MONTANA DEPARTMENT OF FISH AND GAME
FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: Montana TITLE: Southwestern Montana Fisheries Study

PROJECT NO.: F-9-R-23 TITLE: Inventory of Waters of the Project Area

JOB NO.: I-b

PROJECT PERIOD: February 1, 1974 to January 31, 1975

REPORT PERIOD: January 1, 1974 to December 31, 1974

ABSTRACT

Brown and rainbow trout populations were investigated in the Melrose and Reichle sections of the Big Hole River and in section 3 of Poindexter Slough. Comparisons were made in each section with past populations. Tag return data from the two Big Hole sections and staff gage measurements of Poindexter Slough are discussed.

A fish population and habitat study was established in that portion of the East Fork of Blacktail Creek on the Blacktail Game Range. Fish population and stream geomorphic measurements were analyzed relative to past floodplain land use practices. The brook trout population in the "control" section was about two times larger than in the "disturbed" section.

Fish populations were studied in newly established sections of Red Rock River and Bloody Dick Creek.

Species composition and relative abundance of fish in Big Sage Creek and several of its tributaries are documented.

Water temperature data are recorded from two locations on the Big Hole River and one on the Jefferson.

Gill net data are recorded from Morris Pond and the four Axolotl Lakes. Morris and Renfro Ponds were rehabilitated with Pro-Noxfish and results are discussed.

BACKGROUND

Our streams and lakes are receiving continuing, increased fishing pressure. This means that more knowledge and better management of our fisheries resources is paramount. Scientific fisheries inventories and habitat studies are the best way to furnish baseline data to the fisheries manager for aid in the management decisions. In addition, these data provide for more properly placing values upon our fisheries and outdoor recreation resources.

OBJECTIVES

The purpose of this project was to obtain baseline data from the fisheries resource in the project area which will aid management decisions and which can aid in more adequately dealing with land and water development projects that can adversely effect fisheries resources.

PROCEDURES

Electrofishing gear with an output of 0-500 volts variable D.C. was utilized in censusing fish populations where streams were of sufficiently large size to use the electrofishing boat. Electrofishing gear were fished from a fiberglass boat with a mobile positive electrode and a stationary negative electrode attached to the bottom of the boat.

In smaller streams (i.e., Big Sage Creek and its tributaries), fish populations were censused with a backpack unit (Smith-Root, Type 5). In these small stream investigations, 425 volts with a pulse frequency of 60/sec. were used.

Captured fish were anesthetized, measured, marked and released near their capture site. Numbered Floy anchor T-tags were placed behind the dorsal fins of 450 trout from the Melrose section of the Big Hole River.

Population estimates were computed using five computer programs and calculations were made using modifications of "River Electrofishing and Fish Population Estimates" (Vincent, 1971a).

In the East Fork of Blacktail Creek Study, sections 1 and 2 lengths and widths were measured "on the ground". Percent bank cover, sinuosity and reach length measurements were obtained from 1974 aerial photographs (enlarged to 1" = 125'). Elevation and gradient data were obtained from U.S. Geological Survey topographic maps (1968).

Experimental gill nets 125 feet long with graduated mesh sizes were used to sample lake populations. Lake rehabilitation was done with Pro-Noxfish.

Taylor seven-day recording thermographs were operated in August and September at two locations on the Big Hole River and one on the Jefferson.

Water conductivity measurements were obtained with a Hach Model 2510, temperature compensating, conductivity meter.

FINDINGS

Streams

Big Hole River

Reichle Section: This section was established in 1971 to obtain baseline information downstream from the site of the proposed Reichle Dam. The section begins 1½ miles downstream from the proposed dam site and is 4½ miles in length. The average width, measured from aerial photographs taken on July 19, 1968, was 148 feet.

The estimated number of brown trout, during the sampling period, was 151.5 per 1000 feet (Table 1). Total estimated pounds per 1000 feet was 145.7.

During the falls of 1971 and 1972, the estimated numbers per 1000 feet were 120.3 and 117.8, respectively (Peterson, 1973 and Peterson, 1974a). The 1971 and 1972 estimated total pounds per 1000 feet were 112.4 and 139.4, respectively. Brown trout were spawning during the time estimates were made and, therefore, movement may have affected the respective estimates.

TABLE 1. Population estimates per 1000 feet and condition factors for brown trout in the Reichle Section (4½ miles in length) of the Big Hole River, Sept.-Oct., 1974. (80% confidence intervals in parentheses).

Length Interval (Inches)	Estimated Number per 1000 feet	Estimated Pounds per 1000 feet	Condition Factors
6.7-11.2	54.3 (±9.7)	14.8 (±2.6)	37.24 (±4.33)
11.3-15.0	52.8 (±9.8)	42.6 (±8.0)	35.99 (±3.67)
15.1-24.1	44.4 (±18.3)	88.3 (±36.4)	35.42 (±4.97)
Totals or Average	151.5 (±22.9)	145.7 (±37.4)	36.43 (±4.31)

Other species captured included rainbow (101) and brook (1) trout and Arctic grayling (1). However, insufficient numbers and/or too few recaptures precluded making population estimates.

Brown trout length group intervals (Table 1) were based on length frequency distribution analyses. Scales samples were taken from 3.9 to 11.9 inch fish but aging proved too difficult for accurate judgment because of the many check marks on the scales. A relatively good length frequency "break" occurred at 11.2-11.3 inches. Comparison of a few good scales and length frequency analysis indicates that brown trout between 6.7 and 11.2 inches were primarily age group I.

A total of 520 trout were tagged in March-April 1973, in the Reichle Section. From these tags, only 8 (1 rainbow and 7 browns) were returned by fishermen in 1973 and only 5 (1 rainbow and 4 browns) in 1974. This would indicate a very low harvest rate and/or a poor response by fishermen in returning tags from this portion of the river.

Recommendations: Spring population estimates should be made periodically to determine long-term population trends. Brown trout spawning movement may affect population estimates made during the fall, therefore, spring estimates should provide more valid trend comparisons.

Melrose Section: This 22,500 foot section was established in 1969 by Marcoux (Elser and Marcoux, 1971). Prior to April 1974, it was electrofished last in April, 1971. The section was established to provide baseline information upstream from the section of river which would be inundated by the proposed Riechle Dam. It additionally provided data for management purposes.

Brown and wild and hatchery rainbow trout were captured in three marking runs (Table 2). A few brook trout and Arctic grayling were taken but sizes were not recorded. High water during an initial recapture attempt resulted in relatively inefficient electrofishing (i.e., 450 volts produced only 1.0-1.5 amperes) and, therefore, negated further attempts at recapture.

Wild rainbows averaged slightly larger than brown in both length and weight,

but, considerably more than hatchery rainbows in both categories (Table 2).

A total of 367 brown and 83 wild rainbow trout 9.0 inches and larger were tagged with numbered T-tags. As of December 31, 1974, 21 and 9 tags from brown and rainbow trout, respectively, have been returned by fishermen.

TABLE 2. Total numbers, size ranges and mean lengths and weights for brown, wild rainbow and hatchery rainbow trout captured in three marking runs in the Melrose Section (22,500 feet in length) of the Big Hole River, April 1974.

Species	Total Number Captured	Size Range (inches)	Mean Length (inches)	Mean Weight (pounds)
Brown Trout	420	8.5-25.5	14.4	1.28
Rainbow Trout (wild)	95	8.7-19.8	14.7	1.31
Rainbow Trout (hatchery)	117	8.6-16.2	10.8	0.50

The tag return rate for brown trout was 5.7% and for rainbow was 10.8%. The combined tag return for both species was 6.7% compared to 12.5% in 1970 and 9.5% in 1971 in this section (Peterson, 1973). These declining return rates perhaps indicate a declining fishermen response to the return of tags and/or declining harvest rates.

The adipose fins were removed from brown and wild rainbow trout less than 7.0 inches (i.e., age group I) for future age group identification.

Recommendations: Periodic population estimates should be done during the spring to determine long-term population and angler harvest trends. Future tagging should be done only if accompanied by an extensive creel census in order to determine the validity of information derived from tag return information.

East Fork of Blacktail Creek Study

This stream is located approximately 30 miles south of Dillon, Montana. Historically, it has provided the opportunity for excellent fishing in aesthetic surroundings.

On January 1, 1974, the Montana Department of Fish and Game obtained complete ownership of a ranch which encompassed the lower 15.5 miles of the East Fork and the first 1.1 miles of Blacktail Creek. The purpose of the purchase was primarily for elk winter range. About 20,000 acres of deeded and leased land were purchased. the area is called the Blacktail Game Range. The water quality of the stream is of high quality compared with many streams in the area (Elser and Marcoux, 1972). Although streambed stability and cover are excellent on most reaches of the stream, these parameters are depressed in a few areas (e.g., Section 2) due to past livestock and haying operations.

The purpose of this study is to quantify and photograph the stream's geomorphic and riparian response over a long period (10-20 years) to the cessation of the floodplain livestock operation and to measure corresponding changes in fish populations in a disturbed section (Section 2, Figure 1) compared to a mostly undisturbed section (Section 1, Figure 2).

Reaches: The portion of the East Fork on the game range was arbitrarily divided into 3 reaches to depict any gross differences in physical measurements throughout the streams system within the study area. The uppermost reach (reach 3, Figure 3) has the steepest gradient and a sinuosity of 1.86 (Table 3). Sections 1 and 2 are located in reach 3. Reach 1 (Figure 4) has the lowest gradient yet also the lowest sinuosity and perhaps reflects disturbance primarily due to past land use practices.

TABLE 3. Physical measurements of three reaches of the East Fork of Blacktail Creek on Department of Fish and Game property, 1974.

	Elevations[4] (feet)	Gradients[4] (feet/mile)	Stream Lengths[4] (feet)	Sinuosities[5]
Reach 3 [1]	6,740-7,145	92.5	43,123	1.86
Reach 2 [2]	6,572-6,740	79.2	20,838	1.86
Reach 1 [3]	6,395-6,572	75.3	18,113	1.46

1/ From the beginning of Fish and Game property to a ridge approximately 2 miles above the ranch buildings.
2/ From bridge approximately 2 miles above ranch buildings to foot bridge at buildings.
3/ From foot bridge at ranch buildings to mouth.
4/ Measured from U.S.G.S. topographic maps.
5/ Measured from 1974 aerial photos.

On October 2, 1974, aerial photographs were taken of all 3 reaches. The photos were taken at a scale of 1" = 250' and then enlarged to 1" = 125'.

Sections: Section 1 is located 2.2 miles upstream from section 2 and was established as a "control: because of its mostly undisturbed condition and proximity to section 2. Section 2 will be used as the primary study section in order to quantify physical and biological changes resulting from a 10-20 year period of natural rehabilitation.

The average width in section 2 is larger than in section 1 (Table 4) and is probably the result of smaller amounts of bank cover and, therefore, more extensive streambank cutting in section 2. Sinuosities of the two sections and the entire reach were nearly identical.

TABLE 4. Physical measurements of Sections 1 and 2 of the East Fork of Blacktail Creek, 1974.

	Length [1] (feet)	Average Width [1] & [2] (feet)	% Bank Cover	Sinuosity[3]
Section 1	4,860	20.0	78.7	1.85
Section 2	3,000	23.3	56.2	1.86

1/ On the ground measurements.
2/ Measured on August 28, 1974.
3/ Measured from 1974 aerial photos.

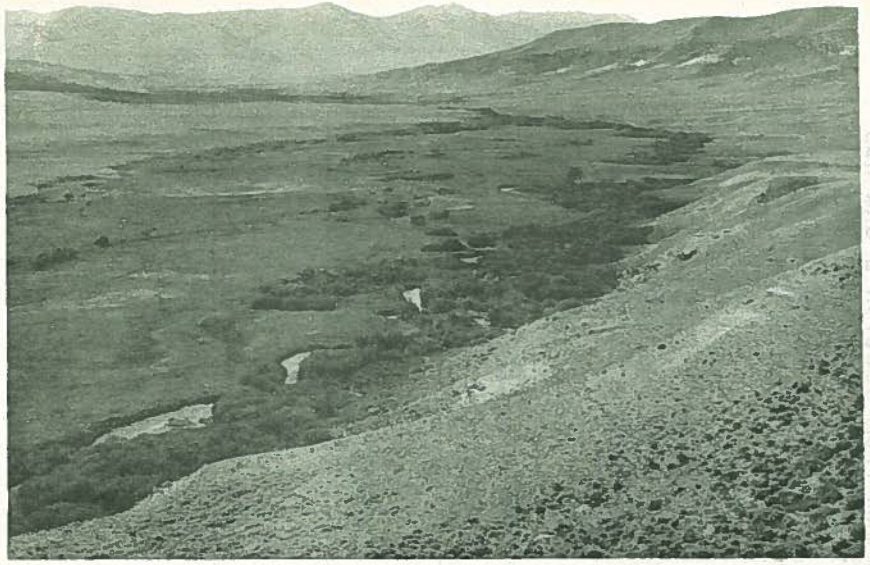

FIGURE 1. Photographic station 5, looking downvalley, Aug. 31, 1974.

FIGURE 2. Photographic station 5, looking upvalley, Aug. 31, 1974.

FIGURE 3. Reach 3, looking upvalley, Aug. 31, 1974.

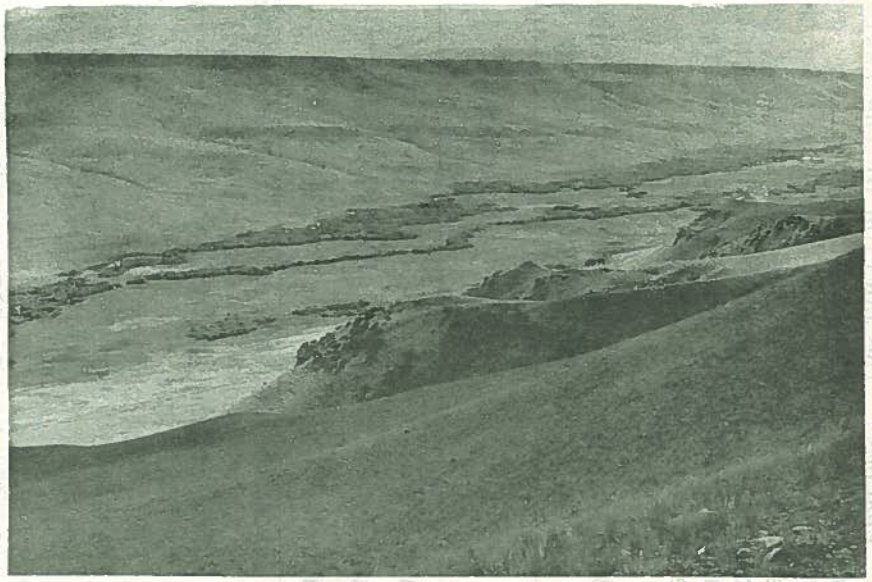

FIGURE 4. Reach 2, looking downvalley, Aug. 31, 1974.

In Table 5, the populations of both sections are compared. The brook trout length group intervals were based mostly on length frequency distribution with the aid of a few "readable" scales. For the most part, intervals 4.0-6.4, 6.5-9.2 and 9.3 inches and larger were age groups I, II and III and older brook trout, respectively.

Analysis of point estimates (at the 80% level) indicate that brook trout population numbers and weights were much larger in the "control" section, section 1, than the "disturbed" section, section 2, (Table 5).

The total number and weight of brook trout per 1000 feet in section 1 was 1.83 and 2.10, respectively, times that in section 2.

TABLE 5. Population estiamtes per 1000 feet and condition factors for brook and rainbow trout in Sections 1 and 2 of the East Fork of Blacktail Creek, July-August, 1974. (80% confidence intervals in parentheses).

Species	Length Interval (inches)	Estimated Number per 1000 feet	Estimated pounds per 1000 feet	Condition Factors
		SECTION 1		
Brook Trout	4.0-6.4	66.0 (±8.8)	3.9 (±0.6)	40.56 (±6.73)
	6.5-9.2	38.9 (±2.7)	8.9 (±0.6)	41.86 (±4.25)
	9.3-15.5	49.4 (±2.3)	29.2 (±1.4)	42.92 (±4.56)
Total or Average		154.3 (±9.7)	42.0 (±1.6)	41.95 (±5.28
Rainbow Trout	9.5-16.3	5.1 (±1.0)	5.3 (±1.2)	39.93 (±4.79)
		SECTION 2		
Brook Trout	4.0-6.4	25.7 (±4.3)	1.3 (@0.3)	42.70 (±7.52)
	6.5-9.2	39.3 (±3.3)	8.0 (±0.7)	41.16 (±4.86)
	9.3-13.9	19.3 (±2.0)	10.7 (±1.0)	41.87 (±4.10
Total or Average		84.3 (±5.7)	20.0 (±1.3)	41.62 (±5.25)
Rainbow Trout	8.8-15.8	3.3 (±0.3)	2.7 (±0.3)	40.00 (±3.47)

Since confidence intervals are small and do not overlap, large differences in the estimates of brook trout numbers and weights between sections appear real and are probably related to habitat differences. A partial creel check showed similar fishing intensities between sections so fishing apparently had little or no effect on these differences. No reason is hypothesized for the similarities between sections in length interval 6.5-9.2 brook trout populations.

Four permanent photographic stations were established near eroded streambanks in section 2 (Figures 5, 6, 7 and 8). From these four photo points, a visual determination can be made of the rate of willow regrowth and/or bank stabilization. A fifth photo point was established on a hill near the median between the two sections (Figures 1 and 2). This station will aid in graphically demonstrating the compartive magnitudes and rates of willow regrowth in the floodplain in both sections.

Recommendations: All parameters studied in both sections in 1974 should

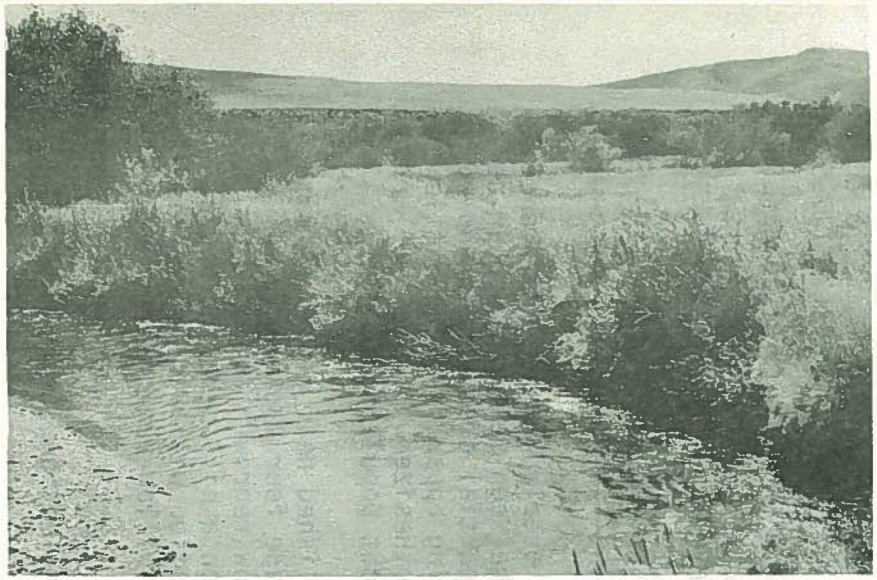

FIGURE 5. Photographic station 1, looking downstream, Aug. 31, 1974.

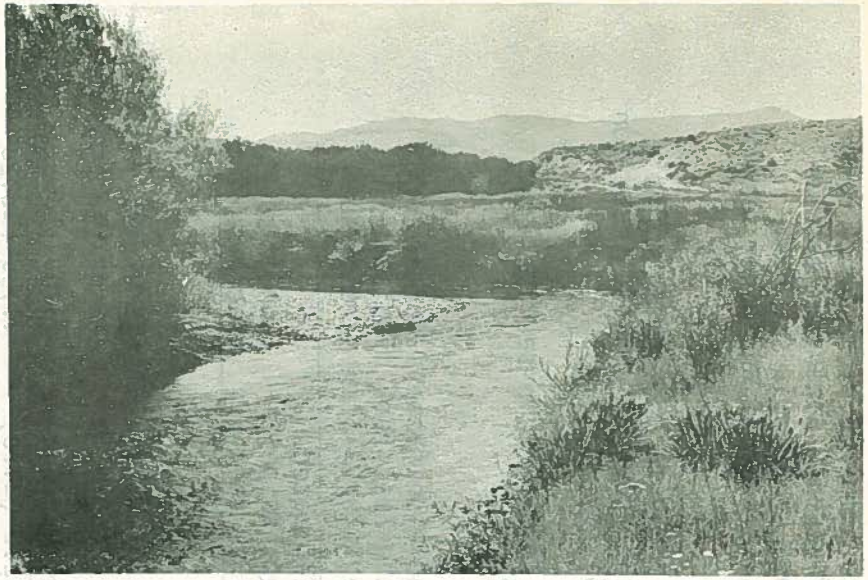

FIGURE 6. Photographic station 2, looking downstream, Aug. 31, 1974.

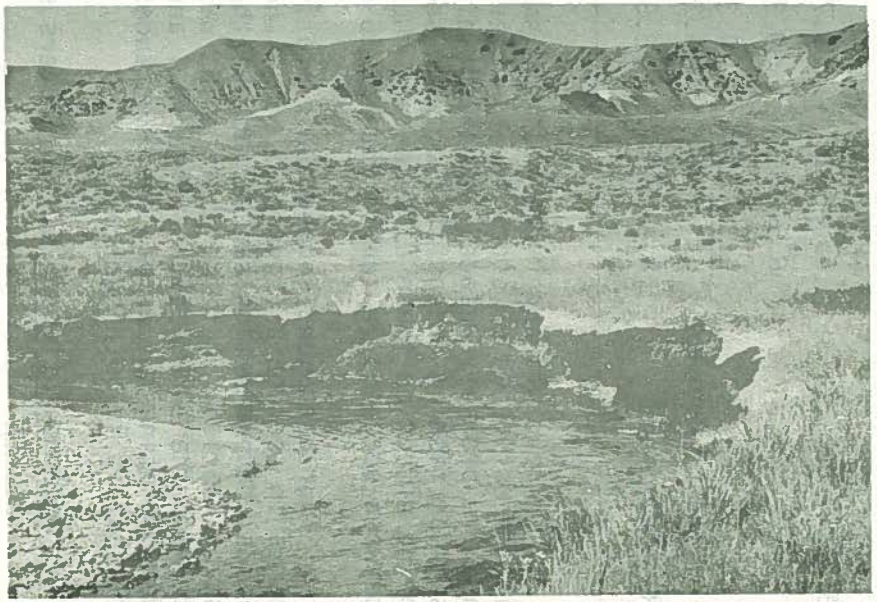

FIGURE 7. Photographic station 3, looking downstream, Aug. 31, 1974.

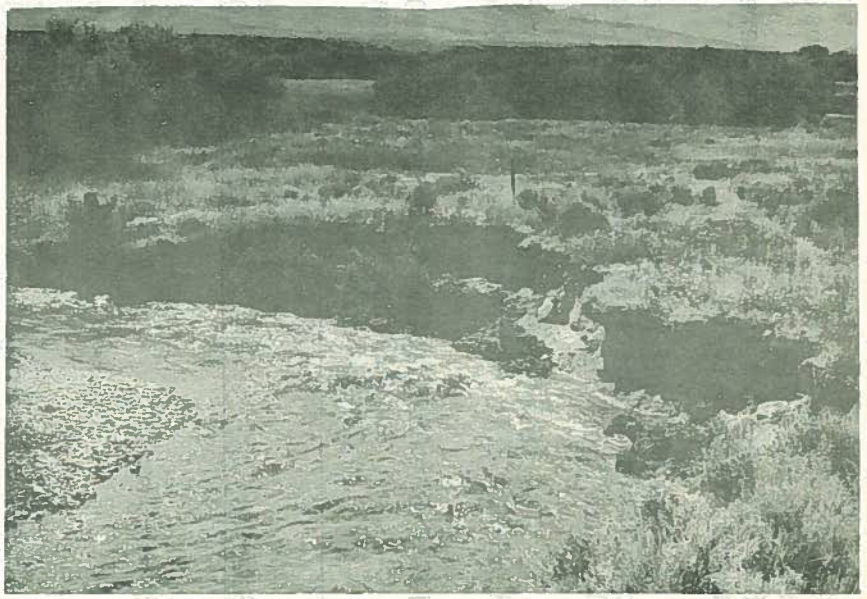

FIGURE 8. Photographic station 4, looking downstream, Aug 31, 1974.

be continued. Additional parameter measurements in both sections should be added as time allows and should include: (1) mountain whitefish populations; (2) pool-riffle periodicity; (3) stream thalweg profiles; (4) gradients; (5) instantaneous flows; (6) suspended and intergravel sediments and D.O.; (7) TDS, pH and other important chemicals; (8) temperatures; and (9) streamflow/fish requirements with aid of cross-sectional analysis.

Poindexter Slough

Poindexter Slough is a meandering spring-fed stream located about three miles southwest of Dillon, Montana and totals about four miles in length. Fishing pressure is relatively high because of its reputation as an excellent fishing spot for brown and rainbow trout. Flows vary from about 30 to 100 cfs (Wipperman and Elser, 1968). A headgate, constructed in 1932 or 1933 (Peter W. Rebish, personal communication) by the Dillon Canal Company, regulates the major water supplier, the Beaverhead River, during the irrigation season (about May 1 to November 1, annually).

A "closed tile drainage system" was constructed in the headwater area during 1971 through a contract funded by the Bureau of Reclamation (described in Peterson, 1973) A resultant change in flow patterns and probably fish populations is expected.

In 1974, 46 staff gage readings were recorded. They ranged from 0.16 on April 1 and 12 to 2.56 on August 30 and September 3. The difference in the low and high represents a much greater range than had previously been recorded in either 1972 (Peterson, 1974a) or in 1973 (Peterson, 1974b). The ranges in 1972 and 1973 were 0.35-2.46 and 0.23-2.00, respectively. I believe these differences represent differences in the type of water year and irrigation regulation between years.

The populations of brown and rainbow trout in section 3 (3,200 feet in length) were sampled by electrofishing during late April and early May 1974.

Brown trout represented about 67% of the population of age group I and older trout. The total estimated number of brown and rainbow trout/1000 feet were 554 and 273, respectively (Table 6).

Brown trout averaged a little longer and heavier than rainbows in age groups I and II, but, not in age group II and older (Table 7). A larger average rainbow in the older age group may be partially explained by immigration of rainbow spawners, at this time of the year, from downstream on the Beaverhead River.

TABLE 6. Population estimates per 1000 feet for brown and rainbow trout in Section 3 of Poindexter Slough, April-May 1974. (80% confidence intervals for total numbers and pounds in parentheses).

Age Group	Brown Trout		Rainbow Trout	
	Number/ 1000 feet	Pounds/ 1000 feet	Number/ 1000 feet	Pound/ 1000 feet
I	387	23	187	9
II	64	30	27	11
III+	103	100	59	63
Total or Ave.	554 (±74)	153 (±9)	273 (±43)	83 (±9)

TABLE 7. Average length (in total inches) and weight (in pounds) for three age groups and average condition factors for brown and rainbow trout in Section 3 of Poindexter Slough, April-May, 1974. (80% confidence intervals in parentheses).

Species	Length			Weight			Condition Factors
	Age Group			Age Group			
	I	II	III+	I	II	III+	
Brown trout	5.4	10.8	13.9	0.06	0.46	0.96	35.34 (±4.98)
Rainbow trout	4.7	10.1	14.2	0.05	0.41	1.08	37.22 (±5.45)

Table 8 shows point estimate comparisons of brown and rainbow trout for five spring samples from 1968. The large increase in age group I brown and rainbow trout in 1974 compared to other years may reflect real increases or may be due to failure to meet the requirements of probability sampling in one or both years. A comparison of a future estimate of the 1973 year class with past records should indicate whether or not the increase was real.

TABLE 8. Brown and rainbow trout population point estimate comparisons for five springs from 1968 to 1974. Estimates are per 1000 feet (confidence intervals were not available for age group estimates of certain years and were therefore not used at all).

Species	Age Group	1968[1/]	1969[2/]	1970[3/]	1972[4/]	1974
Brown Trout	I	-[5/]	45	-	53	387
	II	165	119	-	94	64
	III+	83	61	-	129	103
Total Brown Trout		248[7/]	225	350	276	554
Rainbow Trout	I	-[5/]	46	-	30	187
	II	44	37	-	57	27
	III+	66	45	-	75	59
Total Rainbow Trout		110[6/]	128	284	162	273
Grand Total		358[6/]	353	534	438	837

1/ Elser, 1969.
2/ Elser and Marcoux, 1971.
3/ Data available on file in Dillon field office but not computerized and fish scales not read, therefore, only totals were used.
4/ Unpublished data on file in Dillon field office. Data are computerized and scales were read.
5/ Estimates not made for this age group.
6/ From all available niches.
7/ Age Group I estimates not in totals.

Very little detectable change could be determined for age groups II and III+ brown or rainbow trout. Changes in mature rainbows would not, however, reflect true changes because of spawning movement at this time of year.

Recommendations: Trout populations should be monitored every other spring and staff gage measurements recorded about once a week throughout the year. In addition, all data prior to 1972 should be computerized or re-computerized so that accurate comparisons, with confidence intervals for each age group, can be made for several years before and after the installation of the "closed tile drainage system".

Red Rock River

Upper Roe Section: This 6,250 foot section was established in 1974. This section was established because of the relative influence trout populations moving upstream from Clark Canyon Reservoir were having on resident populations in the Roe Section, several miles downstream.

From measurements made on June 17, 1974, the average width was 42.4 feet and the surface acres were 6.08. Width measurements were made at 100 foot intervals and were determined as the "normal" shoreline (a judgment).

Brown trout comprised approximately 79% of the age group II and older trout population. Brown trout totaled about 209 age group I and older fish per 1000 feet (Table 9). Rainbows totaled about 35 fish per 1000 feet (Table 9). Condition factors were high compared with many other streams in the area.

TABLE 9. Population estimates per 1000 feet and condition factors for brown and rainbow trout in the Upper Roe Section (6,250 feet) of Red Rock River, June 1974. (80% confidence intervals in parentheses).

Species	Length Interval[1] (inches)	Estimated Number per 1000 feet	Estimated pounds per 1000 feet	Condition Factors
Brown trout	4.6-8.9[2]	74.6 (±17.0)	9.7 (±2.2)	42.58 (±5.66)
	9.0-12.0[3]	58.2 (±13.4)	30.9 (±7.2)	42.87 (±3.14)
	12.1-15.6[4]	59.8 (±7.0)	64.0 (±7.5)	40.78 (±3.87)
	15.7-20.1[5]	16.5 (±3.2)	28.6 (±5.6)	36.15 (±3.20)
Total or Average		209.1 (±23.0)	133.2 (±12.0)	41.27 (±4.94)
Rainbow trout	8.7-12.5[3]	19.7 (±6.7)	11.7 (±4.0)	44.60 (±4.67)
	12.6-20.7[5]	15.8 (±4.2)	24.2 (±6.4)	41.11 (±4.70)
Total or Average		35.5 (±4.2)	35.9 (±7.5)	42.86 (±5.18)

1/ Age data available, but, only used in conjunction with length frequency distributions in determining length intervals.
2/ All age group I.
3/ Mostly age group II and a few III's.
4/ Mostly age group III and a few II's.
5/ Age group III and older.

A drawing of electrofishing ingress and egress points is filed with 1974 data.

Recommendations: Fish populations should occasionally be checked in this section for management purposes. More effort should be made in obtaining sufficient numbers of age group I rainbows so that their population can be estimated.

Bloody Dick Creek

James Section: This 3,540 foot section was established in 1974. On July 8, 1974, the average width (measured at 60 foot intervals) was 30.0 feet and the surface acreage was 2.45. A description of the section location is filed with 1974 data.

Brook trout numbers greatly predominate the three populations estimated (Table 10). The estimated total of age group I and older (3.5 inches and larger) brook trout was 509.9 per 1000 feet (Table 10).

TABLE 10. Population estimates per 1000 feet and condition factors for rainbow and brook trout and mountain whitefish in the James Section (3,540 feet in length) of Bloody Dick Creek, August-September, 1974. (80% confidence intervals in parentheses).

Species	Length Interval 1/ (inches	Estimated Number per 1000 feet	Estimated Pounds per 1000 feet	Condition Factors
Rainbow Trout	2.9-5.9	98.3 (±38.4)	3.1 (±1.1)	35.85 (±4.45)
	6.0-9.9	22.9 (±6.8)	5.4 (±1.4)	38.69 (±4.18)
	10.0-14.9	6.8 (±1.4)	3.9 (±0.8)	38.32 (±3.30)
Total or Average		128.0 (±39.3)	12.4 (±2.0)	38.21 (±4.15)
Brook Trout	3.5-5.6	268.1 (±98.9(	9.6 (@3.7)	35.78 (±7.35)
	5.7-8.9	211.0 (±33.3)	33.0 (±5.1)	38.68 (±6.30)
	9.0-12.9	30.8 (±10.4)	11.9 (±4.0)	40.50 (±4.15)
Total or Average		509.9 (±104.8)	54.5 (±7.6)	38.64 (±6.32)
Mountain Whitefish	9.1-14.9	29.9 (±9.6)	25.1 (±7.9)	41.52 (±4.12)
	15.0-18.3	6.5 (±1.7)	11.3 (±2.8)	39.22 (±2.88)
Total or Average		36.4 (±9.9)	36.4 (±8.5)	40.93 (±4.04)

1/ Age data available, but, only used in conjunction with length frequency distributions in determining length intervals.

Big Sage Creek and Tributaries

Electrofishing was done with a backpack shocker. Species composition and relative numbers were the only fish population data collected.

The most numerous trout species captured in Big Sage Creek was rainbow (Table 11). In the lower reach (S34 AC), silt was prominant on stream bottoms and perhaps wholly or partly limited trout numbers as well as aided the predominance of suckers. In the middle two reaches of Big Sage Creek (S15 AA and S27 AD) trout were more and suckers less numerous than in the lower reach. It was observed that better streamside cover and less silt deposits were present in these two middle reaches compared with the lower reach and probably contributed to their relatively larger game fish numbers. The upper reach of Big Sage Creek was visibly less silt laden and streamside cover was extensive, but, flows were relatively small and, therefore, probably contributed to limiting numbers and size of fish.

TABLE 11. Species composition and mean lengths of fish and water conductivities in Big Sage Creek and several of its tributaries, September, 1974. (Size range in parentheses).

Stream and Location	Conductivity (mmhos)	Approx. Section Length	Rainbow Trout		Brook Trout		Cutthroat Trout		Rb x Ct Trout		Mountain Whitefish		White Sucker		Longnose Sucker	
			No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean
Big Sage Creek S34 AC, T12S, R8W	390	200 ft	3	11.8 (10.0-13.5)	-	-	-	-	-	-	16	8.8 (6.2-11.9)	65	9.3 (3.8-14.1)	20	7.6 (5.1-10.5)
Big Sage Creek S15 AA, T12S, R8W	390	250 ft	45	6.3 (2.5-13.4)	4	8.2 (6.2-10.3)	-	-	-	-	7	10.8 (8.7-12.5)	5	10.4 (9.4-11.8)	9	6.5 (3.8-9.8)
Big Sage Creek S27 AD, T11S, R8W	330	400 ft	51	7.8 (2.3-13.4)	4	9.3 (2.9-13.7)	-	-	1	11.5	2	10.2 (8.1-12.3)	-	-	8	10.4 (6.7-13.5)
Big Sage Creek S8 BC, T11S, R8W	200	200 ft	1	5.2	3	7.7 (6.4-8.6)	-	-	2	5.4 (5.0-5.8)	-	-	-	-	-	-
Long Creek S15 BA, T11S, R9W	340	200 ft	6	8.7 (4.5-11.1)	1	8.2	3	8.8 (8.4-9.3	11	8.5 (4.5-12.9)	-	-	-	-	-	-
Basin Creek[1/] S26 AC, T12S, R8W	130	300 ft	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Basin Creek[2/] S36 AB, T12S, R7W	280	spot sampling	-	-	-	-	6	9.1 (5.8-10.6)	-	-	-	-	-	-	-	-
Little Basin Creek S1 BC, T13S, R7W	84	200 ft	-	-	-	-	3	9.7 (8.8-10.3)	1	8.5	-	-	-	-	-	-

- No captured in sample.
* Numerous sculpin and dace were observed in most sections but not captured.
1/ Section is in sagebrush floodplain with extensive streamside livestock grazing. Bank cover was nonexistent and flows were about 2-3 cfs, therefore, high temperatures and/or inadequate flows may be limiting to fish in this section of stream.
2/ Numerous beaver dams and fair streamside vegetation provided habitat even at flows of approximately 1 cfs in this section of stream.

The three tributaries contained cutthroat trout (Table 11). The only other species collected in the tributaries was one rainbow-cutthroat hybrid in Little Basin Creek.

Little Basin Creek had the lowest measured conductivity (Table 11). The highest conductivity readings 390 mmhos) were obtained in the two lower sections of Big Sage Creek. Long Creek's conductivity reading was relatively high at 340 mmhos.

Stream Temperatures

Temperatures were recorded only during the period August 5 to September 13, 1974. The minimum-maximum temperatures recorded for the Big Hole River at the proposed Reichle Dam site and the Children's Center Bridge near Twin Bridges and the Jefferson River at the Silver Star Bridge were 51-72° F, 46-75° F and 47-41° F, respectively.

Lakes

One experimental gill net was set for approximately 24 hours in Morris Pond and each of Axolotl Lakes numbers 1 through 4.

Morris and Renfro Ponds were rehabilitated with Pro-Noxfish on July 22, 1974.

Morris Pond

A sinking gill net was set overnight in this pond in May 1974. Two cutthroat trout, 22 brook trout, 1 mountain whitefish, 12 longnose suckers and 147 white suckers were captured. Brook trout ranged from 6.9 to 13.0 inches in length. The cutthroat were 10.3 and 14.0 inches, respectively. Because of the large number of suckers, the pond was later rehabilitated. I believe that a less than 100% kill occurred due to the large amounts and thickness of emergent pond weeds (species undetermined). The pond weeds could provide shelter for fish into which the toxicant could not reach.

Renfro Pond

I believe that a 100% kill occurred in this pond because of the lack of emergent pond weeds and minimal submergents. Many suckers and a few rainbow trout were observed in the kill.

Axolotl Lakes

A sinking gill net was set overnight in each of the 4 lakes to determine relative abundance and species composition. These lakes were studied to establish baseline data in order to provide management direction for their future respective fishery. The lakes were labled Axolotl #1 through #4 from the uppermost to the lower lake, respectively (Table 12).

The lakes were planted with rainbow trout from 1955 to 1966. Conflicts with a private landowner regarding public access curtailed the plant since 1966.

Only Axolotl #4 was found to contain a self-sustaining fishery. A total of 17 rainbow trout ranging in size from 5.5-20.0 inches (Table 12) were captured in #4.

Lakes 1, 2 and 3 do not contain a self-sustaining fishery, although a fishery could be maintained through frequent plantings. Axolotl #2 has a small tributary

TABLE 12. Gill net data from Axolotl Lakes, October 1974.

Lake	Location	Species[1/]	No.	Length Range (Inches)	Weight Range (Pounds)
Axolotl #1	T7S,R2W,S17AC	Rb.	1	24.0	6.50
Axolotl #2	T7S,R2W,S8CD	Rb.	1	24.0	8.00
Axolotl #3	T7S,R2W,S8AD	None	-	--	--
Axolotl #4	T7S,R2W,S8&9	Rb.	17	5.5 - 20.0	0.06 - 2.78

1/Species abbreviation: Rb. = rainbow trout

not sufficient in size to accommodate rainbow spawning, but, perhaps large enough for another species such as Arctic grayling. Each lake had sufficient depth and apparently enough productivity to provide for an excellent fishery.

Recommendations: Plant lakes #1, 2, and 3 with cutthroat or rainbow trout. Arctic grayling could be considered for #2

RECOMMENDATIONS

Stream and lake inventories should be continued in order to furnish base-line data for comprehensive sport fisheries management in Montana. These data also provide invaluable information in determining resource values for aid in dealing with land and water development projects.

Movement of fish can affect population estimates. This variable should be studied in "disturbed" and relatively "undisturbed" sections of streams. I recommend the Big Hole River and Poindexter Slough be studied in this regard. Special care should be taken to assure all assumptions of the mark-recovery technique are met.

Individual recommendations, where made, are listed with each water.

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Waters referred to:

Basin Creek	01-0340
Big Hole River, Sec. 1	02-0425
Big Hole River, Sec. 2	02-0450
Big Sage Creek	01-6420
Bloody Dick Creek	01-0740
East Fork Blacktail Cr.	01-2380
Jefferson River	10-3840
Little Basin Creek	01-4360
Long Creek	01-4560
Poindexter Slough	01-9320
Red Rock River	01-6140
Axolotl Lakes (#1-4)	13-6920
Morris Pond	(S11 AA, T11S, R14W)
Renfro Pond	(S9 AB, T11S, R10W)