MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION

JOB PROGRESS REPORT

State Montana

Project No. F-20-R-24 Title South Central Fisheries Investigation

Job No. I-a (Supplement) Title Musselshell River Study

Period Covered April 1, 1979 through March 31, 1980

ABSTRACT

Game fish populations were sampled by boom shocker at 12 locations on the Musselshell River to determine species distribution and movement. Barber was the farthest point downstream where a significant trout population was found. The Town of Musselshell was the farthest point upstream where significant numbers of channel catfish and sauger were sampled.

Baited hoop nets were utilized on the lower Musselshell at two locations to capture migratory channel catfish populations. It is hypothesized that the channel catfish had spawned prior to mid-June when trapping was initiated. Numbers of channel catfish captured after June dropped significantly, suggesting an earlier migration period.

Mean monthly water temperatures on the Musselshell River were highest during August at Martinsdale and Harlowton (61 and 68° F), respectively, and during July at Roundup (75° F).

Maximum conductivities recorded at Roundup and Mosby were 1,700 and 2,340 μmhos during 1979. Mean pH for the main stem from Shawmut to Melstone was 8.15.

OBJECTIVES

1) Continue to gather data on species distribution in the lower Musselshell.

2) Identify migratory fish populations and attempt to determine population size and migratory habits in the lower Musselshell.

3) Continue to monitor the status of recently introduced smallmouth bass in the lower and mid-portions of the river.

4) Monitor instream temperatures at specific locations along the river.

5) Further document instream flow recommendations with visual inspections and photographs which will be correlated with U. S. Geological Survey flow records.

PROCEDURES

Thirty-day continuous recording thermographs monitored instream temperatures at three locations on the Musselshell River near Martinsdale, Harlowton and Roundup. Instantaneous daily water temperatures were recorded at Mosby by the USGS.

Electrofishing by boom shocker equipped with a variable voltage pulsating unit (Coffelt VVP-15) provided fish samples from 12 sections over a 220-mile portion of the Musselshell. Mean length of each section was 2.5 miles. Game fish were weighed, measured and marked with individually numbered yellow Floy tags. Scales were collected from sauger, trout and smallmouth bass for age and growth evaluation.

Due to the apparent success of capturing channel catfish in other river systems, use of baited hoop nets as described by Berg (1978) was initiated in mid-June 1979. The feasibility of this sampling technique was tested at two locations on the lower Musselshell. Techniques and procedures faithfully followed those described by Berg (1978) with a few minor exceptions; perforated 1-pint plastic food boxes were used in place of tire inner tubes to contain bait. Fiberglass hoops were used in place of wooden hoops in the construction of nets. Maximum water depths of sets never exceeded 4 feet. All channel catfish captured were weighed, measured and tagged.

Continuous monitoring and recording of flows near Martinsdale, Harlowton, Roundup and Mosby was provided by the USGS. Monthly water quality measurements were also provided by the USGS at Roundup and Mosby.

Instantaneous water quality measurements were obtained at 34 locations on the Musselshell by the Water Quality Bureau, Department of Natural Resources.

FINDINGS

Temperatures

The overall water temperatures in the Musselshell River were considerably warmer during 1979 than in the previous year.

At Mosby, the maximum temperature in 1979 was 80° F and instream temperatures were above 70° F for 48 days. In 1978 the maximum temperature was 75° F and water temperatures remained above 70° F for only 29 days. (Although temperatures recorded at Mosby were instantaneous readings, a rough estimate of the overall temperature regime was provided.)

Continuing upstream, Roundup had an extreme of 80° F for 1979 and 75° F for 1978. The water temperature remained above 70° F for 58 days in 1979 and 31 days in 1978.

Harlowton's high for 1979 was 72° F and remained above 70° F for 4 days. In 1978 the maximum high was 69° F.

The South Fork of the Musselshell, near Martinsdale, never reached 70° F during the study period. Maximum water temperature for 1979 and 1978 was 63 and 65° F, respectively. Instream temperatures above 60° F occurred for 33 days in 1979 and 21 days in 1978.

Electrofishing

High turbidity and conductivity hampered the effectiveness of the electrofishing apparatus on the lower, warm-water portion of the Musselshell. As water cleared in October and November, electrofishing improved until water temperatures approached freezing. Poor performance of electrofishing gear during the late spring and summer demonstrated a need to employ other sampling methods during this period. Four species of game fish were shocked in the warm-water section of the river; they include sauger (Stizostedian canadense), channel catfish (Ictalarus punctatus), smallmouth bass (Micropterus dolomieui) and northern pike (Esox lucius). A total of 50 sauger were sampled during 1979, ranging in length from 10.2-21.0 inches and weighing .28-2.82 pounds. Twelve channel catfish were captured, measuring 11.5-30.0 inches and weighing

.26-13.3 pounds. The length range for smallmouth bass was 7.4-11.5 inches and their weights were .28-1.01 pounds. Only one northern pike was captured measuring 27.5 inches and weighing 4.5 pounds. Lengths and weights for all of the above species are shown in Table 3, and average length, weight and range of sauger and other fish species are given in Tables 5-7.

In spite of the apparent scarcity of introduced smallmouth bass, those that were captured by electrofishing appeared to be growing well. Comparisons between Musselshell smallmouth bass and the smallmouth bass populations studied by Stroud and Clepper (1975) indicated a significant difference in growth rates. Average growth rates reported by Stroud and Clepper were 4 inches for 1-year-olds and 7 inches for 2-year-olds. Smallmouth bass from the Musselshell were 5.3 inches for 1-year-olds and 9.3 inches for 2-year-olds. Present distribution of smallmouth bass in the Musselshell is shown in Figure 3.

Sampling by boom shocker both above and below the diversion dam at Musselshell indicated the complete absence of sauger in the upstream region, and a significant number of channel catfish. The dam appears to be an effective barrier, blocking upstream movement of sauger and channel catfish. Catfish above the dam are the result of planting.

Due to lower conductivity, turbidity and temperature, the upper portion of the Musselshell was sampled by boom shocker with much more success than the lower portion. Brown trout (Salmo trutta), rainbow trout, (Salmo gairdneri) and mountain whitefish (Prosopium williamsoni) were sampled in this section.

Brown trout were found to be the dominant game fish and ranged in length from 7.4-21.6 inches, weighing .18-2.98 pounds. Only two rainbow trout were captured, measuring 10.6 and 13.5 inches and weighing .40 and .90 pounds. The infrequent capture of rainbow in this area suggests the inability of this planted fish to adapt successfully to this habitat. Mountain whitefish are relatively scarce in this section of the Musselshell; only two were captured. They measured 12.0 and 17.7 inches and weighed .62 and 2.25 pounds (Table 4).

The lowest downstream limit of the Musselshell trout population was reaffirmed by intensive electrofishing to be located slightly downstream from Barber (Figure 2).

Baited Hoop Net

Another sampling method employed in the lower section of the Musselshell was the baited hoop net (Figure 1). It was first utilized in mid-June, and proved to be very selective in capturing channel catfish. A few sauger were also taken (Table 2).

Species selectivity of baited hoop nets was also noted by Berg (1978) in the mid-Missouri and by Mayhew (1973). Mayhew's study concluded that the main contributing factor in the selectivity of the baited hoop net was the type of bait utilized.

After several trials it was noted that site location also has an effect on trapping success. The most successful sets were at water depths no less than 3 feet with an active current and a firm substrate.

Most channel catfish were captured in mid-June with catch rate declining as the summer season progressed. A total of 164 channel catfish were captured, ranging in length from 10.2-31.5 inches and weighing .35-12.0 pounds (Table 1). No male or female fish sampled were found to be ripe, nor were any found to have significant gonadal development. This suggests that spawning activity occurred prior to mid-June, possibly as early as late May.

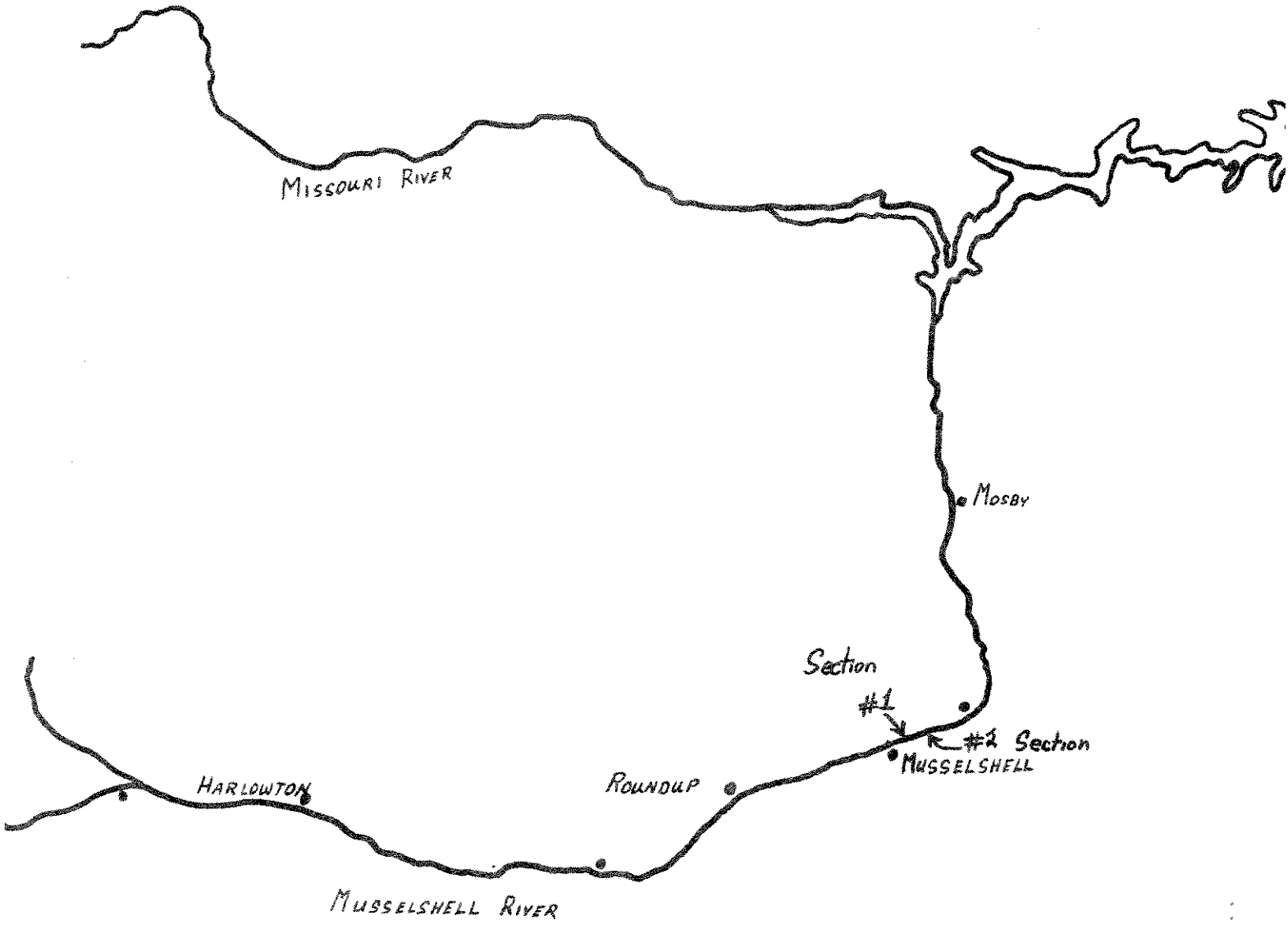

Figure 1. Locations of baited hoop nets used to capture channel catfish.

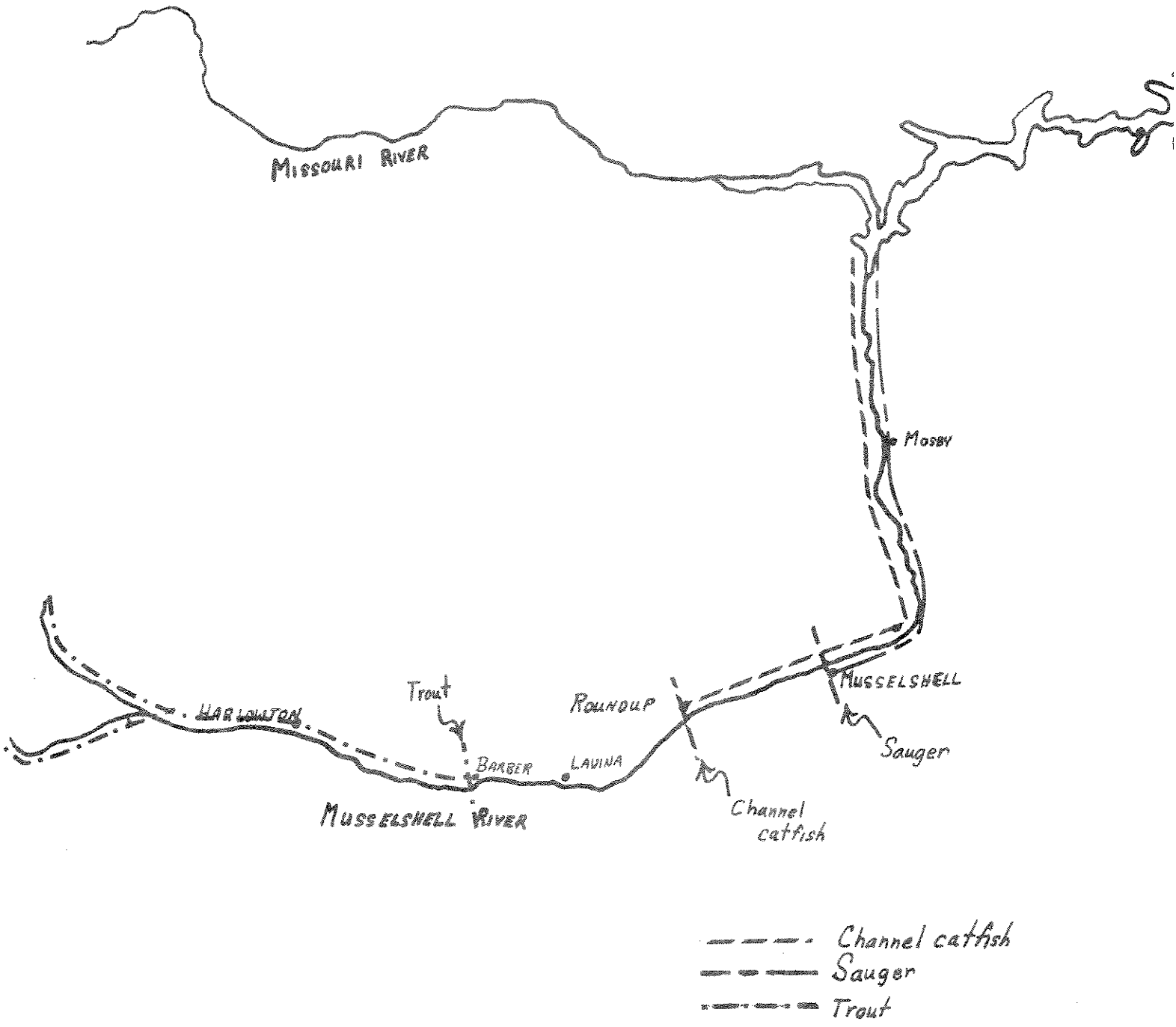

Figure 2. Distribution of various game fish species in the Musselshell River.

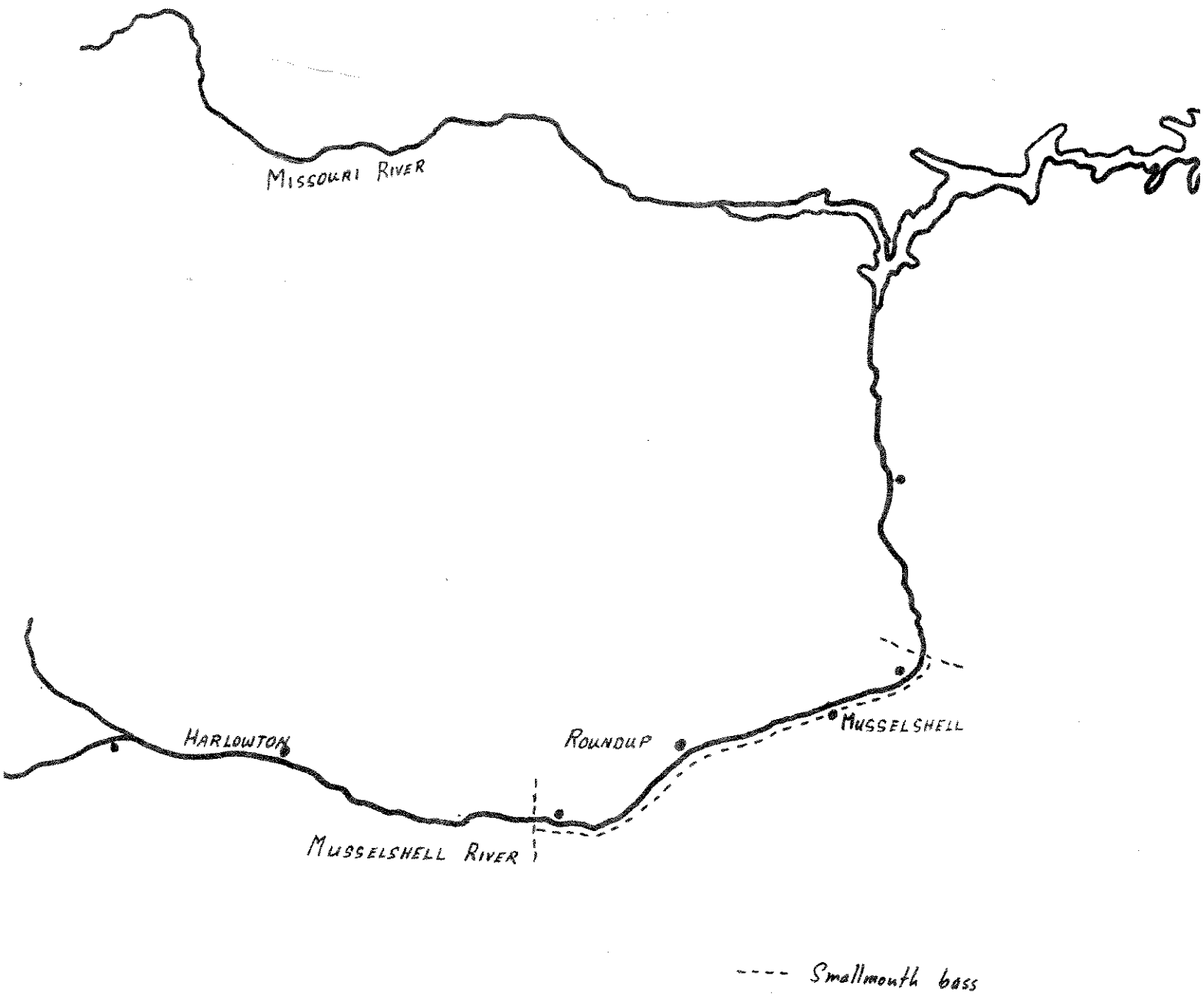

Figure 3. Distribution of recently introduced smallmouth bass, 1979.

Table 1. Channel catfish captured in baited hoop nets, 1979

Location	No. Caught	Range		Mean		Total Weight
		Length (In.)	Weight (Lbs.)	Length (In.)	Weight (Lbs.)	
B. Crawford Ranch	22	11.8-28.0	.45- 9.50	15.4	1.7	37.7
L. Goffena Ranch	142	10.2-31.5	.35-12.00	17.1	2.2	309.4
Total	164	10.2-31.5	.35-12.00	16.8	2.1	347.1

Table 2. Sauger captured in baited hoop nets, 1979

Location	No. Caught	Range		Mean		Total Weight
		Length (In.)	Weight (Lbs.)	Length (In.)	Weight (Lbs.)	
B. Crawford Ranch	2	14.0-17.5	.80- 1.60	15.8	1.2	2.4
L. Goffena Ranch	7	13.3-14.8	.74- .86	14.2	.82	5.7
Total	9	13.3-17.5	.74- 1.60	14.6	.90	8.2

Table 3. Warm-water game fish captured with electrofishing apparatus, 1979

Species	No. Caught	Range		Mean		Total Weight
		Length (In.)	Weight (Lbs.)	Length (In.)	Weight (Lbs.)	
Sauger	50	10.2-21.0	.28- 2.82	15.8	.76	38.17
Smallmouth bass	3	7.4-11.5	.28- 1.01	9.3	.60	1.79
Channel catfish	12	11.5-30.0	.36-13.25	20.9	4.10	49.10
Northern pike	1	27.5	4.5	-	-	27.50

Table 4. Cold-water game fish captured with electrofishing apparatus, 1979

Species	No. Caught	Range		Mean		Total Weight
		Length (In.)	Weight (Lbs.)	Length (In.)	Weight (Lbs.)	
Brown trout	150	7.4-21.6	.18- 2.98	11.87	.76	189.20
Rainbow trout	2	10.6-13.5	.40- .90	12.0	.65	1.30
Mountain whitefish	2	12.0-17.7	.62- 2.25	14.85	1.44	2.86

Table 5. Average length, weight and range of sauger by age class

Age	No.	Range		Mean	
		Length	Weight	Length	Weight
I	0	-	-	-	-
II	5	10.6-13.3	.35- .60	11.6	.44
III	3	13.7-15.7	.70-1.00	14.6	.89
IV	6	15.0-17.0	.92-1.58	15.6	1.09
V	1	17.2	1.25	-	-

Table 6. Average length, weight and range of brown trout by age class

Age	No.	Range		Mean	
		Length	Weight	Length	Weight
0	0	-	-	-	-
I	20	7.4-10.0	.20- .40	9.2	.31
II	36	8.1-12.0	.18- .55	10.6	.42
III	49	11.2-12.6	.46- .84	11.6	.58
IV	20	11.9-13.2	.55- .75	12.8	.71
V	52	12.9-17.6	.70-1.85	13.9	.94
VI	9	15.3-19.2	1.15-1.60	16.8	1.36
VII	2	19.8-20.1	2.34-2.67	20.0	2.50

Table 7. Average length, weight and range of brown trout by age class

Age	No.	Range		Mean	
		Length	Weight	Length	Weight
I	0	-	-	-	-
II	2	6.6- 6.8	.11- .17	6.7	.14
III	27	7.0-10.8	.12- .46	8.9	.28
IV	21	11.0-18.1	.50-2.10	13.1	.83
V	12	12.0-16.0	.60-1.36	14.6	1.10

Table 8. Water quality data, Musselshell River-Roundup (instantaneous readings) - U. S. Geological Survey

Month	Flow (CFS)	Temperature (°C)	pH (Units)	Conductivity (μMhos)	Turbidity (NTU)	Dissolved Oxygen (Mg/L)
January	*E 100	.5	7.8	1,750	-	11.0
February	125	0	7.7	1,530	-	11.3
March	212	.5	8.1	1,420		12.0
	3,350	1.5	8.0	796	-	12.0
April	618	4.0	8.3	1,840	-	11.1
May	1,000	8.0	8.3	1,340	-	9.9
June	307	23.0	8.4	1,220		7.9
	1,940	18.0	8.0	870	-	6.6
	*E 4,500	17.0	7.9	678		7.5
July	-	-	-	-	-	-
August	253	23.0	8.3	1,270	-	8.3
September						
October	98	10.0	8.4	1,710	-	9.6
November	126	2.5	8.5	1,710	-	12.1
December	141	1.0	8.3	1,740	-	12.3

*Estimated.

Table 9. Water quality data, Musselshell River-Mosby (instantaneous readings) - U. S. Geological Survey

Month	Flow (CFS)	Temperature (°C)	pH (Units)	Conductivity (μMhos)	Turbidity (NTU)	Dissolved Oxygen (Mg/L)
January	195	0	7.7	2,340	9.2	10.1
February	226	0	7.7	2,130	8.8	9.1
March	314	0	8.0	2,000	28.0	9.5
	11,800	1.0	8.2	700	1,200.0	8.9
April	1,350	2.0	8.3	2,260	100.0	11.3
May	1,900	10.0	8.4	1,725	64.0	9.7
June	453	23.0	8.4	1,610	28.0	7.9
	2,940	22.0	8.4	875	540.0	6.7
July	-	-	-	-	-	-

Table 10. Water quality data - various locations on Musselshell River (instantaneous readings) - Department of Natural Resources, August 29, 1979

Location	Flow (CFS)	Temperature (°C)	pH (Units)	Conductivity (μMhos)	Turbidity (NTU)
Shawmut	88.31	16.2	8.2	1,064	7.1
Barber	137.74	-	8.3	1,111	11.0
Ryegate	138.94	23.0	8.2	1,111	18.0
Cushman	278.90	-	8.3	1,294	43.0
Lavina	315.20	-	8.3	1,355	46.0
Bundy	275.80	-	8.3	1,468	60.0
Elso	293.00	18.8	8.1	1,366	89.0
Roundup	318.0	20.4	8.2	1,484	177.0
Gage	268.0	22.0	8.1	1,427	220.0
Delphia	339.8	19.0	8.1	1,378	410.0
Musselshell	258.6	20.0	8.3	1,463	175.0
Melstone	315.2	22.0	8.0	1,532	290.0

Table 11. Monthly flows at various locations on the Musselshell, U. S. Geological Survey, 1977-78

Month	Mosby			Musselshell			Roundup			Ryegate			Harlowton			Martinsdale		
	Mean	Max. (CFS)	Min.	Mean	Max. (CFS)	Min.	Mean	Max. (CFS)	Min.	Mean	Max. (CFS)	Min.	Mean	Max. (CFS)	Min.	Mean	Max. (CFS)	Min.
1977																		
Oct.	54	270	34	36	42	33	28	42	23	18	23	14	64	117	49	27	37	22
Nov.	42	97	22	38	83	23	36	83	18	30	84	15	67	104	51	22	34	16
Dec.	78	150	40	53	70	35	51	66	30	43	58	28	77	108	50	24	36	20
1978																		
Jan.	64	70	62	63	68	56	57	66	52	40	43	37	65	70	62	19	22	17
Feb.	79	95	64	70	74	64	68	80	58	43	51	37	71	76	68	19	21	16
Mar.	4,658	15,600	76	1,256	6,900	64	1,281	6,810	63	592	3,350	39	331	995	66	80	308	15
Apr.	1,316	7,950	608	554	1,650	295	511	1,460	270	214	811	98	363	719	251	197	364	131
May	2,634	7,970	722	1,143	1,900	452	1,109	1,650	491	998	1,630	239	1,085	1,690	700	665	1,040	386
June	1,477	2,400	886	956	1,280	649	956	1,250	706	815	1,310	540	716	1,070	415	509	770	356
July	1,516	4,330	392	661	1,080	317	720	1,130	362	512	960	285	392	760	121	224	493	66
Aug.	290	458	226	236	331	195	266	367	210	150	285	118	101	137	66	42	64	30
Sept.	733	4,810	240	252	355	186	239	343	153	148	239	90	144	210	96	50	77	28

Water Quality and Flows

Data gathered by the USGS and Water Quality Bureau on various physical parameters is summarized in Tables 8-11.

RECOMMENDATIONS

1) Complete the identification of species present in the lower 70 miles of the Musselshell and determine species distribution and composition.

2) Determine the migration pattern of the channel catfish and sauger in the warm-water section of the Musselshell.

3) Continue to monitor the progress of introduced smallmouth bass throughout the drainage.

4) Continue to monitor instream temperatures with thermographs.

5) Continue the gathering of data to substantiate instream flow recommendations and correlate this information with flows and water quality provided by the USGS and the Montana Water Quality Bureau.

6) Long-range objectives should include population estimates and determination of species composition for the entire drainage, and ultimately to develop an aquatic resource management plan for the Musselshell River.

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