Assessment of a daily limit of two trout on the sport fishery at McGee Lake, Wisconsin. No. 142 1984

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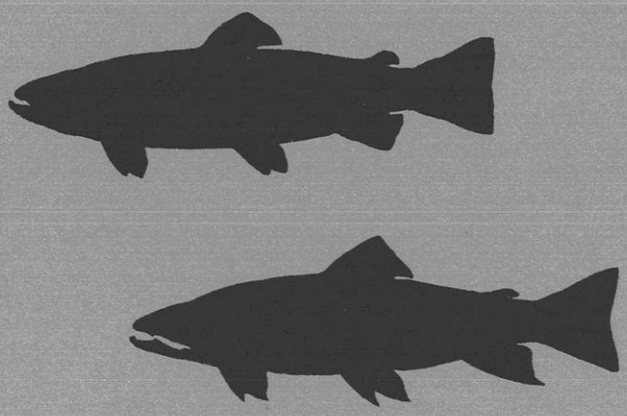

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ABSTRACT

Experimental regulations allowing anglers to keep 2 trout/day of any size caught on natural or artificial baits was tested at 23-acre McGee Lake during 1980-82 to determine if these regulations and responses of anglers to them would result in development of a catch and release fishery for brook trout *(Salvelinus fontinalis)* of larger-than-average size for this region of the state.

Angler use during 1980-82 averaged 188 hour/acre (172-205 range) and annual harvest averaged 74 trout/acre (61-93 range) and 27 lb/acre (20-35 range). Average length of trout creeled was 9.1 inches and 30% exceeded 10 inches. The average number of trout released was 51/acre (43-64 range). Each season anglers kept more trout than they released. The 3-season average ratio was 1.5:1. Angler exploitation of the 3 stocks of domestic yearlings averaged 37% (31-46 range). Mortality due to other causes was equal or greater each season. Average postseason abundance of brook trout 15 inches or larger was 1/acre.

Catch to keep was more characteristic of the 1980-82 fisheries than was catch and release. Each season the predominant group of anglers were local residents (residing within 25 miles) who fished with natural baits with the intent of catching 2 trout/trip to keep and none to release.

The 2/day regulation was the primary constraint on harvest. Absence of a size limit had no regulatory impact.

Although a catch and release fishery failed to evolve, the 2/day limit and angler responses to it and the opportunity to fish with natural baits produced a catch to keep fishery that was different from the normal fishery on a Wisconsin lake annually stocked with trout. Angler use and exploitation were both reduced and much more evenly distributed over the course of the season. Catch/hour and average size of trout creeled were also higher than normal for the season as a whole and particularly for the last 3 months of each 5-month season.

Management implications of the experiment were ambivalent. If the special regulations and stocking rate are continued, the fishery will probably continue as a high quality catch to keep one that will be used primarily by local anglers. A catch and release fishery will not evolve unless the number of nonlocal anglers seeking such recreation greatly increases and harvest by anglers fishing with natural baits greatly decreases. The potential (only partially realized during 1980-82) of McGee Lake to grow and sustain a large population of large brook trout (over 15 inches) will probably not be achieved unless use of natural baits is prohibited.

INTRODUCTION

If angling pressure and harvest continue to increase on Wisconsin's trout waters as predicted (DNR Fish and Wildlife Comprehensive Plan 1979), both recreational quality and quantitative yield are in danger of exceeding desirable management levels. Remedial actions to apply more stringent regional angling regulations, or species-specific or site-specific regulations are three strategies likely to become increasingly important in trout fishery management in Wisconsin. Increased emphasis is also planned for regulations that stress recreational quality and nonconsumptive use of trout fisheries. Such regulations currently apply to portions of 6 Wisconsin trout streams representing in total approximately 20 miles of stream. An intensive assessment of these special regulations fisheries has been completed on only one of the waters, a mile-long reach of the Race Branch of the Willow River in St. Croix County (Hunt 1981). A moderately intensive evaluation has also been completed for the 2.4 mile portion of Castle Rock Creek in Grant County (Kerr 1982). Information on the fisheries in the special regulations zones on the Wolf River in Langlade and Menominee counties and the Peshtigo River in Marinette County is too sketchy to support any substantial conclusions regarding the merit of continuing, modifying, or removing the regulations now in force. Assessment of special regulations on the Namekagon River in Sawyer County and Trout Creek in Iowa County is in progress.

In addition to the trout fishing opportunities available on nearly 9,000 miles of streams, Wisconsin also provides additional opportunity to trout anglers on approximately 153 lakes and several hundred smaller spring ponds. Quality-emphasis regulations had not been tried on any of these lentic trout fisheries, however, prior to initiation of the study reported here on the McGee Lake fishery in Langlade County during the 1980-82 trout fishing seasons.

This study had two primary objectives:

1. Determine if angling regulations that permitted a maximum harvest of 2 trout/day of any size, caught on natural baits (except minnows) or artificial lures would provide an adequate constraint on the harvest to allow an abundant stock of large brook trout *(Salvelinus fontinalis)* to exist throughout the fishing season.
2. Determine if these regulations would attract a majority of anglers seeking recreational experiences focused on "catch and release" angling (nonconsumptive use) not "catch to keep" angling, despite the opportunity to fish legally with natural baits.

The last phase of the second objective was a particularly important factor in the experiment, since in most trout fisheries managed to emphasize the catch and release concept, use of natural baits is prohibited because of the high mortality usually associated with release of trout caught on natural baits (Wydoski 1977). It was hypothesized that use by nonlocal anglers (residing 25 miles or more from McGee Lake) would increase—anglers that would be attracted to McGee Lake because of the new regulations emphasizing catch and release management (Hunt 1970, 1981).

The set of special regulations chosen for testing at McGee Lake was based in part on successful applications of similar sets to portions of two trout streams in California. Gerstung (1975) concluded that application of these regulations to a 3.7 mile stretch of Hat Creek during the 1973 season resulted in: reducing the seasonal harvest of brown trout *(Salmo trutta)* and rainbow trout *(Salmo gairdneri)* by two-thirds, no decrease in angler use, and more even distributions of anglers and harvest throughout the season. About half of the anglers participating chose to fish with natural baits. He also reported that both the number and weight of trout in the study zone at the end of the 1973 season more than doubled over that characteristically present during several previous seasons when anglers could keep up to 10 trout/day.

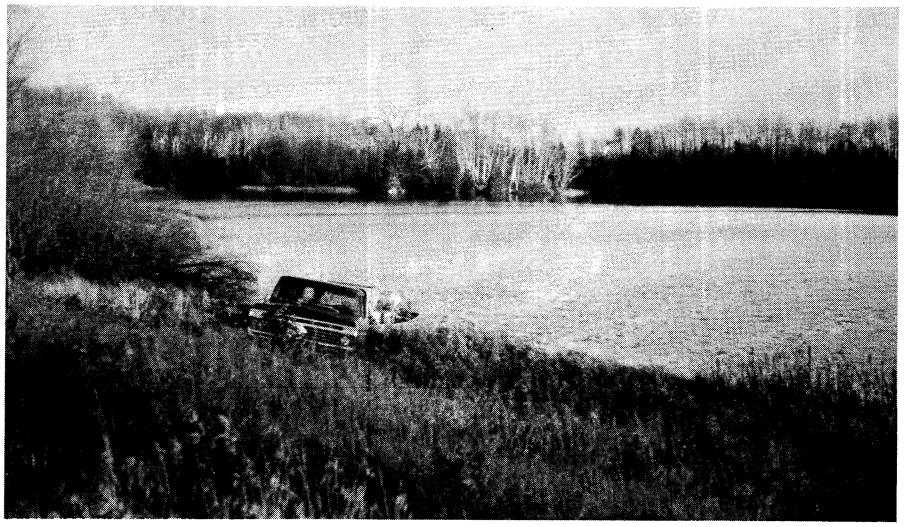
Dienstadt (1977) did not have pretreatment data to use for comparison, but he concluded that reducing the bag limit from 10/day to 2/day on a mile of Hot Creek in 1974 probably increased the catch rate during 1974-76 by at least 250% in this brown trout fishery. Only 19% of the anglers who caught trout kept 2/trip while 61% released all trout caught. Estimated total catch of trout released was 3 times greater than the preseason population. Voluntary release was more important as a management factor than was the 2/day limit.

DESCRIPTION OF STUDY SITE

McGee Lake was selected as a study site because of its unusual physical and biological qualities identified during a previous study there and information obtained on the sport fishery during that study (Hunt 1979). Growth of stocked brook trout was found to be exceptionally good, but high angler harvest precluded efficient use of this unusual quality, a quality that offered a management option of producing an abundant stock of larger-than-average brook trout if harvest could be greatly reduced. As a study site involving operation of a creel census, McGee Lake offered particularly favorable qualities too. All land around the lake is in DNR ownership and most anglers parked their cars in the only lot provided for that purpose.

The lake is located in southeastern Langlade County and constitutes the source of Drew Creek, a Class I brook trout stream. Surface area based on measurements made in July 1969 is 22.7 acres and maximum depth is 38 ft. There is no inlet stream but several spring seepage areas are evident along the north and northwest shore (Fig. 1) as well as in the lake bottom. Total alkalinity ($CaCO_3$) of surface water at the outlet measured 174 ppm on 10 April 1981 and pH measured 8.1. (Other physical-chemical qualities of water samples on that date are summarized in Append. Table 8.) Water temperatures are probably never a constraint on suitability of any portion of the lake for trout. The highest surface water temperature recorded during the study was 22.8 C (73 F) in early August 1982 (Append. Fig. 8) and surface feeding activity by trout was observed throughout the summers of 1980-82. Lack of sufficient dissolved oxygen for trout may, however, restrict trout use of a portion of the lake during late summer. D.O. exceeded 4 ppm throughout the lake during spring and early summer of 1982, but in early August 1982, D.O. had declined to only 2 ppm at 18 ft and to nearly zero at a depth of 22 ft. By mid-October, following the autumn turnover, D.O. values of 4 ppm or more again characterized the entire lake (Append. Fig. 8).

In 1974 the lake was chemically treated by the DNR with rotenone and antimycin to remove several species of warmwater panfish, minnows, and a few game fish (including trout) that provided a poor sport fishery. A substitute trout fishery was established by restocking with domestic brook trout in 1975 and 1976. No fishing was permitted during 1975. Stocking in 1976 was completed a few days before the fishing season opened. That pattern continued each season thereafter, including the years of this study.



McGee Lake provides an aesthetic fishing site. Most of the lake is lined with natural vegetation.

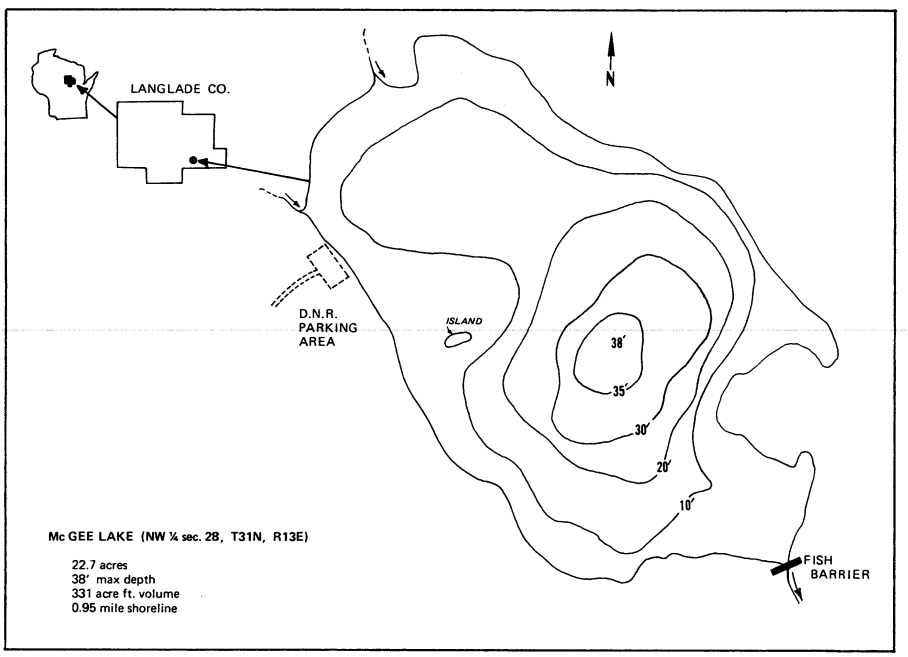


FIGURE 1. Location and map of McGee Lake study site.

In 1977 McGee Lake was used as one of 3 lakes to evaluate field performance of 3 strains of domestic brook trout (Hunt 1981). A creel census and postseason electrofishing inventory of the standing stock were conducted to determine angler exploitation, growth, and survival rates of the 3 strains.

Since chemical treatment, abundant populations of brook sticklebacks *(Culaea inconstans)* and fathead minnows *(Pimephales notatus)* and a sparse population of mudminnows *(Umbra lima)* have developed. Some natural reproduction of brook trout has also occurred annually since restocking in 1975. Spawning is concentrated in a small region of upwelling groundwater near the northeast corner of the lake at water depths of 10-12 ft. Year class

strengths of wild stocks were not determined during the study period because of low electrofishing efficiency of the sampling gear for trout less than 6 inches. However, because all domestic trout stocked during 1980-82 were permanently marked, it was possible to identify trout as to wild or domestic origin that were examined during creel census operations or collected during mark-recapture sampling for population estimations.

There was no movement of fish into or out of McGee Lake during the study via the outlet to Drew Creek. A fish-proof barrier and water level control structure prevented such movement.

METHODS

Annual quotas of 4,000 domestic yearling trout were obtained from the Langlade DNR hatchery in 1980 and the Lakewood DNR hatchery in 1981 and 1982. All quotas were Nashua strain brook trout. Trout to be stocked were individually counted, marked by fin-clips to designate their year class and sorted for length within a range of approximately 2 inches. Samples of 100 trout were measured individually to the nearest 0.1 inch and weighed to the nearest gram. Stocking was done done a few days prior to the fishing season and after completion of the April estimate of trout in the lake.

Mark-recapture sampling to derive estimates of the standing stock of trout was done with a standard 230-volt boom-shocker unit capable of operating in both AC and pulsed DC modes. The DC system was used on 5 of 6 population inventories, the exception being the April 1982 inventory when AC was used because of a malfunction of the DC circuitry in the field. Operation was normally in the range of 40-45 pulses/sec. and 8 amp. Electrofishing collections were made after sunset and involved several circuits of the entire lake shoreline each evening. Sampling dates were: 29-30 April 1980, 8-9 April 1981, 26-27 April 1982, for the prefishing season inventories, and 3-4 October 1980, 2-3 October 1981 and 1, 3 October 1982 for the postfishing season inventories. In each case the "marking run" was done the first evening and the "recapture run" was done the second evening.

Trout collected after each circuit on marking runs were weighed to the nearest gram and measured for total length to the nearest 0.1 inch. All permanent fin-clips designating year class for domestic individuals captured were also recorded. Trout that had no permanent fin-clips were assumed to be of wild origin or survivors of domestic origin stocked prior to 1980. All trout collected on the marking runs were given a temporary mark by removing the tip of the lower lobe of the caudal fin. All marking run trout were held in a wire screen cage until the electrofishing operation that evening was completed and all collected trout had been examined and temporarily marked. The entire sample was then released from the wire cage.

Recapture-marked trout collected during recapture sampling were tallied by permanent mark (year class) categories within inch groupings. Unmarked trout collected during the recapture phases were processed for length-weight data and year class data the same way all trout collected on marking runs had been processed.

Population estimates were derived using the Chapman modification of the Petersen mark-recapture formula. Separate estimates were made for trout in each inch group represented (6 inches or larger). The number estimated/inch group was then distributed by year class based on ratios of year class marks/inch group. Biomass estimates were derived by multiplying the average weight of trout sampled/inch group by the number of trout estimated to be present in that inch group and year class. Average lengths of trout by year class were based on averages of lengths measured to the nearest 0.1 inch, data collected from marking run-sampled trout were supplemented by those "unmarked" individuals measured to the nearest 0.1 inch on recapture runs.

Although no abundance estimates were made for wild trout of age 0, because of low electrofishing efficiency, some were picked up during electrofishing in October and retained for use in determination of trout food habits. They were promptly killed and preserved in 10% Formalin as whole specimens until stomachs could be removed later in the laboratory for processing. These small trout were collected for food habits analysis because trout of this size were not retained by anglers. Stomachs from angler-caught trout were obtained during the course of interviewing anglers as part of the creel census effort each fishing season of the study. Stomachs were preserved in Formalin and identified by date, fish length, and year class. Lab processing of stomachs consisted of determining the total volume of food/stomach by water displacement (to nearest 0.1 ml) and classifying contents to order and frequency of occurrence.

Creel census consisted of a combination of personal interviews of anglers at the end of their fishing trips (see creel census form Append. Fig. 9), on-site counts of anglers, vehicles and boat trailers during census interview periods (Append. Fig. 10) and operation of a vehicle axle counter (Model 160 JR Traficounter) installed across the road to the DNR parking lot. The axle counter was in place throughout the fishing season to provide a source of data to estimate angler use during periods when creel census personnel were not present. Correction factors for accuracy of the axle counter were derived by keeping track of the number of vehicles and boat trailers that entered and left the parking lot during periods when census personnel were present. Correction factors were also calculated each season for (1) adjusting total axle counts of angler vehicles only by deducting counts accumulated by nonangler traffic, based on ratios of such use during on-site observations by census personnel, and (2) relating the angler-car axle counts at the parking lot to the number of anglers who gained access to McGee Lake without entering at the DNR parking lot.

Census personnel worked a 16-hour shift (6 a.m.-10 p.m.) on the opening day of each season and a 15-hour shift on the second day. During the remaining weeks, 6-8 hour shifts were scheduled for one of each two weekend days and 2 or 3 of the 5 weekdays. Days worked were randomly selected but time periods were not. Work hours were concentrated in the periods when anglers who had completed their fish-

ing trips were most likely to be contacted (8 a.m.-10 a.m. and 7 p.m.-9 p.m.).

Occasional profiles of water temperature and dissolved oxygen were determined during 1982 with an electronic instrument (YSI Model 51) that measured temperature to the nearest whole degree C and D.O. to the nearest 0.1 ppm. Measurements were made at the surface and at 1 ft intervals to the bottom at a site where water depth was approximately 30 ft. On each such survey a few 60 ml water samples were also collected at various depths to determine D.O. based on chemical titrations and processing with the Hach Model OX-2-P field test kit. D.O. samples were not collected below depths where a previous sample indicated a zero value.

RESULTS

The Sport Fishery

Trout fishing seasons at McGee Lake during 1980-82 began at 5 a.m. on the first Saturday in May and closed on 30 September at midnight providing 151 days of fishing in 1980, 152 days in 1981 and 153 days in 1982. DNR creel census personnel were present to interview anglers on 82 days in 1980, 78 days in 1981, and 86 days in 1982. About 40% of the fishing hours/season were covered by census personnel based on an assumed 16-hour "fishing day" on opening day and 15-hour "fishing days" for the rest of the season (6 a.m. to 9 p.m.). Interview information was obtained from 1,331 angler trips and 1,262 creeled trout were examined.

The take-home catch by this successful angler was characteristic of the sport fishing at McGee Lake during 1980-82. Two trout of larger-than-average size (for Wisconsin trout fisheries) were caught and kept and none were released.

During the 1980 season, angling effort amounted to 91 trips/acre and 188 hour/acre (Table 1). The following season angler use was slightly higher, with a 4% increase in trips (96/acre) and a 9% increase in hours (205/acres). During the last year of the study, angler use declined to only 66 trips/acre and 172 hour/acre, 27% fewer trips than were made in 1980 and 31% fewer than in 1981 (Fig. 2).

The 3-season trend in number of brook trout harvested was similar to the trips and hours patterns (Fig. 3). Harvest in 1981 exceeded the 1980 harvest by 35% (93/acre vs.69/acre), while the 1982 harvest was 34% less than that made in 1981 (61/acre vs.93/acre). Average size of brook trout harvested was 9.0 inches for the 1980 season, 9.5 inches for the 1981 season, and 8.4 inches for the 1982 season. Annual harvest in terms of biomass averaged 27 lb/acre for the 3 seasons of the study.

The number of trout released/season showed a different trend from the one common for trips, hours and harvest. The highest number of trout released/season was 64/acre in 1980 followed by 2 successive seasons of decline—to 45/acre in 1981 and 43/acre in 1982. In all 3 seasons more trout were creeled than were released, contrary to the normal pattern for catch and release fisheries. The average ratio of trout creeled to trout released was 1.5:1 (Table 1).

Catch rates for all anglers combined and for all 3 seasons averaged 0.39 trout/hour for trout creeled and 0.27 trout/hour for trout released. Each season of the study, a high proportion of the anglers failed to catch even 1 trout/trip. Such unsuccessful anglers accounted for 51% of all trips in 1980, 41% in 1981, and 42% in 1982. For all 3 seasons combined the unsuccessful rate was 45% (Table 1).

Month by month trends in the distribution of angler hours/month and harvest/month were quite similiar (Fig. 4). During May, approximately 32% of the total hours and 36% of the total harvest was accounted for (3 season averages). By the end of June, the second month of the 5-month season, 49% of the total hours and 50% of the total harvest had been logged in. Monthly catches of trout released/season tended to be more skewed in distribution with 50% of the total occurring during May and 67% accumulating by the end of June (Fig. 4 and Append. Table 9).

Length frequency distributions of brook trout harvested each season were distinctively different (Fig. 5). For the 1980 season, the 8-inch group was dominant, accounting for 26% of all trout creeled. In 1981 it was the 9-inch group that was dominant in the harvest, accounting for 28% of the total. In 1982 anglers kept more trout in the 7-inch group than any other (35% of total harvest). Two trout were kept in the 5-inch group in 1982, the only season that trout of this size showed up in the creel census. In the combined length frequency compilation for all 5,059 trout harvested during 1980-82, trout in the 9-inch group were slightly more numerous than those in the 8-inch group. Trout that were 10 inches or larger accounted for 30% of the 3-season harvest, an impressive proportion for a brook trout fishery in Wisconsin.

Most of the anglers participating in this special regulation fishery chose to use natural baits (primarily earth-

worms) in all 3 seasons. This group accounted for 73% of the trout creeled and 50% of the trout released during 1980-82 (Table 2). Anglers who chose to fish exclusively with artificial lures (classified in Table 2 in the spin lure and fly categories) logged only 12% of the fishing trips, 13% of the angler hours, 15% of the trout harvested, and 30% of the trout released. The even smaller minority of anglers who used only artificial flies as bait experienced as a group the best catch rates of the four common groupings of anglers. Fly fishers creeled 0.83 trout/hour and released 0.98 trout/hour (3 season averages). These anglers using natural baits averaged only 0.43 trout creeled/hour and 0.20 trout released/hour (Table 2).

All 3 seasons the fishery was dominated by anglers fishing from boats as contrasted with those fishing from shore (or wading). The boat-angler group made 68% of all trips, and caught 79% of the trout creeled and 80% of the trout released during 1980-82 (Table 3). Catch rates were also better for the group of anglers fishing from boats, but the differences were not as dramatic in comparison to other participant characteristics for those anglers fishing from shore. Angling effort by shore anglers decreased each year of the 3-year study.

Information gathered on the number of anglers/vehicle was quite consistent all 3 fishing seasons and also within each season for the two angler groupings of "boat anglers" vs. "shore anglers". Average values for each season and for each participant group fell in the narrow range of 2.0-2.5 anglers/vehicle (Table 4). Within the range of angler party sizes observed (1 to 5), a party size of 2 was most common each season for anglers fishing from boats. Anglers fishing from shore were about evenly represented by angler party sizes of 1 or 2 (Append. Table 10).

Out of the total 3,181 successful trips (5,761 − 2,580 = 3,181), anglers released all trout on only 217 (7%) of those trips (Table 5). This "catch and release" percentage did, however, increase from season to season - from 3% in 1980 to 6% in 1981 to 12% in 1982.

Anglers who caught at least 1 trout/trip kept the first 1 or 2 trout caught and released no trout on 68% of 3,181 trips made during 1980-82. They caught and kept 2 trout/trip and released no trout on 44% of those 3,181 successful trips (Table 5). Of the estimated 3,446 trout released during 1980-82, 16% were released on trips when no trout were creeled, 12% were released on trips when 1 trout/trip was creeled, and the remaining 72% were released by the successful anglers who also decided to keep 2 trout/trip. However, among this last group of successful anglers, 67% (1,409 ÷ 2,095) simply kept the first 2 trout caught.

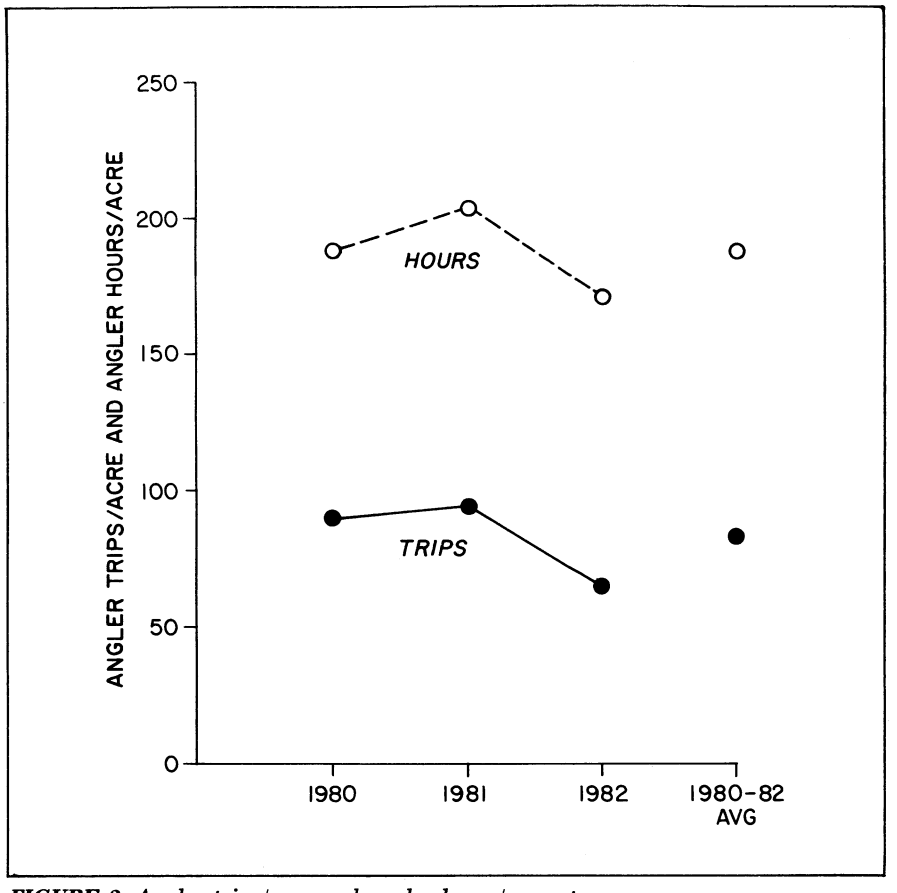


FIGURE 2. Angler trips/acre and angler hours/acre at McGee Lake during the 1980-82 fishing seasons.

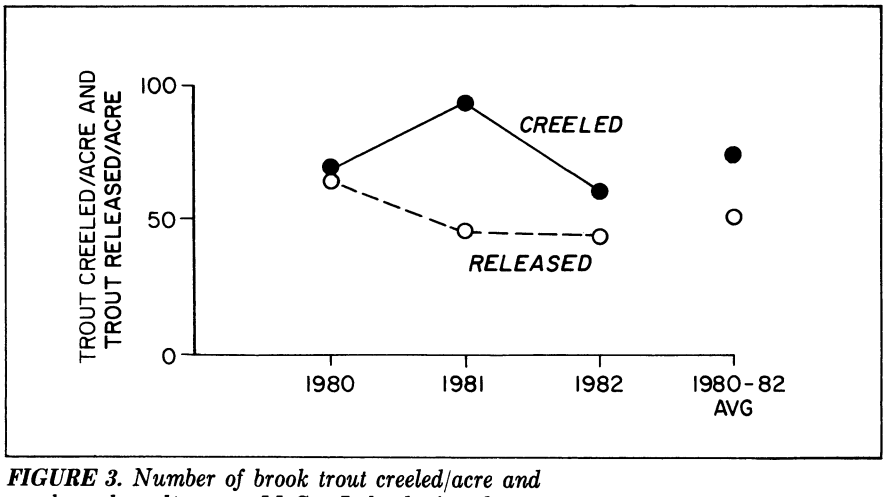


FIGURE 3. Number of brook trout creeled/acre and number released/acre at McGee Lake during the 1980-82 fishing seasons.

More than half of the trout released during 1980-82 were caught on just 5% of the total fishing trips—the trips on which 5 or more trout/trip were released. Approximately 72% (2,481) of all the trout released during 1980-82 were released on just 12% of the total trips—the category of trips composed of anglers who kept 2/trip and released 1 or more.

Most of the trout harvested each season were domestic yearlings. They comprised 87% of the 1980 yield, 87% of the 1981 yield, and 88% of the 1982 yield (Table 6). Domestic age II stocks could be identified in the harvest the last 2 years of the study when they accounted for 6% of the yield in 1981 and

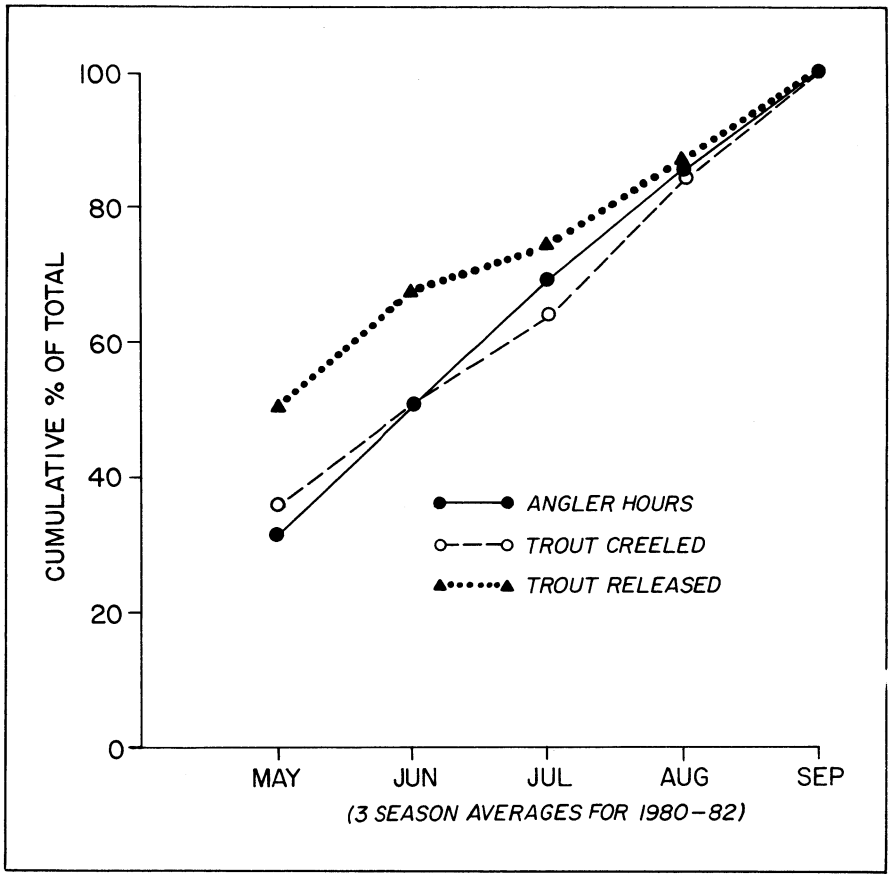


FIGURE 4. Monthly cumulative percentage trends for the number of angler hours, number of trout creeled and number of trout released based on average values per month for the 1980-82 fishing seasons.

TABLE 1. *Comparisons of several sport fishery characteristics at McGee Lake based on creel census information gathered during the 1980-82 fishing seasons.*

Characteristic	1980	1981	1982	Average
Angling trips/acre	91	96	66	84
Angling hours/acre	188	205	172	188
Trout creeled/acre	69	93	61	74
Pounds creeled/acre	25	35	20	27
Avg. length of trout kept (inches)	9.0	9.5	8.4	9.1
Trout released/acre	64	45	43	51
Catch rate/hour:				
Creeled	0.37	0.45	0.35	0.39
Released	0.34	0.22	0.25	0.27
Total	0.71	0.67	0.60	0.66
Ratio of trout creeled:released	1.1:1	2.1:1	1.4:1	1.5:1
Percent of trips on which no trout were caught	51	41	42	45
Percent of successful trips on which all trout were released*	3	6	12	7
Percent of successful trips on which the first 2 trout caught were kept*	32	53	46	44

* A successful trip is one on which at least one trout was caught but not necessarily kept.

4% in 1982. Domestic age III made up 1% of the harvest in 1982, the only season this stock could be identified by permanent marks (fin clips).

Contributions of wild brook trout to the fishery could not be clearly identified any of the 3 seasons because such trout could not be distinguished readily from domestic trout stocked prior to 1980. However, it is likely that all or nearly all of the 7% of the harvest in 1982 that consisted of trout other than permanently marked ages I-III domestic fish were wild brook trout.

Trout Population Characteristics

When the 1980 fishing season began, the standing stock of brook trout numbered approximately 189/acre. This stock consisted of 13 trout/acre that had survived from introductions of domestic trout in previous years or they could have been wild trout. Supplementing this carryover stock were the 4,000 (176/acre) domestic yearlings introduced a few days earlier (Fig. 6). Biomass of this standing stock was equivalent to 39 lb/acre (Fig. 7). Domestic yearlings accounted for 72% of the weight and 93% of the number of trout present.

On 3 October 1980, 3 days after the close of the fishing season, abundance of brook trout larger than 6 inches was estimated to be only 22/acre, an 88% decrease since May. Biomass of this standing stock was 13 lb/acre or 67% less than that present in the spring. Only 7% of the domestic yearlings survived through the fishing season. These survivors accounted for 59% of the standing stock and 46% of the biomass.

In the spring of 1981 the same number of yearling brook trout were released but their total weight was somewhat greater (Append. Table 11). Consequently the 1981 stock contributed about 1 lb/acre more to the total weight (45 lb/acre) of trout in the lake when the fishing season began. Augmenting this domestic stock were 17 trout/acre weighing 16 lb/acre that were resident to the lake as a result of previous introductions or natural reproduction.

By October 1981 the trout population had again been drastically depleted—to only 30/acre weighing 13 lb/acre. Abundance of trout over 6 inches had declined by 84% and biomass of such trout had declined by 71% since May. Survival of the domestic age I fish was only 8%. Survival through the fishing season by the domestic age II stock was 13% (Append. Table 12).

The third release of 4,000 yearlings in the spring of 1981 bolstered the preseason standing stock to 197/acre and its biomass to 36 lb/acre. Yearlings stocked in 1982 were smaller on the average than were those stocked in 1980 or 1981. The number of resident trout (over 6 inches) present in late April, 1982 was the best encountered during the 3 year study, numbering 21/acre and weighing 13 lb/acre.

At the close of 1982 season the population of brook trout consisted of 32 domestic yearlings/acre, 2 domestic age II/acre and 25 trout/acre of unknown origin. In total it was the best population for this time of year that was observed during the study. Biomass of this stock (26 lb/acre) was also much better than that present the previous

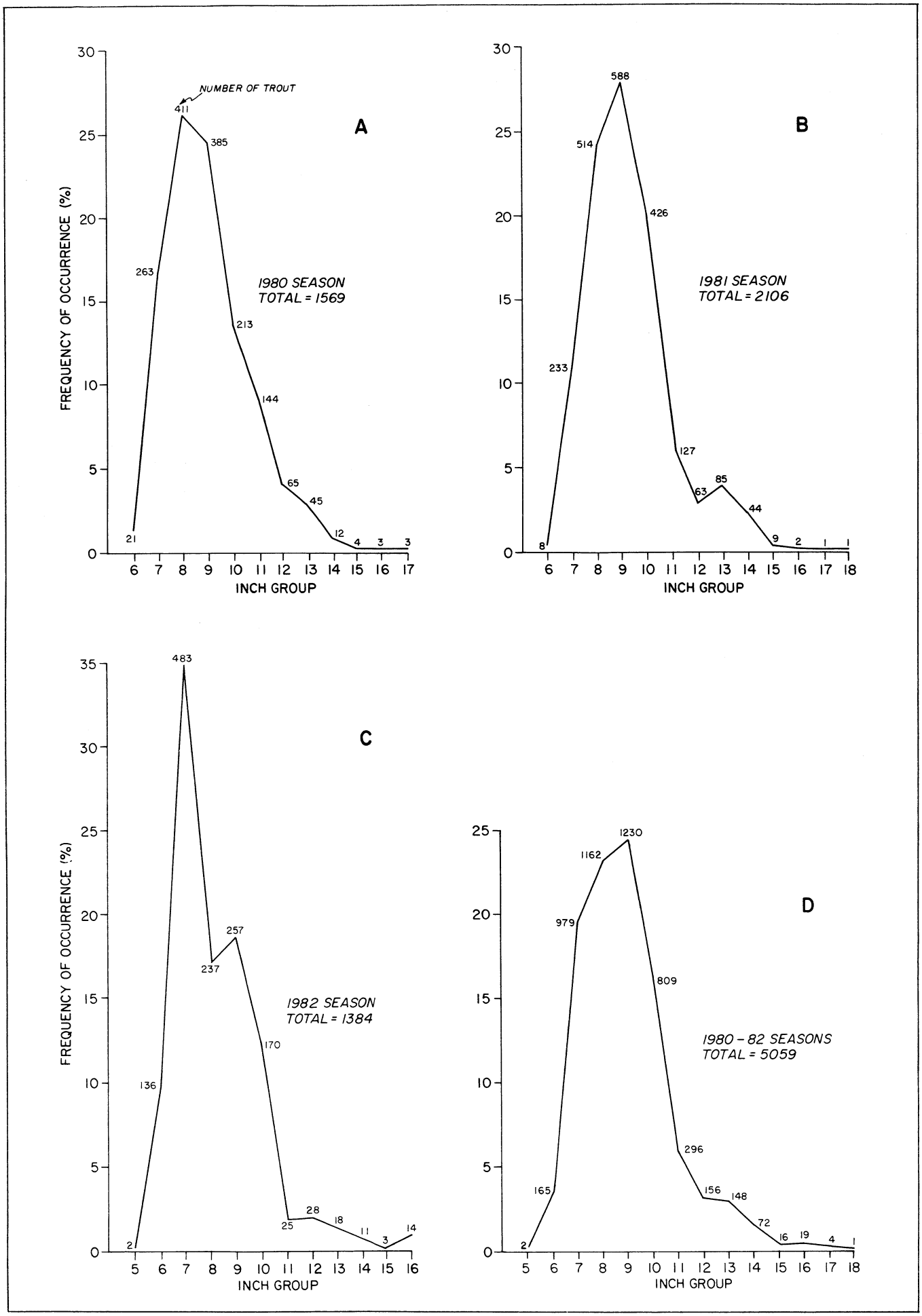


FIGURE 5. Length frequency distributions of brook trout harvested during the 1980-82 fishing seasons at McGee Lake, summarized by season (A, B, C) and a composite summary for all three seasons (D).

TABLE 2. *Estimated angler use, catch and catch rates for the 1980-82 trout fishing seasons, summarized by bait type used and season.*

Item	1980	1981	1982	1980-82 Average	Percent of Total
Angler trips/acre					
Natural bait	73.4	69.6	38.1	60.4	71.5
Spin lure	4.4	10.6	6.6	7.2	8.5
Fly	1.7	3.0	5.3	3.3	3.9
Combination	11.9	12.5	16.5	13.6	16.1
Total	91.4	95.7	66.5	84.5	100.0
Angler hours/acre					
Natural bait	147.5	137.0	93.2	125.9	66.9
Spin lure	9.1	28.7	16.0	17.9	9.5
Fly	3.1	5.9	10.6	6.5	3.5
Combination	28.0	33.8	52.1	38.0	20.1
Total	187.7	205.4	171.9	188.3	100.0
Trout creeled/acre					
Natural bait	55.1	70.1	38.3	54.5	73.4
Spin lure	3.2	10.4	3.2	5.6	7.5
Fly	2.5	4.8	8.9	5.4	7.3
Combination	8.3	7.6	10.5	8.8	11.8
Total	69.1	92.9	60.9	74.3	100.0
Trout released/acre					
Natural bait	39.4	19.3	17.2	25.3	50.0
Spin lure	10.4	10.6	5.2	8.7	17.2
Fly	8.7	3.7	6.8	6.4	12.6
Combination	5.5	11.6	13.4	10.2	20.2
Total	64.0	45.2	42.6	50.6	100.0
Trout creeled/hour					
Natural bait	0.37	0.51	0.41	0.43	
Spin lure	0.35	0.36	0.20	0.31	
Fly	0.81	0.81	0.84	0.83	
Combination	0.30	0.22	0.20	0.23	
Average	0.37	0.45	0.35	0.39	
Trout released/hour					
Natural bait	0.27	0.14	0.18	0.20	
Spin lure	1.14	0.37	0.32	0.49	
Fly	2.81	0.63	0.64	0.98	
Combination	0.20	0.34	0.26	0.27	
Average	0.34	0.22	0.25	0.27	

TABLE 3. *Estimated angler use, catch and catch rate for the 1980-82 trout fishing seasons, summarized by angler group and season.*

Item	1980	1981	1982	1980-82 Average	Percent of Total
Angler trips/acre:					
Boat anglers	50.6	68.0	52.3	57.0	67.5
Shore anglers	40.8	27.7	14.2	27.5	32.5
Total	91.4	95.7	66.5	84.5	100.0
Angler hours/acre:					
Boat anglers	130.3	163.6	150.8	148.2	78.7
Shore anglers	57.4	41.8	21.0	40.1	21.3
Total	187.7	205.4	171.8	188.3	100.0
Trout creeled/acre:					
Boat anglers	52.0	72.3	54.0	59.4	80.0
Shore anglers	17.1	20.6	6.9	14.9	20.0
Total	69.1	92.9	60.9	74.3	100.0
Trout released/acre:					
Boat anglers	50.0	38.0	37.0	41.7	82.4
Shore anglers	14.0	7.2	5.6	8.9	17.6
Total	64.0	45.2	42.6	50.6	100.0
Trout hour/creeled:					
Boat anglers	0.40	0.44	0.36	0.40	
Shore anglers	0.30	0.49	0.33	0.37	
Average	0.37	0.45	0.35	0.39	
Trout/hour released:					
Boat anglers	0.38	0.23	0.25	0.29	
Shore anglers	0.24	0.17	0.27	0.23	
Average	0.34	0.22	0.25	0.27	

two Octobers. The survival rate of domestic yearlings through the fishing season was also the highest rate (18%) observed during the study. Survival rates of the age II stock and age III stock through the fishing season were 25% and 26%, respectively.

Angler exploitation rates for the 3 stocks of domestic yearlings were: 34% in 1980, 46% in 1981, and 31% in 1982 (Table 7). These same stocks experienced total morality rates of 93%, 92% and 82% during the fishing season period. Mortality unaccounted for by harvest was, therefore, greater or equal to the mortality directly attributable to angling. Exploitation of the age II domestic stock in 1981 exceeded the rate for exploitation rates of domestic age I trout (57% vs. 46%). In 1982 exploitation rates for trout in these two groups was about the same (29% for age II and 31% for age I). Mortality of age II domestic trout unaccounted for by harvest was 30% through the 1981 fishing season and 46% through the 1982 fishing season.

Growth of yearling trout that survived through the 1980-82 fishing seasons averaged 42% by length (from 7.2 inches when stocked to 10.2 inches in October) and 181% by weight (from 69 g average to 194 g average). Age II domestic survivors present at the beginning of the 1981-82 seasons had an average length of 12.3 inches and an average weight of 342 g. At the end of the 1981-82 seasons these averages for the surviving individuals sampled were 12.7 inches (+3%) and 397 g (+16%). The only stock of domestic age III that could be tracked by permanent marks was that present in 1982. In April average age length of this age group was 13.4 inches and average weight was 456 g. Only 5 survived through the fishing season. They averaged 14.3 inches (+7%) and 499 g (+10%). Coefficient of condition factors (R) were excellent for all of the age groups present in the spring and fall of all years, another indication of the excellent conditions for growth of trout in this lake (Append. Table 13).

Based on analyses of food identified in 496 trout stomachs collected during 1980-81, two species of fish were particularly important in the diet of trout.

Brook sticklebacks and fathead minnows accounted for 50% of the total volume of food present and 48% of all the stomachs contained at least one of these species (Append. Table 14). Aquatic Diptera (primarily in the Chironomidae family) were the most common category of food consumed (present in 55% of all stomachs) and ranked second in volumetric importance (23% of total). Food habits of brook trout in McGee Lake are discussed in more detail by Hunt (1984), including information from trout stomachs collected in 1982.

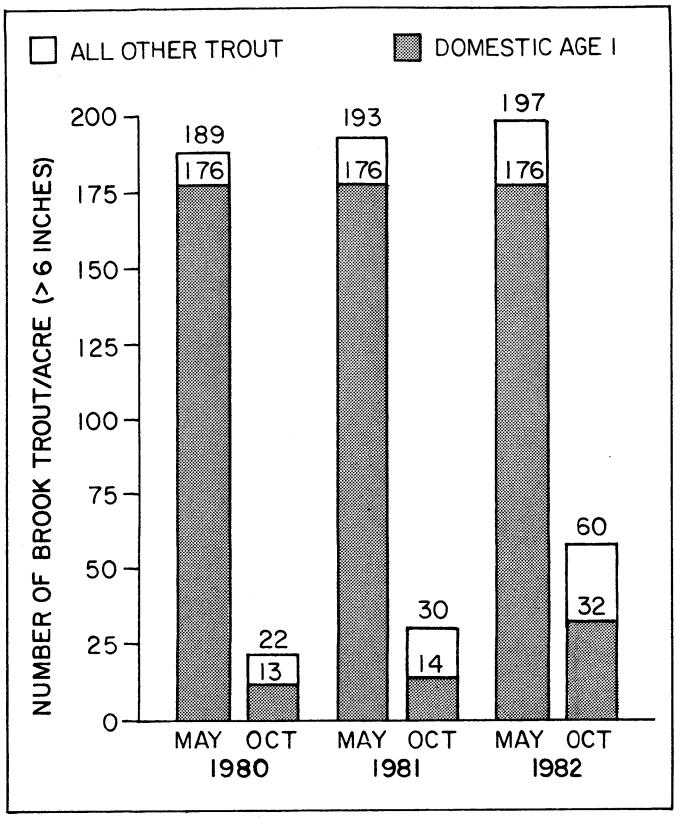


FIGURE 6. Standing stocks of brook trout in McGee Lake each May and October in 1980-82.

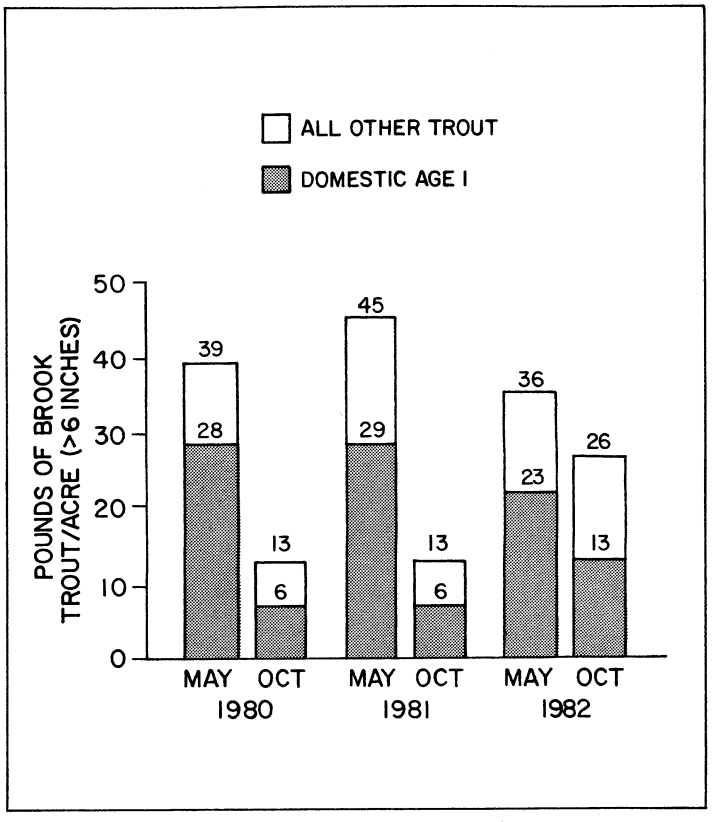


FIGURE 7. Biomass of standing stocks of brook trout in McGee Lake each May and October of 1980-82.

TABLE 4. *Distribution of anglers at McGee Lake during 1980-82 trout fishing seasons according to the number of anglers/vehicle.**

Angler Group	Anglers/Vehicle 1980	1981	1982	1980-82 Average
Boat anglers	2.5	2.2	2.0	2.2
Shore anglers	2.2	2.2	2.3	2.2
All anglers	2.4	2.2	2.1	2.2

* More detailed analysis presented in Appendix Table 9.

TABLE 5. *Distribution of angler trips at McGee Lake during the 1980-82 trout fishing seasons according to the number of trout creeled per trip and number released per trip.*

Year	No. Trout Creeled/Trip	0	1	2	3	4	5	6-10	11+	Total No. Trips	Total No. Trout Released
1980	0	1,054	9	9	5	2	2	3	0	1,086	93
	1	389	4	7	5	3	2	5	0	415	143
	2	332	26	29	26	23	38	87	16	577	1,218
Trip totals		1,775	39	45	36	28	42	95	16	2,078	
No. trout released			39	90	108	112	210	667	228		1,454
1981	0	898	36	27	9	3	3	3		979	168
	1	223	9	36	7	3	2	4		284	156
	2	675	63	99	9	27	9	25	4	911	701
Trip totals		1,796	108	162	25	33	14	32	4	2,174	
No. trout released			108	324	75	132	70	256	60		1,025
1982	0	628	24	34	27	5	5	10	1	734	296
	1	131	15	4	13	3	3		1	170	109
	2	402	64	63	25	17	22	13	1	607	562
Trip totals		1,161	103	101	65	25	30	23	3	1,511	
No. trout released			103	202	195	100	150	157	60		967
1980-82 totals	0	2,580	69	70	41	10	10	18	1	2,797	557
	1	743	28	47	25	9	7	9	1	869	408
	2	1,409	153	191	60	67	69	125	21	2,095	2,481
Trip totals		4,732	250	308	126	86	86	152	23	5,761	
No. trout released			250	616	378	344	430	1,080	348		3,446

TABLE 6. *Contributions of various age groups of brook trout to the number and weight of trout harvested at McGee Lake during the 1980-82 trout fishing seasons.*

Season	Domestic Age I			Domestic Age II			Domestic Age III			Other			Total		
	No.	Weight (lb)	Avg. Length (inches)	No.	Weight (lb)	Avg. Length (inches)	No.	Weight (lb)	Avg. Length (inches)	No.	Weight (lb)	Avg. Length (inches)	No.	Weight (lb)	Avg. Length (inches)
1980	1,364	430.8	8.5							205	142.2	11.9	1,579	573.0	9.0
1981	1,842	607.9	9.2	128	116.5	13.4				136	78.9	11.5	2,106	803.3	9.5
1982	1,225	356.4	8.0	59	39.8	12.1	8	9.5	14.7	92	42.1	10.9	1,384	447.8	8.4
1980-82 Total or Avg.	4,431	1,395.1	8.7	187	156.3	13.0	8	9.5	14.7	433	263.2	11.6	5,059	1,824.1	9.1

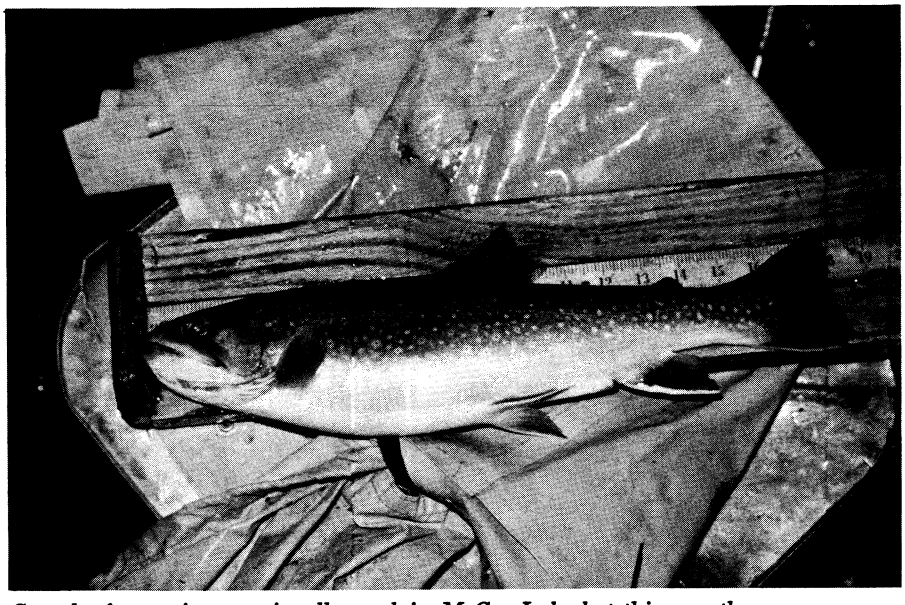
* Of wild origin or domestic trout stocked prior to 1980.

TABLE 7. *Angler exploitation rates* of domestic stocks of brook trout in McGee Lake during the 1980-82 trout fishing seasons.*

Fishing Season	Age Group I	II	III
1980	34	**	**
1981	46	57	**
1982	31	29	42
1980-82 Avg.	37		
1981-82 Avg.		43	

* Percent of preseason number that was harvested during the fishing season.

** Preseason number present was not known so exploitation rate could not be calculated.



Growth of trout is exceptionally good in McGee Lake but this growth potential was poorly utilized during 1980-82. Even a daily limit of only 2 trout did not provide an adequate constraint on harvest to allow an accumulation of ages II and III trout that could utilize the conditions for excellent growth as illustrated by this 18-inch brook trout.

DISCUSSION

The sport fishery at McGee Lake during 1980-82 was much more characteristic of a normal "catch to keep" trout fishery than it was of a catch and release fishery despite the restriction of harvest to only 2 trout/day. Each season anglers kept more trout than they released. The estimated 3-season totals were 5,071 trout creeled and 3,446 trout released, a ratio of 1.5:1. This ratio is much closer to the 1:1 ratio typical of several catch to keep trout fisheries censused in Wisconsin (Hunt et al. 1962, Avery and Hunt 1981) than it is to the 1:268 ratio characterizing the catch and release trout fishery on the Race Branch in Wisconsin (Hunt 1981) or the ratio of 1:39 reported by Klein (1972) for the special regulation fishery for rainbow trout at Parvin Lake in Colorado.

Nonconsumptive use by anglers at McGee Lake (in the sense of releasing all trout caught) was practised on only 7% of the trips on which trout were caught. Consumptive use, to the extreme permitted by the regulations, was the rule on 44% of the 3,181 successful trips—2 trout/trip were kept and none were released.

Half of the angler trips made to McGee Lake during 1980-82 involved travel distances of less than 25 miles one way (Append. Table 14). This travel circumference, representing what could be called "local angler use", increased in proportional importance during the 3-year study rather than decreasing. Stated in opposite terms, the number of nonlocal anglers specifically seeking out McGee Lake because it offered a specialized recreational opportunity did not increase from year to year as hypothesized.

Although the fishery during 1980-82 turned out to be predominantly a catch to keep one, the low daily bag limit probably reduced angler use and harvest and also helped to spread out the distribution of use and harvest more evenly through the season. Angler use of McGee Lake during the 1977 season amounted to 150 trips/acre and 457 hour/acre (Hunt 1981), use indexes 79% and 143% greater than comparable average values for the 1980-82 seasons. The probability that seasonal patterns of use and harvest were also impacted by the special regulations during 1980-82 is supported by the fact that only 32% of the total angler hours and 36% of the total harvest those seasons were logged in May. During 1977,

by contrast, use and harvest were much greater in May accounting for 55% of the total hours and 77% of the total yield (Append. Table 9). Jesien (1977) in a 2-year study of the stocked rainbow trout fishery at Sunset Lake in Portage County reported similarly skewed early season values: 67% of the total hours and 59% of the total yield was recorded in May. At Adams Lake, also in Portage County 55% of the total fishing effort for stocked brook trout and 65% of the total harvest occurred in May during the 1977 season (Hunt 1981).

Prior to the 1977 fishing season, McGee Lake was stocked with 3 strains of domestic yearling brook trout at a combined density of 264/acre. Angler exploitation of these yearlings was 80%. Jesien (1977) estimated harvest rates of 49% for rainbow trout in Sunset Lake in 1975 and 87% in 1976. In nearby Adams Lake I estimated that anglers caught nearly 100% of the brook trout stocked in 1977. In comparison to these rates, the 37% exploitation rate of yearling brook trout in McGee Lake during 1980-82 was, therefore, not a high value for a lake fishery dependent largely on domestic trout. It seems reasonable to conclude that the low daily limit of only 2 trout contributed to reducing angler use and exploitation even though the majority of anglers visiting McGee Lake came with the intent of catching trout to keep not release.

This experiment was the first in Wisconsin to apply special regulations to a trout lake to encourage development of a catch and release fishery and the first such experiment on a lake or trout stream in Wisconsin to promote such a fishery without prohibiting use of natural baits. I suspect that 2 factors were primarily responsible for the appearance, instead, of a good catch to keep fishery. The most important factor was the fact that natural baits could be legally used. Anglers exercised this option exclusively on 72% of all angling trips made during 1980-82 and this proportion increased to 88% of all trips if those anglers are included that tried a combination of fishing methods (one of which was probably use of natural bait).

These values are not unusual for trout anglers fishing the "normal regulation" waters in Wisconsin (Hunt et al. 1962, Meyers and Thuemler 1976, Avery and Hunt 1981, Avery 1983). The catch records of anglers using natural baits also indicate that keeping trout was a stronger motive than just catching trout. The ratio of trout kept to trout released for this grouping of anglers was 2.1:1. By contrast the group of anglers who fished with artificial flies exclusively posted a ratio of 0.8:1. They released more trout than they kept, but even this ratio is also indicative of a fairly strong emphasis on catching trout to keep as part of the trip experience.

A second factor that probably encouraged development of the catch to keep fishery was the large average size of brook trout caught, particularly in a region of the state noted for good brook trout fishing in many of its spring ponds but where trout creeled do not exceed the minimum legal size by more than an inch or two. Mean length of trout creeled at McGee Lake averaged 9.1 inches during 1980-82 and 30% of those trout exceeded 10 inches. By contrast, brook trout caught from spring ponds within a few miles of McGee Lake averaged only 7.4 inches from Hoglot Springs (1969-72), 7.8 inches from Hogelee Springs (1972), 8.3 inches from Rabes Lake (1969-75), and 8.4 inches from Clubhouse Springs (1969-75) based on creel census data reported by Carline and Brynildson (1977). Brook trout fisheries in good Wisconsin streams tend to provide anglers with smaller trout, too. Brook trout kept at Lawrence Creek in central Wisconsin during the 1955-57 seasons averaged only 7.5 inches and only 3% exceeded 10 inches (Hunt et al. 1962). Catches from the North Branch of Beaver Creek in northeast Wisconsin averaged 8.7 inches for 1979 and 17% exceeded 10 inches, while those caught at Eighteen Mile Creek in northwest Wisconsin averaged 8.2 inches for 1979 and 7.6 inches for 1980. None of the brook trout measured in the 1980 census at Eighteen Mile Creek exceeded 10 inches and only 5% did so in the 1979 census (Avery 1983).

Harvest at McGee Lake during the 1980-82 seasons was almost entirely regulated by the bag limit of 2/day. Absence of a size limit was inconsequential. The traditional 6-inch length limit for stream trout fisheries in Wisconsin would have had little deterrent value either. Only 2 of 5,059 trout kept were less than 6 inches and only 3% were less than 7 inches. A size limit of 8 inches or larger would have been necessary to have a meaningful impact on yield. Approximately 23% of the 3-season total of trout kept were smaller than 8 inches (Fig. 5).

Harvest plus mortality due to other causes reduced the standing stocks of brook trout considerably each summer of the study, but particularly in 1980 and 1981. Reduced exploitation of both age I and age II domestic stocks during the 1982 season was evidently reflected in the much better population remaining at the close of the season. Biomass of this mixed stock of surviving domestic trout and progeny of wild origin was 100% greater than that of the stocks present after the 1980 and 1981 seasons. However, it seems likely that 26 lb/acre is still well below the potential of McGee Lake to sustain a fast-growing population of brook trout through the summer. Nearby Hogelee Springs and Spiegel Springs supported self-sustaining populations of brook trout weighing 40 lb/acre and 48 lb/acre, respectively, in the fall during the years these ponds were annually surveyed by Carline and Brynildson (1977) and fall standing stocks of 62 lb/acre and 96 lb/acre were reported by Carline (1977) for brook trout in Hoglot Springs and Maxwell Springs.

Although the density and biomass of the fall population in 1982 were both considerably better than abundance or biomass in the fall of 1980 and 1981, there was no corresponding buildup in the number of larger brook trout. McGee Lake held approximately 107 brook trout over 12 inches in October 1980, but only 90 in the fall of 1981 and only 85 in the fall of 1982. Comparable values for trout over 15 inches were 29, then 8, then 20 (Append. Table 15). Better survival of domestic yearlings during the summer of 1982, not a stockpiling of more larger trout, was the primary factor contributing to the increase in number and biomass of trout after the 1982 season. None of the surviving yearlings attained 12 inches.

MANAGEMENT IMPLICATIONS

Management implications of this experiment, the first of its kind on a Wisconsin trout lake fishery, are perhaps best characterized as "ambivalent". Clearly the dramatic and generally favorable changes precipitated by applications of similar regulations to the fisheries at Hat Creek and Hot Creek in California failed to occur at McGee Lake. The fishery was dominated by anglers who were primarily interested in quickly catching 2 brook trout of larger-than-average size than is typical for the region and then they stopped fishing. Pure catch and release tactics were practiced by a very small minority of anglers. Harvest was reduced to something less than what would be expected under normal fishing regulations, but it was still high enough in combination with mortality due to other causes to circumvent stockpiling of a large number of large brook trout during the 3 years of the study.

On the other hand, the severity of the 2/day bag limit did have management consequences that could be viewed as positive when examined against the background of information gathered on the same lake in 1977 when more liberal regulations were in effect. (1) Angler use and harvest were disbursed more evenly throughout the 5-month seasons in 1980-82 than in 1977. (2) The average catch rate (creeled or released) was higher for 1980-82 than for 1977 (0.66 vs. 0.58/hr). (3) Monthly catch rates during 1980-82 were also much better the last 4 months of each season than was the case in 1977. In general, therefore, the 2/day limit tended to provide better angling quality throughout the season and reduce angling competition (Append. Table 9).

Another plus factor in management of the fishery via the 2/day limit is evidence that at least some large brook trout survived through the 1980-82 fishing seasons. Their number was never impressive, but average abundance of 20 fish over 15 inches remaining in the fall is much better than no trout of this size at the close of the 1977 season. No trout larger than 18 inches were ever observed in the harvest by creel census personnel, but each season (including 1977) interviewed anglers reported seeing or hearing of trout exceeding 20 inches that had been caught.

The "bottom line" conclusions that can be drawn from this 3-year study would seem to be these: (1) If the present set of special regulations and stocking procedures are continued, the same kind of sport fishery is likely to continue also. The pattern that developed the first season did not change much the next two seasons. (2) If a predominantly characteristic catch and release fishery is to replace the present fishery emphasizing catch to keep, two trends must evolve: much greater use by nonlocal anglers seeking catch and release recreation, and decreased harvest (if not use) by anglers fishing with natural baits. (3) If these two trends do not occur, the fishery will continue as a modified "put, grow and take" trout lake fishery, providing a bit of added diversity to a largely local angler clientele that would not be available if McGee Lake were managed routinely like other trout lakes in the region. The diversity that is now offered at McGee Lake is the opportunity to use natural baits legally to catch brook trout of larger-than-average size for the region at catch rates that are higher than normal and to do so throughout the fishing season.

If neither of these recreational scenarios is acceptable as long-term management strategies, two options could be considered as alternatives: (1) Replace the present set of experimental regulations with whatever the current normal regulations are for other trout lakes in the region based on the assumption that it is wiser to again manage McGee Lake like other trout lakes in the region rather than perpetuate the present site-specific fishery or gamble that more anglers seeking catch and release fishing will eventually be attracted. (2) Replace the present special regulations with an even more stringent set that would eliminate use of natural baits based on the assumptions that angling exploitation would be greatly reduced, more large brook trout would accumulate, and more anglers seeking catch and release recreation would be attracted to the only trout lake in Wisconsin offering such recreation. Should either of these suggestions or an alternative strategy be initiated, a followup evaluation of its effectiveness would seem to be axiomatic.

APPENDIX. Supplementary Tables and Figures.

TABLE 8. *Physical-chemical characteristics of McGee Lake based on a surface water sample taken 10 April 1981.*

Parameter	Value
pH	8.1
Total alkalinity (mg/l as $CaCO_3$)	174
Specific conductance (umhos/cm at 25 C)	340
Nitrates (mg/l)	0.07
Phosphates (mg/l)	0.02
Ammonia (mg/l)	0.03
Chlorides (mg/l)	2
Calcium (mg/l)	41
Magnesium (mg/l)	20
Potassium (mg/l)	2
Sodium (mg/l)	2
Sulfates (mg/l)	9
Iron (mg/l)	0.1
Turbidity	0.35

TABLE 9. *Angler hours/acre, trout creeled/acre, trout released/acre and catch rates at McGee Lake during the 1977 and 1980-82 fishing seasons summarized by month and cumulative percentages. Data for 1977 are included to facilitate comparisons of 1980-82 characteristics with those from a season when more liberal regulations were in effect. 1977 data are from Hunt (1981).*

	May		June		July		August		September	
Year	Hours/ Acre	Cum. %	Hours/ Acre	Cum. %	Hours/ Acre	Cum. %	Hours/ Acre	Cum. %	Hours/ Acre	Cum. %
1980	51.5	27.4	48.1	53.1	43.4	76.2	24.9	89.5	19.8	100.0
1981	77.4	37.7	29.8	52.2	29.6	66.5	41.7	86.8	27.2	100.0
1982	50.8	29.6	20.7	41.6	40.6	65.2	23.8	79.1	36.0	100.0
Avg.	59.9	31.8	32.9	49.3	37.8	69.3	30.1	85.3	27.7	100.0
1977	252.5	55.3	69.4	70.5	78.2	87.6	35.6	95.4	20.9	100.0
Year	Creeled/ Acre	Cum. %	Creeled/ Acre	Cum. %	Creeled/ Acre	Cum. %	Creeled/ Acre	Cum. %	Creeled/ Acre	Cum. %
1980	29.1	42.1	17.9	68.0	11.7	84.9	5.5	92.9	4.9	100.0
1981	36.3	39.1	5.8	45.3	8.1	94.1	28.5	84.7	14.2	100.0
1982	14.8	24.3	7.2	36.1	11.5	54.9	11.8	74.3	15.7	100.0
Avg.	26.7	35.9	10.3	49.8	10.4	63.8	15.3	84.4	11.6	100.0
1977	181.1	77.2	20.1	85.8	21.9	95.1	7.8	98.5	3.6	100.0
Year	Released/ Acre	Cum. %	Released/ Acre	Cum. %	Released/ Acre	Cum. %	Released/ Acre	Cum. %	Released/ Acre	Cum. %
1980	40.1	62.7	18.3	91.2	1.0	92.8	0.7	93.9	3.9	100.0
1981	16.6	36.7	2.0	41.2	4.3	50.7	15.0	83.8	7.3	100.0
1982	19.8	46.4	5.4	59.0	5.0	70.7	1.7	74.7	10.8	100.0
Avg.	25.5	50.4	8.6	67.4	3.4	74.1	5.8	85.6	7.3	100.0
1977	33.8	98.8	0.1	100.0	0.0	100.0	0.0	100.0	0.0	100.0
Year	Creeled/ Hour		Creeled/ Hour		Creeled/ Hour		Creeled/ Hour		Creeled/ Hour	
1980	0.57		0.32		0.27		0.22		0.25	
1981	0.47		0.19		0.28		0.68		0.52	
1982	0.29		0.35		0.28		0.50		0.44	
Avg.	0.44		0.29		0.28		0.47		0.40	
1977	0.72		0.29		0.28		0.22		0.17	

TABLE 10. *Distribution of anglers at McGee Lake during the 1980-82 trout fishing seasons according to the number of anglers per vehicle.*

Year	Angler Group	Percent Distribution of all Anglers According to Angler/Vehicle 1	2	3	4	5+	Avg. No. Anglers/ Vehicle
1980	Boat anglers	10	51	27	10	2	2.5
	Shore anglers	34	33	18	7	8	2.2
	All anglers	21	43	23	9	4	2.4
1981	Boat anglers	16	54	24	4	2	2.2
	Shore anglers	35	31	16	15	3	2.2
	All anglers	22	46	21	8	3	2.2
1982	Boat anglers	17	41	27	12	3	2.0
	Shore anglers	15	21	42	12	10	2.3
	All anglers	17	35	31	12	5	2.1
1980-82	Boat anglers	14	49	26	9	2	2.2
	Shore anglers	28	28	25	11	8	2.2
	All anglers	20	41	25	10	4	2.2

TABLE 11. *Number, weight and size of domestic age I lots of brook trout stocked in McGee Lake during 1980-82.*

Stocking Date	No. Stocked	No./Acre Stocked	Lb Stocked	Lb/Acre Stocked	Avg. Length (inches)	Avg. Weight (g)
30 Apr 80	4,000	176	640.0	28.2	7.5	73
29 Apr 81	4,000	176	648.5	28.7	7.5	74
29 Apr 82	4,000	176	520.2	22.9	6.6	59

TABLE 12. *Number and weight of brook trout present in McGee Lake before and after the 1980-82 trout fishing seasons.*

Period	Domestic Age I No.	No./ Acre	Weight (Lb)	Lb/ Acre	Domestic Age II No.	No./ Acre	Weight (Lb)	Lb/ Acre	Domestic Age III No.	No./ Acre	Weight (Lb)	Lb/ Acre	Other* No.	No./ Acre	Weight (Lb)	Lb/ Acre	All Trout No.	No./ Acre	Weight (Lb)	Lb/ Acre
April-May 1980**	4,000	176.2	640.0	28.2									292	12.9	244.5	10.8	4,292	189.1	884.5	39.0
October 1980	302	13.3	138.9	6.2									198	8.7	144.6	6.4	500	22.0	283.3	12.6
April-May 1981**	4,000	176.2	648.5	28.6	226	10.0	195.5	8.6					145	6.4	166.1	7.3	4,371	192.6	1,010.1	44.5
October 1981	306	13.5	125.3	5.5	30	1.3	30.2	1.3					349	15.4	134.1	5.9	685	30.2	289.6	12.7
April-May 1982**	4,000	176.2	520.2	22.9	205	9.0	132.2	5.8	19	0.8	19.0	0.8	240	10.6	135.4	6.0	4,464	196.6	805.8	35.5
October 1982	734	32.3	301.3	13.3	51	2.2	37.9	1.7	5	0.2	5.5	0.2	568	25.0	240.8	10.6	1,358	59.7	585.5	25.8

* Brook trout of wild origin or stocked prior to 1980.

** Combined estimates for standing stocks in late April based on electrofishing inventories plus the number and weight of the domestic stock of yearlings released after the inventory.

TABLE 13. *Growth and condition (R) of domestic brook trout stocked in McGee Lake during 1980-82.*

Item	1980 Age I	1981 Age I	1981 Age II	1982 Age I	1982 Age II	1982 Age III
Length (inches)						
April	7.5	7.5	12.5	6.6	12.1	13.4
October	10.5	10.1	13.2	10.0	12.2	14.3
Increment	3.0	2.6	0.7	3.4	0.1	0.9
Percent gain	40	35	6	52	1	7
Weight (g)						
April	73	74	392	59	293	454
October	209	186	457	186	337	499
Increment	136	112	65	127	44	45
Percent gain	186	151	17	215	15	10
Coef. of Condition (R)*						
April	1.73	1.73	1.95	2.08	1.91	1.88
October	1.80	1.78	1.84	1.87	1.79	1.85
Percent change	4	3	-6	-10	-6	-2

* $R = 10W \div L^3$ where W is weight in grams and L is total length in inches.
(R factors are derived from individual fish, not from average lengths and weights.)

TABLE 14. *Food composition of 496 brook trout from McGee Lake collected during May-October of 1980 and 1981.*

Food Category	Percent Stomachs Containing Item*	Percent Total Food Volume**
Fish[1]	48.4	50.3
Diptera[2]	54.8	23.0
Hemiptera	32.7	1.4
Coleoptera	5.2	0.2
Trichoptera	2.0	0.2
Odonata	5.6	4.4
Hymenoptera	2.2	0.1
Ephemeroptera	2.4	0.1
Amphipoda	5.2	2.9
Cladocera	15.9	6.3
Decopoda[3]	7.5	6.1
Gastropoda	3.2	< 0.1
Oligochaeta	0.1	< 0.1
Miscellaneous	9.5	4.9

* 30 stomachs contained no food

** Total volume - 756 ml.

[1] Identifiable species were brook stickleback *(Culaea inconstans)* and fathead minnow *(Pimephales promelas)*.

[2] Primarily Chrionomidae.

[3] All were crayfish *(Orconectes virilis)*.

TABLE 15. *Distribution of angler trips made to McGee Lake during the 1980-82 fishery seasons according to distance traveled from the residence of anglers.*

Travel Distance in Miles	1980		1981		1982		1980-82	
	No. of Trips	% of Total	No. of Trips	% of Total	No. of Trips	% of Total	No. of Trips	% of Total
0-24	851	41	1,174	54	831	55	2,856	50
25-49	311	15	217	10	227	15	755	13
50-99	623	30	435	20	272	18	1,330	23
100	291	14	348	16	181	12	820	14
Total	2,076	100	2,174	100	1,511	100	5,761	100

TABLE 16. *Summary of the number of brook trout in McGee Lake in May and October of 1980-82 that were larger than 12 inches and larger than 15 inches.*

	Number of Brook Trout							
	1980		1981		1982		1980-82 Avg.	
Size Group	May	October	May	October	May	October	May	October
12 inches	165	107	278	90	112	58	185	85
15 inches	13	29	25	23	12	8	17	20

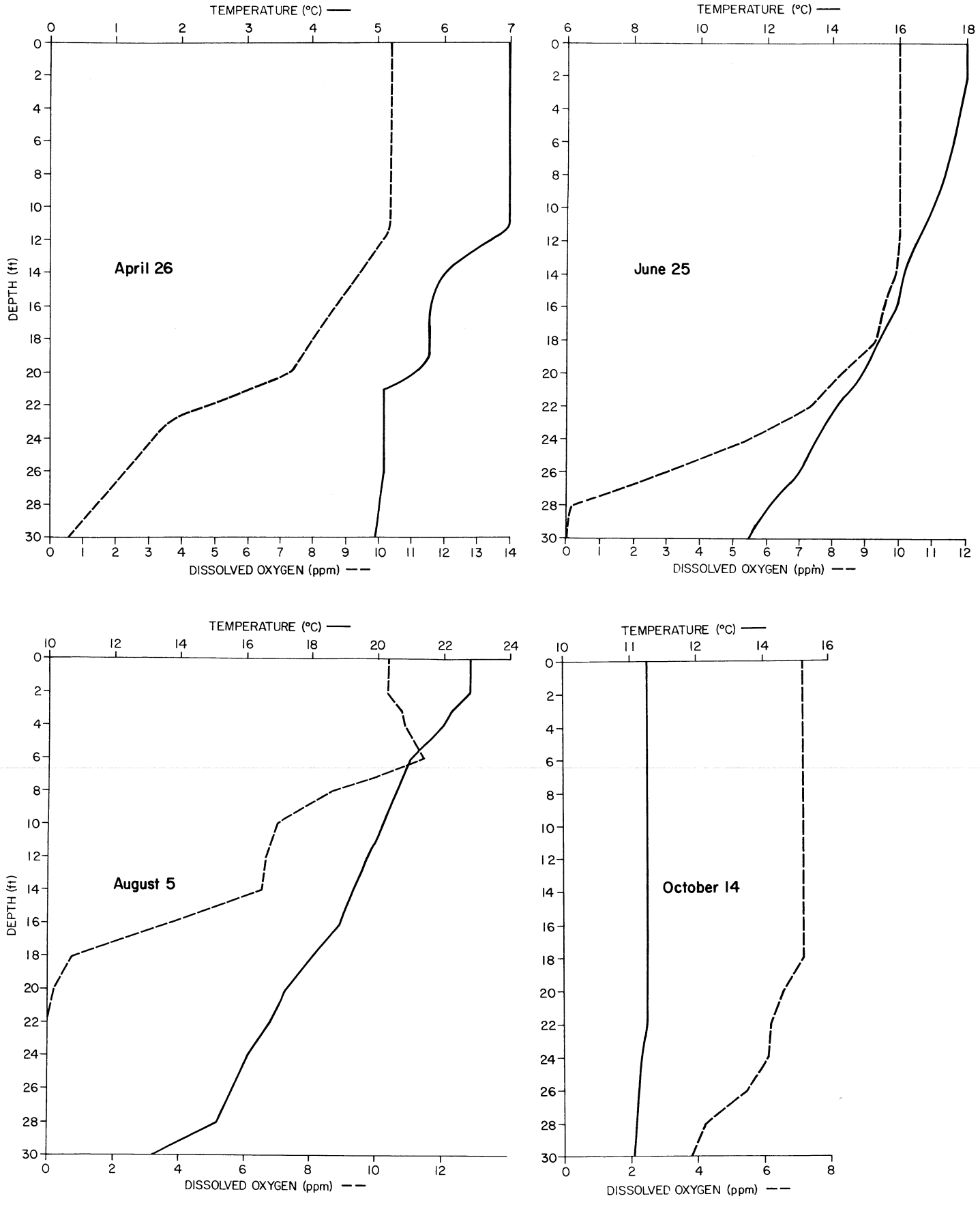
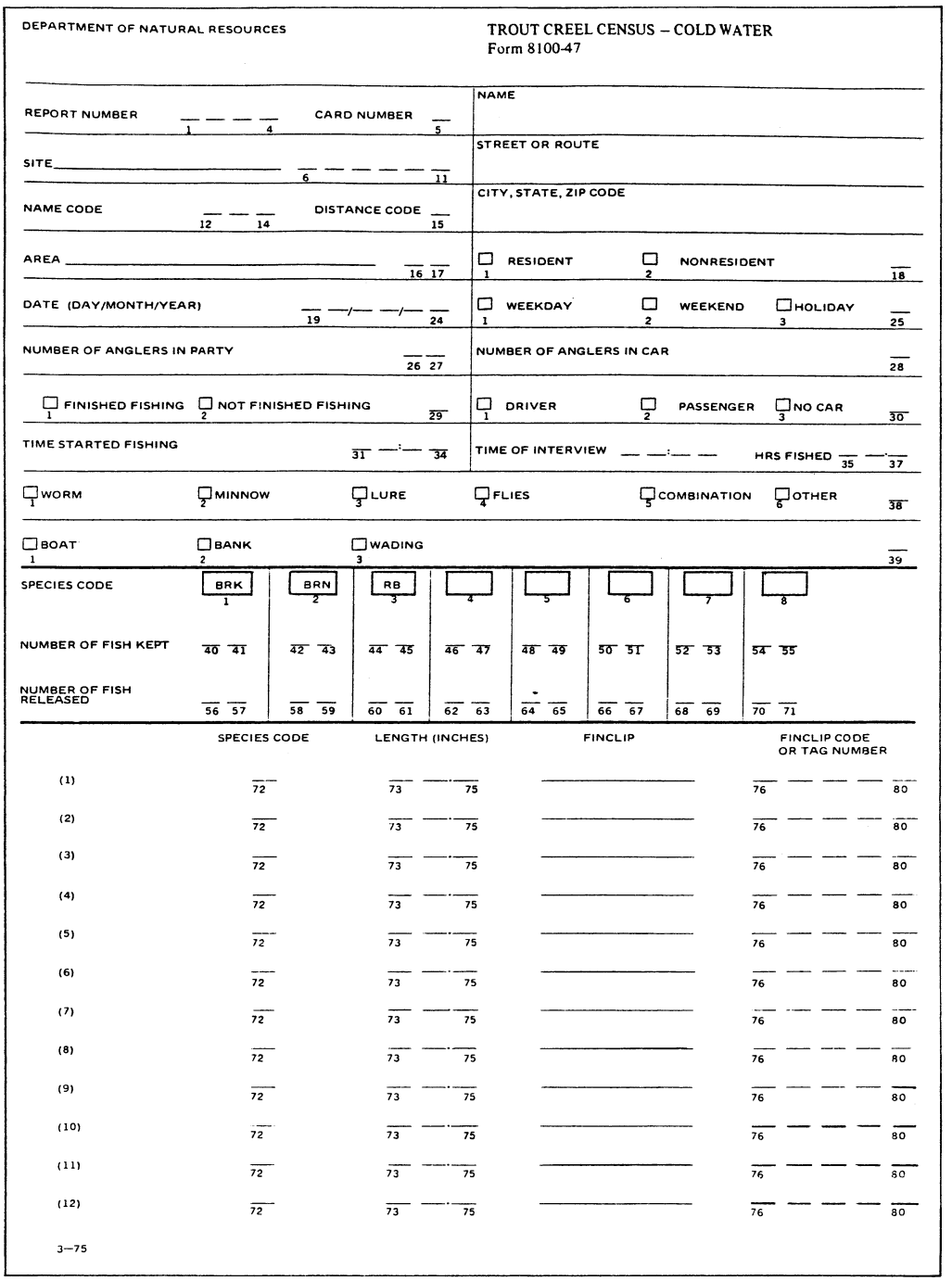


FIGURE 8. *Vertical changes in water temperature and concentrations of dissolved oxygen in McGee Lake during April, June, August and October 1982.*



DEPARTMENT OF NATURAL RESOURCES

TROUT CREEL CENSUS – COLD WATER
Form 8100-47

REPORT NUMBER ___ ___ ___ ___ (1–4) CARD NUMBER ___ (5)

SITE ___ ___ ___ ___ ___ ___ (6–11)

NAME CODE ___ ___ ___ (12–14) DISTANCE CODE ___ (15)

AREA ___ ___ ___ (16–17)

DATE (DAY/MONTH/YEAR) ___ ___/___ ___/___ ___ (19–24)

NUMBER OF ANGLERS IN PARTY ___ ___ (26–27)

☐ FINISHED FISHING (1) ☐ NOT FINISHED FISHING (2) ___ (29)

TIME STARTED FISHING ___ ___:___ ___ (31–34)

NAME

STREET OR ROUTE

CITY, STATE, ZIP CODE

☐ RESIDENT (1) ☐ NONRESIDENT (2) ___ (18)

☐ WEEKDAY (1) ☐ WEEKEND (2) ☐ HOLIDAY (3) ___ (25)

NUMBER OF ANGLERS IN CAR ___ (28)

☐ DRIVER (1) ☐ PASSENGER (2) ☐ NO CAR (3) ___ (30)

TIME OF INTERVIEW ___ ___:___ ___ HRS FISHED ___ ___.___ (35–37)

☐ WORM (1) ☐ MINNOW (2) ☐ LURE (3) ☐ FLIES (4) ☐ COMBINATION (5) ☐ OTHER (6) ___ (38)

☐ BOAT (1) ☐ BANK (2) ☐ WADING (3) ___ (39)

SPECIES CODE	BRK (1)	BRN (2)	RB (3)	(4)	(5)	(6)	(7)	(8)
NUMBER OF FISH KEPT	40 41	42 43	44 45	46 47	48 49	50 51	52 53	54 55
NUMBER OF FISH RELEASED	56 57	58 59	60 61	62 63	64 65	66 67	68 69	70 71

	SPECIES CODE (72)	LENGTH (INCHES) (73–75)	FINCLIP	FINCLIP CODE OR TAG NUMBER (76–80)
(1)				
(2)				
(3)				
(4)				
(5)				
(6)				
(7)				
(8)				
(9)				
(10)				
(11)				
(12)				

3–75

FIGURE 9. *Creel census form used at McGee Lake during the 1980-82 trout fishing seasons.*

Department of Natural Resources

SPORT FISHERY CENSUS OF TROUT LAKES WHERE AXLE COUNTERS ARE EMPLOYED 4-77

SITE _____ DATE __ __/ __ __/ __ __

OBSERVATION TIME . . . . . __ __:__ __ STOP __ __: __ __

AXLE COUNTER NUMBER AT START . . . . . __ __ __ AT STOP __ __ __

Number of cars at site at start	__ __	at stop __ __
Number of cars entering during period	__ __	
Number of cars leaving during period	__ __	
Number of boat trailers at site at start	__ __	at stop __ __
Number of boat trailers entering during period . .	__ __	
Number of boat trailers leaving during period . .	__ __	
Number of anglers on lake at start	__ __	at stop __ __
Number of boat anglers entering during period . .	__ __	
Number of boat anglers leaving during period . .	__ __	
Number of anglers on shoreline at start	__ __	at stop __ __
Number of shoreline anglers entering during period	__ __	
Number of shoreline anglers leaving during period	__ __	
Number of anglers interviewed during period . . .	__ __	

FIGURE 10. Axle counter form used at McGee Lake during the 1980-82 trout fishing seasons.

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