3	1.53	1.43
						Sep. 1-30, 1952	130	7-11	8.6	1.64	1.53
						Oct. 1-31, 1952	98	8-11	9.0	1.75	1.61
						Nov. 1-30, 1952	17	8-11	9.4	1.68	1.52
						Dec. 1-31, 1952	11	8-11	9.4	1.61	1.42
						Feb. 1-14, 1953	60	8-11	9.5	1.65	1.51
						Mar. 3-21, 1953	47	8-12	9.7	1.69	1.55

Table 7. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches)		Av. R When Stocked	Date Stocked	Date Growth Data Were Collected	Number Measured and Weighed	Length (TL Inches)		Av. K or R When Collected	
		When Stocked Range	Av.					When Collected Range	Av.	K	R
Cather Lake (10 acres) Chippewa County	840	6-8	7.4	1.48	May 4, 1951	Jun. 1-30, 1951	135	8-10	9.3	1.77	1.66
						Jul. 1-31, 1951	83	9-11	9.8	1.62	1.58
						Aug. 1-31, 1951	167	9-11	9.8	1.50	1.44
						Sep. 1-30, 1951	85	9-11	9.8	1.49	1.42
						Oct. 1-31, 1951	16	9-11	10.3	1.52	1.44
Cather Lake	1,260	6-8	7.0	1.56	May 7, 1952	Jun. 12-30, 1952	30	7-9	8.1	1.50	1.46
						Jul. 1-31, 1952	59	8-9	8.2	1.47	1.40
						Aug. 1-31, 1952	26	8-9	8.3	1.38	1.33
						Sep. 5-10, 1952	9	8-9	8.5	1.54	1.46
						Oct. 26, 1952	8	8-11	9.5	1.82	1.72
Mar. 3-21, 1953	6	10-12	10.9	--	1.52						
Riley Lake (17 acres) Chippewa County	600	6-8	7.4	1.48	May 4, 1951	Jun. 15-30, 1951	31	8-10	9.4	1.75	1.70
						Jul. 1-31, 1951	15	9-11	10.2	1.72	1.71
						Aug. 1-31, 1951	60	9-12	10.7	1.65	1.59
						Sep. 1-30, 1951	33	10-12	11.0	1.66	1.56
						Oct. 1-31, 1951	23	10-12	11.3	1.60	1.50
						May 1-31, 1952	24	12-14	13.0	1.80	1.73
						Jun. 1-15, 1952	8	12-14	13.4	1.78	1.77
						Sep. 1-30, 1952	21	12-15	13.7	1.77	1.59
Riley Lake	600	6-8	7.0	1.56	May 7, 1952	Aug. 1-31, 1952	8	10-11	10.5	1.60	1.50
						Sep. 1-30, 1952	23	10-11	10.5	1.69	1.53

Table 7. Growth and Coefficient of Condition ... continued

Waters Stocked	Number Stocked	Length (TL Inches)		Av. R When Stocked	Date Stocked	Date Growth Data Were Collected	Number Measured and Weighed	Length (TL Inches)		Av. K or R When Collected	
		When Stocked Range	Av.					When Collected Range	Av.	K	R
Rock Lake (46 acres) Kenosha County	2,110	7-10	--	--	Apr. 2, 1959	Apr. 18, 1959	26	8-11	8.6	--	1.70
						May 1-9, 1959	24	8-11	9.3	--	--
						May 15-31, 1959	24	8-11	9.5	--	1.72
						Jun. 1-13, 1959	33	9-12	10.0	--	1.75
Rock Lake	3,050	8-11	9.6	1.64	Apr. 8, 1960	Apr. 23, 1960	52	8-11	9.6	--	1.72
Moose Lake (74 acres) Waukesha County	9,792	7-10	8.7	1.65	Apr. 1, 1959	May 1-5, 1959	448	7-10	8.7	--	1.51
						May 16-31, 1959	157	8-11	9.2	--	1.51
						Jun. 1-26, 1959	293	8-11	9.8	--	1.48
Fish Lake (252 acres) Dane County	10,000	8-11	9.6	1.57	Apr. 22, 1960	May 1, 1960	167	8-11	9.8	--	1.50

$$a/ \quad K = \frac{W \cdot 10^5}{L^3}$$

where W equals weight in grams and L equals standard length in millimeters.

$$R = \frac{W \times 10}{L^3}$$

where R equals weight in grams and L equals total length in inches.

REFERENCES

Apelgren, Bert

1956. Recovery of marked trout - Cataract Pond, Monroe County. West Cen. Area Rept., Fish Mgt. Div., Wis. Conservation Dept., 2 pp. (Typewritten)

Apelgren, Bert J. and Thomas A. Klick

1954. Preliminary report of trout population study on Kinnickinnic River, St. Croix County, Wisconsin. West Cen. Area Rept., Fish Mgt. Div., Wis. Conservation Dept., 5 pp. (Mimeo)

Brasch, John G.

1957. Cultivating our fish crop. Wis. Conservation Bull. 22(6):15-19.

Brasch, John, James McFadden and Stanley Kmiolek

1958. The eastern brook trout; its life history, ecology, and management. Pub. 226, Wis. Conservation Dept., 11 pp.

Brasch, John and Wallace Niemuth

1951. Over-winter survival of hatchery-reared brown trout in Sawyer Creek, Washburn County, Wisconsin. Invest. Rept. 640, Fish Mgt. Div., Wis. Conservation Dept., 7 pp. (Mimeo)

Brynildson, Clifford L.

1956. Comparative study of stocked rainbow and brown trout in Milner Branch, Grant County. So. Area Invest. Memo. 170, Fish Mgt. Div., Wis. Conservation Dept., 15 pp. (Typewritten)
- 1957a. Comparative study of stocked rainbow and brown trout in Milner Branch, Grant County. So. Area Invest. Memo. 205, Fish Mgt. Div., Wis. Conservation Dept., 22 pp. (Typewritten)
- 1957b. Summary of a creel census conducted on a selected number of Southern Area trout waters. So. Area Invest. Memo. 232, Fish Mgt. Div., Wis. Conservation Dept., 4 pp. (Typewritten)
- 1957c. The over-winter survival, growth and mortality of planted brown trout in Harker-Lee Creek, Iowa County. So. Area Invest. Memo. 241, Fish Mgt. Div., Wis. Conservation Dept., 10 pp. (Typewritten)
1958. Creel census results of a selected number of Southern Area trout waters. So. Area Invest. Memo. 245, Fish Mgt. Div., Wis. Conservation Dept., 9 pp. (Typewritten)

- Brynildson, C. L., John Truog and John Mason
1958. Observations on the survival, growth and opening day harvest of three groups of stocked brown trout in Citron Creek, Crawford County. So. Area Invest. Memo. 246, Fish Mgt. Div., Wis. Conservation Dept., 9 pp. (Typewritten)
- Brynildson, Clifford and John Truog
1959. Population estimates of the major fish species in a two mile study area in Camp Creek, Richland County. So. Area Invest. Memo. 251, Fish Mgt. Div., Wis. Conservation Dept., 10 pp. (Typewritten)
1961. Investigation of the survival and growth of the brown trout fingerlings stocked in Trout Creek, Iowa County, on June 16, 1960. So. Area Intra-Dept. Memo., Fish Mgt. Div., Wis. Conservation Dept., 7 pp. (Typewritten)
- Brynildson, Oscar M.
1949. A second report on McGiveran kettle lakes near Pine Lake, Chippewa County, Wisconsin. Univ. Wis. Dept. of Zoology, 30 pp. (Typewritten)
1950. A third report on McGiveran kettle lakes near Pine Lake, Chippewa County, Wisconsin. Univ. Wis. Dept. of Zoology, 26 pp. (Typewritten)
1951. Analyses of the creel census, growth, and food habits of rainbow trout and largemouth bass from the McGiveran lakes during 1951. Univ. Wis. Dept. of Zoology, 28 pp. (Ditto)
- 1953a. Results of a creel census conducted on several Southern Area trout streams. So. Area Invest. Memo. 116, Fish Mgt. Div., Wis. Conservation Dept., 4 pp. (Typewritten)
- 1953b. A summary of brown trout studies on Black Earth Creek, Dane County, 1949 to 1953. So. Area Invest. Memo. 117, Fish Mgt. Div., Wis. Conservation Dept., 3 pp. (Typewritten)
- 1953c. Growth and the coefficient of condition of brown and brook trout in Dell Creek, Sauk County. So. Area Invest. Memo. 124a, Fish Mgt. Div., Wis. Conservation Dept., 13 pp. (Typewritten)
- 1954a. A preliminary report of the fish populations in Black Earth and Mt. Vernon Creeks, Dane County, Wisconsin. So. Area Invest. Memo. 138, Fish Mgt. Div., Wis. Conservation Dept., 3 pp. (Typewritten)
- 1954b. Distribution, composition and growth of trout in Rocky Run Creek, Columbia County. So. Area Invest. Memo. 149, Fish Mgt. Div., Wis. Conservation Dept., 4 pp. (Typewritten)

- 1955a. Age and length-weight studies of trout in Mt. Vernon and Black Earth Creeks. So. Area Invest. Memo. 156 (Job Plan 1D, D. J. Project No. F-4-R-2), Fish Mgt. Div., Wis. Conservation Dept., 18 pp. (Mimeo)
- 1955b. Fishing pressure and harvest study on Black Earth and Mt. Vernon Creeks on opening week end of the trout fishing season of 1954-55. So. Area Invest. Memo. 157 (Job Plan 1B, D. J. Project No. F-4-R-2), Fish Mgt. Div., Wis. Conservation Dept., 5 pp. (Typewritten)
- 1955c. Fish populations and association studies in Mt. Vernon and Black Earth Creeks. So. Area Invest. Memo. 159 (Job Plan 1A, D. J. Project No. F-4-R-2), Fish Mgt. Div., Wis. Conservation Dept., 14 pp. (Typewritten)
- 1956a. Trout reproductive potential in Mt. Vernon, Black Earth and Dell Creeks. So. Area Invest. Memo. 174 (Job Plan 1C, D. J. Project No. F-4-R-3), Fish Mgt. Div., Wis. Conservation Dept., 4 pp. (Ditto)
- 1956b. Age and length-weight studies of trout in Mt. Vernon and Black Earth Creeks. So. Area Invest. Memo. 175 (Job Plan 1D, D. J. Project No. F-4-R-3), Fish Mgt. Div., Wis. Conservation Dept., 12 pp. (Ditto)
- 1956c. Fish populations and association studies in Mt. Vernon and Black Earth Creeks. So. Area Invest. Memo. 176 (Job Plan 1A, D. J. Project No. F-4-R-3), Fish Mgt. Div., Wis. Conservation Dept., 15 pp. (Ditto)
1957. Fish populations and association studies in Mt. Vernon and Black Earth Creeks. (Job Plan 1A, D. J. Project No. F-4-R-4), Fish Mgt. Div., Wis. Conservation Dept., 9 pp. (Ditto)
1958. Lime-treatment of brown-stained lakes and their adaptability for trout and largemouth bass. Ph.D. Thesis, University of Wisconsin.
- 1959a. Trout survival and growth data in Cold Water Research Group files. Fish Mgt. Div., Wis. Conservation Dept.
- 1959b. Growth of brook trout in Valley Lake, Forest County. Intra-Dept. Memo., Cold Water Group, Fish Mgt. Div., Wis. Conservation Dept., 1 p. (Typewritten)
- 1959c. Yield and growth of rainbow trout stocked in Moose and Rock Lakes. Monthly (Aug.) Res. Rept., Cold Water Group, Fish Mgt. Div., Wis. Conservation Dept., 3 pp. (Ditto)

- 1960a. Annual progress report of the trout lakes study. Fish Mgt. Div., Wis. Conservation Dept., 9 pp. (Mimeo)
- 1960b. Survival of fall-stocked brown, brook, and rainbow trout in Black Earth, Mt. Vernon, and Dell Creeks. Monthly (April) Res. Rept., Cold Water Group, Fish Mgt. Div., Wis. Conservation Dept., 3 pp. (Ditto)
- 1960c. Growth and survival of rainbow trout in Black Earth Creek, and Fish and Palette Lakes. Monthly (May) Res. Rept., Cold Water Group, Fish Mgt. Div., Wis. Conservation Dept., 3 pp. (Ditto)
- 1960d. Population estimate of the rainbow trout stocked in Rock Lake, Kenosha County, February 17, 1960. Intra-Dept. Memo., Cold Water Group, Fish Mgt. Div., Wis. Conservation Dept., 2 pp. (Typewritten)
- 1960e. Trout yield from Fish Lake, Dane County. Data in Cold Water Group files. Fish Mgt. Div., Wis. Conservation Dept.
- 1960f. Creel census records from Palette Lake, Vilas County. Monthly (Aug.) Res. Rept., Cold Water Group, Fish Mgt. Div., Wis. Conservation Dept., 2 pp. (Ditto)
- 1960g. Fish Population estimate on Trout Creek, Iowa County. Monthly (Sep.) Res. Rept., Cold Water Group, Fish Mgt. Div., Wis. Conservation Dept., 2 pp. (Ditto)
- Brynildson, Oscar M. and John Klingbiel
1957. A progress report on the "fly-fishing" project on a section of the Peshtigo River. Fish Mgt. Div., Wis. Conservation Dept., 9 pp. (Mimeo)
- Brynildson, Oscar M. and Howard E. Snow
1956. Fishing pressure and harvest study on Black Earth and Mt. Vernon Creeks in April, May and June, 1956. (Job Plan 1B, D. J. Project No. F-4-R-3), Fish Mgt. Div., Wis. Conservation Dept., 4 pp. (Ditto)
- 1957a. Fishing pressure and harvest study on Black Earth and Mt. Vernon Creeks in 1956. (Job Plan, D. J. Project No. F-4-R-4), Fish Mgt. Div., Wis. Conservation Dept., 10 pp. (Ditto)
- 1957b. Age and length-weight studies of trout in Mt. Vernon and Black Earth Creeks. (Job Plan 1D, D. J. Project No. F-4-R-4), Fish Mgt. Div., Wis. Conservation Dept., 9 pp. (Ditto)

Burdick, Milton E.

1956. Those trout lakes: What's the score? Wis. Conservation Bull., 21(4):8-10.

1957. Effect of ice fishing on fall plants in converted lakes. N. E. Area Rept., Fish Mgt. Div., Wis. Conservation Dept., 3 pp. (Mimeo)

1958. Length and weights of brook trout from Valley Lake, Forest County. N. East Area Intra-Dept. Memo. (Nov.), Fish Mgt. Div., Wis. Conservation Dept., 3 pp. (Typewritten)

1959. Length and weights of brook trout from Valley Lake, Forest County. N. East Area Intra-Dept. Memo. (Jan., Feb., May, and June), Fish Mgt. Div., Wis. Conservation Dept., 2-3 pp. (Typewritten)

Burdick, Milton E. and Oscar M. Brynildson

1960. Fly fishing only. Wis. Conservation Bull. 22(6):11-14.

Burdick, Milton E. and Edwin L. Cooper

1956. Growth rate, survival, and harvest of fingerling rainbow trout planted in Weber Lake, Wisconsin. Jour. Wildl. Mgt., 20(3):233-239.

Chamberlain, Thomas K.

1943. Research in stream management in the Pisgah National Forest. Trans. Am. Fish. Soc., 72:150-176.

Christenson, Lyle M.

1955a. Relative return and movement of marked legal-sized brown and rainbow trout stocked in South Fork of Willow River, St. Croix County. West Cen. Area Rept., Fish Mgt. Div., Wis. Conservation Dept., 9 pp. (Typewritten)

1955b. Sabin Pond (Richland County) - Creel census results and residual population. West Cen. Area Intra-Dept. Memo., Fish Mgt. Div., Wis. Conservation Dept., 4 pp. (Typewritten)

1956. Differential catchability of starved and recently-fed trout. West Cen. Area Intra-Dept. Memo., Fish Mgt. Div., Wis. Conservation Dept., 4 pp. (Typewritten)

1957. Creel census summary concerning 1956 fall-stocked trout. West Cen. Area Rept., Fish Mgt. Div., Wis. Conservation Dept., 3 pp. (Typewritten)

Christenson, Lyle, Vernon Hacker and Oscar Brynildson

1954. Does fall trout stocking pay? Wis. Conservation Bull., 19(1):15-17.

Cooper, Edwin L.

- 1953c. Returns from plantings of legal-sized brook, brown, and rainbow trout in the Pigeon River, Otsego County, Michigan. Trans. Am. Fish. Soc., 82:265-280.

Cooper, Edwin L. and Norman G. Benson

1951. The coefficient of condition of brook, brown, and rainbow trout in the Pigeon River, Otsego County, Michigan. Prog. Fish-Cult., 14(4):181-192.

Degurse, Paul E. and John W. Mason

1958. Little Brule River project. Prog. Rept., Path. Nutn. Sec., Fish Mgt. Div., Wis. Conservation Dept., pp. 16-21 (Ditto)

Dunham, Donald K.

1955. Survival of hatchery-reared legal-size brown and rainbow trout within designated boundaries. N. W. Area Rept., Fish Mgt. Div., Wis. Conservation Dept., 4 pp. (Typewritten)

Eschmeyer, R. W.

1938. Experimental management of a group of small Michigan lakes. Trans. Am. Fish. Soc., 67:120-129.

Frankenberger, Ludwig

1959. Trout survival data in W. Gen. Area files. Fish Mgt. Div., Wis. Conservation Dept.

1960. Evaluation of an experimental fall fingerling stocking program. W. Gen. Area Invest. Memo. 5, Fish Mgt. Div., Wis. Conservation Dept., 8 pp. (Mimeo)

Hacker, Vernon A.

1954. A study of spring versus fall stocking in Willow Creek, Waushara County, Wisconsin. E. Gen. Area Rept., Fish Mgt. Div., Wis. Conservation Dept., 17 pp. (Typewritten)

1957. The Green Lake story. Wis. Conservation Bull., 22(6):3-6.

Hale, John G. and Lloyd L. Smith, Jr.

1955. Results of planting catchable-size brown trout, Salmo trutta fario L., in a stream with poor natural reproduction. Prog. Fish-Cult., 17(1):14-19.

Herman, Elmer F.

1955. Bonus trout waters. Wis. Conservation Bull., 20(1):24-25.

Holloway, Ancil D. and Thomas K. Chamberlain

1942. Trout management and stocking results in the national forests of the southern Appalachians. Trans. N. Am. Wildl. Conf., 7:245-249.

Hoover, Earl E. and M. S. Johnson

1938. Migration and depletion of stocked brook trout. Trans. Am. Fish. Soc., 67:224-227.

Johnson, Waldo E.

1954. Dynamics of fish production and carrying capacity of some northern soft-water lakes. Ph.D. Thesis, University of Wisconsin.

Johnson, W. E. and A. D. Hasler

1954. Rainbow trout production in dystrophic lakes. Jour. Wildl. Mgt., 18(1):113-134.

Kelly, D. W.

1953. A study of the suitability of abandoned granite quarries near St. Cloud, Minnesota, for put-and-take fishing of brown and rainbow trout. Invest. Rept. 141, Div. Game and Fish, Bur. Fish., Minn. Dept. Conservation, 9 pp. (Mimeo)

Klak, G. E.

1941. The condition of brook trout and rainbow trout from four eastern streams. Trans. Am. Fish. Soc., 70:282-289.

Klick, Thomas A.

- 1956a. Fall and spring planted brook trout study, North Branch Trempealeau River, Jackson County. W. Cen. Area Intra-Dept. Memo., Fish Mgt. Div., Wis. Conservation Dept., 5 pp. (Typewritten)
- 1956b. Fall and spring planted brook trout study, Tank Creek, Jackson County. W. Cen. Area Intra-Dept. Memo., Fish Mgt. Div., Wis. Conservation Dept., 4 pp. (Typewritten)
- 1956c. Results from fall and spring stocking of brown trout in Brewer Creek, Juneau County. W. Cen. Area Prog. Rept., Fish Mgt. Div., Wis. Conservation Dept., 9 pp. (Typewritten)
1959. Fall vs. spring-stocked brown trout, Brewer Creek, Juneau County, Wisconsin. W. Cen. Area Invest. Memo. 3, Fish Mgt. Div., Wis. Conservation Dept., 20 pp. (Mimeo)

Klick, Thomas A. and Thayre McCutchin

1951. Five year trout study, Mt. Vernon Creek, Dane County. So. Area Invest. Memo. 18, Fish Mgt. Div., Wis. Conservation Dept., 6 pp. (Typewritten)

Klingbiel, John and Ralph A. Jones

1955. Report on the trout management demonstration project - Dent Creek. N. E. Area Rept., Fish Mgt. Div., Wis. Conservation Dept., 6 pp. (Ditto)

Mason, John W.

1958. Progress report, Little Blue River. Intra-Dept. Memo., Prog. Rept., Path. Nutn. Group, Fish Mgt. Div., Wis. Conservation Dept., 5 pp. (Typewritten)

1959a. Survival of stocked rainbow trout in the Little Brule River Fish Refuge. Intra-Dept. Memo., Monthly (May) Res. Rept., Path. Nutn. Group, Fish Mgt. Div., Wis. Conservation Dept., 2 pp. (Typewritten)

1959b. Survival and growth of stocked brook and rainbow trout in Mt. Vernon and Black Earth Creeks. Intra-Dept. Memo., Monthly (Nov.) Res. Rept., Path. Nutn. Group, Fish Mgt. Div., Wis. Conservation Dept., 3 pp. (Typewritten)

Miller, R. B.

1952. Survival of hatchery-reared cutthroat trout in an Alberta stream. Trans. Am. Fish. Soc., 81:35-42.

1958. The role of competition in the mortality of hatchery trout. Jour. Fish. Res. Bd. Canada, 15(1):27-44.

Miller, R. B. and R. C. Thomas

1957. Alberta's "pothole" trout fisheries. Trans. Am. Fish. Soc., 86:261-268.

Miller, R. B., A. C. Sinclair and P. W. Hochachka

1959. Diet, glycogen reserves and resistance to fatigue in hatchery rainbow trout. Jour. Fish. Res. Bd. Canada, 16(3):321-328.

Needham, Paul R. and Daniel W. Slater

1944. Survival of hatchery-reared brown and rainbow trout as affected by wild trout populations. Jour. Wildl. Mgt., 8(1):22-36.

Peterka, John

1959. The biology of trout and bass in artificially alkalized bog lakes. Prog. Rept., Dept. of Zoology, U. of Wis., 14 pp. (Ditto)

Primising, Mike

1959. Willow Creek totals for two shocker runs in the fall of 1959. E. Cen. Area Intra-Dept. Memo. (Oct.), Fish Mgt. Div., Wis. Conservation Dept., 3 pp. (Typewritten)

1960a. Spring shocker totals for Peterson Creek, Waupaca County. E. Cen. Area Intra-Dept. Memo. (May), Fish Mgt. Div., Wis. Conservation Dept., 3 pp. (Typewritten)

1960b. Spring shocker totals for Willow Creek, Waushara County.
E. Cen. Area Intra-Dept. Memo., Fish Mgt. Div., Wis.
Conservation Dept., 3 pp. (Typewritten)

Schmitz, William R.

1955. The biology of trout and bass in artificially alkalized bog lakes. Job Completion Rept. (Job I-A, D. J. Project No. F-6-R-1), Wis. Conservation Dept., 5 pp. (Ditto)

1956. The biology of trout and bass in artificially alkalized bog lakes. Job Completion Rept. (Job I-A, D. J. Project No. F-6-R-2), Wis. Conservation Dept., 3 pp. (Mimeo)

1958. The biology of trout and bass in artificially alkalized bog lakes. Prog. Rept., Dept. of Zoology, U. of Wis., 4 pp. (Ditto)

Schneberger, Edward

1956. Recent trends in fish management. Wis. Conservation Bull., 21(5):3-6.

Schneberger, Edward, Edwin L. Cooper and Charles N. Lloyd

1954. Wisconsin trout management. Fish Mgt. Div. Rept., Wis. Conservation Dept., 19 pp. (Mimeo)

Schneberger, Edward and Lyman O. Williamson

1943. The results of planting legal-sized trout in the Deerskin River, Vilas County, Wisconsin. Trans. Am. Fish. Soc., 72:92-96.

Schumacher, Robert E.

1958. Dusche Creek creel census and population study. Minn. Fish and Game Invest. 1, Minn. Dept. Conservation, pp. 1-25.

Shetter, David S.

1939. Success of planting fingerling trout in Michigan waters as demonstrated by marking experiments and creel censuses. Trans. N. Am. Wildl. Conf., 4:318-325.

1947. Further results from spring and fall plantings of legal-sized, hatchery-reared trout in streams and lakes of Michigan. Trans. Am. Fish. Soc., 74:35-58.

1950. Results from planting of marked fingerling brook trout (*Salvelinus f. fontinalis* Mitchill) in Hunt Creek, Montmorency County, Michigan. Trans. Am. Fish. Soc., 79:77-93.

Shetter, David S. and Albert S. Hazzard

1941. Results from the plantings of marked trout of legal size in streams and lakes of Michigan. Trans. Am. Fish. Soc., 70:446-467.

Smith, Lloyd L., Jr.

1941. The results of planting brook trout of legal length in the Salmon Trout River, northern Michigan. Trans. Am. Fish. Soc., 70:249-258.

Smith, Lloyd L., Jr., and Beatrice S. Smith

1945. Survival of seven to ten inch planted trout in two Minnesota streams. Trans. Am. Fish. Soc., 73:108-116.

Snow, H. E. and C. L. Brynildson

1956. Comparison of costs of fall and spring stocked brown and rainbow trout. So. Area Invest. Memo. 196, Fish Mgt. Div., Wis. Conservation Dept., 4 pp (Typewritten)

Threinen, C. W.

1958. Cause of mortality of a midsummer plant of rainbow trout in a southern Wisconsin lake, with notes on acclimation and lethal temperatures. Prog. Fish-Cult., 20(1):27-32.

Trembly, Gordon L.

1945. Results from plantings of tagged trout in Spring Creek, Pennsylvania. Trans. Am. Fish. Soc., 73:158-172.

Truog, John Rayne

1957. Population estimate, migration, and winter survival of fall stocked trout in Black Earth Creek, Dane County. So. Area Invest. Memo. 205, Fish Mgt. Div., Wis. Conservation Dept., 5 pp. (Typewritten)

1959. Growth and the coefficient of condition of fall stocked rainbow trout in Sabin Pond, Richland County. So. Area Intra-Dept. Memo., Fish Mgt. Div., Wis. Conservation Dept., 3 pp. (Typewritten)

White, Ray J.

- 1959a. Annual progress report of the habitat evaluation project (evaluation of watershed stabilization procedures). Fish Mgt. Div., Wis. Conservation Dept., 102 pp. (Mimeo)

- 1959b. Survival of fall-stocked brown and brook trout in the Big Roche-a-Cri Creek. Monthly (May) Res. Rept., Hab. Eval. Proj., Fish Mgt. Div., Wis. Conservation Dept., 8 pp. (Ditto)



1959c. Survival, yield, and growth data from Big Roche-a-Cri and McKenzie Creeks in Hab. Eval. Proj. files, Fish Mgt. Div., Wis. Conservation Dept.

1960a. Annual progress report of the habitat evaluation project (evaluation of watershed stabilization procedures). Fish Mgt. Div., Wis. Conservation Dept., 76 pp. (Mimeo)

1960b. Creel census on Black Earth and Mt. Vernon Creeks, Dane County. Monthly (June) Res. Rept., Hab. Eval. Proj., Fish Mgt. Div., Wis. Conservation Dept., 6 pp. (Ditto)

White, Ray J., Oscar M. Brynildson and George V. Skowronski

1958. Evaluation of watershed stabilization procedures on McKenzie and Big Roche-a-Cri Creeks. Prog. Rept., D. J. F-4-R-5, Fish Mgt. Div., Wis. Conservation Dept., 105 pp. (Ditto)

Wisconsin Conservation Department

1955. Fish Management Activities of Area 3, 1955. West Cen. Area Activities Rept., Fish Mgt. Div., Wis. Conservation Dept., 16 pp. (Mimeo)

1957. Fish Management Activities of West Central Area 1957. West Cen. Area Activities Rept., Fish Mgt. Div., Wis. Conservation Dept., 30 pp. (Mimeo)

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