MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION

JOB PROGRESS REPORT

State: MONTANA

Project Title: STATEWIDE FISHERIES INVESTIGATIONS

Project No: F-46-R-3

Study Title: SURVEY AND INVENTORY OF COLDWATER AND WARMWATER ECOSYSTEMS

Job No: V-b

Job Title: SOUTH CENTRAL MONTANA COLDWATER FISHERIES INVESTIGATIONS

Project Period: November 1, 1988 through June 30, 1990

ABSTRACT

Cooney Reservoir management direction to produce a mixed trout/walleye fishery continues on schedule. Size of Cooney walleyes continues to increase with fall fish averaging 17.3 in and 2.06 lb. No walleye reproduction has been found, so additional fish were planted in spring 1990 to supplement the declining population. Walleyes appear to be controlling the sucker population which now averages 13.6 in and is on the decline. Netting and electrofishing surveys during 1989 indicated higher than average numbers of rainbow trout were present, but by spring 1990 the population was down. The decline in rainbows was the result of increased harvest by fishermen. Catch rates for summer were 0.84 trout/hour and for winter 0.22 trout/hour. Black crappie numbers in Cooney are increasing.

Tiger muskies were introduced into Lower Glaston Lake. Muskies that were 1.2 in when planted in late May grew to an average of 14.2 in by mid-October.

East and West Rosebud and Emerald lakes were planted with McBride cutthroat from 1986 through 1989 with the idea of establishing a self-sustaining fishery. Growth and survival of cutthroat has been poor, with no sign of reproduction. Evidence suggests that brown trout present in each lake have been using cutthroat and all other species present for forage. DeSmet strain rainbows were introduced into all three lakes during May 1990.

Thirty-seven alpine lakes located in the Absaroka-Beartooth Wilderness Area were surveyed in 1989. Results of these surveys and recommendations are summarized. Background information on Absaroka-Beartooth lake management is included. Results of the volunteer Absaroka-Beartooth trailhead creel and angler survey conducted during 1988 and 1989 are included.

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OBJECTIVES AND DEGREE OF ATTAINMENT

1. To ensure, within hydrologic constraints, that flows in streams supporting trout fisheries do not fall below 1975-85 averages.

2. To maintain the region's stream banks and channels in their present or improved condition.

3. To maintain water quality at or above current levels as measured at U.S.G.S. water quality monitoring stations.

4. To maintain fish populations and habitat in streams affected by resource development activity at levels at least as good as present status.

5. To maintain a trout fishery of at least 4,200 angler-days per year with a catch rate of 0.5 fish per hour on the upper Musselshell River (state funded).

6. To acquire a fishing access site on the Musselshell River between Selkirk Fishing Access Site (FAS) and Harlowton (state funded).

7. Maintain 27,000 angler-days per year trout fishing in Cooney Reservoir while the walleye population develops.

8. Establish naturally reproducing populations of Yellowstone cutthroat trout in East and West Rosebud and Emerald lakes.

9. Maintain acceptable (0.25 fish/hr.) fisheries in lakes and reservoirs where natural reproduction is inadequate (state funded).

10. Increase use of Yellowtail Afterbay to 10,000 or more angler-days/year and Lodge Crass Storage Reservoir to at least 5,000 angler days/year (state funded).

11. Maintain approximately 40,000 angler-days per year in Absaroka-Beartooth Wilderness lakes (state funded).

12. Make at least 1,000 angler contacts per year on major coldwater lakes and reservoirs (state funded).

Most of the objectives were addressed during this project period. Objective 5 could not be met due to drought effects described in the report. Objective 6 cannot be met until a willing landowner is found. Objective 8 is no longer being pursued as described in the report. The DeSmet strain of rainbow trout may prove more successful than the McBride cutthroat trout. Objective 10 - management Lodge Grass Reservoir has been assumed by the U.S. Fish and Wildlife Service as requested by the Crow Tribe.

PROCEDURES

Minimum instream flows that will provide adequate trout habitat conditions were determined by the wetted perimeter method (Nelson 1980). Instream flow recommendations for the upper Musselshell River and key tributaries will be included in the Department of Fish, Wildlife and Parks' (MDFWP) application under the Missouri River Basin Water Reservation to be filed in 1990. Existing MDFWP water rights and the Missouri River Basin Reservation are protected through MDFWP review of new water use permit applications.

Stream banks and channels are protected from poorly designed projects through MDFWP participation in administration of the Stream Protection Act and Natural Streambed and Land Preservation Act.

Water discharge permits issued by the U.S. Environmental Protection Agency (EPA) and the Montana Department of Health and Environmental Sciences are reviewed and comments offered. Timber sale plans, grazing allotment management plans, environmental assessments and environmental impact statements are also reviewed to ensure adequate protection, mitigation, and compensation of fisheries resources. MDFWP personnel will assist the Beartooth Ranger District of the Custer National Forest in developing an action plan to protect the native population of Yellowstone cutthroat trout in Crooked Creek.

Trout population densities in streams are monitored using electrofishing methods described by Vincent (1971). Other electrofishing surveys are conducted as needed to address specific needs using standard methods. Spot creel checks are conducted to determine catch rates and angler satisfaction with regulations. Regulations are adjusted as necessary to help achieve desired fish population levels. In an effort to improve access to the upper Musselshell River, riverfront properties that become available for sale are investigated for potential as fishing access sites.

Lake and reservoir trout populations are monitored through standardized gill net sets, trap netting, and electrofishing surveys. Angler success is assessed through spot creel checks by fisheries and enforcement personnel. Stocking rates and strategies are adjusted as necessary to maintain desired angler catch rates.

Fishing access site acquisition and development for streams and lakes throughout the region are prioritized in coordination with Parks Division personnel. High intensity recreational use of Cooney Reservoir requires intensive management of fishery resources and recreational facilities. Information and education efforts are directed towards encouraging use of other lake and reservoir resources, especially Yellowtail Afterbay and Lodge Grass Storage Reservoir. A warden creel census is implemented annually to increase angler contacts and expand the region's fishery data base. Additional angler use information will be gathered by designing and

implementing a trailhead creel census for the Absaroka-Beartooth Wilderness in cooperation with the Custer National Forest.

RESULTS AND DISCUSSION

Cooney Reservoir

Management of Cooney Reservoir as a mixed walleye/trout fishery has been surprisingly successful. In most waters, this combination has not worked well. Rainbow trout are stocked in Cooney annually, and walleye fry were stocked in 1984, 1985, and 1986. A summary of sampling results is included in Table 1. Gill nets, trap nets, and night electrofishing were used to monitor the development of the Cooney fishery.

To monitor walleye spawning activity in Cooney Reservoir during 1989, electrofishing was conducted during three nights from mid-April into early May. For the second year, a large boom shocking boat normally used on the Yellowstone River was employed. Twenty-eight male walleyes were collected ranging from 13.4 to 18.6 in with a mean of 14.4 in (Table 1). Of the 28 walleyes sampled, 25 were ripe males; no females were collected. Electrofishing during two nights in mid-April, 1990, resulted in 17 walleyes ranging from 14.0 to 21.1 in with a mean of 16.6 in. Of the 17 walleyes sampled, 13 were ripe males and two were non-gravid females. Another dead non-gravid female, 22.4 in long and 3.76 lb, was found floating on the surface.

During night electrofishing in spring 1988, 109 walleyes were collected with approximately the same amount of effort (Fredenberg 1989). Walleyes have not been stocked in Cooney since 1986, and no evidence of successful spawning has been found. It appears the walleye population is declining primarily due to harvest by fishermen.

Unconfirmed reports indicate walleyes have been moving out of Cooney Reservoir during spring and into its tributaries, Willow Creek and Red Lodge Creek. Only two walleyes were found in electrofishing the mouths of these tributary streams during 1988, 1989, and 1990. These fish were probably in the area in response to an abundance of forage fish. Major flooding of both streams during the spring of 1988 and 1989 probably destroyed any potential walleye spawning that might have taken place. Spring flows were more average in 1990.

Night electrofishing in Cooney has proven successful for sampling rainbow and brown trout, precluding sampling with gill nets in the spring. The major advantage is that mortality rates for fish collected in gill nets is higher than with electrofishing. One hundred seventy-four rainbow trout ranging from 11.0-18.1 in with a mean of 13.8 were collected in 1989. Fifty-eight brown trout ranging from 3.9-20.7 in with a mean of 9.7 in were also collected. Many more trout could have been sampled, but sampling

Table 1. Species composition and length range of fish sampled in Cooney Reservoir during 1989 and 1990.

Date	Methods	Rainbow Trout	Brown Trout	Suckers	Walleye	Black Crappie	Rainbow Length Range	Rainbow $\bar{X}$ Length	Walleye Length Range	Walleye $\bar{X}$ Length
04/17/89	Electrofishing	52	11	-	11	-	11.0-16.5	13.7	13.7-15.0	14.4
04/24/89	Electrofishing	122	47	-	9	-	11.1-18.1	13.8	13.9-15.2	14.4
05/04/89	Electrofishing	-	-	-	8	-	-	-	13.4-18.6	14.7
					Catch Per Net Night					
05/16/89	2 Traps	3.5	0	≈700 12"-18"	0.5	-	14.9-15.9	15.4	15.5	15.5
10/10/89	Gill Nets 2 Sinkers 2 Floaters	22.0	2.25	21.0	12	2.5	8.0-15.3	11.9	14.3-23.0	17.2
10/10/89	1 Trap	15	-	14	2	9	10.2-15.8	11.9	18.1-21.6	19.8
04/18/90	Electrofishing	36	20	-	10	-	8.6-17.2	14.0	14.0-17.3	15.8
04/25/90	Electrofishing	22	2	-	7	2	9.1-17.0	14.5	14.5-21.1	17.8
					Catch Per Net Night					
04/19/90	4-Trap Nets	3.8	0.5	117	3.3	-	12.1-17.0	14.4	13.7-19.2	16.8

stopped after an adequate sample was collected. Electrofishing is particularly effective for sampling brown trout, as evidenced by the comparatively small number of browns taken with trap nets and gill nets (9 during 1989 and 2 in 1990).

During 1990 sampling, two black crappies (4.0 and 11.1 in) and several other smaller crappies were observed. Fifty-eight rainbow trout were collected ranging from 8.6 to 17.2 in with a mean of 14.2 in, along with 22 brown trout ranging from 6.9 to 17.0 in with a mean of 11.6 in. Spring electrofishing results indicate carryover of rainbow trout through the winter of 1989-1990 was much lower than for the winter of 1988-1989. This poor carryover was probably due to increased harvest by anglers. Stocking rates have remained constant for several years. Mortality of rainbows resulting from walleye predation should be declining because, although the average size of walleye is growing, the walleye population is declining at a rate that more than compensates.

Trap nets set in Cooney during mid-May 1989 caught an estimated 700 adult suckers from 12 to 18 inches, but only seven rainbow trout and one walleye. Trap nets set in Cooney during mid-May 1990 caught 468 suckers ranging from 7.1 to 17.8 in, 13 walleyes, 2 brown trout, and 15 rainbow trout. Twelve of the walleyes were ripe males and one was a gravid female. Surface water temperature at the time was 46^{0} F. Trap nets are particularly effective for sampling certain species of fish, but their success is clearly tied to water levels, water temperature, trap location, and spawning times.

Gill nets set in Cooney during fall 1989 captured higher numbers of rainbow trout, brown trout, and walleyes and lower numbers of suckers when compared to long term averages. Rainbow trout sampled in fall netting consisted of 76 fish from 8.0-12.6 in from the 1988 stocking, and 12 fish from 13.7-16.1 in from the 1986-87 stocking. Brown trout sampled consisted of 9 fish from 11.5-14.7 in. Walleye catch consisted of 24 fish (13.2-17.1 in) from the 1986 stocking and 24 fish (17.2-23.0 in) from the 1984-85 stockings. Twenty-one suckers per net were taken, which is considerably less than the 10 year average of 67. Ten black crappie ranging from 3.0-6.7 in were also taken. The first black crappie of unknown origin was taken in Cooney during fall 1988 with a beach seine. Spring electrofishing results also confirm that the crappie population in Cooney is increasing.

A trap net set in Cooney during fall gill netting captured only 14 suckers compared to an estimated 1100 per trap during the fall of 1988. Also taken in the trap net were an additional nine black crappies. The trap net catch again confirms the decrease in numbers of suckers and increase in numbers of black crappie in Cooney indicated by the gill net catches and electrofishing data.

With the exception of several unconfirmed reports of 3-4 in walleye, no small walleyes have been sampled for four years. The smallest walleye sampled in 1988 was 9.8 in, 13.4 in 1989, and 13.7

in for 1990. Lack of recruitment of small fish into the population indicates little or no reproduction of walleyes in Cooney. In 1989, the average size of walleyes taken in spring sampling (14.5 in and .99 lb) increased 2.8 in in length and 1.07 lb in weight when compared to walleyes sampled in the fall (17.3 in and 2.06 lb). Average size of 30 walleyes from spring 1990 was 16.7 in and 1.68 lb. Stomachs of all the walleyes checked from fall sampling were full of forage fish, especially small suckers and crappie. Walleyes captured during fall were in excellent shape with body cavities full of visceral fat. With the increase in average walleye size, fishing pressure has also increased. Boat anglers, with the proper equipment and fishing techniques, have been successful at catching walleyes. With the lack of recruitment, no stocking since 1986, and increased fishing pressure, the walleye population in Cooney is declining. Walleye fingerlings were planted in June 1990 to supplement the declining population.

One of the primary reasons for introducing walleyes into Cooney was to help control an expanding sucker population which competes with trout for food and space. In 1984, when walleyes were first introduced, the sucker population was made up of 49% 6 to 10 in fish, 27% 10 to 12 in fish, and 14% 12+ in fish. In fall 1988, 3% of the suckers were less than 12 in with a mean length of 13.6 in. By fall 1989, the trend had leveled off with 3% of the suckers less than 12 in and a mean length of 13.6 in. Suckers are spawning successfully (many sucker fry are observed each fall not the following spring), but walleyes are effectively cropping the subadult suckers and preventing recruitment into the sucker population.

Growth and survival of rainbow trout in Cooney during 1989, as reflected in fall net samples, was down slightly from 1987 and 1988. The mean length of 11.9 in for fall 1989 is only slightly lower than the mean for 1987 and 1988 of 12.3 in. The number of rainbow trout per net from 1989 fall sampling (22 fish) was higher than in 1987 (20 fish) but below 1988 samples (32.5 fish). Spring 1990 electrofishing results show a substantial decline in the number of rainbows present in the lake when compared to data from spring 1989.

Catch rate and angler satisfaction for Cooney Reservoir was good throughout the summer and into the early winter of 1989. A catch rate of 0.84 trout/hour was compiled from warden creel information gathered during late July through August and into early September. Catch rates on trout for January and early February dropped to about 0.22 fish/hour. No data is available, but indications from fishermen interviews are that catch rates and harvest for late winter and spring have dropped off considerably. These reports confirm findings from spring netting and electrofishing surveys that the number of rainbow trout carried over the winter of 1989-90 was below average. Until this past year, an annual stocking rate of 100,000 Arlee rainbows has provided a good fishery in Cooney with satisfactory catch rates and spring carry-over. But with increasing harvest and fishing

pressure, this stocking rate is no longer adequate to meet the goal of maintaining a 0.25 fish/hour catch rate. The rainbow stocking rate for Cooney must be increased to provide a satisfactory fishery.

Catch rates for walleyes in Cooney are highly variable. As the average size of walleyes has increased, fishing pressure on walleyes has increased. Wardens reported checking a number of walleye limits during June 1990. Since reproduction of walleyes is unconfirmed, stocking will probably be required to maintain the walleye fishery that has developed in Cooney Reservoir.

Lower Glaston Lake

Four gill nets set in Lower Glaston Lake during May 1989 failed to capture any of the 20,000 Eagle Lake rainbow or 20,000 McBride cutthroat planted in 1984 (Table 2). Most of these fish, stocked with the objective to compare growth and survival of the two species, are now gone from the reservoir. Four rainbows from a 1988 plant of 4,000 4-7 in Arlee rainbows were found, along with four brown trout which have access to the lake via the inlet canal from Sweetgrass Creek. One hundred twenty-nine white suckers were taken in the four nets.

Lower Glaston Lake has been stocked with many species of fish over the years, but none of the plants have produced a satisfactory fishery. The most successful species in the lake is the white sucker. In an attempt to establish a trophy fishery and to help control suckers, tiger muskie were selected as a management alternative. Twenty-eight hundred 1.2 in tiger muskie were planted into Glaston on May 25, 1989.

Two gill nets and a trap net set in Glaston during mid-October caught ten tiger muskies ranging from 12.9-15.9 in. Growth of these fish over the first summer was excellent and comparable to growth rates of muskies introduced into Lebo Lake. One McBride cutthroat from the 1984 plant was also netted.

Two gill nets and five trap nets set in Glaston during mid-May 1990 captured 2 rainbows from the 1988 plant; 1 brown trout, 2 cutthroat from the 1984 plant; 12 perch, 590 suckers and 8 tiger muskies from the 1989 introduction. The two McBride cutthroat trout, which averaged 20.0 in and 3.15 lb, were exceptional fish. The tiger muskies which averaged 14.2 in from fall 1989 samples grew over winter to an average length of 15.5 in by spring 1990. An additional plant of tiger muskies is scheduled for 1990.

Deadman's Basin Reservoir

Deadman's Reservoir experienced severe drought conditions in 1988 and 1989. Previous work discussed the impact of low water conditions in 1985 on the fishery in Deadman's (Fredenberg and Poore 1989). Average month-end content of the reservoir for the period July through November 1988 was only 59% of the average

Table 2. Results of Netting Surveys In Four Reservoirs During 1989 and 1990 (continued).

Reservoir	Date	No. of Nets	Rainbow Trout	Brown Trout	Cutthroat Trout	Brook Trout	Mountain Whitefish	Yellow Perch	White Suckers	Longnose Suckers	Tiger Muskie
Lower Glaston Reservoir	5/22/90	2-gill nets	2 (4) 11.5-15.7 (13.8)	--	--	--	--	6 (12) 2.5-13.8 (11.1)	24 (48) 6.3-15.6 (12.1)	1 (2) 11.9-13.1 (12.5)	4 (8) 14.3-16.3 (15.5)
	5/22/90	5-trap nets	--	0.2 (1) 23.1	0.4 (2) 19.4-20.7 (20.0)	--	--	--	108 (540) 6.3-15.6 (12.1)	--	--
East Rosebud Lake	5/4/90	4-gill nets	0.25 (1) 9.6	6.25 (25) 9.6-23.3 (14.2)	2.5 (10) 7.9-11.1 (9.2)	0.25 (1) 9.6	2.75 (11) 7.3-13.6 (10.1)	--	--	4.75 (19) 9.1-19.1 (15.8)	--
Emerald Lake	5/3/90	1-gill net	--	26 (26) (10.8)	1 (1) 8.0	13 (13) 9.7-13.5 (11.0)	13 (13) 11.4-16.1 13.1	--	--	1 (1) 14.3	--
	5/3/90	1-trap net	--	--	--	2 (2) 9.7-10.7 (10.2)	1 (1) 15.5	--	--	11 (11) 12.7-18.0 (15.2)	--
West Rosebud Lake	5/3/90	3-gill nets	--	13 (39) 6.6-18.8 (12.3)	4.3 (13) 9.2-13.6 (10.6)	--	7.3 (22) 8.7-18.4 (14.9)	--	--	1 (3) 12.7-16.1 (14.3)	--

[1]Catch per net (Total number sampled)

[2]Length range (mean length)

Table 2. Results of Netting Surveys In Four Reservoirs During 1989 and 1990.

Reservoir	Date	No. of Nets	Rainbow Trout	Brown Trout	Cutthroat Trout	Brook Trout	Mountain Whitefish	Yellow Perch	White Suckers	Longnose Suckers	Tiger Muskie
Lower Glaston Reservoir	5/23/89	4-gill nets	1 (4)[1] 11.4-13.1 (12.1)[2]	1 (4) 12.1-16.0 (13.6)	--	--	0.25 (1) 11.7	1.25 (5) 5.3-12.6 (9.5)	32.25 (129) 6.5-15.6 (10.8)	--	--
	10/16/89	2-gill nets	16 (32) 8.2-15.8 (11.6)	--	.5 (1) 19.6	--	--	2.5 (5) 5.4-13.2 (7.3)	26.5 (53) 6.1-15.6 (11.2)	--	--
	10/16/89	1-trap net	19 (19) 9.0-15.1 (14.1)	1 (1) 17.0	--	--	1 (1) 11.2	--	33 (33) 12.6-15.9 (14.4)	--	4 (4) 14.0-15.9 (14.6)
East Rosebud Lake	5/16/89	4-gill nets	0.25 (1) 7.0	4.25 (17) 9.9-21.2 (15.3)	3.75 (15) 8.3-12.6 (10.5)	--	1.75 (7) 7.8-10.8 (10.0)	--	0.5 (2) 18.6-18.8 (18.7)	4.25 (17) 13.1-18.4 (16.3)	--
Emerald Lake	5/17/89	1-gill net	--	11 (11) 9.0-11.8 (10.9)	4 (4) 8.6-9.8 (9.4)	24 (25) 7.6-16.9 (10.3)	1 (1) 15.4	--	--	--	--
West Rosebud Lake	5/17/89	3-gill nets	0.66 (2) 6.6-13.5 (10.0)	27 (81) 7.0-27.8 (13.4)	2.6 (8) 8.4-14.8 (10.8)	3 (9) 10.4-13.4 (11.9)	4 (12) 11.7-19.3 (14.5)	--	--	2.3 (7) 13.3-17.4 (14.6)	--

[1]Catch per net (Total number sampled)

[2]Length range (mean length)

recorded for the same period in 1985. These low water levels appear to have affected both the rainbow and kokanee populations in the reservoir. Low water severely restricted angler use on Deadman's during this period by hampering boat launching.

Fredenberg and Poore (1989) discussed the pattern of alternating weak and strong year classes of kokanee that was developing in Deadman's. Low water in 1985 resulted in poor survival of that year's plant. Water conditions were good in 1986, and a strong year class was produced. Due to limited availability of fish in 1987, only 32,000 kokanee were planted in Deadman's compared to a normal request of 200,000. Therefore, the strong 1986 year class dominated the population in both 1988 and 1989.

Twenty-four kokanee collected during spring netting in 1988 averaged 11.2 in. Only one kokanee less than 9.5 in and three greater than 12.5 in were collected. This strong 1986 year class was still dominant in the spring of 1989. The average size of kokanee collected was 13.2 in with 74% of the fish between 13.0 and 16.0 in. The 1987 year class was again missing, but four fish from the 1988 plant were collected.

Fall samples showed the same patterns. A very strong spawning run of kokanee was noted in 1988 due to the strong 1986 year class. An average of 35.6 kokanee per net was collected compared to an average of 13.25 fish per net reported for 1986 and 1987 (Fredenberg and Poore 1989). The average size of the mature kokanee collected in 1988 was 14.7 in, representing predominantly age 2 fish from the 1986 year class. Some of the spawners exceeded 19.0 in indicating age 3 fish from the weak 1985 year class were present in the spawning population. A few kokanee from the 1987 plant were collected in the fall of 1988, but they comprised less than 10% of the sample.

The fall kokanee catch was poor in 1989 due to the lack of 2 yr old spawners. The spawning population was again dominated by 3 yr old fish from the 1986 year class, with spawners collected averaging 16.0 inches. A few mature fish in the 12 to 15 in size range were collected and were probably 2 yr olds from the 1987 plant. About 12 kokanee from the 1988 plant were collected in the fall of 1989, indicating that some fish from this plant did survive the poor water conditions.

Kokanee appeared to mature earlier in 1989 than they had in the past. On November 4, 1987 a large number of kokanee were collected as part of a spawn-taking operation at Deadman's. Based on the sex ratio and condition of the fish, it appeared that peak spawning time had not been reached (Fredenberg and Poore 1989). A second egg take was made on December 1, and about two-thirds of the females were ripe. In 1989, all 12 female kokanee checked from the October 18 net sample were already spent; 5 of 28 males were spent. Two trap nets were set near the inlet canal on November 16, 1989 to evaluate the potential of collecting kokanee eggs from Deadman's. Eleven of the 14 females collected were again spent. Based on

these data it appears that peak spawning occurred almost a month earlier in 1989 than in 1987.

Low water levels in 1988 and 1989 appear to have impacted the rainbow population in Deadman's Reservoir. Catch rates during spring netting declined from an average of 18 rainbow per net in 1988 to 13.6 fish per net in 1989. Fall netting showed an even greater decline with average catch rates dropping from 10.5 fish per net in 1988 to only 3 fish per net in 1989. Few fish from the 1988 rainbow trout plant were captured in the spring or fall of 1989, and only two fish from the 1989 spring plant were collected in the fall. These weak year classes may show up in a lack of larger rainbow in the next few years.

The poor catchability of McConaughy rainbow by bank fishermen has been addressed in the past (Fredenberg and Poore 1989). Shoreline fishing is a significant part of the angling pressure at Deadman's. The Arlee strain has demonstrated a greater tendency in the past to occupy the shoreline areas of this reservoir. Therefore, beginning in 1990, 100,000 Arlee and 100,000 McConaughy rainbow will be planted each year to try and provide the maximum opportunity possible for all anglers using the reservoir.

East Rosebud Lake

Through the years, East Rosebud Lake has been stocked with rainbow trout, brown trout, Yellowstone cutthroat, and brook trout. In June 1986, an introduction of 9700 7 in McBride cutthroat were introduced in June 1986. McBride cutthroat were chosen because they have shown superior reproductive performance in various other Beartooth lakes with physical characteristics similar to those of East Rosebud Lake. Additional plants of McBride cutthroats were made in 1987, 1988, and 1989.

Four gill nets set in East Rosebud Lake during mid-May 1989 took 15 McBride cutthroat (Table 2). Six cutthroat ranging from 8.3-9.0 in were from the 1988 stocking, and nine fish ranging from 10.3-12.6 in were from the 1987 plant. Growth and survival of the McBride cutthroat following three years of plants is poor. Predation by brown trout and downstream movement into the outlet stream are two factors influencing cutthroat numbers in the lake.

Brown trout in 1989, and for the past 15 years, dominated the sample. A survey of brown trout stomach contents confirmed that larger browns are feeding on 8-11 in cutthroat trout. Brown trout are also keeping the lake's longnose sucker population under control. The smallest sucker sampled was 13.1 in with a mean size of 16.5 in.

The catch from four gill nets set in East Rosebud Lake during 1990 again confirmed the poor growth and survival shown by the McBride cutthroat in this lake. Seven cutthroat from the 1989 plant and three from the 1988 plant were netted. A survey of stomach contents from the 25 brown trout collected revealed 9 to 10

in cutthroat present in five brown trout. Several 17 in brown trout had 9 to 10 in cutthroat in their stomachs. The smallest sucker netted was 9.1 in with a mean length of 15.8 in.

Since McBride cutthroat have failed to provide a satisfactory fishery in East Rosebud Lake, the decision was made to discontinue planting the cutthroat. DeSmet strain rainbow trout were selected for introduction and were planted (6,000) into East Rosebud Lake during May 1990.

On May 24, 1989, approximately 900 feet of the lower end of the inlet stream to East Rosebud Lake was electrofished with a back pack shocker to check for spawning trout. Only one 16.2 in rainbow trout was collected and several other 16-18 in rainbows were observed in a deep hole. One dead spent rainbow was also observed near the lake. No cutthroat trout were observed in the inlet stream. No spawning fish were observed during our May 1990 survey of the inlet stream.

Emerald Lake

Emerald Lake, a shallow mesotrophic lake, contains a mixed population of brown trout, brook trout, mountain whitefish, and longnose suckers. Rainbow trout had been stocked most years since 1945 with limited success. In 1986, 2437 7-8 in McBride cutthroat were stocked in May and June. Similar numbers of cutthroat were planted in 1987, 1988, and 1989.

A gill net set in Emerald Lake in 1989 recaptured four McBride cutthroat ranging from 8.6-9.8 in from the 1988 stocking (Table 2). As in East Rosebud Lake, growth and survival of McBride cutthroat in Emerald Lake is poor. Both brown trout (11) and brook trout (25), species we have not planted for years, were more numerous in the net. Similar netting results have been obtained for the last several years. The smallest fish sampled was a 7.6 in brook trout. These results suggest that brown trout and brook trout are controlling fish populations in Emerald Lake. No longnose suckers were collected in the net.

Data from nets set in Emerald Lake during 1990 again confirmed the poor growth and survival of McBride cutthroat in this lake. As in 1989, brown trout (26) and brook trout (15) were more abundant in the nets than cutthroat (1). The smallest fish sampled was an 8.0 in cutthroat trout. Eleven longnose suckers were sampled in 1990 compared to none in 1989, but most of these were taken with a trap net.

Because of the poor growth and survival of McBride cutthroat trout, DeSmet strain rainbow trout were selected for introduction into Emerald Lake. DeSmet rainbows (1,500) were planted during May 1990.

West Rosebud Lake

West Rosebud Lake contains a mixed population of brown trout, brook trout, mountain whitefish, and longnose suckers. Rainbow trout were planted yearly from 1955 to 1985 with limited success. Based on the same considerations used for East Rosebud Lake and Emerald Lake, McBride cutthroat were also selected to establish a partially self-sustaining fishery in West Rosebud Lake. During June 1986, 359 18-22 in brook stock and 2448 7.4 in McBride cutthroat were introduced into the lake. Similar numbers of 6-8 in cutthroat were stocked during 1987, 1988, and 1989.

Three gill nets set during mid-May 1989 took eight cutthroat trout, three ranging from 8.4-9.8 in from the 1988 stocking, four ranging from 10.6-11.4 from the 1987 stocking, and one 14.8 in fish from the 1986 plant (Table 2). Eighty-one brown trout, two rainbows, and nine brook trout were also taken. Seven percent of the 120 fish taken in the nets were under 9.5 in; the smallest fish was 6.6 in.

Nets set in West Rosebud during 1990 took six cutthroat from the 1989 stocking ranging from 9.2 to 10.7 in, six from the 1988 stocking ranging from 10.6-11.3 in, and one from the 1987 stocking 13.6 in. Thirty-nine brown trout sampled in the nets, outnumbering cutthroat trout by three to one. Five percent of the 78 fish taken in the nets were under 9.5 in, the smallest fish being 6.6 in. Because of the poor growth and survival of McBride cutthroat trout in West Rosebud Lake, 2,400 DeSmet strain rainbow trout were introduced during May 1990.

McBride cutthroat from four years of plants in West Rosebud, Emerald, and East Rosebud Lakes have all shown poor growth and survival. In addition, no evidence of natural reproduction or spawning fish have been found. The pattern of effective cropping of sub-adult fish of all species by a well established brown trout population is a dominating influence in all three lakes. Brown trout dominance evident in these lakes, all waters with similar physical features and fish populations, makes development of a self-sustaining fishery very difficult. In addition to the competition with brown and brook trout, the fishery in these three lakes all receive relatively heavy fishing pressure. Although brown trout are the most abundant and successful species in these lakes, they are relatively difficult for anglers to catch. The future for McBride cutthroat in these lakes does not appear promising. Given the past history and existing fisheries in these lakes, the potential for establishing a self-sustaining fishery is limited. DeSmet strain rainbow trout were introduced into all the waters in 1990 in what may be a final attempt at establishing a catchable self-sustaining fishery. Otherwise, annual stocking of legal sized trout may be necessary.

Absaroka-Beartooth Wilderness Lakes

The Absaroka-Beartooth Wilderness Area established in 1978 encompasses 930,584 acres and contains more area over 10,000 feet in elevation than any other area in the U.S. It rates as one of the top four or five wilderness areas in the country, receiving about 320,000 visitor-days of use each year. For comparison, the Bob Marshall Wilderness area receives about 150,000 visitor days use yearly. The Absarokee Beartooth Wilderness area (A-B) and lands immediately adjacent contain 948 high mountain lakes, 318 of which contain fish and 630 that are barren. Approximately 204 of these lakes have self-sustaining fisheries and 114 are stocked. Stocking schedules vary from yearly in some of the more heavily used areas to once every six to ten years in the lakes managed for trophy fisheries.

Pat Marcuson, during the time he worked for the MDFWP out of Red Lodge, gathered a tremendous amount of information on the A-B lakes and created a massive data base. He also developed fisheries management plans for each major drainage. Since that time, a computer data base containing the latest information on the lakes with fisheries has been developed. Two temporary employees, working from mid-July to September, collect fisheries information used to update the high mountain lake computer data base. During 1989, 37 lakes were surveyed (Table 3).

Present management in the A-B area allows a ten fish limit for lakes and 5 from streams. Recently, there has been a proposal to reduce fish limits and standardize them for all high mountain lakes and streams statewide. The proposed new limit would allow three fish of any size. During 1988 and 1989, a voluntary trailhead creel information survey was implemented at the major access points to the A-B Wilderness area. The purpose of the survey was to address the proposed three fish limit, estimate harvest, solicit public comments and gather additional fisheries information.

The areas selected for coverage in 1988 included the Clarks Fork drainage at Chief Joseph Campground, East Rosebud, Lake Fork of Rock Creek, and Upsidedown Trail on the Boulder River. In 1989, the survey was expanded to include the trailhead on the West Fork of the Stillwater and the main Stillwater near Woodbine Campground. Figure 1 is an example of the information card used in the creel survey.

Eighty percent of the 281 people who answered question one think the present wilderness limits are satisfactory (Table 4). Eighty percent of the 278 people who answered question two did not want to see the limit reduced to three fish in wilderness lakes and streams. Seventy-two percent of the people who answered question three did not want to see the limit reduced to three fish in any A-B areas. By a four to one majority, fishermen responding to the survey wanted to see the present limits retained.

Absaroka - Beartooth Wilderness Area Volunteer Angler Report

Please fill out this creel card upon completion of your trip and deposit it in a Fish, Wildlife, and Parks creel box, mail to FWP, or give the card to a Forest Service or FWP employee. Your cooperation will help us better manage the Absaroka-Beartooth fishery. INFORMATION FROM UNSUCCESSFUL ANGLERS IS JUST AS IMPORTANT AS THAT FROM ANGLERS CATCHING A LIMIT. Thank you for assisting us! Additional forms are available at the trailhead.

PLEASE REPORT RESULTS FOR ONLY ONE ANGLER ON THIS CARD *TOTAL NUMBER OF FISH CAUGHT BY SIZE*

WATER FISHED (LAKE OR STREAM)	LOCATION (Drainage)	MONTH &DATES	HOURS FISHED		UNDER 8"	8-12"	12-16"	OVER 16"	TOTAL CAUGHT	TOTAL KEPT
				CUTTHROAT						
				RAINBOW						
				BROOK						
				OTHER						
				CUTTHROAT						
				RAINBOW						
				BROOK						
				OTHER						
				CUTTHROAT						
				RAINBOW						
				BROOK						
				OTHER						

Do you think:

	YES	NO
1) Current limits for lakes (10 fish) and streams (5 fish) in the Absaroka-Beartooth wilderness are satisfactory?	☐	☐
2) Limits should be reduced to 3 fish in the entire wilderness?	☐	☐
3) Limits should be reduced to 3 fish in some areas or drainages but not others?	☐	☐

COMMENTS:

If you would be willing to participate in a statewide bio-economic survey, please give your name, address, and zip code.

Figure 1. Example of the trailhead volunteer angler report form used at the main access points to the Absaroka-Beartooth Wilderness Area during 1988 and 1989.

Table 3. Summary of data collected during 1989 by gill net and hook and line from alpine lakes in the Absaroka-Beartooth Wilderness.

Lake	Drainage	Code	Species	Status	Last Stocked	Sample Date	No. of Fish	Range Length	Mean Length	Comments
Albino Lake	Clarks Fork	245	CT	ST	87	7/18/89	46	6.3-16.1	12.7	Fish were trying to spawn in the outlet.
Burnt Bacon Lake	Clarks Fork	231	GR	ST	85	7/25/89	0			No fish seen cruising or risen. Beautiful lake. Recommend restocking Freshwater shrimp along shore.
Cliff Lake	Clarks Fork	146	GR	SS	55	8/2/89	10	7.5-10.0	8.1	Spawning potential seems limited, but is obviously sufficient. Access difficult because of deadfalls.
Flat Rock Lake	Clarks Fork	190	CT	Some reproduction occurring. ST	86	7/26/89	21			Decent spawning potential in inlet stream. Many hungry fish cruising in the afternoon. May need to reduce stocking.
Fox Lake	Clarks Fork	74	EB RB GR CTX	SS SS SS SS	?	7/31/89	15 5 1 1	6.3-13.8 8.8-14.3 9.3 6.8	9.2 11.5 9.3 6.8	Good spawning potential. Nice variety of fish with EB dominant.

Table 3. Summary of data collected during 1989 by gill net and hook and line from alpine lakes in the Absaroka-Beartooth Wilderness (continued).

Lake	Drainage	Code	Species	Status	Last Stocked	Sample Date	No. of Fish	Range Length	Mean Length	Comments
Golden Lake	Clarks Fork	236	CT	ST	86	7/18/89	3 46	Gill 12.8 -14.0 Hook & Line 10.0 -16.0	13.2 13.8	Day sample with gill nets yielded only 3 fish. 23 caught on hook and line survey.
Hidden Lake	Clarks Fork	234	CT	SS	?	7/19/89	20	7-15.4	10.8	Many fish cruising and rising. Fish were actively spawning in the inlet stream. Good potential. 1 GT cross observed 2.14" caught by fishermen.
Jasper Lake	Clarks Fork	237	CT	ST	82	7/18/89	6	14.4-18.5	17.2	Fish were in excellent shape.
Kersey Lake	Clarks Fork	60	LT EB	? SS	81 ?	8/15/89 8/15/89	3 8	14.7-16.8 10.7-12.6	15.6 11.6	LT seem ready to spawn. Average size seems to be increasing.
Lake of the Clouds	Clarks Fork	93	CT	ST	84	8/3/89	12	10.5-13.0	11.6	Some of these fish were very thin.
Lake of the Winds	Clarks Fork	100	CT	ST	85	8/3/89	13	7.1-14.1	11.3	Fish were thin.

Table 3. Summary of data collected during 1989 by gill net and hook and line from alpine lakes in the Absaroka-Beartooth Wilderness (continued).

Lake	Drainage	Code	Species	Status	Last Stocked	Sample Date	No. of Fish	Range Length	Mean Length	Comments
Marsh Lake	Clarks Fork	19	RB	ST	CT 89	1989	0			No fish observed or sampled. Accidently stocked with CT 8/7/89.
Mermaid Lake	Clarks Fork	91	CT	ST	82	8/8/89	3	12.4-19.5	16.8	A few very large CT.
Mosquito Lake	Clarks Fork	18A	GR	ST	85	1989	0	0	0	Excellent Lake. Plenty of food - leeches, shrimp and mayflies. No fish.
Picasso Lake	Clarks Fork	84	GT	ST	84	8/8/89	11	10.8-15.0	13.4	Trout were very healthy. Incredible numbers of shrimp. No sign of reproduction.
Skeeter Lake	Clarks Fork	149	GR	ST	85	7/24/89	1	14.9	14.9	No other signs of fish.
Spaghetti Lake	Clarks Fork	150	GR	ST	85	7/25/89	2	15.8-16.0	15.9	Fish were very fat. 1 other seen rising.

Table 3. Summary of data collected during 1989 by gill net and hook and line from alpine lakes in the Absaroka-Beartooth Wilderness (continued).

Lake	Drainage	Code	Species	Status	Last Stocked	Sample Date	No. of Fish	Range Length	Mean Length	Comments
Stephanie Lake	Clarks Fork	89	CT	ST	82	8/9/89	20	9.8-11.6	10.8	Lake appeared overcrowded. Fish were thin, trying to spawn in the cutlet. No adequate substrate.
Swamp Lake	Clarks Fork	17	GR	ST	85	7/14/89 7/?/89	0 0	0 0	0 0	1,300 CT planted 8/7/89.
Swede Lake	Clarks Fork	235	CT	ST	88	7/20/89	13	6-18.4	11.0	Difficult access, but worth the trip.
Widewater Lake	Clarks Fork	72	EB RB	SS SS	EB RB	8/1/89 8/1/89	19 17	5.8-11.4 6.6-14.1	8.8 10.4	
Wiedy Lake	Clarks Fork	18	GR	ST	85	7/19/89	0	0	0	No fish apparent in July. 875 CT stocked 8/7/89.
Anvil Lake	Stillwater	36	CT	ST	85	8/22/89	8	11.8-13.0	12.4	70% of shoreline burned in 1988.
Beauty Lake	Stillwater	34	CT	SS	68	8/22/89	8	8.3-10.3		Fire of '88 missed this lake. Plenty of trout swimming & rising. (End of gill net was chewed off by rodents.)

Table 3. Summary of data collected during 1989 by gill net and hook and line from alpine lakes in the Absaroka-Beartooth Wilderness (continued).

Lake	Drainage	Code	Species	Status	Last Stocked	Sample Date	No. of Fish	Range Length	Mean Length	Comments
Chrome Lake	Stillwater Fork	1	GR	ST	85	1989	0			No fish cruising or rising. Fresh water shrimp present.
Fly Lake	Stillwater	25	EB	SS	?	8/23/89	23	5.9-12.3	9.7	Fish are slightly larger and healthier than neighboring lakes.
Goose Lake	Stillwater	42	CT	SS	?	8/16/89	18	5.9-13.0	8.2	
Lake Aries	Stillwater	29	EB	SS	?	8/22/89	31	6.0-9.0	8.3	Fish were thin and the lake may well be overpopulated.
Mountain View Lake	Stillwater		WH SUCKR EB	SS		8/9/89	31 3	6.5-11.1 6.4-8.0	8.1 7.1	Some chubs sampled with a dip net.
Picket Pin Lake	Stillwater	105	CT	ST	89	9/22/89	13	13.4-16.5	14.5	
Sourdough Lake	Stillwater	24	EB	SS	?	8/23/89	42	5.8-9.6	8.4	Overabundance of brook trout. Trout are thin.

Table 3. Summary of data collected during 1989 by gill net and hook and line from alpine lakes in the Absaroka-Beartooth Wilderness (continued).

Lake	Drain-age	Code	Spe-cies	Status	Last Sto-cked	Sample Date	No. of Fish	Range Length	Mean Length	Comments
Spider Lake	Still-water	26	EB	SS	?	8/23/89	36	6.8-10.1	8.6	Overcrowded and fish were a bit thin.
Wrong Lake	Still-water	20	CT	Some 2"-3" fry seen swimming. ST	85	8/23/89	4	9.3-11	10.0	Steep access from Courthouse Lake. Water was turbid. Net was set in the afternoon only. Access makes an overnight sample difficult.
Horse-shoe Lake	Slough Creek	2	CT	ST	84	8/16/89	0			No fish were seen cruising or rising. None sampled. The water was slightly turbid.
Lake Abun-dance	Slough Creek	1	CT	Some re-productionS T	87	8/15/89	6	14.5-16.1	15.3	Ducks caught in the net (3). May have scared the smaller trout away from the net. Stomachs packed with shrimp.
Peace Lake Clouds	Slough Creek	5	CT	SS	X	8/16/89	24	6.5-10.9	9.0	Somewhat stunted. Stomachs were full of leeches. Cutthroat Indigenous special protection needed.

Table 3. Summary of data collected during 1989 by gill net and hook and line from alpine lakes in the Absaroka-Beartooth Wilderness (continued).

Lake	Drain-age	Code	Spe-cies	Status	Last Sto-cked	Sample Date	No. of Fish	Range Length	Mean Length	Comments
Fossil Lake	East Rosebud Creek Fork	25	CT	ST	86 89	8/9/89	32	6.6-13.0	9.9	Some have encysted parasites in the stomach lining. Some reproduction may be indicated by aging the trout by their scales.

Table 4. Summary of responses to volunteer angler surveys conductd at major trailheads into the Absaroka-Beartooth Wilderness Area.

1988 Survey

Question	Fished Only Lakes		Fished only Streams		Fished Both Lakes & Streams		TOTALS
	Yes	No	Yes	No	Yes	No	
1). Are current limits satisfactory?	47	9	11	0	7	8	Yes 65 / 17 No
2). Should limits be reduced to 3 fish for lakes and streams?	11	36	4	5	6	7	Yes 32 / 48 No
3). Should limits be reduced to 3 fish for some areas?	18	30	3	3	1	13	Yes 22 / 46 No

1989 SURVEY

Question	Fished Only Lakes		Fished Only Streams		Fished Both Lakes & Streams		TOTALS
	Yes	No	Yes	No	Yes	No	
1). Are current limits satisfactory?	94	21	46	13	20	5	Yes 160 / 39 No
2). Should limit be reduced to 3 fish for lakes and streams?	11	103	11	48	3	22	Yes 25 / 173 No
3). Should limits be reduced to 3 fish for some areas?	33	84	13	47	7	18	Yes 51 / 145 No

TOTALS FOR BOTH 1988 & 1989

	YES	NO
Question #1	225	56
Question #2	57	221
Question #3	73	191

In spite of the liberal fish limits for the A-B mountain area, anglers kept only 26% of their catch in 1988 and 27% in 1989 (Table 5). Anglers already release three out of four fish they presently catch without being required to by restrictive regulations. A-B anglers keep 35% of the brook trout they catch, 24% of rainbows, and 22% of cutthroat. This trend is also consistent with recommended management since many waters would benefit from additional brook trout harvest and reduced cutthroat trout harvest. Catch rates for 1988 and 1989 were identical with 2.6 fish per hour on lakes, 4.3 fish per hour on streams, and 2.4 fish per hour for people fishing both lakes and streams. Catch rates for the A-B mountains are excellent when compared to statewide averages.

Implementation of more restrictive regulations throughout the entire A-B Wilderness at this time is not warranted because: 1) Use is restricted by difficult access and the large number of lakes containing fisheries. Maintained trails lead to less than half the lakes with fish. 2) Many A-B lakes need more harvest because they contain overabundant populations of brook trout and (in some lakes) Yellowstone cutthroat. 3) Unlike most wilderness lakes many A-B lakes are uniquely fertile and productive. Even with liberal limits, optimum harvest has not been reached. 4) Our trailhead creel survey indicates people are regulating their own harvest and prefer this to being required to follow unnecessarily stringent regulations.

Several areas along major trails (especially where horses are allowed) are showing signs of overuse and may require some type of special management. Most A-B wilderness users, however, are satisfied with present management and the resource is in excellent shape.

Rivers

Musselshell River

Spring mark-recapture estimates are conducted on a 1.25 mile section of the Musselshell River just upstream of Selkirk Fishing Access site since 1985. In 1985, after spring population estimates were made, the Musselshell River drainage suffered serious drought. This resulted in a loss of over 50% of the catchable brown trout population in the Selkirk section by 1986 (Fredenberg 1987). The major loss was in the smaller (6-14 in) trout. Musselshell flows were near normal in 1986, but no rebound in the fish population was noted. A major shift in population structure was observed between 1985 and 1987. In the 1985 population, 14 inch and larger brown trout comprised 34% of the population. Due to high mortality of small fish during 1985 and lack of recruitment in 1986, the 1987 population consisted of 70% 14 inch and larger trout (Fredenberg 1988).

Drought conditions occurred in the Musselshell again in 1987, although flows were not as low as recorded in 1985. The brown trout population experienced another major decline between 1987 and

Table 5. Summary of catch information from volunteer angler survey conducted at major trail heads into the A-B wilderness area.

1988 SURVEY

	Lakes Only	Streams Only	Lakes* and Streams	Total
Total hours fished	434	63	174	671
Total cutthroat caught	670	19	205	894
Total rainbows caught	194	82	70	346
Total brook trout caught	267	167	144	578
Total fish caught	1131	268	419	1818
Fish caught/hour	2.6	4.3	2.4	

1989 SURVEY

	Lakes Only	Streams Only	Lakes and Streams	Total
Total hours fished	680	272	177	1129
Total cutthroat caught	613	74	106	793
Total rainbows caught	245	542	158	945
Total brooktrout caught	911	558	247	1716
Total fish caught	1769	1165	428	3362
Fish caught/hour	2.6	4.3	2.4	

Combined Totals for 1988 & 1989

Total hours	1800
Total cutthroat	1687
Total rainbow	1291
Total brook	2294
Total fish	5180

*Column refers to people who responded that they had fished a combination of lakes and streams while in the A-B wilderness.

1988. Estimated numbers of 6 inch and larger brown trout dropped from 202 per mile to 106 per mile. However, unlike 1985, the major loss (65%) occurred in the 14 in and greater fish, compared to only an 8% loss for fish 6 to 14 inches long. This loss may have been at least partially due to natural mortality of older fish in this larger size group.

The Musselshell River experienced extreme drought conditions in 1988, much worse than 1985. Average monthly flows recorded at the USGS gauge at Harlowton approximately 20 miles downstream from the shocking section were only 0.94 and 1.29 cfs for August and September, respectively. Periods of zero flow were recorded during both months. Several sections of the river in the shocking section were completely dewatered. All surviving fish were trapped in the deep holes that retained water. Despite these conditions, the population of 6 inch and larger brown trout increased by over 130% between 1988 and 1989, from 106 to 248 fish per mile. The population of 6 to 14 inch fish increased by 160%, and the population of fish greater than 14 inches increased by 104%.

This major increase during severe drought conditions is very difficult to explain. As water levels in the river dropped, there may have been a significant movement of brown trout up- or downstream. A number of these fish could have been trapped in the shocking section by dewatered sections of stream and then remained in the area as water levels improved. An irrigation ditch withdraws water at the lower end of the shocking secition. A large number of fish may have moved into this ditch as water dried up in the river, then moved back out into the shocking section as the ditch was dewatered. Considerable more work will be needed before the relationship between flows and brown trout population levels in the Musselshell River are understood.

Another factor may also impact future fish population levels in the Selkirk section. Recent low water levels and the resulting lack of high flushing flows has caused a serious accumulation of silt in several areas within the shocking section. If this accumulation continues, the habitat in these areas may degrade to the point it would no longer hold trout or support any spawning. Thus, this river section may support few trout even if good flows return.

MANAGEMENT RECOMMENDATIONS

1.) Cooney Reservoir - continue monitoring status of trout/walleye fishery with gill net, trap net, electrofishing, and creel census. Continue assessment of natural reproduction in walleye population and continue planting until it is confirmed. Follow development of black crappie population and its affect on the rainbow trout fishery. Increase the size of the rainbow trout plant from 100,000 to 150,000-200,000 6 in and larger fish.

2.) Lower Glaston Lake - continue monitoring fish populations in the lake. Evaluate growth and survival of tiger muskie introduction.

3.) Deadman's Basin Reservoir - continue monitoring status of kokanee/walleye fishery. Continue planting both McConaughy and Arlee rainbow trout to accommodate boat and shoreline anglers.

4.) East and West Rosebud and Emerald Lakes - discontinue planting McBride cutthroat in favor of DeSmet strain rainbow trout. Continue monitoring growth survival and spawning activity of cutthroat trout plants and DeSmet rainbow trout.

5.) Absaroka-Beartooth mountain lakes - continue monitoring status of fish populations in selected lakes and continue stocking as outlined in mountain lake management plans. Update mountain lake management plans. Collect golden trout eggs from Sylvan Lake in 1990 and 1991. Collect fisheries information from mountain lakes located in the Crazy mountains and update data base.

6.) Musselshell River - continue sampling Selkirk section to monitor drought effects in the upper drainage. Encourage flushing flows during good water years to remove excessive siltation. Consider more restrictive regulations if poor water and habitat conditions persist.

LITERATURE CITED

Fredenberg, W.A. 1987. Southcentral Montana fisheries investigations, Musselshell River study. Montana Department of Fish, Wildlife and Parks Job Progress Report F-20-R-30, Job III-a.

Fredenberg, W.A. 1988. Southcentral Montana fisheries investigations, Musselshell River study. Montana Department of Fish, Wildlife and Parks Job Progress Report F-20-R-31, Job III-a.

Fredenberg, W.A., and M.D. Poore 1989. Survey and inventory of coldwater and warmwater ecosystems, southcentral Montana coldwater fisheries investigations. Montana Department of Fish, Wildlife and Parks Job Progress Report F-46-R-1, Job V-b.

Nelson, F.A. 1980. Evaluation of four instream flow methods applied to four trout rivers in southwest Montana. Montana Department of Fish, Wildlife and Parks, Bozeman, Montana.

Vincent, E.R. 1971. River electrofishing and fish population estimates. Progressive Fish-Culturist 36(3):163-167.

Prepared by: Michiel Poore, Ken Frazer

Date: July 10, 1990

Waters referred to:

Albino Lake	5-22-7126-03
Anvil Lake	5-22-7163-03
Beauty Lake	5-22-7243-03
Burnt Bacon Lake	5-22-7382-03
Chrome Lake	5-22-7455-03
Cliff Lake	5-22-7460-03
Cooney Reservoir	5-22-7518-05
Deadman's Basin Reservoir	5-18-7540-05
East Rosebud Lake	5-22-7714-03
Emerald Lake	5-22-7812-03
Flat Rock Lake	5-22-7921-20
Fly Lake	5-22-7923-03
Fossil Lake	5-22-7924-03
Fox Lake	5-22-7938-03
Golden Lake	5-22-7987-03
Goose Lake	5-22-7994-03
Hidden Lake	5-22-8095-03
Horseshoe Lake	5-22-8134-03
Jasper Lake	5-22-8180-03
Kersey Lake	5-22-8274-03
Lake Abundance	5-22-7112-03
Lake Aries	5-22-7173-03
Lake of the Clouds	5-22-8338-03
Lake of the Winds	5-22-8344-03
Lower Glaston Lake	5-22-8554-03
Marsh Lake	5-22-8589-03
Mermaid Lake	5-22-8662-03
Mosquito Lake	5-22-8730-03
Musselshell River	5-18-6740-10
Peace Lake	5-22-8874-03
Picasso Lake	5-22-8877-03
Picket Pin Lake	5-22-8880-03
Skeeter Lake	5-22-9208-03
Sourdough Lake	5-22-9330-03
Spaghetti Lake	5-22-9332-03
Spider Lake	5-22-9335-03
Stephanie Lake	5-22-9342-03
Swamp Lake	5-22-9385-03
Swede Lake	5-22-9387-03
Sylvan Lake	5-22-9394-03
West Rosebud Lake	5-22-9744-03
Widewater Lake	5-22-9758-03
Wiedy Lake	5-22-9760-03
Wrong Lake	5-22-9831-03