MONTANA DEPARTMENT OF FISH AND GAME

FISHERIES DIVISION

JOB PROGRESS REPORT

State Montana

Project No. F-9-R-20 Title Southwestern Montana Fisheries Study

Job No. I-b Title Inventory of Waters of the Project Area

Project (fiscal) Period: July 1, 1971 - June 30, 1972

Report Period: January 1, 1971 - December 31, 1971

ABSTRACT

Trout populations of the Melrose and Reichle Sections of the Big Hole River were estimated in April and September-October, respectively. Tags were placed in trout in the Melrose Section and angler tag return data were evaluated.

Water temperature data were recorded at Reichle on the Big Hole River.

A partial creel survey was conducted on the Big Hole River in Sections 1 and 2.

A "closed tile drainage system" was constructed in the headwaters area of Poindexter Slough with funds from the Bureau of Reclamation. An annual series of physical and chemical measurements was initiated to study the effects that may occur in the stream as a result of this construction.

The population of several lakes were surveyed with gill nets. Delmoe Lake was rehabilitated for the removal of redside shiners and an opening day creel survey was conducted on Hidden Lake.

BACKGROUND

The importance of proper fisheries management manifests itself when the reality of overcrowding in urban areas creates a mass migration to areas of quality outdoor recreation such as in Montana. In Montana, fishermen represent well over 25 percent of that portion of the public that travels for outdoor recreation. Proper and effective fisheries management of all waters depends to a large degree upon the quality of fish survey data.

In addition to providing an important aid to fisheries management, surveys provide information with which to better put values on the fish and wildlife resources. These values must be established before an effective defense against damaging land and water developments can be established. Only if the quantity as well as the quality of the fish and wildlife resources are retained can future generations enjoy "the quality outdoor recreation experience."

OBJECTIVES

The purpose of this job is to determine the physical, chemical and biological characteristics of the waters of importance to the recreational fishery of the project area.

PROCEDURES

Electrofishing gear with an output of 0-500 volts variable direct current was utilized in censusing stream and river populations. The gear was fished from a fiberglas boat with a mobile positive electrode and a stationary negative electrode attached to the bottom of the boat. The captured fish were anesthetized, measured, weighed, marked and released near the capture site.

Population estimates were computed using Chapman's modified formula (Chapman,1951) of the Petersen mark-and-recapture method. A computer program was utilized to facilitate the estimation of population parameters.

Experimental gill nets 125 feet long with graduated mesh sizes were used to sample lake and pond populations. Lake rehabilitation was done with Pro-Noxfish. Chemical evaluations were done with the aid of a Hach CR-EL chemistry kit.

A Taylor seven-day recording thermograph was operated on the Big Hole River and the recording sheets were changed weekly. Water temperatures were recorded in Fahrenheit degrees.

FINDINGS

Streams

On the Big Hole River during 1971, trout population estimates were made in April for the 22,500-foot Melrose Section and during the last part of September and the first part of October for the 23,760-foot Reichle Section. Multiple mark and recapture runs were necessary for both sections.

A total of 410 brown trout and 188 wild rainbow trout were tagged with Floy anchor T-tags in the Melrose Section during April 1971.

Water temperatures were recorded at Reichle from the last part of May through the middle of October 1971.

A partial creel survey was conducted in Sections 1 and 2 of the Big Hole River from July 5 through August 12, 1971.

A "closed tile drainage system" was constructed in headwater area of Poindexter Slough during the spring of 1971. Devastating hydrologic and biologic changes will probably result from this construction. Therefore, a series of physical and chemical measurements was initiated here in 1971 and should be repeated periodically until the environment stabilizes.

Big Hole River

Melrose Section - The total number of brown and rainbow trout per 1,000 feet was estimated at 81.7 and 33.5, respectively (Table 1). The total population for brown and rainbow combined was similar to the April 1970 estimate (Elser and Marcoux 1972). However, the point estimate for brown trout increased and the estimate for rainbow decreased slightly from 1970 to 1971.

Comparisons of the populations since September 1969 are shown in Table 2. No abnormally large changes occurred in similar length groups or in the average weights of the populations during the four sampling periods. Length group comparisons are made (Table 2) despite the fact that these groups do not correspond directly to age groups when compared to length frequency distributions. "Aging" these groups from scales was found to be extremely difficult and in many cases impossbile due to the many "check marks" present on the scales.

From September 1969 to April 1971 brown trout averaged 86 percent of the wild brown and rainbow trout population.

TABLE 1. Wild brown and rainbow trout population estimates per 1,000 feet and condition factors for the Melrose Section (22,500 feet) of the Big Hole River, April 1971. (95% confidence intervals in parentheses).

Species	Length interval (inches)	Population per 1,000 ft.	Pounds per 1,000 ft.	Condition factor
Brown trout	6.0 - 13.9	38.5	21.6	35.76
	14.0 - 17.9	27.1	40.8	36.07
	18.0 - 28.9	16.1	42.8	35.26
	Totals	81.7 (±27.2)	105.2 (±29.5)	35.80 1/
Rainbow trout	7.0 - 12.9	14.6	6.9	36.32
	13.0 - 25.9	18.9	27.7	38.00
	Totals	33.5 (±15.2)	34.6 (±19.9)	37.08 1/

1/ Mean condition factors.

TABLE 2. Comparisons of point estimates of the brown trout population in the Melrose Section of the Big Hole River from September 1969 to April 1971. (Pounds in parentheses).

Size interval	Number in section			
	Sept. 1969	April 1970	Sept. 1970	April 1971
6.0 - 13.9	875 (487)	623 (362)	945 (437)	866 (487)
14.0 - 17.9	648 (992)	889 (1281)	929 (1503)	609 (919)
18.0 - +	421 (1207)	262 (743)	294 (811)	363 (964)
Totals	1944 (2686)	1774 (2386)	2168 (2751)	1838 (2370)
Ave. Wt. (lbs.)	1.34	1.34	1.27	1.29

The mean condition factors for spring 1971 brown trout was 35.80 and rainbow trout, 37.08 (Table 1).

Tag return rates for 1971 spring marked trout were 8.3 and 12.2 percent for brown and rainbow, respectively (Table 3). The 1970 return rate for brown trout marked in April 1970 was 14.0 percent and for rainbow trout , 9.3 percent (Table 3). The 1971 tag return rate for both species combined was 9.5 percent compared to 12.6 percent in 1970. About 67 percent of the brown and 70 percent of the rainbow trout tags were returned within the first two months of the season compared to 75 and 61 percent, respectively, in 1970 (Elser and Marcoux, 1972).

TABLE 3. Anchor tags returned from tagged wild brown and rainbow trout in the Melrose Section of the Big Hole River, 1971.

Total trout tagged over 10 inches	Totals returned 1969 1/	1970 1/	1971	Percent returned thru 1970 1/	Percent returned thru 1971	Combined Percent returned thru 1971
September 1969						
Brown - 333	5	13	6	11.4	13.2	13.0
Rainbow - 59	0	6	1	10.2	11.9	
April 1970						
Brown - 487	-	67	13	14.0	16.4	15.2
Rainbow - 205	-	19	6	9.3	12.2	
April 1971						
Brown - 410	-	-	34	-	8.3	9.5
Rainbow - 188	-	-	23	-	12.2	

1/ Information from Elser and Marcoux, 1972.

Reichle Section - The Reichle Section was established in 1971 to obtain trout population information downstream from the site of the proposed Reichle Dam. The top of the section is one and one-half miles downstream from the Reichle site and about 20 miles downstream from the town of Melrose. It is four and one-half miles in length and includes a variety of hydrologically different zones. The average width of the section, as determined from aerial photographs taken on July 19, 1968, was 148 feet.

The total number of brown trout per 1,000 feet of stream was estimated to be 120.3 (Table 4). The length intervals for brown trout were estimated mainly from the length frequency distribution of the electrofished sample with minor assistance from scale observations. Like the Melrose Section, many "check marks" are present on the scales which makes accurate aging from scales extremely difficult or impossible. The interval 6.7 - 11.2 inches (Table 4) is basically age group I. But, the other intervals may not accurately represent any particular age groups and are,therefore, arbitrary in nature.

TABLE 4. Wild brown and rainbow trout population estimates per 1,000 feet and condition factors for the Reichle Section (4½ miles) of the Big Hole River, Sept. - Oct., 1971. (95% confidence intervals in parentheses).

Species	Length interval (inches)	Population per 1,000 ft.	Pounds per 1,000 ft.	Condition factor
Brown trout	6.7 - 11.2	53.6 (± 13.3)	15.7 (± 3.9)	37.07 (± 8.31)
	11.3 - 14.1	21.2 (± 8.0)	16.7 (± 6.3)	36.34 (± 6.26)
	14.2 - 18.4	39.7 (± 12.7)	63.0 (±20.2)	37.76 (± 7.04)
	18.5 - 23.0	5.8 (± 3.5)	17.0 (±10.1)	36.69 (± 6.32)
Totals		120.3 (± 20.3)	112.4 (±23.7)	37.12[1/] (± 7.36)
Rainbow trout[2/]	6.7 - 23.0	20.1 (± 19.4)	14.4 (±13.9)	36.84 (± 5.76)

1/ Mean condition factor.
2/ Only 34 rainbow were marked and of those only 2 were recaptured.

The point estimate of wild rainbow trout per 1,000 feet was 20.1 (Table 4). However, only two marked rainbow were recaptured, making the confidence intervals very large.

The mean condition factors for brown and rainbow trout were 37.12 and 36.84, respectively (Table 4).

Temperatures - Figure 1 shows the average five-day maximum and minimum temperatures from June through the middle of October 1971, as recorded near the proposed Reichle Dam site.

The highest maximum temperature occurred on August 8 and was 72°F. Recorder problems precluded continuous temperature records for the study period.

Creel Census - A total of 66 fishermen were contacted in Section 1 and their combined catch rate was 0.6 fish per hour (Table 5). In Section 2, 76 fishermen were contacted and their combined catch rate was 1.0 fish per hour.

Hatchery rainbow predominated in the creel in both sections. However, access areas, where trout were planted, were the areas where the greatest majority of fishermen contacts were made. Few brown trout , 0.7 percent of the catch, were observed in creels in Section 2 and would indicate that few brown trout are present in this section of stream. Arctic grayling and brook trout were taken in Section 2 but were not observed in creels in Section 1.

Of the total number of fishermen contacted in Section 1, 85 and 15 percent fished from shore and boat, respectively. Fishermen preferred to fish in this section with bait (46 percent) and artificial flies (41 percent).

In Section 2, 88 and 12 percent fished from shore and boat, respectively. Artificial flies (59 percent) and lures (24 percent) were preferred fishing methods in this section.

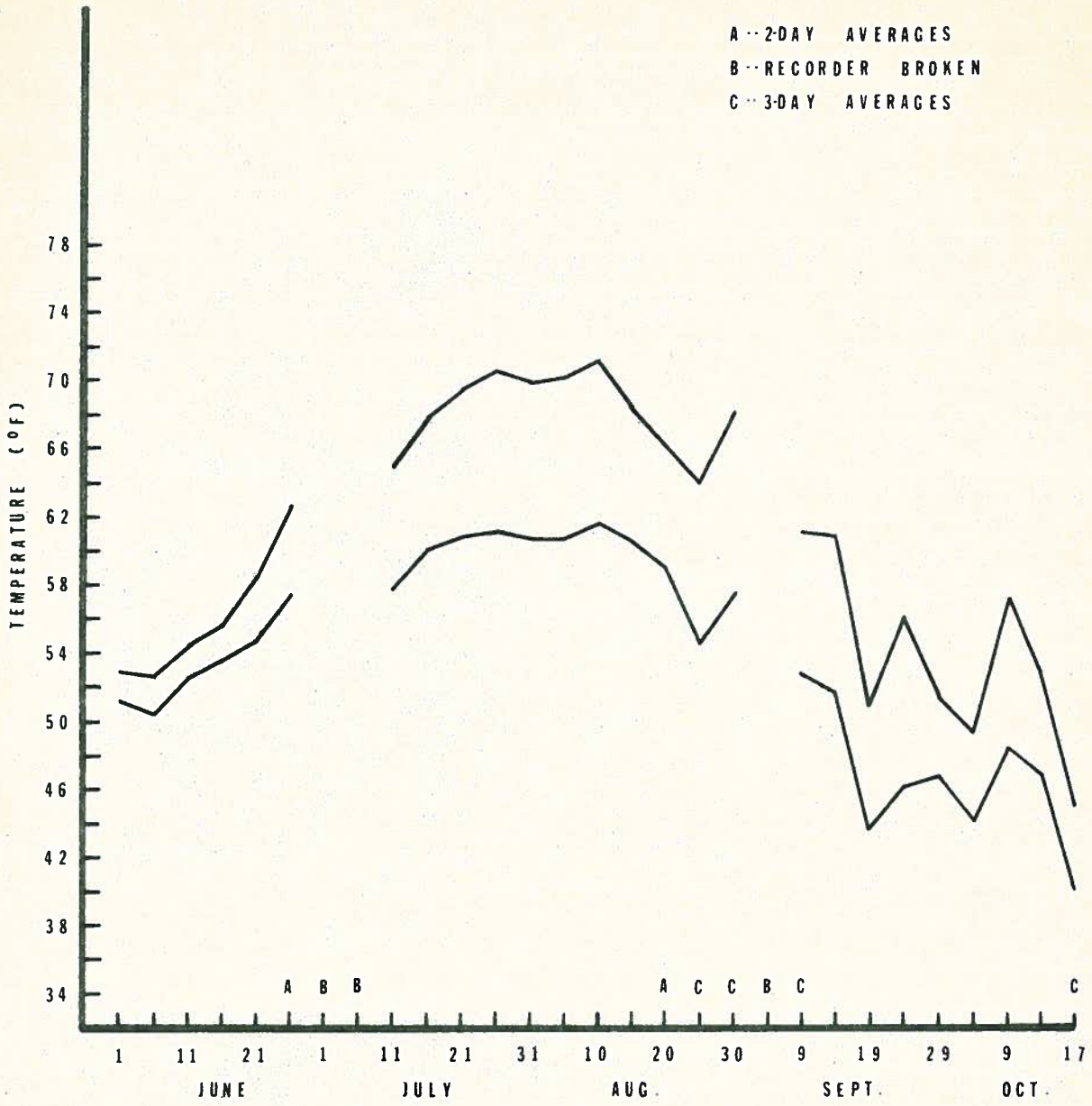

FIGURE 1. Average five-day maximum and minimum temperatures recorded at Reichle on the Big Hole River, 1971.

TABLE 5. Creel information from the partial creel survey in Sections 1 [1/] and 2 [1/] of the Big Hole River from July 5 to August 12, 1971.

Section	Fishermen contacted	Fish in creel	Total hours fished	Catch per hour	Percent of catch [2/]					
					Rb-H	Rb-W	LL	Eb	Gr	Wf
1	66	111	186.5	0.595	67.6	14.4	15.3	0	0	2.7
2	76	152	153.0	0.993	63.2	17.8	0.7	7.2	2.6	8.5

1/ Section 1 is that portion of the stream from the Jefferson River to Divide. Section 2 is that portion of stream from Divide to the confluence of Pintlar Creek.

2/ Abbreviations: RB-H = hatchery rainbow, Rb-W = wild rainbow, LL = brown trout, Eb = brook trout, Gr = Arctic grayling, Wf = mountain whitefish.

Poindexter Slough

Poindexter Slough is a meandering spring-fed stream located about three miles southwest of the town of Dillon, Montana and totals about four miles in length. It has a reputation as an excellent brown and rainbow trout stream and has a consequent high fishing pressure. Poindexter's flows vary from about 30 to 100 cfs (Wipperman and Elser, 1968). A headgate, constructed about 1932 or 1933 (Peter W. Rebish, personnel communication) by the Dillon Canal Company, regulates the major water supply from the Beaverhead River during the irrigation season (about May 1 to November 1 annually).

During the past few high-water periods, ranchers in the headwaters area of Poindexter have been having flood problems due to an increased water table. The ranchers insisted the problems were a result of the East Bench Canal which was apparently causing sub-irrigation. An impending legal suit by the ranchers against the Bureau of Reclamation, who built the canal, pre-empted action to alleviate the problems. A "closed tile drainage system" was constructed in the headwater area during 1971, through a contract funded by the Bureau. The construction began on April 14 and was completed on June 21, 1971. Size of the pipe used ranged from 8 to 15 inches in diameter.

This changed drainage system undoubtedly increased the speed of drainage and lowered the water table in the headwater area, thereby increasing flows during the late spring and summer and decreasing flows in the winter and early spring. I feel that during low water years these decreased flows in the winter and spring may become detrimental to the trout population in Poindexter. In addition to these changes in flow regime, I feel that manipulation of the channel in the headwater area can have an effect upon the established hydrologic pattern of the stream. In turn, increased sediment and bedload materials will thereby deplete the food supply and spawning areas for trout and will consequently decrease the trout population.

Twelve staff gage measurements were taken from August 2 to September 17, 1971. They ranged from 1.88 to 2.28.

A total of 32 pH and turbidity measurements (determined with a Hach CR-EL chemistry kit) were made from June 18 to September 17, 1971. The pH ranged from 6.8 on July 20 to 8.0 on September 7. The mean pH for this period was 7.65. The turbidities ranged from 0 ppm on three different dates to 10 ppm on July 19. Dates of highest turbidity readings corresponded to dates of lowest pH and were July 19 and 20.

I recommended that trout populations be estimated every other spring and that flows be monitored year around. A relationship between low winter and early spring flows and decreases in trout quantity and quality may become evident in the near future.

Lakes

Experimental gill nets 125 feet long with graduated mesh sizes were set in Cowbone and Darkhorse Lakes, Culver, McDonalds and Widgeon Ponds, and Kelly Reservoir during 1971. Delmoe Lake and part of its three tributaries were rehabilitated in an effort to eradicate redside shiners. A creel survey was conducted on opening day of fishing (June 20) on Hidden Lake.

Cowbone Lake

A floating and a sinking gill net were set overnight in August. Only one cutthroat trout was captured (Table 6) although rainbow and rainbow x cutthroat hybrids have been reported as being present in the past. The lake is about nine acres in area and at least 35 feet deep. Since spawning areas are nil, I recommend stocking 1,000 cutthroat fry every two years and periodically evaluating these plants with gill nets.

Darkhorse Lake

A floating and a sinking gill net were set overnight in Darkhorse Lake during August. Cutthroat, rainbow and rainbow x cutthroat hybrid trout were taken (Table 6). Darkhorse has a surface area of about nine acres and is at least 30 feet deep but the spawning area is nil. I recommend stocking 1,000 cutthroat fry every two years and periodically evaluating these plants with gill nets.

Culver Pond

A floating gill net was set overnight in Culver during June. Species captured are shown in Table 6. This pond has a reputation as one of the quality brook trout fisheries in the area. However, fishermen who have fished the pond a lot in the past have been complaining that the average size and number of fish in the creel has greatly decreased in recent years. Prior to 1963 the pond was fed entirely by springs. The pond drains through a standpipe-weir combination built into the dam; therefore, no species other than those introduced legally or illegally would normally be present in the pond. In 1963, an irrigation ditch was built that directed flows from Red Rock River directly into Culver.

In 1964 rehabilitation of the pond with rotenone was done. At that time the pond was drained to the lowest level possible and the toxicant added. A kill at or near 100 percent may have been possible under those conditions.

During the winter of 1970-71, the personnel at Red Rock Refuge lowered the pond one foot below its normal winter level to provide additional areas of feed deposition for trumpeter swans.

TABLE 6. Gill net data from lake surveys, 1971.

Lake (code number)	Type of set[1]	Number of sets	Species caught[2]	Number caught	Size range (inches)	Average length (inches)	Average weight (pounds)
Cowbone Lake (02-7650)	Floating	1	--	0	-	-	-
	Sinking	1	Ct	1	11.5	11.5	0.59
Darkhorse Lake (02-7700)	Floating	1	Ct	4	8.9-10.9	9.9	0.30
			Rb	1	7.2	7.2	0.14
			RbxCt	1	9.2	9.2	0.26
	Sinking	1	--	0	-	-	-
Culver Pond (01-8680)	Floating	1	RbxCt	2	11.5-15.4	13.5	1.21
			Eb	8	9.1-17.0	13.0	1.07
			Gr	1	17.0	17.0	1.50
			WSu	65	5.9-17.2	12.4	0.89
McDonalds Pond (01-9100)	Floating	1	Rb	11	9.7-18.8	13.7	1.23
			RbxCt	1	9.6	9.6	0.47
			WSu	53	7.4-18.0	13.8	1.25
Widgeon Pond (01-9820)	Sinking	1	WSu	80	6.3-17.0	13.4	1.03
Kelly Res. (01-9000)	Floating	1	Rb	2	7.5-11.6	9.6	0.32
			Eb	1	11.2	11.2	0.55
	Sinking	1	Rb	1	7.5	7.5	0.21
			Eb	14	7.3-12.0	9.4	0.35

1/ 125-foot standard experimental gill nets consisting of five 25-foot panels of 3/4, 1, 1¼, 1½, and 2-inch square mesh netting.

2/ Species abbreviations: Ct = cutthroat trout, Eb - brook trout, Gr = Arctic grayling, Rb = rainbow trout, RbxCt = rainbow x cutthroat hybrid, WSu = white sucker.

I feel that by running irrigation water directly into Culver, new species were introduced and a reinvasion of suckers was possible. I also feel that lowering the pond in winter may decrease its carrying capacity.

I recommend that the Department of Fish and Game ask the Bureau of Sport Fisheries and Wildlife to give more consideration to the fisheries on Red Rock Refuge. I feel that alternatives to running irrigation water into and lowering the winter level of Culver Pond will have to be found before its former quality fishery will again be realized.

McDonalds Pond

A floating gill net was set overnight in McDonalds during June. This pond has a reputation as a quality fishery for both rainbow trout and Arctic grayling. Grayling were not taken, however, in the gill net (Table 6).

Widgeon Pond

A sinking gill net was set overnight in Widgeon in June. The only species taken was white sucker (Table 6). Brook trout were still present in this pond near the mouth of the stream according to creel information.

With proper management of this pond, relative to game fish populations, a good fishery may be realized here in the future. I, therefore, recommend that Widgeon Pond be classified as having future fisheries management potential.

Kelly Reservoir

A floating and a sinking gill net were set overnight in Kelly during June. Rainbow and brook trout were taken in both nets (Table 6). The population are maintained through natural propagation. Because of its proximity to Dillon, the reservoir is a popular fishing spot in the winter and early spring but is lowered for irrigation and municipal needs each summer to a level that makes it undesirable for fishing. I recommend, therefore, that attempts be made to induce the Beaverhead National Forest to include fishing and recreation in their multiple use plan for Kelly Reservoir to insure a water level favorable for fish.

Delmoe Lake

On September 24, the Forest Service and the Department of Fish and Game cooperated with rehabilitation effort for Delmoe Lake. The purpose was to completely eradicate all redside shiners from this reservoir with the use of Pro-Noxfish. Just prior to these efforts, the reservoir was lowered to its lowest possible level for the primary purpose of inspecting and repairing the dam. The levels were at this lowest level during rehabilitation.

The predominant species killed were redside shiners and longnose suckers. It was estimated that a 100 percent "kill" was accomplished in the reservoir. However, because of their complexity and magnitude, a total kill of redside shiners in the three tributaries feeding the reservoir was not accomplished. Therefore, it is certain that redside shiners will reinvade the reservoir.

Cutthroat trout are to be stocked in the reservoir in 1972. I recommend evaluating this plant during the spring of 1974 before additional plants are made.

Hidden Lake

A checking station was set up on opening day, June 20, and a total of 12 fishermen were checked. They caught 48 rainbow trout in 57 hours for a catch rate of 0.84 fish per hour. The total fish caught per fisherman was 4.0. The average length and weight of the creeled trout was 16.2 total inches and 1.32 pounds, respectively. The size of the fish in the catch ranged from 14.4 to 18.5 inches. The weight ranged from 1.02 to 1.81 pounds. Periodic creel checks and/or gill net sets should be continued.

RECOMMENDATIONS

In general, stream and lake inventories should be continued. The information is the basis for sport fisheries management in Montana and is a valuable aid in determining values when dealing with land and water development projects.

Specific recommendations are in the text under the headings of each water studied.

LITERATURE CITED

Chapman, D. C. 1951. Some properties of the hypergeometrical distribution with application to zoological censuses. Univ. Calif. Publ. Stat., 1(7):131-160.

Elser, A. A. and R. G. Marcoux. 1972. Inventory of the waters of the project area. Job Progress Report, Federal Aid in Fish and Wildlife Restoration Acts. Mont. Proj. No. F-9-R-19, Job I-a, 38 pp.

Wipperman, A. H. and A. A. Elser. 1968. Inventory of the waters of the project area. Job Completion Report, Federal Aid in Fish and Wildlife Restoration Act. Mont. Proj. No. F-9-R-16, Job I, 14 pp.

Prepared by Norman W. Peterson

Date June 6, 1973

Waters referred to:

Big Hole River Sec. 1	02-0425
Big Hole River Sec. 2	02-0450
Poindexter Slough	01-9320
Cowbone Lake	02-7650
Culver Pond	01-8680
Darkhorse Lake	02-7700
Delmoe Lake	10-8600
Hidden Lake	13-7800
Kelly Reservoir	01-9000
McDonalds Pond	01-9100
Widgeon Pond	01-9820