The trout fishery of the lower Big Hole River, Montana, during 1977 and 1978
by Vincent John Kozakiewicz

A thesis submitted in partial fulfillment of the requirements for the degree of MASTER OF SCIENCE in Fish and Wildlife Management
Montana State University

Abstract:
A partial creel census to determine the fishermen use and harvest was conducted during 1977 and 1978 on a 16 km section of the lower Big Hole River. Approximately 41 and 47% of the estimated total number of anglers using the study area in 1977 and 1978 respectively were interviewed. Anglers residing within 80 km of the study area comprised 62% of the fishermen interviewed in 1977 and 65% in 1978. About 64 and 62% of the anglers kept zero fish in 1977 and 1978 respectively. In 1977 0.05% of the anglers kept the bag limit of ten trout. Less than 3% of the anglers kept the bag limit of five trout in 1978. Catch rates of fish kept were 0.25 and 0.28 fish/hour in 1977 and 1978 respectively. In 1977 an estimated 5,397 anglers fished 15,698 hours on the study area. Bank anglers accounted for about 80% of the total number of anglers and 76% of the total hours fished. An estimated 3,987 anglers fished 9,-945 hours on the study area in 1978. Bank anglers accounted for 62% of the anglers and 61% of the hours fished in that year. A total of 1,088 boats used the study area during the study with 41% of the use occurring in 1977. A total of 3,974 trout were harvested in 1977 with bank anglers catching 66%. In 1978 about 2,746 trout were harvested with bank anglers catching 48%. Brown trout constituted an estimated 78% of the harvest in 1977 and 72% in 1978. Age II and older fish comprised 99 and 98% of the brown trout harvest in 1977 and 1978 respectively. The April to September 1977 mortality rate for these brown trout was 43% with fishing mortality accounting for 64% of that mortality. Harvest of Age II and older brown trout was responsible for 70% of the annual mortality from fall 1977 to fall 1978. Harvest accounted for 44% of the annual mortality of Age III and older brown trout during the same period.

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Signature Vincent J. Kozakiewicz

Date August 3, 1979

In memory of

Kenneth David Lorang, a friend and colleague.

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ABSTRACT

A partial creel census to determine the fishermen use and harvest was conducted during 1977 and 1978 on a 16 km section of the lower Big Hole River. Approximately 41 and 47% of the estimated total number of anglers using the study area in 1977 and 1978 respectively were interviewed. Anglers residing within 80 km of the study area comprised 62% of the fishermen interviewed in 1977 and 65% in 1978. About 64 and 62% of the anglers kept zero fish in 1977 and 1978 respectively. In 1977 0.05% of the anglers kept the bag limit of ten trout. Less than 3% of the anglers kept the bag limit of five trout in 1978. Catch rates of fish kept were 0.25 and 0.28 fish/hour in 1977 and 1978 respectively. In 1977 an estimated 5,397 anglers fished 15,698 hours on the study area. Bank anglers accounted for about 80% of the total number of anglers and 76% of the total hours fished. An estimated 3,987 anglers fished 9,945 hours on the study area in 1978. Bank anglers accounted for 62% of the anglers and 61% of the hours fished in that year. A total of 1,088 boats used the study area during the study with 41% of the use occurring in 1977. A total of 3,974 trout were harvested in 1977 with bank anglers catching 66%. In 1978 about 2,746 trout were harvested with bank anglers catching 48%. Brown trout constituted an estimated 78% of the harvest in 1977 and 72% in 1978. Age II and older fish comprised 99 and 98% of the brown trout harvest in 1977 and 1978 respectively. The April to September 1977 mortality rate for these brown trout was 43% with fishing mortality accounting for 64% of that mortality. Harvest of Age II and older brown trout was responsible for 70% of the annual mortality from fall 1977 to fall 1978. Harvest accounted for 44% of the annual mortality of Age III and older brown trout during the same period.

INTRODUCTION

The lower Big Hole River lies between the towns of Divide and Twin Bridges. It is approximately 82 km of the highest quality trout habitat in Montana (Brown et al. 1965). It has supported a trout fishery since at least the early 1900's when the Union Pacific Railroad offered special train service from Butte to the Big Hole River for fishermen. Recently apparent increased use has caused certain sportsmen groups to become concerned about the fishery of the lower Big Hole River.

Fishermen use and harvest on the lower Big Hole River previous to this study were measured by limited creel censuses and the solicitation of fishermen logs. However, populations of brown *(Salmo trutta)* and rainbow trout *(Salmo gairdneri)* in a 6.9 km section of the lower river have been monitored periodically since 1969 (Elser and Marcoux 1971 and 1972, Peterson 1974, Wells and Nelson 1978). A comparison of estimates made in 1970 and 1977 showed the numbers of brown trout less than 45.7 cm in total length have increased. However, the numbers of brown trout 45.7 cm and larger and all size classes of rainbow trout larger than 18.0 cm have decreased over those years (Wells and Nelson 1978).

The purpose of this study was to determine angler use and harvest of brown and rainbow trout in a reach of the lower Big Hole

River and relate it to the existing populations. It was designed to measure the individual impacts of boat and bank fishermen. Field work was conducted from May into September of 1977 and 1978.

DESCRIPTION OF THE STUDY AREA

The Big Hole River lies predominantly in Beaverhead County in southwestern Montana. It arises in the Bitterroot Mountains near the town of Jackson and flows approximately 182 km in a sinuous course to its confluence with the Jefferson River. From Jackson the river flows northward through the upper Big Hole valley then eastward to Divide. From Divide the river turns southward through the Big Hole canyon and the lower Big Hole valley then turns northward. It receives tributaries from both the Bitterroot and Pioneer mountains.

The Big Hole River drains a total land area of 6,413 km^2 (U.S.G.S. 1978). Major economic activities in the drainage are cattle ranching, haying, mining and recreation. The withdrawal of water from the river for irrigation of hayfields has been implicated as a major detriment to the fishery of the Big Hole drainage (Heaton 1960, Wipperman 1965, Wells and Nelson 1978). Heavy metals and siltation from two mining operations have entered the river in the past but corrective action was taken in 1959 (Heaton 1960).

The study area extended from the Trapper Creek Road Bridge at Melrose 16 km downstream to the boat pullout behind the Glen Bar (Fig. 1). The elevation of the study area at the U.S.G.S. gage site was 1,434 m above sea level (U.S.G.S. 1978). The average

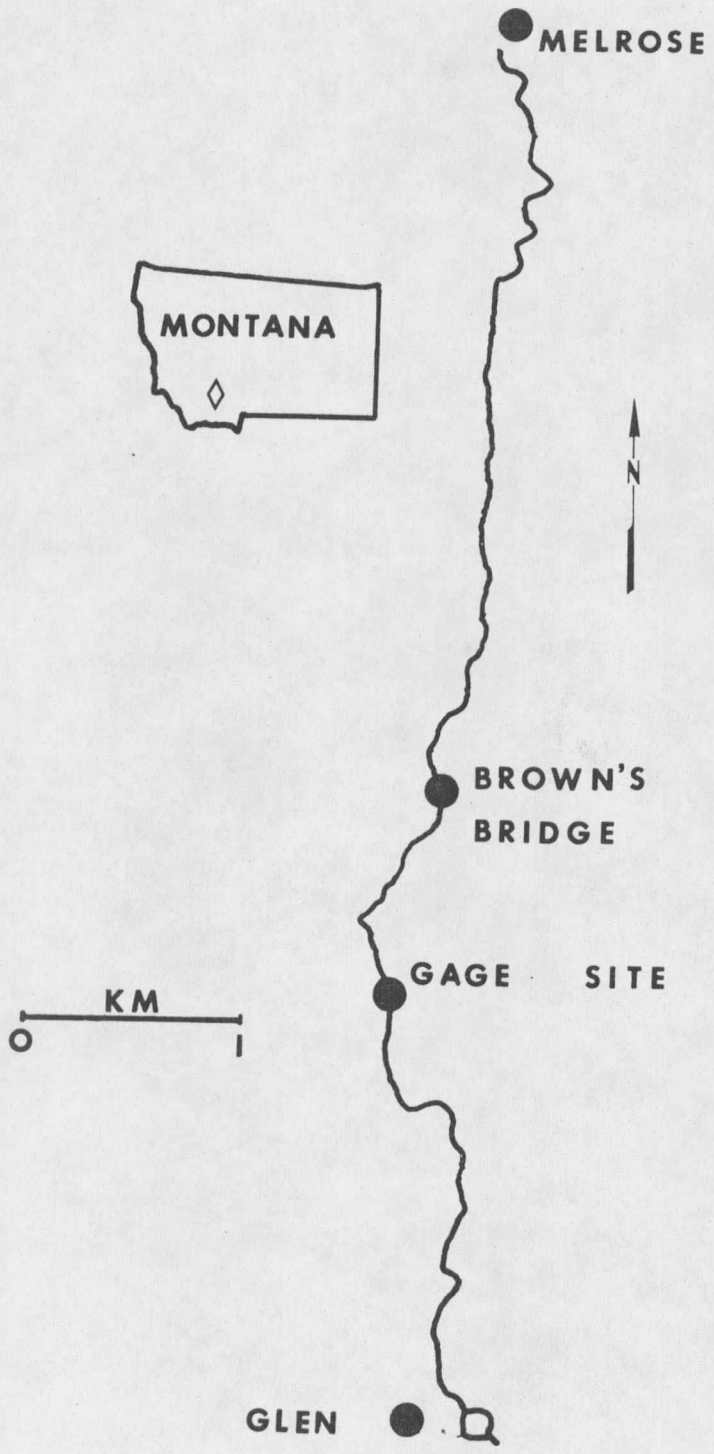

Figure 1. Map of the study area.

gradient for the lower Big Hole River was approximately 6.8 m per km and stream width was generally greater than 38 m (Montana Department of Fish and Game 1979).

The river within the study area was composed mostly of riffles and large pools. The substrate consisted mainly of cobble interpersed with gravel and sand. The riparian zone contained grasses, cottonwood *(Populus)*, willow *(Salix)*, rose *(Rosa)* and other deciduous shrubs.

The mean, minimum and maximum flows of the lower Big Hole River at the gage site in the study section for a 54 year period ending in 1977 were 32.77 m^3/sec, 1.39 m^3/sec and 405 m^3/sec respectively (U.S.G.S. 1978). An unnatural maximum flow of 651 m^3/sec was recorded when the Wise River Resevoir dam failed in 1927. Mean and maximum flows in water year 1977 were below normal. The mean, minimum and maximum flows were 19.45 m^3/sec, 4.36 m^3/sec and 131 m^3/sec respectively (U.S.G.S. 1978). The mean and maximum flows in water year 1978 were higher than those in the previous year. The mean, minimum and maximum flows were 42.31 m^3/sec, 3.34 m^3/sec and 204.89 m^3/sec respectively (U.S.G.S. unpublished data). The minumum flow was recorded between the first fall and second spring of the study.

In the study section the river is entirely surrounded by private ranchland. Fishermen were provided access to the river

through the courtesy of the land owners. Floaters (anglers using boats) were allowed convenient access at the Trapper Creek Road Bridge, Brown's Bridge and the lower study section boundary. Bank anglers (fishing from shore and wading) were given walk-in access at numerous locations.

METHODS

General Pattern of Creel Census

Selection of Census Days

Creel censuses were conducted from May 21 to September 9, 1977 and from May 20 to September 8, 1978 to obtain estimates of angling pressure and harvest. Dr. David Bowden of Colorado State University designed the creel census used in this study. The census basically consisted of dividing the fishing season into strata of two weeks. Two weekend days, one Saturday and one Sunday, were randomly selected to be censused in each stratum. Two weekdays were randomly selected to be sampled from each week within each stratum. Weeks containing a holiday were considered to be separate strata. In these strata the census was conducted on both weekend days, the holiday and two of the remaining weekdays.

Sampling on a Census Day

The length of the fishing day was considered to extend from 6 A.M. to 10 P.M. Instantaneous counts (made within 1 hr) of bank anglers observed fishing were made four times each census day. The time of the first count was selected randomly to begin at 6, 7, 8, or 9 A.M. Each of the following three counts were made

at intervals of 4 hours.

The census day was divided into four 4-hr periods: 6-10 A.M., 10 A.M.-2 P.M., 2-6 P.M. and 6-10 P.M. Bank anglers were interviewed during one of the two earlier periods and one of the two latter periods. Floaters were interviewed during the remaining two periods. Approximately 75% of the floaters using the study area ended their trips at Glen and 25% at Brown's Bridge. The selection of the sampling location was weighted in proportion to the pressure so that the probability of sampling at Glen was three times that of sampling at Brown's Bridge.

Fishermen were interviewed individually. Information collected from interviews included length of time fished, methods of angling, residency and sex. The number, weight and total length of each fish kept and the number of fish released were recorded by species.

Modification of General Pattern of Creel Census

Several modifications of the basic sampling program were used. They were applied to increase sampling efficiency during periods of heavy boating and when additional manpower was available.

Weekends-Floaters/Method A

All floaters terminating their fishing day at Brown's Bridge and Glen were interviewed by a creel clerk on all weekend days and

holidays within the stratum. An attempt was also made to interview anglers floating beyond Glen. Since virtually all floaters were contacted, each variable recorded was summed and no variance was calculated. This method was used in Strata 1-8, 13 and 1-9, 13 during 1977 and 1978 respectively when boating pressure was high.

Weekends-Floaters/Method B

A stationary creel clerk interviewed all floaters at Glen on all weekend days in the stratum. Each variable recorded at Glen was summed and no variance was calculated. The roving creel clerk sampled floaters at Brown's Bridge during two 4-hr periods per day on all weekend days in the stratum. A daily total and corresponding variance for each variable at Brown's Bridge were estimated using Formulae 1, 2 and 3.

$$T_i = 1.5(X_{i1} + X_{i2}) \qquad \text{Formula 1}$$

$$V(T_i) = 1.5S^2 \qquad \text{Formula 2}$$

$$S_i^2 = \frac{\Sigma X_{ij}^2 - (\Sigma X_{ij})^2/m_i}{m_i - 1} \qquad \text{Formula 3}$$

where T_i = the estimated total for day i

X_{ij} = the total on day i and 4-hr period j

$V(T_i)$ = the variance of T on day i

S_i^2 = The variance of the 4-hr periods sampled

and m_i = the number of 4-hr periods sampled on day i.

Daily estimates of variables from all floaters were obtained by adding the estimates of each variable from Glen and Brown's Bridge. This method was applied in Stratum 9 during 1977 when floating began to decrease.

Weekends-Floaters/Method C

The roving creel clerk contacted all floaters at both take-out sites on one Saturday and one Sunday per stratum. The estimate of each variable for both weekends within the stratum was obtained by doubling the total from the one Saturday and one Sunday. The variance of each variable was obtained by combining the appropriate data from all Saturdays sampled by this method in the formula:

$$S^2 = \frac{\Sigma(X_i - \bar{X})^2}{n-1} \qquad \text{Formula 4}$$

where X_i = the total on day i

$\bar{X}$ = the mean for all the days sampled

and n = the number of days sampled.

The variance for the two Saturdays in a stratum was estimated as $2S^2$. Since a pooled estimator of variance was used, the variance was the same for each Saturday in strata subjected to this method. The estimate and variance of each variable for Sundays were obtained

similiarly. This method was applied in Strata 10-12 during 1977 and 1978 when floating was uncommon.

Weekdays-Floaters/Method A

Floaters were sampled 3 days per week by the roving creel clerk during two randomly chosen 4-hr periods on each census day. The method of choosing the site for contacting and counting floaters is described in the previous section Sampling on a Census Day.

Each variable from each 4-hr period was multiplied by 2 when obtained at Glen and 6 when obtained at Brown's Bridge. The resulting sums of each variable from the two 4-hr samples were added to give the estimate of the variable for the census day. Formulae 5 and 6 were used to determine estimates of daily totals and variances.

$$T_i = T_{i1} + T_{i2} \qquad \text{Formula 5}$$

$$V(T_i) = \frac{1}{3}(T_{i1} - T_{i2})^2 \qquad \text{Formula 6}$$

where T_i = the estimated total for day i

T_{i1} and T_{i2} = the total on day i and 4-hr period j

and $V(T_i)$ = the variance of T on day i.

The weekly total and variance for each variable was estimated as:

$$T = \frac{N}{n}\Sigma T_i \qquad \text{Formula 7}$$

$$V(T) = \frac{N^2(N-n)S^2}{N\chi n} + \frac{N\Sigma V(T_i)}{n} \qquad \text{Formula 8}$$

$$S^2 = \frac{\Sigma(T_i - \bar{T})^2}{n-1} \qquad \text{Formula 9}$$

where T = the estimated weekly total

V(T) = the variance of the weekly total

N = the number of weekdays in the stratum

and n = the number of days sampled.

This technique was used for Strata 1-8 and 1-9 during 1977 and 1978 respectively when boating pressure was high.

Weekdays-Floaters/Method B

The roving creel clerk sampled floaters during one randomly chosen 4-hr period per day on two days per week. The method of choosing the site for contacting and counting floaters is described in the previous section Sampling on a Census Day. An estimate of the daily total for each variable was obtained by multiplying each variable by 4 or 12 when obtained at Glen and Brown's Bridge respectively. Estimates of weekly totals were calculated using Formula 7. The variance for a week was calculated as:

$$V(T) = N^2S^2/n \qquad \text{Formula 10}$$

where N, S^2 and n are defined for Formulae 7, 8 and 9. An overestimate of the actual variance resulted from the use of Formula 10

due to the absence of daily variances. This technique was applied in Stratum 9 during 1977 when boating pressure began to decrease.

Weekdays-Floaters/Method C

The roving creel clerk contacted all floaters for the entire census day on two days per week. Low boating pressure made it possible to contact all boaters. Daily totals were obtained by summation and no daily variances were calculated. A weekly estimate of each variable was calculated using Formula 7. Variance was calculated as:

$$V(T) = N^2(\frac{N-n}{n})S^2/n \qquad \text{Formula 11}$$

where N, S^2 and n are as defined for Formula 7, 8 and 9. This procedure was applied in Strata 10-13 during 1977 and 1978.

Weekends-Bank Anglers/Method A

The roving creel clerk sampled bank anglers except those at Glen and Brown's Bridge. The number of hours fished in the area covered by the roving creel clerk was determined by averaging the number of anglers observed during the four instantaneous counts and multiplying by the length of the fishing day (16 hrs). Daily fishing pressure for bank anglers was determined from:

$$H = 16\bar{Y} \qquad \text{Formula 12}$$

where H = the total number of hours fished per day

and $\bar{Y}$ = the average number of anglers observed fishing during the four instantaneous counts.

Variance of the daily fishing pressure was determined as:

$$V(H) = 16^2 S^2/4 \qquad \text{Formula 13}$$

where S^2 = the variance of the four instantaneous counts.

The mean hours fished/completed trip was calculated from data from interviews. It was used to determine the number of anglers fishing on the census day in the following formula:

$$F = H/\bar{h} \qquad \text{Formula 14}$$

where F = the estimate of the number of anglers

H = the estimate of the number of hours fished during the day

and $\bar{h}$ = the mean hours fished/completed trip.

The catch rate of fish kept and released by species was calculated from data obtained in interviews by dividing the number of fish caught by the number of hours fished. Only information from fishermen who had completed fishing was used when it represented 50% or more of the daily sample of fishing trips for the area covered by the roving creel clerk. Information from fishermen who had not completed fishing was included on days when the above condition was not met. The estimate of the number of fish caught was determined

by the equation:

$$C = \bar{c}H \qquad \text{Formula 15}$$

where C = the estimate of the number of fish caught

$\bar{c}$ = the catch rate

and H = the daily estimate of hours fished.

Variance for the number of fishermen was calculated as:

$$V(F) = \frac{1}{(\bar{h})^2} (V(H) + F^2 V(\bar{h})) \qquad \text{Formula 16}$$

Variance for catch was calculated as:

$$V(C) = \bar{c}^2 V(H) + H^2 V(\bar{c}) \qquad \text{Formula 17}$$

where V(F) = the variance of the number of fishermen

V(H) = the variance of the number of hours fished (Formula 13)

V(C) = the variance of the catch

and $V(\bar{h})$ and $V(\bar{c}) = S^2$ in Formula 3 with the number of parties substituted for m_i.

The large sample size obtained necessitated the application of a correction factor to the variances of the number of fishermen and catch. V(F) and V(C) were multiplied by the factor:

$$\frac{H - \text{hours sampled}}{H} \qquad \text{Formula 18}$$

The estimates of the daily total for each variable for bank fishermen at Glen and Brown's Bridge were collected by the stationary creel clerks waiting for floaters. Since virtually all bank anglers were contacted at these locations each recorded variable was summed and no variance was calculated.

The estimate of the daily total for each variable in the study area was obtained by adding the total obtained by the roving creel clerk to the totals collected by the two stationary creel clerks. The daily variance of each variable was calculated only from data taken by the roving creel clerk since stationary clerks obtained essentially complete counts. This method was applied in conjunction with Weekends-Floaters/Method A.

Weekends-Bank Anglers/Method B

Anglers except those at Glen and Brown's Bridge were sampled and data were analyzed by the methods described for variables obtained by the roving creel clerk in Weekends-Bank Anglers/Method A. The sample of the number of anglers, hours fished and fish kept and released by species at Brown's Bridge were obtained during the same two 4-hr periods censused in Weekends-Floaters/Method B. The estimate and variance for each variable were calculated from the formulae:

$$H_i = 2(H_{i1} + H_{i2}) \qquad \text{Formula 19}$$

$$V(H_i) = 4(H_{i1} - H_{i2})^2 \qquad \text{Formula 20}$$

where H_i = the estimated total for day i

$V(H_i)$ = the variance of H on day i

and H_{i1} and H_{i2} = the total on day i and 4-hr period j.

The stationary creel clerk contacted bank anglers at Glen. Therefore the daily total of each variable obtained from this site was summed and no variance was calculated.

Daily totals and variances for the entire study area were obtained by adding data from Glen, Brown's Bridge and the remainder of the section. This method was applied in conjunction with Weekends-Floaters/Method B.

Weekends-Bank Anglers/Method C

Daily estimates and variances of all variables for the entire section including bank fishermen at Glen and Brown's Bridge were determined by the procedure described for variables obtained by the roving creel clerk in Weekends-Bank Anglers/Method A.

The estimates and variances of the stratum were calculated as described in Weekends-Floaters/Method C. Weekends-Bank Anglers/Method C was applied in conjunction with Weekends-Floaters/Method C.

Weekdays-Bank Anglers/Method A

The daily estimate and variance of each variable for bank fishermen except those at Glen and Brown's Bridge were determined

as described in Weekends-Bank Anglers/Method A. Daily estimates for the Glen and Brown's Bridge subsections were determined as described in Weekdays-Floaters/Method A.

Daily estimates and variances for the entire study area were obtained by adding data from Glen, Brown's Bridge and the remainder of the study section. Weekly estimates and variances were determined by using the combined daily estimates in Formulae 7, 8 and 9. This method was applied in conjunction with Weekdays-Floaters/Method A.

Weekdays-Bank Anglers/Method B

Estimates of daily totals and variances were obtained by the roving creel clerk as described in Weekends-Bank Anglers/Method A. The estimates and variances for each stratum were calculated by using the daily estimates in Formulae 7 and 11. This method was applied in conjunction with Weekdays-Floaters/Method B and C.

Estimates and Variances for Strata and Seasons

The estimate of each variable in each stratum was determined by adding the pertinent estimates obtained from floaters and bank anglers. Estimates from weekends and weekdays were calculated separately then combined.

The variance for each variable was either summed or estimated statistically. The variance for weekends in each stratum in which Weekends-Floaters/Method A and B were used in conjunction with

Weekends-Bank Anglers/Method A and B was obtained by adding the variances from the two methods. The variance for weekends in each stratum when Weekends-Floaters/Method C was used in combination with Weekends-Bank Anglers/Method C was obtained by adding the daily estimates from the two methods and using the combined estimates in Formula 4.

The estimate and variance of each parameter for floaters and bank anglers on weekdays were made by adding data from the two sources. Variances for each week or stratum were obtained by using Formula 8 and 9.

The seasonal estimate and its variance for each variable were obtained by combining figures from all strata in the fishing season.

Estimates of Fish Populations

The populations of brown and rainbow trout in the 16 km section of the lower Big Hole River were estimated in the spring and fall of 1977 and 1978. Personnel from the Montana Department of Fish and Game made mark and recapture estimates by electrofishing. Estimates of the population and biomass were computed using methods described in Vincent (1971 and 1974). Personnel from the Montana Cooperative Fishery Unit provided assistance in electrofishing.

Age Determination and Statistical Analyses

Scales were taken from fish for age determinations. The age structure of the harvest was computed from fish in the creel and the age structure of the population was determined from fish captured during electrofishing operations. Mr. Jerry Wells, of the Montana Department of Fish and Game, aged fish in the population samples. He also examined the scales of fish taken in the harvest aged by the author.

Statistical tests were made using methods in Snedecor and Cochran (1978). Statistical analyses were performed using "MSUSTAT" programs on MSU's Sigma 7 computer and a Monroe 1785 desk calculator. Statistical differences were considered to be significant at $P<0.05$ and highly significant at $P<0.01$.

RESULTS

Interviews

Interviews were conducted with 2,198 anglers in 1977 and 1,866 anglers in 1978. Approximately 41 and 47% of the estimated total number of anglers using the study area in 1977 and 1978 respectively were interviewed. Interviews were conducted on 69 days each year which was approximately 62% of each fishing season.

The average lengths of the fishing day for floaters and bank anglers ranged from about 2-3 hours and are shown in Table 1. These averages were similiar to those for fishermen on the West Gallatin River and Big Spring Creek (Lyden 1973, Peterson 1970). The average angler fished 1.5 hours longer on the Bighorn River (Stevenson 1975). The average length of the fishing day for floaters on weekends-holidays in 1977 was significantly greater than for bank anglers during the same period (t-test). Bank anglers on weekdays fished a significantly longer day in 1977 than in 1978 (t-test).

TABLE 1. THE AVERAGE LENGTH OF THE FISHING DAY (IN HOURS) ON THE LOWER BIG HOLE RIVER

	Weekends-Holidays		Weekdays	
Year	Bank Anglers	Floaters	Bank Anglers	Floaters
1977	2.7	3.2	2.7	3.1
1978	2.6	2.9	2.1	2.8

Each fisherman interviewed was classified as a local (residing within 80 km of the study area), a non-local resident of Montana (residing within the state but more than 80 km from the study area) or a nonresident. Local fishermen dominated on the lower Big Hole River. In 1977 about 62% of the fishermen interviewed were locals, 11% were non-local residents of Montana and 27% were nonresidents. In 1978 about 65% were locals, 11% were non-local residents of Montana and 24% were nonresidents. Local anglers were also dominant on Big Spring Creek (Peterson 1970). They were not dominant on the West Gallatin (Lyden 1973), Bighorn (Stevenson 1975) and upper Madison rivers (Vincent 1978).

Professional guides operated 11 and 10% of the boats on the study area in 1977 and 1978 respectively. In contrast they operated 77% of the boats on the upper Madison River (Vincent 1978).

The gender of anglers interviewed is shown in Table 2. Figures include data on both licensed and unlicensed (juvenile) fishermen. Nearly 90% of the anglers were males in both years. Males constituted 80% or more of the licensed anglers on Big Spring Creek (Peterson 1970) and the Bighorn River (Stevenson 1975).

TABLE 2. THE NUMBERS AND PERCENTS (IN PARENTHESIS) OF MALE AND FEMALE ANGLERS IN INTERVIEWS ON THE LOWER BIG HOLE RIVER.

Year	Males	Females
1977	1946 (88)	252 (12)
1978	1673 (90)	193 (10)

The fishermen's use of various types of lures is summarized in Table 3. Artificial flies were the most commonly used single type of lure on the study are constituting over 33% of the total usage each year. Flies comprised 30% or more of the lures used on the upper Madison River (Vincent 1978).

TABLE 3. THE NUMBERS AND PERCENTS (IN PARENTHESIS) OF THE TYPES OF LURES USED BY ANGLERS ON THE LOWER BIG HOLE RIVER.

Year	Bait	Hardware	Flies	Combination
1977	598 (27)	365 (17)	797 (36)	438 (20)
1978	405 (22)	303 (16)	859 (46)	299 (16)

The distribution of the numbers of trout kept by anglers who had completed their fishing day is shown in Appendix Table 22. In 1977 only about 0.05% of the anglers interviewed kept the limit of ten trout. Approximately 64% of the anglers kept zero trout.

The average lengths of brown trout examined in the creels in 1977 and 1978 are shown by strata in Appendix Table 23. The average lengths were 37.5 cm in 1977 and 36.8 cm in 1978. The weighted average lengths (by harvest/stratum) were within 0.3 cm of the average lengths. Average lengths of brown trout creeled on the lower Big Hole River from 1954 to 1963 ranged from 32.3 cm to 35.3 with the mean for those 10 years being 34 cm (Wipperman 1965).

The average lengths of rainbow trout examined in the creels in 1977 and 1978 are shown by strata in Appendix Table 24. The average lengths were 33.5 cm and 32.8 cm in 1977 and 1978 respectively. Average lengths of rainbow trout reported by Wipperman (1965) ranged from 26.9 cm to 31.8 cm with the 10 year mean being 28.4 cm.

Average weights of brown and rainbow trout examined in the creels in 1977 and 1978 are presented in Appendix Table 25. Mean weights in both years were similar for each species. The average weight of brown trout was greater than rainbow trout.

Catch Rates

Catch rates were calculated by dividing the total estimated number of fish caught (both kept and released) and only those kept by the total estimated number of hours fished. The catch rates for floaters and bank anglers are presented in Table 4. Catch rates of floaters were slightly greater than those of bank anglers.

TABLE 4. THE NUMBER OF FISH KEPT AND RELEASED AND FISH KEPT (IN PARENTHESIS)/HOUR BY FLOATERS AND BANK ANGLERS ON THE LOWER BIG HOLE RIVER.

	Weekends-Holidays		Weekdays	
Year	Bank Anglers	Floaters	Bank Anglers	Floaters
1977	0.41 (0.26)	0.61 (0.38)	0.48 (0.21)	0.66 (0.30)
1978	0.38 (0.19)	0.68 (0.35)	0.52 (0.30)	0.73 (0.32)

Fishing Pressure

The estimates of the numbers of anglers and hours fished during each stratum in 1977 are presented in Table 5. An estimated 5,397 anglers fished 15,698 hours in the study area. Bank anglers accounted for about 80% of the total number of anglers and approximately 76% of the total hours fished. Use by bank anglers was lowest in Stratum 4 when the water level was high and greatest in Stratum 11 after high water had subsided.

Use by floaters was greater in Strata 1-6 than in later strata. Water levels were higher during the first six strata making floating more desirable. The number of floaters and hours they fished were greatest in Stratum 3 when the salmon flies, *Pteronarcys californica*, were emerging.

The estimates of the number of bank anglers and hours fished during each stratum on weekends-holidays and weekdays in 1977 are

TABLE 5. THE ESTIMATED NUMBERS OF ANGLERS AND HOURS FISHED DURING EACH STRATUM IN 1977. (95% CONFIDENCE INTERVAL)

Stratum	Date	Bank Anglers		Floaters		Stratum Total	
		Numbers	Hours	Numbers	Hours	Numbers	Hours
1	5/21-5/27	289	722	83	302	372	1024
2	5/28-6/3	304	826	100	234	404	1060
3	6/4-6/10	270	669	253	995	523	1664
4	6/11-6/17	122	253	144	309	266	562
5	6/18-6/24	244	634	137	508	381	1142
6	6/25-7/1	217	534	110	442	327	976
7	7/2-7/8	354	806	56	176	410	982
8	7/9-7/15	259	681	28	120	287	801
9	7/16-7/22	233	737	12	42	245	779
10	7/23-7/29 + 7/30-8/5	511	1478	75	207	586	1685
11	8/6-8/12 + 8/13-8/19	643	2150	70	287	713	2437

TABLE 5 CONTINUED.

Stratum	Date	Bank Anglers		Floaters		Stratum Total	
		Numbers	Hours	Numbers	Hours	Numbers	Hours
12	8/20-8/26 + 8/27-9/2	513	1440	19	60	532	1500
13	9/3-9/9	342	1064	9	22	351	1086
	Total	4301	11994	1096	3704	5397(±580)	15698(±1471)

presented in Table 6. Use was proportionately greater on weekends-holidays. About 46% of the number of bank anglers fished 45% of the fishing hours on weekends-holidays which comprised only 31% of the fishing days.

The estimates of the number of floaters and the hours they fished during each stratum on weekends-holidays and weekdays in 1977 are shown in Table 7. As with bank anglers use of the study area was also proportionately greater on weekends-holidays. About 56% of the floaters fished 49% of the fishing hours on weekends-holidays.

The estimates of the numbers of anglers and hours fished during each stratum in 1978 are presented in Table 8. Approximately 3,987 anglers fished 9,945 hours in the study area. This was a 26 and 37% decrease in the number of anglers and hours fished respectively from 1977.

Bank anglers accounted for 62% of the total number of fishermen and 61% of the total hours fished in 1978. These figures represent a decline of 43 and 49% respectively from 1977. The decrease in the number of bank anglers from 1977 to 1978 was highly significant (t-test). This was probably caused by higher flows in 1978 which made wading extremely difficult until late July. Fishing pressure by bank anglers increased substantially in Strata 11-13 after high flows.

The number of floaters and hours fished by floaters increased 39 and 5% respectively in 1978. The increase in the number of

TABLE 6. THE ESTIMATED NUMBERS OF BANK ANGLERS AND THE HOURS FISHED ON WEEKENDS-HOLIDAYS AND WEEKDAYS DURING EACH STRATUM IN 1977.

Stratum	Weekends-Holidays Date	Anglers	Hours	Weekdays Date	Anglers	Hours
1	5/21-5/22	169	531	5/23-5/27	120	192
2	5/28-5/30	211	509	5/31-6/3	93	317
3	6/4-6/5	144	337	6/6-6/10	126	332
4	6/11-6/12	50	132	6/13-6/17	73	121
5	6/18-6/19	98	253	6/20-6/24	146	380
6	6/25-6/26	63	141	6/27-7/1	154	393
7	7/2-7/4	138	429	7/5-7/8	216	377
8	7/9-7/10	104	254	7/11-7/15	155	437
9	7/16-7/17	113	342	7/18-7/22	120	395
10	7/23-7/24 + 7/30-7/31	210	570	7/25-7/29 + 8/1-8/5	302	909
11	8/6-8/7 + 8/13-8/14	222	735	8/8-8/12 + 8/15-8/19	420	1414
12	8/20-8/21 + 8/27-8/28	227	566	8/22-8/26 + 8/29-9/2	286	874
13	9/3-9/5	212	635	9/6-9/9	130	429
	Total	1961	5434		2341	6570

TABLE 7. THE ESTIMATED NUMBERS OF FLOATERS AND HOURS FISHED ON WEEKENDS-HOLIDAYS AND WEEKDAYS DURING EACH STRATUM IN 1977.

Stratum	Weekends-Holidays Date	Weekends-Holidays Anglers	Weekends-Holidays Hours	Weekdays Date	Weekdays Anglers	Weekdays Hours
1	5/21/5/22	66	260	5/23-5/27	17	42
2	5/28-5/30	68	151	5/31-6/3	32	83
3	6/4-6/5	108	302	6/6-6/10	146	692
4	6/11-6/12	101	221	6/13-6/17	43	88
5	6/18-6/19	76	212	6/20-6/24	61	297
6	6/25-6/26	40	126	6/27-7/1	70	317
7	7/2-7/4	24	108	7/5-7/8	32	68
8	7/9-7/10	18	76	7/11-7/15	10	45
9	7/16-7/17	12	42	7/18-7/22	0	0
10	7/23-7/24 + 7/30-7/31	50	130	7/25-7/29 + 8/1-8/5	25	77
11	8/6-8/7 + 8/13-8/14	30	133	8/8-8/12 + 8/15-8/19	40	154
12	8/20-8/21 + 8/27-8/28	14	46	8/22-8/26 + 8/29-9/2	5	14
13	9/3-9/5	9	22	9/6-9/9	0	0
	Total	616	1829		481	1877

TABLE 8. THE ESTIMATED NUMBERS OF ANGLERS AND HOURS FISHED DURING EACH STRATUM IN 1978. (95% CONFIDENCE INTERVAL)

Stratum	Date	Bank Anglers		Floaters		Stratum Total	
		Numbers	Hours	Numbers	Hours	Numbers	Hours
1	5/20-5/26	114	225	88	221	202	446
2	5/27-6/2	114	259	89	251	203	510
3	6/3-6/9	126	192	137	298	263	490
4	6/10-6/16	160	443	189	309	349	752
5	6/17-6/23	105	273	302	619	407	892
6	6/24-6/30	174	259	109	343	283	602
7	7/1-7/7	118	279	93	262	211	541
8	7/8-7/14	185	271	115	318	300	589
9	7/15-7/21	131	297	149	386	280	683
10	7/22-7/28 + 7/29-8/4	300	768	88	255	388	1023
11	8/5-8/11 + 8/12-8/18	329	982	97	372	426	1354

TABLE 8 CONTINUED.

Stratum	Date	Bank Anglers		Floaters		Stratum Total	
		Numbers	Hours	Numbers	Hours	Numbers	Hours
12	8/19-8/25 + 8/26-9/1	442	1307	40	149	482	1456
13	9/2-9/8	169	532	24	75	193	607
	Season Total	2467	6087	1520	3858	3987(±458)	9945(±1083)

floaters was probably the result of higher flows which produced better floating conditions. The slight increase in hours fished resulted from faster flowing water.

Table 9 shows the estimates of the number of bank anglers and hours fished during each stratum in 1978. About 46% of the number of bank anglers fished 48% of the fishing hours on weekends-holidays which only comprised 31% of the fishing days. The number of bank anglers and hours they fished on weekends-holidays were greatest in Stratum 13 which included the Labor Day Weekend. On weekdays these parameters were greatest in Strata 4 and 12. The salmon flies hatched during Stratum 4 and lower water made wading attractive in Stratum 12.

The estimates of the number of floaters and hours they fished on weekends-holidays and weekdays during each stratum in 1978 are presented in Table 10. About 49% of the floaters fished 47% of their fishing hours on weekends-holidays. Greatest use occurred in Strata 4 and 5 for weekends-holidays and weekdays respectively.

Boats On The Study Area

Table 11 shows the estimates of the numbers of boats on weekends-holidays and weekdays during each stratum in 1977 and 1978. An estimated total of 1,088 boats were used on the study area during the 2 years. About 41% of the boat use was in 1977.

TABLE 9. THE ESTIMATED NUMBERS OF BANK ANGLERS AND HOURS FISHED ON WEEKENDS-HOLIDAYS AND WEEKDAYS DURING EACH STRATUM IN 1978.

Stratum	Weekends-Holidays			Weekdays		
	Date	Anglers	Hours	Date	Anglers	Hours
1	5/20-5/21	65	132	5/22-5/26	50	93
2	5/27-5/29	85	211	5/30-6/2	29	48
3	6/3-6/4	44	102	6/5-6/9	81	90
4	6/10-6/11	32	83	6/12-6/16	128	360
5	6/17-6/18	58	206	6/19-6/23	47	67
6	6/24-6/25	76	132	6/26-6/30	98	127
7	7/1-7/2	49	142	7/3-7/7	70	137
8	7/8-7/9	109	149	7/10-7/14	76	122
9	7/15-7/16	22	70	7/17-7/12	108	227
10	7/22-7/23 + 7/29-7/30	120	278	7/24-7/28 + 7/31-8/4	180	490
11	8/5-8/6 + 8/12-8/13	168	432	8/7-8/11 + 8/14 -8/18	161	550
12	8/19-8/20 + 8/26-8/27	184	565	8/21-8/25 + 8/28-9/1	259	742
13	9/2-9/4	121	396	9/5-9/8	48	136
	Total	1133	2898		1335	3189

TABLE 10. THE ESTIMATED NUMBERS OF FLOATERS AND THE HOURS FISHED ON WEEKENDS-HOLIDAYS AND WEEKDAYS DURING EACH STRATUM IN 1978.

Stratum	Weekends-Holidays			Weekdays		
	Date	Anglers	Hours	Date	Anglers	Hours
1	5/20-5/21	75	178	5/22-5/26	13	43
2	5/27-5/29	69	166	5/30-6/2	20	85
3	6/3-6/4	90	220	6/5-6/9	47	78
4	6/10-6/11	12	22	/12-6/16	177	287
5	6/17-6/18	210	467	6/19-6/23	92	152
6	6/24-6/25	56	127	6/26-6/30	53	217
7	7/1-7/2	49	145	7/3-7/7	44	117
8	7/8-7/9	43	132	7/10-7/14	72	187
9	7/15-7/16	76	153	7/17-7/21	73	233
10	7/22-7/23 + 7/29-7/30	18	26	7/24-7/28 + 7/31-8/4	70	229
11	8/5-8/6 + 8/12-8/13	22	52	8/7-8/11 + 8/14-8/18	75	319
12	8/19-8/20 + 8/26-8/27	12	93	8/21-8/25 + 8/28-9/1	28	56
13	9/2-9/4	10	47	9/5-9/8	14	28
	Total	742	1828		778	2031

TABLE 11. THE ESTIMATED NUMBERS OF BOATS ON WEEKENDS-HOLIDAYS AND WEEKDAYS DURING EACH STRATUM IN 1977 AND 1978. (95% Confidence Interval)

	1977				1978			
Stratum	Date	Weekends-Holidays	Weekdays	Stratum Total	Date	Weekends-Holidays	Weekdays	Stratum Total
1	5/21-5/27	24	10	34	5/20-5/26	28	7	35
2	5/28-6/3	28	11	39	5/27-6/2	25	8	33
3	6/4-6/10	44	56	100	6/3-6/9	37	17	54
4	6/11-6/17	39	17	56	6/10-6/16	6	83	89
5	6/18-6/24	31	33	64	6/17-6/23	91	37	128
6	6/25-7/1	15	30	45	6/24-6/30	24	27	51
7	7/2-7/8	12	8	20	7/1-7/7	22	19	41
8	7/9-7/15	9	3	12	7/8-7/14	18	28	46
9	7/16-7/22	6	0	6	7/15-7/21	29	35	64
10	7/23-7/29 + 7/30-8/5	18	10	28	7/22-7/28 + 7/29-8/4	10	25	35
11	8/6-8/12 + 8/13-8/19	12	15	27	8/5-8/11 + 8/12-8/18	10	30	40

TABLE 11 CONTINUED.

Stratum	1977 Date	1977 Weekends-Holidays	1977 Weekdays	1977 Stratum Total	1978 Date	1978 Weekends-Holidays	1978 Weekdays	1978 Stratum Total
12	8/20-8/26 + 8/27-9/2	6	2	8	8/19-8/25 + 8/26-9/1	6	12	18
13	9/3-9/9	3	0	3	9/2-9/8	6	6	12
	Season Total	247	195	442(±86)		312	334	646(±122)

The total number of boats used on the study area increased 46% in 1978. In each year approximately 48% of the boats were used in the study area on weekends-holidays. The average number of boats per stratum for the two fishing seasons were not significantly different (t-test). Also, the average number of boats that floated the study area during Strata 1-6 in the two years were not significantly different (t-test). However, the average number of boats that floated during Strata 7-13 in 1978 was significantly greater than in the comparable period in 1977 (t-test). The higher flows in 1978 allowed anglers to float later into the fishing season without portaging.

Fish Harvested and Released

The estimated numbers of trout harvested and released in 1977 are presented in Table 12. A total of 3,974 trout were kept and 3,928 released. About 77 and 78% of the fish kept and released respectively were brown trout.

Bank anglers caught about 66 and 74% of the trout kept and released respectively in 1977. Approximately 73% of the fish they kept and 75% of the fish they released were brown trout. Bank anglers kept and released about equal numbers of rainbow trout.

Approximately 83 and 90% of the trout which floaters kept and released respectively were brown trout. Both the greatest numbers of brown trout kept and released per week were in Stratum 3 when

TABLE 12. THE ESTIMATED NUMBERS OF BROWN AND RAINBOW TROUT KEPT AND RELEASED DURING EACH STRATUM IN 1977. (95% CONFIDENCE INTERVALS)

		Bank Anglers				Floaters				Stratum Total			
		Brown Trout		Rainbow Trout		Brown Trout		Rainbow Trout		Brown Trout		Rainbow Trout	
Stratum	Date	Kept	Released	Kept	Released	Kept	Released	Kept	Released	Kept	Released	Kept	Released
1	5/21-5/27	173	67	46	0	169	81	20	2	342	148	66	2
2	5/28-6/3	129	33	48	15	142	183	20	9	271	216	68	24
3	6/4-6/10	91	17	33	9	328	295	67	58	419	312	100	67
4	6/11-6/17	26	13	15	13	40	28	11	3	66	41	26	16
5	6/18-6/24	123	103	30	30	184	115	24	7	307	218	54	37
6	6/25-7/1	132	144	46	19	57	29	37	0	189	173	83	19
7	7/2-7/8	158	380	60	88	50	22	10	0	208	402	70	88
8	7/9-7/15	75	106	23	9	20	20	6	9	95	126	29	18
9	7/16-7/22	159	138	85	43	1	25	0	6	160	163	85	49
10	7/23-7/29 + 7/30-8/5	134	193	102	182	33	15	10	12	167	208	112	194
11	8/6-8/12 + 8/13-8/19	232	389	129	180	31	100	10	2	263	489	139	182
12	8/20-8/26 + 8/27-9/2	312	299	40	38	42	8	10	0	354	307	50	38
13	9/3-9/9	196	278	43	109	11	4	1	0	207	282	44	109
	Total	1940	2160	700	735	1108	925	226	108	3048(±602)	3085(±791)	926(±208)	843(±305)

the salmon flies were emerging and fishing pressure by floaters was greatest (Table 5). The greatest number of rainbows kept and released per week also were in Stratum 3.

The estimates of the numbers of fish kept and released by bank anglers on weekends-holidays and weekdays during each stratum of 1977 are shown in Table 13. Bank anglers caught approximately 53 and 34% of the total number of fish they kept and released respectively on weekends-holidays when they expended about 45% of their fishing hours (Table 6). Brown trout comprised 74% of the fish kept and 76% of the fish released on weekends-holidays. On weekdays approximately 72% of the fish kept and 74% of the fish released were brown trout.

Table 14 shows the number of fish kept and released by floaters on weekends-holidays and weekdays during each stratum of 1977. Floaters caught approximately 49 and 38% of the total number of fish they kept and released respectively on weekends-holidays when they expended about 49% of their fishing hours (Table 7). About 89% of the fish kept and 91% of those released on weekends-holidays were brown trout. Approximately 81 and 89% of the fish kept and released respectively on weekdays were brown trout.

The estimates of the number of fish harvested and released in 1978 are presented in Table 15. A total of 2,746 trout were kept in 1978, a decrease of 31% from 1977. A total of 2,946 trout were released in 1978 which was a 35% decrease from 1977. Brown trout

TABLE 13. THE ESTIMATED NUMBERS OF BROWN AND RAINBOW TROUT KEPT AND RELEASED BY BANK ANGLERS ON WEEKENDS-HOLIDAYS AND WEEKDAYS DURING EACH STRATUM IN 1977.

	Weekends-Holidays					Weekdays			
		Brown Trout		Rainbow Trout			Brown Trout		Rainbow Trout	
Stratum	Date	Kept	Released	Kept	Released	Date	Kept	Released	Kept	Released
1	5/21-5/22	110	54	26	0	5/23-5/27	63	14	20	0
2	5/28-5/30	90	18	41	3	5/31-6/3	39	15	7	12
3	6/4-6/5	48	9	19	9	6/6-6/10	43	8	13	0
4	6/11-6/12	19	0	11	0	6/13-6/17	7	13	4	13
5	6/18-6/19	28	20	22	7	6/20-6/24	95	83	8	24
6	6/25-6/26	34	18	7	0	6/27-7/1	98	126	40	19
7	7/2-7/4	118	109	26	32	7/5-7/8	40	271	34	56
8	7/9-7/10	21	13	10	7	7/11-7/15	55	93	13	1
9	7/16-7/17	108	60	47	8	7/18-7/22	51	78	38	34
10	7/23-7/24 + 7/30-7/31	111	53	57	47	7/25-7/29 + 8/1-8/5	23	140	46	135
11	8/6-8/7 + 8/13-8/14	97	52	43	34	8/8-8/12 + 8/15-8/19	135	337	86	147

TABLE 13 CONTINUED.

Stratum	Weekends-Holidays Date	Brown Trout Kept	Brown Trout Released	Rainbow Trout Kept	Rainbow Trout Released	Weekdays Date	Brown Trout Kept	Brown Trout Released	Rainbow Trout Kept	Rainbow Trout Released
12	8/20-8/21 + 8/27-8/28	160	112	17	15	8/22-8/26 + 8/29-9/2	152	187	23	23
13	9/3-9/5	107	221	34	68	9/6-9/9	90	57	9	41
	Total	1051	739	360	230		891	1422	341	505

TABLE 14. THE ESTIMATED NUMBERS OF BROWN AND RAINBOW TROUT KEPT AND RELEASED BY FLOATERS ON WEEKENDS-HOLIDAYS AND WEEKDAYS DURING EACH STRATUM IN 1977.

	Weekends-Holidays					Weekdays				
		Brown Trout		Rainbow Trout			Brown Trout		Rainbow Trout	
Stratum	Date	Kept	Released	Kept	Released	Date	Kept	Released	Kept	Released
1	5/21-5/22	142	41	13	2	5/23-5/27	27	40	7	0
2	5/28-5/30	94	84	20	4	5/31-6/3	48	99	0	5
3	6/4-6/5	104	85	22	7	6/6-6/10	224	210	45	51
4	6/11-6/12	3	1	1	0	6/13-6/17	37	27	10	3
5	6/18-6/19	57	38	7	7	6/20-6/24	127	77	17	0
6	6/25-6/26	17	6	7	0	6/27-7/1	40	23	30	0
7	7/2-7/4	42	22	10	0	7/5-7/8	8	0	0	0
8	7/9-7/10	17	20	2	9	7/11-7/15	3	0	3	0
9	7/16-7/17	1	25	0	6	7/18-7/22	0	0	0	0
10	7/23-7/24 + 7/30-7/31	18	0	2	2	7/25-7/29 + 8/1-8/5	15	15	8	10
11	8/6-8/7 + 8/13-8/14	11	30	2	0	8/8-8/12 + 8/15-8/19	20	70	8	2

TABLE 14 CONTINUED.

Stratum	Weekends-Holidays Date	Brown Trout Kept	Brown Trout Released	Rainbow Trout Kept	Rainbow Trout Released	Weekdays Date	Brown Trout Kept	Brown Trout Released	Rainbow Trout Kept	Rainbow Trout Released
12	8/20-8/21 + 8/27-8/28	40	0	10	0	8/22-8/26 + 8/29-9/2	2	8	0	0
13	9/3-9/5	11	4	1	0	9/6-9/9	0	0	0	0
	Total	557	356	97	37		551	569	128	71

TABLE 15. THE ESTIMATED NUMBERS OF BROWN AND RAINBOW TROUT KEPT AND RELEASED DURING EACH STRATUM IN 1978.(95% CONFIDENCE INTERVAL)

		Bank Anglers				Floaters				Stratum Total			
		Brown Trout		Rainbow Trout		Brown Trout		Rainbow Trout		Brown Trout		Rainbow Trout	
Stratum	Date	Kept	Released	Kept	Released	Kept	Released	Kept	Released	Kept	Released	Kept	Released
1	5/20-5/26	52	23	20	21	81	23	8	9	133	46	28	30
2	5/27-6/2	106	6	42	10	76	90	11	10	182	96	53	20
3	6/3-6/9	15	35	1	6	78	64	31	15	93	99	32	21
4	6/10-6/16	33	16	20	4	211	131	47	71	244	147	67	75
5	6/17-6/23	25	18	28	19	169	167	60	59	194	185	88	78
6	6/24-6/30	0	97	11	18	116	88	32	17	116	185	43	35
7	7/1-7/7	24	45	10	22	82	67	22	39	106	112	32	61
8	7/8-7/14	41	12	54	34	94	120	22	31	135	132	76	65
9	7/15-7/21	38	32	22	15	102	150	43	39	140	182	65	54
10	7/22-7/28 + 7/29-8/4	83	42	46	32	48	64	14	44	131	106	60	76
11	8/5-8/11 + 8/12-8/18	212	161	93	107	40	102	19	45	252	263	112	152
12	8/19-8/25 + 8/26-9/1	200	360	42	105	12	52	4	38	212	412	46	143
13	9/2-9/8	67	106	22	48	14	14	3	3	81	120	25	51
	Total	896	953	411	441	1123	1132	316	420	2019(±469)	2085(±389)	727(±189)	861(±225)

comprised 74 and 71% of the fish kept and released respectively. These figures were 3 and 7% less than in 1977.

Bank anglers caught about 48% of the fish kept and 47% of those released in 1978. These figures were 18 and 27% less respectively than in 1977. About 69% of the fish they harvested and 68% of the fish they released were brown trout. Bank anglers kept 54% less and released 56% fewer brown trout in 1978. Bank anglers kept and released the greatest number of brown trout per week in Stratum 12 when their fishing pressure was highest (Table 8). Bank anglers kept 41% and released 40% fewer rainbow trout respectively in 1978 than in 1977. As in 1977 about equal numbers of rainbow trout were kept and released.

Floaters kept and released 8 and 50% more trout respectively in 1978 than in 1977. Brown trout made up approximately 78% of the fish kept and 73% of those released. Floaters kept and released 1 and 22% more brown trout respectively in 1978 than in 1977. Both the numbers of brown trout kept and released diminished after Stratum 9 when floaters decreased in numbers (Table 9). Floaters kept and released 40 and 289% more rainbow trout respectively in 1978 than the previous year.

Table 16 presents the estimates of the numbers of fish kept and released by bank anglers on weekends-holidays and weekdays during each stratum in 1978. Bank anglers kept 62% and released

TABLE 16. THE ESTIMATED NUMBERS OF BROWN AND RAINBOW TROUT KEPT AND RELEASED BY BANK ANGLERS ON WEEKENDS-HOLIDAYS AND WEEKDAYS DURING EACH STRATUM IN 1978.

	Weekends-Holidays					Weekdays			
		Brown Trout		Rainbow Trout			Brown Trout		Rainbow Trout	
Stratum	Date	Kept	Released	Kept	Released	Date	Kept	Released	Kept	Released
1	5/20-5/21	35	23	12	7	5/22-5/26	17	0	8	14
2	5/27-5/29	46	0	21	10	5/30-6/2	60	6	21	0
3	6/3-6/4	13	35	1	6	6/5-6/9	2	0	0	0
4	6/10-6/11	5	1	1	1	6/12-6/16	28	15	19	3
5	6/17-6/18	25	5	28	12	6/19-6/23	0	13	0	7
6	6/24-6/25	0	0	5	0	6/26-6/30	0	97	6	18
7	7/1-7/2	18	37	1	9	7/3-7/7	6	8	9	13
8	7/8-7/9	20	12	18	24	7/10-7/14	21	0	36	10
9	7/15-7/16	4	4	10	3	7/17-7/21	34	28	12	12
10	7/22-7/23 + 7/29-7/30	21	22	28	22	7/24-7/28 + 7/31-8/4	62	20	19	10
11	8/5-8/6 + 8/12-8/13	62	80	30	17	8/7-8/11 + 8/14-8/18	150	82	63	90

TABLE 16 CONTINUED.

Stratum	Weekends-Holidays Date	Brown Trout Kept	Brown Trout Released	Rainbow Trout Kept	Rainbow Trout Released	Weekdays Date	Brown Trout Kept	Brown Trout Released	Rainbow Trout Kept	Rainbow Trout Released
12	8/19-8/20 + 8/26-8/27	68	111	7	48	8/21-8/25 + 8/28-9/1	133	249	35	57
13	9/2-9/4	51	82	18	41	9/5-9/8	17	24	3	7
	Total	368	412	180	200		530	542	231	241

44% of the total catch on weekends-holidays. These figures were 11% less and 10% more than in 1977. Approximately 67% of the fish, both kept and released, on weekends-holidays were brown trout. On weekdays about 70 and 69% of the fish kept and released respectively were brown trout.

The estimates of the numbers of fish kept and released by float fishermen on weekends-holidays and weekdays in 1978 are shown in Table 17. About 50% of the fish kept and 40% of those released were captured on weekends-holidays. These figures were 1% less and 12% more respectively than in 1977. Brown trout comprised 78% of the fish floaters kept and 70% of those released on weekends-holidays. These figures were 7% more and 21% less respectively than in 1977. Seventy eight percent of the fish kept and 69% of the fish released on weekdays were brown trout. These figures were 3 and 19% less than in 1977.

Age Structure of Brown Trout Harvested

The age structure of the brown trout harvested in 1977 is presented in Table 18. Age II and older fish comprised 99% of the harvest in 1977, while Age III and older represented 69% of the total catch. Age III fish made up the single largest age group in the harvest with approximately 42%.

TABLE 17. THE ESTIMATED NUMBERS OF BROWN AND RAINBOW TROUT KEPT AND RELEASED BY FLOATERS ON WEEKENDS-HOLIDAYS AND WEEKDAYS DURING EACH STRATUM IN 1978.

	Weekends-Holidays					Weekdays			
		Brown Trout		Rainbow Trout			Brown Trout		Rainbow Trout	
Stratum	Date	Kept	Released	Kept	Released	Date	Kept	Released	Kept	Released
1	5/20-5/21	68	23	8	9	5/22-5/26	13	0	0	0
2	5/27-5/29	66	60	11	10	5/30-6/2	10	30	0	0
3	6/3-6/4	71	61	21	15	6/5-6/9	7	3	10	0
4	6/10-6/11	4	4	0	1	6/12-6/16	207	127	47	70
5	6/17-6/18	139	137	47	40	6/19-6/23	30	30	13	13
6	6/24-6/25	36	15	19	4	6/26-6/30	80	73	13	13
7	7/1-7/2	54	43	12	18	7/3-7/7	28	24	10	21
8	7/8-7/9	54	55	12	11	7/10-7/14	40	65	10	20
9	7/15-7/16	48	46	20	0	7/17-7/21	54	104	23	39
10	7/22-7/23 + 7/29-7/30	12	14	0	12	7/24-7/28 + 7/31-8/4	36	50	14	32
11	8/5-8/6 + 8/12-8/13	2	0	4	0	8/7-8/11 + 8/14-8/18	38	102	15	45

TABLE 17 CONTINUED.

Stratum	Weekends-Holidays Date	Brown Trout Kept	Brown Trout Released	Rainbow Trout Kept	Rainbow Trout Released	Weekdays Date	Brown Trout Kept	Brown Trout Released	Rainbow Trout Kept	Rainbow Trout Released
12	8/19-8/20 + 8/26-8/27	10	24	2	6	8/21-8/25 + 8/28-9/1	2	28	2	32
13	9/2-9/4	2	8	1	1	9/5-9/8	12	6	2	2
	Total	566	490	157	127		557	642	159	287

TABLE 18. THE NUMBERS OF BROWN TROUT HARVESTED IN EACH AGE GROUP ON THE LOWER BIG HOLE RIVER IN 1977. Percents are in parenthesis.

Stratum	Date	Age Group I	II	III	IV and Older	Stratum Total
1	5/21-5/27	0(0)	17(5)	140(41)	185(54)	342
2	5/28-6/3	0(0)	73(27)	84(31)	113(42)	270
3	6/4-6/10	0(0)	63(15)	147(35)	210(50)	420
4	6/11-6/17	0(0)	30(45)	21(32)	15(23)	66
5	6/18-6/24	0(0)	120(39)	126(41)	61(20)	307
6	6/25-7/1	0(0)	70(37)	79(42)	40(21)	189
7	7/2-7/8	0(0)	71(34)	85(41)	52(25)	208
8	7/9-7/15	2(2)	40(42)	40(42)	12(13)	95
9	7/16-7/22	0(0)	58(36)	70(44)	34(21)	160
10	7/23-7/29 + 7/30-8/5	0(0)	71(43)	66(40)	28(17)	166
11	8/6-8/12 + 8/13-8/19	18(7)	110(42)	110(42)	24(9)	262
12	8/20-8/26 + 8/27-9/2	7(2)	135(38)	181(51)	32(9)	355
13	9/3-9/9	0(0)	56(27)	124(60)	27(13)	207
	Season Total	27(1)	914(30)	1273(42)	833(27)	3047

The age structure of the harvest of brown trout in 1978 is presented in Table 19. Age II and older fish comprised 98% of the harvest in 1978, while age groups III and older represented about 73% of the total catch. Age III fish again made up the single largest age group in the harvest with about 40%. The differences between the age structure of the harvest in 1977 and 1978 were not statistically significant (chi-square).

Age Structure of Rainbow Trout Harvested

The age structure of rainbow trout harvested in 1977 is presented in Table 20. Age II and older fish comprised 94% of the harvest in 1977, while age III and older represented 63% of the total catch. Age IV and older fish made up the single largest age group in the harvest with approximately 37%.

The age structure of the harvest of rainbow trout in 1978 is presented in Table 21. Age II and older fish comprised 97% of the harvest, while age III and older fish represented about 75% of the total catch. Age IV and older fish again made up the single largest age group in the harvest with about 42%. The difference between the age structures of the harvest in 1977 and 1978 was highly significant (chi-square). The harvest contained greater percentages of older fish in 1978.

TABLE 19. THE NUMBERS OF BROWN TOURT HARVESTED IN EACH AGE GROUP ON THE LOWER BIG HOLE RIVER IN 1978. Percents are in parenthesis.

Stratum	Date	Age Group I	II	III	IV and Older	Stratum Total
1	5/20-5/26	0(0)	17(12)	51(38)	67(50)	135
2	5/27-6/2	0(0)	31(17)	82(45)	69(38)	182
3	6/3-6/9	0(0)	23(25)	40(43)	30(32)	93
4	6/10-6/16	0(0)	24(10)	93(38)	127(52)	244
5	6/17-6/23	0(0)	23(12)	89(46)	81(42)	193
6	6/24-6/30	0(0)	39(34)	37(32)	39(34)	115
7	7/1-7/7	1(1)	30(29)	45(43)	28(27)	104
8	7/8-7/14	1(1)	36(27)	59(44)	38(28)	134
9	7/15-7/21	1(1)	45(32)	67(48)	27(19)	140
10	7/22-7/28 + 7/29-8/4	1(3)	39(31)	56(44)	31(24)	127
11	8/5-8/11 + 8/12-8/18	20(8)	96(38)	101(40)	35(14)	252
12	8/19-8/25 + 8/26-9/1	13(6)	68(32)	60(28)	73(34)	214
13	9/2-9/8	10(12)	37(46)	18(22)	16(20)	81
	Total	47(2)	508(25)	798(40)	661(33)	2014

TABLE 20. THE NUMBERS OF RAINBOW TROUT HARVESTED IN EACH AGE GROUP ON THE LOWER BIG HOLE RIVER IN 1977. Percents are in parenthesis.

Stratum	Date	Age Group I	II	III	IV and Older	Stratum Total
1	5/21-5/27	0	10(16)	21(32)	34(52)	65
2	5/28-6/3	0	16(24)	19(28)	33(48)	68
3	6/4-6/10	0	27(27)	23(23)	50(50)	100
4	6/11-6/17	0	13(50	6(25)	6(25)	25
5	6/18-6/24	0	22(41)	13(24)	19(35)	54
6	6/25-7/1	0	39(47)	22(26)	22(26)	83
7	7/2-7/8	0	36(52)	22(32)	11(11)	69
8	7/9-7/15	2(8)	11(38)	9(31)	7(23)	29
9	7/16-7/22	4(5)	31(36)	20(23)	31(36)	86
10	7/23-7/29 + 7/30-8/5	0	20(18)	30(27)	62(55)	112
11	8/6-8/12 + 8/13-8/19	29(21)	35(25)	35(25)	40(29)	139
12	8/20-8/20 + 8/27-9/2	4(8)	25(50)	8(17)	13(25)	50
13	9/3-9/9	12(27)	3(7)	14(33)	14(33)	43
	Season Total	51(6)	288(31)	242(26)	342(37)	923

TABLE 21. THE NUMBERS OF RAINBOW TROUT HARVESTED IN EACH AGE GROUP ON THE LOWER BIG HOLE RIVER IN 1978. Percents are in parenthesis.

Stratum	Date	Age Group I	II	III	IV and Older	Stratum Total
1	5/20-5/26	0	8(29)	6(21)	14(50)	28
2	5/27-6/2	0	18(35)	8(15)	26(50)	52
3	6/3-6/9	0	7(21)	8(35)	17(54)	32
4	6/10-6/16	0	13(20)	13(20	40(10)	66
5	6/17-6/23	0	2(2)	18(20)	69(78)	89
6	6/24-6/30	0	3(6)	15(35)	25(59)	43
7	7/1-7/7	0	6(19)	10(31)	16(50)	32
8	7/8-7/14	0	8(11)	40(53)	27(36)	75
9	7/15-7/21	0	18(28)	20(31)	27(41)	65
10	7/22-7/28 + 7/29-8/4	9(15)	23(39)	9(15)	19(31)	60
11	8/5-8/11 + 8/12-8/18	10(9)	39(35)	53(47)	10(9)	112
12	8/19-8/25 + 8/26-9/1	4(8)	8(17)	19(42)	15(33)	46
13	9/2-9/8	1(6)	12(47)	12(47)	0	25
	Season Total	24(3)	165(23)	231(32)	305(42)	725

Mortality Rates of Fish Populations

Estimates of the population and mortality rates of brown and rainbow trout in the study area (Appendix Table 26) were obtained from Wells and Nelson (1978) and J. Wells (personal communication). The spring to fall mortality rates for brown trout age II and older were 43 and 44% in 1977 and 1978 respectively. The mortality rate for brown trout in 1978 may be overestimated because of probable inflated estimates of the spring population (J. Wells personal communication).

The mortality rate for age II and older rainbow trout from April to September was 54 and 47% in 1977 and 1978 respectively. The 1978 mortality rate for rainbow trout may also be overestimated.

Mortality Attributed to Harvest

In 1977 harvest accounted for about 64% of the mortality of brown trout age II and older from April to September. It was responsible for 82% of the over summer mortality of age II and older brown trout.

The creel census was continued by personnel of the Montana Department of Fish and Game through November 1977. Harvest

estimates from this census were 152,63 and 33 brown trout ages II, III and IV and older respectively. These estimates and those of brown trout kept the following summer were added to determine the percent of the annual mortality due to harvest. The harvest of brown trout age II and older was responsible for 70% of the annual mortality from the fall 1977 to the fall 1978. Harvest accounted for 44% of the annual mortality of brown trout age III and older during the same year.

The calculated harvest of rainbow trout age II and older in 1977 accounted for 103% of the mortality from April to September. It was responsible for 75% of the over summer mortality of age III and older rainbow trout. The harvest of age II and older fish was responsible for 256% of the annual mortality from the fall of 1977 to the fall of 1978. It accounted for 270% of the annual mortality of age III and older fish during the same period. These estimates of mortality attributed to harvest indicate the population estimates (Appendix Table 26) for rainbow trout are probably underestimated. Previous estimates of rainbow trout within the study area were about 28-30% greater (Wells and Nelson 1978).

SUMMARY AND DISCUSSION

The 16 km study area on the lower Big Hole River supported a fishery of an estimated 5,397 anglers who fished 15,698 hours and harvested a total of 3,974 trout in 1977. In 1978 it supported an estimated 3,987 anglers who fished 9,945 hours and harvested a total of 2,746 trout. Brown trout comprised about 77 and 74% of the trout harvested in 1977 and 1978 respectively. Bank anglers caught about 66% of the trout in 1977 and 48% in 1978.

Light levels of harvest have no detectable effects on fishing stocks. Moderate levels of harvest produce reductions in age structures, increases in mortality rates, decreases in the average size of catches and increased yields. Overfishing reduces the age structures of populations to the level that spawners are largely composed of one age group and increasing efforts result in decreasing yields.

The age structures, mortality rates, average sizes of the catch and yields indicate the brown trout of the study area are being subjected to

light harvest rates. The higher level of harvest and use in 1977 produced no measurable changes in these parameters from those in 1978.

The age structure of both the harvest and population were very similar during the two years of the study. The age structure of the harvest of brown trout in 1977 was, 30, 42 and 27% in ages, II, III and IV and older respectively (Table 18). In 1978 the harvest was composed of 25, 40 and 33% of the same age groups (Table 19). The brown trout population in the fall of 1977 was composed of 46,32 and 22% age II, III and IV and older fish respectively (Appendix Table 26). In 1978 the fall population was composed of 45, 31 and 24% of the same age groups (Appendix Table 26).

Mortality rates of brown trout did not increase under the greater harvest and use in 1977. The total mortality rates for this species was about 43% during both fishing seasons studied (Appendix Table 26). The mortality rates for age groups III and older appeared to be slightly greater in 1978 when the harvest was lower but this is probably the result of inflated population estimates in the spring of 1978. Furthermore the fishing mortality was estimated to have comprised only 64% of the total mortality in brown trout age II and older during the census period in 1977 and about 70% of the annual mortality in these age groups from the fall of 1977 to the fall of 1978.

The average length and weight of the catch were not reduced by the greater level of fishing in 1977 and were not statistically significant from those of 1978 (t-test). The average length of the catch was 37.5 cm in total length in 1977 and 36.8 cm in 1978. These figures were about 2.8-3.5 cm greater than the average reported by Wipperman (1965) from 1954 to 1963. However, the length and weight of age group II and the weight of age group IV and older fish were greater in 1978. These differences were highly significant.

In 1977 the yield of age II and older brown trout was 1,526 kg and in 1978 it was 1,144 kg. The increased yield in 1977 with the greater fishing pressure could indicate a moderate harvest rate. However, since other parameters associated with moderate levels of harvest did not occur concurrently it is doubtful the increased yield also indicates anything but a light level of harvest.

All of the parameters measured show the brown trout population of the study section is capable of sustaining the level of harvest experienced in 1977 without detriment. Regulations more restrictive than those in effect during 1977 are not needed to safeguard the well-being of the brown trout in the study area. The daily bag limit of ten trout of 1977 was reduced to five trout with only one over 45.7 cm in 1978. The probable effect of this regulation was to increase natural mortality by an estimated 6.6% of the harvest. The elimination of one mortality factor is offset by an increase

in other mortality factors resulting in no annual improvement in survival (Shetter and Alexander 1966). A proposal to close the river to fishing from June 10-25 would have the same effect of needlessly increasing natural mortality by an estimated 11 and 22% of the harvest while denying anglers recreational use and harvest.

If the size limit of only one fish over 45.7 cm imposed in 1978 had been in effect in 1977 it is estimated this would have reduced the harvest of these larger fish by 17%. Attempts to protect these 6 year and older fish (J. Wells personal communication) would be non-productive. Furthermore, this restriction did not distribute the catch of these larger fish among more anglers. Only about 6% of the fishermen kept trout larger than 45.7 cm in 1977 and less that 5% did so in 1978.

The establishment of a catch-and-release-fly fishing-only section can not be justified on the basis of the measured parameters of the brown trout population. The instigation of such a measure would only reduce the available fishing area and opportunity for over 50% of the anglers using the study area (Table 3) and cater to a special interest group. Shetter and Alexander (1966) noted a decrease in use after special regulations were adopted.

Regulations to restrict commercial guides to alleviate congestion would be ineffective because they comprise only about 10-11% of the floaters using the study area. If the intent of

this regulation is to reduce usage by nonresidents, it would have little effect since they make up only about 25-30% of the anglers using the study area and do not fish solely with guides. Enforcment of this type of regulation would also be extremely difficult.

Closing the fishing season after October 1 to protect spawning brown trout is unnecessary. The present escapement of adults is sufficient to maintain recruitment. Furthermore, increasing the number of spawners does not necessarily produce an increase in the number of fish recruited into the fishery. The production of young in excess of the carrying capacity of the habitat for that population segment only results in increased density-dependent mortality (Ricker 1954). This is probably why Latta (1965) and Shetter and Alexander (1966) found no direct relationship between the number of adult brook trout present in the fall and young surviving to the following fall.

The age structure and average size of rainbow trout in the catch indicated this population also was subjected to light - moderate rates of harvest. The harvest in 1977 was composed of 31, 26 and 37% age II, III and IV and older rainbow trout respectively. In 1978 it was composed of 23, 32 and 42% of the same age groups. The harvest in 1977 was composed of a greater proportion of younger fish than in 1978 when harvest was less. The difference in age structure was highly significant (chi-square). The mean

lengths and weights of the catch were not significantly less in 1977 (t-test). The average lengths and weights of age groups II and III in the harvest of 1977 were greater than in 1978. These differences were highly significant. The greater hearvest of age III and older rainbow trout in 1977 did not cause a substantial decrease in the harvest of age IV and older fish in 1978 (Tables 20 and 21).

Escapement of adult rainbow trout appears to be adequate to maintain recruitment. The harvest of age III and older fish did not decline. It was 587 in 1977 and 536 in 1978 (Tables 20 and 21).

The brown and rainbow trout populations of the study area are producing a sustainable annual surplus of more than 3,974 fish under the present levels of utilization and habitat. This level of surplus could be reduced by a significant increase in harvest or a decline in habitat quality and/or quantity. Increased harvest does not appear to be an immediate threat to the well-being of the populations at this time. Fishermen harvest actually declined 1,228 trout from 1977 to 1978 (Tables 12 and 15). Presently the fishery resources of the study area will best be served by efforts to maintain and enhance the habitat, especially stream flows. Regressions of weight at length showed that the greater weight/length of brown trout in 1978 was highly significant (F-test). Analysis by age group showed a highly significant difference in age group IV and older. It appears that the higher stream flows in 1978

produced greater weights in older brown trout. The weight/length relationship in age group III rainbow trout was also significantly greater in 1978 when flows were greater. Flows greater than those of 1977 are necessary to allow the trout fishery of the lower Big Hole River to reach its full potential.

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APPENDIX

TABLE 22. THE DISTRIBUTION OF THE NUMBERS OF TROUT KEPT BY ANGLERS ON THE LOWER BIG HOLE RIVER DURING 1977 AND 1978. From completed trips only.

No. of Fish Kept	1977 No. of Anglers Contacted	1978 No. of Anglers Contacted
0	1328	1031
1	361	285
2	134	161
3	85	90
4	60	39
5	36	47
6	26	4
7	18	
8	10	
9	4	
10	1	
Total	2063	1657

TABLE 23. THE AVERAGE LENGTHS OF BROWN TROUT CREELED ON THE LOWER BIG HOLE RIVER DURING EACH STRATUM IN 1977 AND 1978.

Stratum	1977				1977			
	Date	No. Fish	Total No. cm	Ave. Length	Date	No. Fish	Total No. cm.	Ave. Length
1	5/21-5/27	186	7131.6	38.3	5/20-5/26	80	3055.9	38.2
2	5/28-6/3	163	6646.4	40.8	5/27-6/2	88	3152.1	35.8
3	6/4-6/10	219	8552.4	39.0	6/3-6/9	82	2966.7	36.2
4	6/11-6/17	27	982.7	36.4	6/10-6/16	42	1671.1	39.8
5	6/18-6/24	133	4610.1	34.7	6/17-6/23	142	5511.0	38.8
6	6/25-7/1	65	2320.8	35.7	6/24-6/30	45	1639.3	36.4
7	7/2-7/8	106	3797.3	35.8	7/1-7/7	80	2871.5	35.9
8	7/9-7/15	46	1613.2	35.1	7/8-7/14	83	3003.0	36.2
9	7/16-7/22	40	1443.0	36.1	7/15-7/21	84	2991.6	35.6
10	7/23-7/29 + 7/30-8/5	31	1101.6	35.5	7/22-7/28 + 7/29-8/4	37	1332.0	36.0
11	8/6-8/12 + 8/13-8/19	58	2032.5	35.0	8/5-8/11 + 8/12-8/18	64	2199.6	34.4
12	8/20-8/26 + 8/27-9/2	66	2325.6	35.2	8/19-8/25 + 8/26-9/1	53	2036.6	38.4
13	9/3-9/9	56	2110.0	37.7	9/2-9/8	41	1427.7	34.8
	Total	1196	44667.2	37.5		921	33858.1	36.8

TABLE 24. THE AVERAGE LENGTHS OF RAINBOW TROUT CREELED ON THE LOWER BIG HOLE RIVER DURING EACH STRATUM IN 1977 AND 1978.

Stratum	1977				1978			
	Date	No. Fish	Total No. cm.	Ave. Length	Date	No. Fish	Total No. cm.	Ave. Length
1	5/21-5/27	32	1151.6	36.0	5/20-5/26	15	490.7	32.7
2	5/28-6/3	25	870.5	34.8	5/27-6/2	26	855.7	32.9
3	6/4-6/10	22	755.9	34.4	6/3-6/9	25	854.5	34.2
4	6/11-6/17	16	506.7	31.7	6/10-6/16	15	516.6	34.4
5	6/18-6/24	17	568.7	33.4	6/17-6/23	50	1796.3	35.9
6	6/25-7/1	18	588.5	32.7	6/24-6/30	18	619.0	34.4
7	7/2-7/8	25	795.0	31.8	7/1-7/7	26	829.1	31.9
8	7/9-7/15	13	419.6	32.3	7/8-7/14	28	864.1	30.9
9	7/16-7/22	22	734.6	33.4	7/15-7/21	39	1221.0	31.3
10	7/23-7/29 + 7/30-8/5	11	402.0	36.6	7/22-7/28 + 7/29-8/4	13	397.5	30.6
11	8/6-8/12 + 8/13-8/19	28	897.4	32.0	8/5-8/11 + 8/12-8/18	32	994.9	31.1
12	8/20-8/26 + 8/27-9/2	12	392.2	32.7	8/19-8/25 + 8/26-9/1	12	390.1	32.5
13	9/3-9/9	15	519.9	34.7	9/2-9/8	15	461.0	30.7
	Total	256	8602.6	33.6		314	10290.5	32.8

TABLE 25. THE AVERAGE WEIGHTS (KG) OF BROWN AND RAINBOW TROUT CREELED ON THE LOWER BIG HOLE RIVER IN 1977 AND 1978. Sample sizes are in parenthesis.

Brown Trout			
Age	1977		1978
II	0.24 (130)		0.28 (140)
III	0.49 (223)		0.52 (266)
IV and Older	0.81 (247)		0.90 (218)
AVE. WT.	0.57 (600)	AVE. WT.	0.60 (624)

Rainbow Trout			
Age	1977		1978
II	0.24 (50)		0.22 (35)
III	0.40 (41)		0.31 (45)
IV and Older	0.63 (47)		0.52 (84)
AVE. WT.	0.42 (138)	AVE. WT.	0.40 (164)

TABLE 26. SPRING AND FALL ESTIMATES OF THE POPULATIONS OF BROWN AND RAINBOW TROUT AND OVER SUMMER MORTAILITY RATES ON THE LOWER BIG HOLE RIVER IN 1977 (Wells and Nelson 1978) AND 1978 (J. Wells personal communication). 80% Confidence intervals (in parenthesis).

Brown Trout

1977

Age Group	Spring	Fall	Mortality Rate
II	4951	2805	43%
III	3729	1975	47%
IV & older	2176	1367	37%
Total	10856 (±2771)	6147 (±982)	43%

1978

Age Group	Spring	Fall	Mortality Rate
II	4419	2991	32%
III	4187	2075	50%
IV & older	3224	1617	50%
Total	11830 (±2348)	6683 (±1181)	44%

Rainbow Trout

1977

Age Group	Spring	Fall	Mortality Rate
II	442	377	15%
III	465	137	70%
IV & older	655	201	69%
Total	1563 (±393)	715 (±315)	54%

1978

Age Group	Spring	Fall	Mortality Rate
II	1675	1030	38%
III	567	262	54%
IV & older	528	189	64%
Total	2770 (±744)	1481 (±574)	46%

Kozakiewicz, Vincent John
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