MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: Montana PROJECT TITLE: Northwest Montana Fishery Study

PROJECT NO.: F-7-R-36 JOB TITLE: Inventory of waters of the project area

JOB NO.: I-a

PERIOD COVERED: July 1, 1986 to June 30, 1987

ABSTRACT

The total winter fishing pressure estimate for Lake Mary Ronan in 1987 was 5,101 man days, and the total estimated harvest was 25,505 fish. The average catch per angler was 5.0 fish, and the catch per angler hour was 1.2 fish. Kokanee comprised 99 percent of the catch. The summer opening day catch was 2.3 fish per angler with kokanee comprising 80 percent of the catch.

The average catch per net night of kokanee from fall gill net surveys (1986) from Lake Mary Ronan was 23.2 fish. The spring netting surveys yielded 3.0 kokanee per net night.

The sampling of Mysis (Mysis relicta), commonly known as opposum shrimp, was conducted for six lakes in June of 1987. The number of Mysis per square meter increased in both Ashley and McGregor lakes. Mysis densities in Swan and Flathead lakes were similar to those found in 1986.

Bull trout redd count inventories were conducted in the fall of 1986. Redd counts in the Middle Fork (351) and North Fork tributary streams (184) were similar to the 1985 counts, but the number of redds varied considerably among individual streams. Swan River tributary redd counts increased from 109 in 1985 to 210 in 1986. Redd counts in all tributary streams monitored in the Swan drainage were higher than in 1985.

Gill net surveys were conducted for 16 lakes to monitor the size of mature spawning kokanee. Several management adjustments were made to the kokanee stocking program.

A total of 67 stream hydraulic notices (FG124 permits), 108 stream alteration projects involving the private sector (SB310 permits), 48 Corps of Engineer projects (404 permits), and 1 lakeshore alteration project (175 permit) were reviewed during the 1986-87 report period.

A partial creel census was conducted on the South Fork of the Flathead River above Hungry Horse Reservoir in 1983. Anglers kept 18 percent of the fish creeled. The total estimate of harvest in the entire South Fork for 1983 was 4,382 fish.

Four preliminary micro-hydro projects were reviewed during the project period. Concerns and recommendations are being addressed as the application process proceeds.

Preliminary electrofishing and creel census data were collected for Echo Lake to determine the status of the largemouth bass fishery.

An evaluation of the performance of rainbow trout strains is summarized for Woods, Dollar, and Metcalf lakes.

BACKGROUND

The fisheries resource in Region 1 is supported by 645 lakes totalling 240,000 acres and 2,400 miles of trout streams. The total estimated fishing pressure for Region 1 (1985-1986) as determined by a statewide mail questionnaire survey was 515,976 man days of fishing effort. Approximately 67 percent of the angling pressure was expended on trout lakes, 28 percent on trout streams, 3 percent on warm water lakes and reservoirs, and the remaining 2 percent undesignated (lakes and streams). The monitoring of the fisheries resource is an ongoing project to update the fisheries management program for maintaining or improving the fishery. Particular emphasis will be given to the following objectives:

OBJECTIVES

1. To monitor the kokanee fishery of Lake Mary Ronan by conducting a winter and opening day (summer) creel census to determine angler effort and success and collecting fish population data with gill nets to determine average size, age class distribution, and growth rates of kokanee.

2. To establish relative abundance indices of kokanee and other associated game fish species in large regiona lakes (over 3,000 surface acres). This segment will emphasize initial work on Whitefish and Ashley lakes. This objective was not met.

3. To determine fisheries potential of lakes and streams by obtaining chemical, physical, and biological parameters for the management of sport

fish species with emphasis placed on: a) monitoring Mysis population trends in Ashley, Flathead, Little Bitterroot, McGregor, Swan, and Whitefish lakes; b) monitoring bull trout redd counts in spawning tributaries of the Flathead and Swan rivers systems; c) evaluating the catch and release area on the Thompson River; and d) summarizing the summer creel census data collected during the 1983 angling season for the upper South Fork Flathead River above Hungry Horse Reservoir.

4. To monitor kokanee size fluctuations of annual spawning populations in several lakes including Ashley, Bull, Glen, Holland, Lake Blaine, Lake Mary Ronan, Lindbergh, Little Bitterroot, Spar, Swan, Tally, and Whitefish lakes.

5. To investigate and approve lake and stream alteration projects as required by the Montana Streambed Preservation Act, NSLPA, Lakeshore Protection Act, and Army Corps of Engineers 404 permit program.

6. To prepare comments, recommendations, and estimate minimum stream flow requirements for aquatic life in streams where micro-hydro development projects have been proposed.

7. To survey the largemouth bass population of Echo Lake to determine impacts of angler harvest.

8. To assess stocking success of several rainbow trout strains for Metcalf, Woods, and Dollar lakes.

PROCEDURES

General lake and stream inventories are conducted as described in the Montana Lake and Stream Inventory Manual. Surveys include procedures to obtain fish population information by use of gill nets, trap nets, seining, electrofishing, scale reading for age and growth analysis, creel census for fishing pressure and harvest data, and water chemistry, plankton, and bottom fauna collections for monitoring water quality.

Experimental gill nets, 125 feet in length by 6 feet in depth with a graduated mesh size from 1/2 to 2 inches were used to sample fish in lakes. Mysis collections were taken by making replicate 30 meter vertical hauls with a 1 meter diameter net 2 feet in length with a mesh size of 0.05 mm. Samples were taken during the dark phases of the moon during June.

Information derived from fisherman interviews (Lake Mary Ronan) were recorded on census forms and included the number of anglers per party, hours fished, total fish caught, species, and residency of anglers. Traffic counters were installed at two locations to enumerate vehicle traffic by fisherman accessing the lake. Angling pressure and fish harvest estimates were derived from a combination of creel data and traffic counts collected at time intervals between census days.

Fish population estimates were derived from Chapman's modification of the Peterson mark and recapture formula. Fish data were collected by boat electrofishing, hook and line, and snorkeling.

FINDINGS AND DISCUSSION

Lake Mary Ronan

Winter Creel Census

A winter creel census was conducted at Lake Mary Ronan on 13 days during the period of January 10 through March 15, 1987 (closing date for the winter ice fishing season).

Winter fishing pressure and harvest estimates from the state park and south side access points are presented in Table 1. The total estimated winter fishing pressure was 5,101 angler days and the total estimated harvest was 25,505 fish. The average daily use was 80 man days with an average daily harvest of 398 fish during the 64 day census period. Kokanee salmon comprised 99 percent of the catch while the remaining 1 percent were westslope cutthroat and rainbow trout. The average catch per angler was 5.0 fish and the average catch per angler hour was 1.2 fish.

Table 1. Fishing pressure and harvest estimates for State Park and south side access area of Lake Mary Ronan, winter 1987.

Time	No. Anglers/		State Park			Southside Road			Total	Total
Interval	Days	party	Cars	Anglers	Harvest	Cars	Anglers	Harvest	Anglers	Harvest
1/10-3/15	64	1.9	1043	3882	19410	641	1219	6095	5101	25505

The age group composition of kokanee was 31 percent II+ fish and 69 percent III+ fish. Age II+ fish averaged 8.8 inches ranging in size from 7.9 to 9.9 inches. Age III+ fish averaged 11.4 inches ranging from 10.0 to 13.9 inches. The average size and species composition of the catch is presented in Table 2.

Table 2. Average size (total length in inches), range, and species composition of the catch, Lake Mary Ronan, 1986-1987 winter creel.

Species	Number of Fish	Average Size	Range	Composition of Catch
Kokanee	1315	10.6	7.9-13.9	99%
Westslope Cutthroat	3	13.2	12.8-13.7	1%
Rainbow	11	15.7	11.9-18.5	

Flathead County residents comprised 46 percent of the anglers followed by Lake County with 23 percent, Sanders County 17 percent, and Missoula County 8 percent. Ninety-one percent of the angling pressure resided within a 4 county area, an 80-mile radius of Lake Mary Ronan. Five percent lived in outlying counties and 4 percent were non-residents.

In comparing data from the 1985-1986 winter census, the catch rate per angler was similar (4.9 fish in 1985-1986 vs 5.0 fish in 1986-1987). However, the catch per man hour dropped from 1.6 fish in 1985-1986 to 1.2 fish in 1986-1987. A job supplement report detailing the results of the 1986-1987 winter creel census will be presented at a later date.

Opening Day Creel Census

The fishing season at Lake Mary Ronan opens with the general opening of streams on the third Saturday in May. Opening day creel census data have been collected annually since 1965 as an index to provide information on the well being of the kokanee fishery.

In 1987, a total of 52 trout and kokanee anglers interviewed were successful in creeling 120 fish of which 80 percent were kokanee. Westslope cutthroat comprised 16 percent of the catch while rainbow trout made up 4 percent. Catch rates were 2.3 fish per angler and 0.53 fish per angler hour. Missoula County residents comprised 32 percent of the fishermen followed by 26 percent for Flathead County, 11 percent for Lake County, 10 percent for Ravalli County, 14 percent for other counties, and 7 percent non-residents.

In comparison to the 1986 opening day census, angler success decreased by 2.3 fish per angler and 0.57 fish per hour effort. Age II+ kokanee decreased in size from 10.3 inches in 1986 to 9.8 inches in 1987. The size of Age III+ kokanee remained relatively constant, averaging 12.4 inches in 1986 as compared to 12.3 inches in 1987. A summary of the 1987 day catch data for 1986 and 1987 is shown in Table 3.

Table 3. Summary of Lake Mary Ronan opening day creel census data for 1986 and 1987. Percent species composition is shown in parenthesis.

	1986	1987	
No. Parties	30	26	
No. Anglers	79	52	
No. Fish Caught	365	120	
Kokanee	317	96	(80)
Cutthroat Trout	40	19	(16)
Rainbow Trout	0	5	(4)
No. Hours Fished	337	227	
Average Length Trip (Hours)	4.25	4.36	
No. Fish/Angler	4.62	2.30	
Average Catch/Hour	1.08	0.53	
Residency of Anglers (Percent)			
Missoula County	53	31	
Flathead County	21	26	
Lake County	9	12	
Other Counties	12	24	
Non-resident	5	7	

Gill Net Surveys - Fall and Spring

Annual gill net surveys are conducted in spring and fall to determine the relative success of trout and kokanee populations. A total of 6 gill nets (3 floating and 3 sinking nets) are fished over night for each sampling period. The catch per net night (fall netting) of immature kokanee (Age I+ and II+) increased from 9.7 fish in 1985 to 23.2 fish in 1986. Age I+ kokanee decreased in size by 0.8 inches in 1986 as compared to 1985 while Age II kokanee decreased by 0.2 inches. The catch per net night of kokanee in 1987 was 3.0 fish. In the spring of 1987 II+ kokanee also exhibited a decrease in size from 9.8 inches in 1986 to 9.2 inches in 1987. If kokanee continue to decrease in size, stocking numbers may have to be adjusted downward to reduce competition and allow for increased growth.

The catch per net night of rainbow trout remained the same (2.5) during the fall of 1985 and 1986, whereas cutthroat trout decreased from 3.5 in 1985 to 2.7 fish per net night in 1987. The catch per net night of both rainbow and cutthroat trout remained relative stable in the spring of 1986 and 1987 ranging from 0.5 to 1.7 fish per net night. A comparison of the Lake Mary Ronan gill net catch data of trout and kokanee for spring and fall of 1985, 1986, and 1987 is shown in Table 4.

Table 4. Comparison of Lake Mary Ronan gill net catch data of kokanee and trout for spring and fall netting series, 1986 through 1987. (Mature spawning kokanee not included in fall netting data.)

	Fall 1985				Fall 1986			
Species	No.	Avg.Catch Per Net	Avg. Size	Standard Deviation	No.	Avg.Catch Per Net	Avg. Size	Standard Deviation
Kokanee (I+)	28	4.7	8.7	0.33	86	14.3	7.9	0.45
Kokanee (II+)	30	5.0	10.9	0.46	53	8.8	10.9	0.66
Avg. Combined	58	9.7	9.8	----	139	23.2	9.0	----
Rainbow Trout	15	2.5	14.0	4.44	15	2.5	14.7	3.18
Westslope Cutthroat Trout	21	3.5	10.3	0.39	16	2.7	12.1	2.08

	Spring 1986				Spring 1987			
Species	No.	Avg.Catch Per Net	Avg. Size	Standard Deviation	No.	Avg.Catch Per Net	Avg. Size	Standard Deviation
Kokanee (I+)					3	0.5	6.5	0.15
Kokanee (II+)	7	1.2	9.8	0.46	9	1.5	9.2	0.33
Kokanee (III+)	11	1.8	12.4	0.58	1	.2	12.2	0.00
Avg. Combined	18	3.0	11.4	----	13	2.2	8.9	----
Rainbow Trout	10	1.7	14.6	3.24	6	1.0	16.5	2.45
Westslope Cutthroat Trout	3	0.5	11.6	0.98	8	1.3	11.7	1.33

LAKE AND STREAM SURVEYS

Mysis Monitoring

Mysis were first introduced into northwestern lakes in 1968, 1975, and 1976 in an attempt to improve the local sports fisheries. Since 1983, six lakes having viable Mysis populations were monitored during the month of June to follow population trend fluctuations. In addition, monthly samples on Whitefish and Swan lakes were collected from June, 1985, through June, 1986, to determine seasonal density changes. Results of the June Mysis sampling are presented in Table 5.

Table 5. Northwest Montana regional lake *Mysis* monitoring, June 1983 - June 1987.

Lake	Mysis per Square Meter				
	1983	1984	1985	1986	1987
Ashley	1.3	13.0	12.1	36.9	86.3
Little Bitterroot	7.3	24.5	21.9	16.4	21.7
Flathead	0	5.1	19.3	176.4	169.6
McGregor	6.1	13.7	3.8	11.8	30.3
Swan	20.1	71.0	94.9	251.6	222.6
Whitefish	18.5	86.3	229.0	175.8	65.0

Mysis samples collected by replicate, total depth, vertical hauls from two deep water stations in each lake. In 1983, samples were collected in 30 m hauls with a larger mesh net.

The density of *Mysis* per square meter appear to be increasing in both Ashley and McGregor lakes whereas Whitefish lake seems to be on a down cycle. Highest densities occurred in Flathead and Swan lakes but their numbers have not fluctuated significantly since 1986. A Job Supplement Report to F-7-R authored by Scott Rumsey entitled "Mysis monitoring in western Montana lakes" is in preparation.

Bull Trout Redd Inventories

Bull trout redd inventories have been conducted in the North Fork and Middle Fork of the Flathead River since 1979. The initial study was funded by the Environmental Protection Agency (EPA) and continued since 1983 under Bonneville Power Administration (BPA) contract studies to monitor redd counts for selected bull trout spawning streams. A summary of bull trout redd counts since 1979 in the upper Flathead River drainage is shown in Table 6. Overall, the redd counts in the North Fork and Middle Fork drainages were similar to those counted in 1985. However, significant declines were noted for Coal Creek in the North Fork and Morrison Creek in the Middle Fork drainage. The Coal Creek redd count dropped from 40 in 1985 to 13 in 1986, the lowest since monitoring efforts were initiated. Trail Creek counts increased almost three-fold from 25 in 1985 to 69 in 1986. The number of redd counts in Lodgepole Creek doubled from 20 in 1985 to 42 in 1986 and was the highest since 1979.

Table 6. Bull trout redd counts for selected areas of tributaries chosen for monitoring in the Flathead drainage.

Stream	1979	1980	1981	1982	1983	1984	1985	1986
North Fork:								
Big	10	20	18	41	22	9	9	12
Coal	38	34	23	60	73	61	40	13
Whale	35	45	98	211	141	133	94	90
Trail	34	31	78	94	56	32	25	69
TOTAL	117	130	217	406	292	235	168*	184
Middle Fork:								
Morrison	25	75	32	86	67	38	99	52
Granite	14	34	14	34	31	47	24	37
Lodgepole	32	14	18	23	23	23	20	42
Ole		19	19	51	35	26	30	36
TOTAL	71	142	83	194	156	134	173	167
GRAND TOTAL	188	272	300	600	448	369	341	351

*High flows may have obliterated some of the redds.

Four bull trout streams were also inventoried in the Swan River drainage. The number of redds observed in all the streams inventoried increased over 1985 by almost two-fold. A summary of bull trout spawning redd counts from 1982 through 1986 is shown in Table 7.

Table 7. Number of bull trout redds found in 4 selected tributaries to the Swan River during 1982 through 1985.

	Number of Redds				
Creek	1982	1983	1984	1985	1986
Elk	56	91	93	19	53
Goat	33	39	31(20)	40	56
Lion	63	49	88	26	55
Squeezer	41	57	83	24	46
TOTAL	193	236	295	109	210

Thompson River Fish Population Estimates

In May, 1984, a 6.8 mile section of the Thompson River extending from the mouth of Deerhorn Creek downstream to the confluence of the West Fork of the Thompson River was designated as a catch and release fishery. An electrofishing section (Bighole section) was set up about midway through the catch and release area to monitor the possible changes in size and number of fish under a no harvest regulation. These data will be compared to shocking sections upstream (Meadow Creek and Little Thompson) which are open to harvest under the general fishing regulations.

In 1986, an estimated population of 141 rainbow trout 4.0 inches and over were present in the Big Hole section. This compares with 80 rainbow trout per 1,000 feet collected in 1984. Electrofishing efforts in 1985 to obtain fish population estimates in the Big Hole section were unsuccessful due to high water. In 1985 the densities of rainbow trout in the Little Thompson section were 256 per 1,000 feet as compared to 187 in 1986. Both rainbow trout and whitefish numbers decreased in 1986, but brook trout showed a sizeable gain. A summary of the Thompson River fish population estimates for the years 1973 through 1986 is shown in Table 8.

Table 8. Summary of Thompson River fish population estimates.

				Total est. 4" and over per 1,000 ft. stream					
Mo.	Year	Section	Section Length(ft)	Rb	Eb	Mwf	DV	Total	% Rb over 7"
Apr	1973	Meadow Creek	9,000	81	88	133	-	302	58
Sept	1979	Meadow Creek	9,000	124	51	9	-	175	9
Apr	1974	Little Thompson	11,000	62	-	240	-	302	-
Apr	1983	Little Thompson	11,000	57	13	120	-	190	54
July	1985	Little Thompson	8,360*	256	52	230	-	538	20
July	1986	Little Thompson	8,360*	187	108	184	2	481	22
Apr	1984	Big Hole**	6,000	80	-	80	-	160	19
July-Aug	1985	Big Hole**	6,000	^	^	^	^	---	21
Sept	1986	Big Hole**	6,000	141	7	2	3	153	23

Rb = Rainbow
EB = brook trout
Mwf = mountain whitefish
DV = bull trout

*section shortened in 1985
**catch/release
^no valid estimate

The percent of rainbow trout exceeding 7.0 inches in the Big Hole Section remained about the same in 1986 as compared to 1984 and 1985. Similarly, the Little Thompson section showed little change in the percent of rainbow trout exceeding 7.0 inches. A length frequency distribution of rainbow trout collected from the Big Hole section is shown in Table 9.

Table 9. Length frequency distribution of rainbow trout collected from Big Hole section of the Thompson River in 1984, 1985 and 1986.

Size	1984	1985	1986	Size	1984	1985	1986
3.0 - 3.9	16	20	0	10.0 - 10.9	2	3	3
4.0 - 4.9	9	141	60	11.0 - 11.9	0	1	3
5.0 - 5.9	36	65	106	12.0 - 12.9	0	1	1
6.0 - 6.9	34	35	55	13.0 - 13.9	1	1	0
7.0 - 7.9	12	30	35	14.0 - 14.9	1	0	1
8.0 - 8.9	1	15	17	15 and up	1	1	2
9.0 - 9.9	1	10	5	TOTAL	114	313	288

South Fork Flathead River Creel Census

A partial creel census was conducted during the summer of 1983. Data were collected from the Meadow Creek check station above Hungry Horse Reservoir near the Bob Marshall Wilderness border. A total of 326 anglers surveyed fished a total of 558 days. Ninety-four percent of the anglers interviewed entered the South Fork River from this access point. Of the anglers interviewed, 53 percent fished below the wilderness boundary while 47 percent entered the wilderness to fish. A summary of anglers censused for the Meadow Creek check station is presented in Table 10.

Table 10. Number of fishing days, cutthroat trout caught, kept and catch rates (per hour) for wilderness and non-wilderness anglers surveyed in the South Fork Flathead River in 1983.

Section	Total Days	Total Hours Fished	Fish Caught	No. Kept	Catch Angler	Percent Kept
Non-wilderness	334	1089	861	359	0.8	42
Wilderness	224	978	2160	181	2.2	8
TOTAL	558	2067	3021	540	1.5	18

Non-wilderness anglers kept more than five times the number of fish than wilderness anglers although non-wilderness anglers were successful in catching only a third as many cutthroat trout.

The 1983 statewide fishing pressure survey conducted by the MDFWP estimated angler use for the South For Flathead River above Hungry Horse Reservoir to be 4,555 (±3058) angler days. South Fork anglers fished an average of 3.7 hours and kept 0.26 cutthroat per day. Based on those averages, the number of cutthroat trout harvested (caught and kept) in the

entire South Fork was 4,382 fish. A detailed creel analysis will be presented in a MDFWP report by Ray Zubik entitled "Consolidation and analysis of fisheries data collected in the Bob Marshall Wilderness complex with emphasis on the South Fork of the Flathead River."

LAKE MONITORING OF KOKANEE POPULATIONS

Kokanee were first introduced into Montana waters in 1916. The initial introduction was made into Flathead Lake and the progeny of these fish became the source of subsequent introductions into northwestern Montana lakes. Flathead Lake and tributary streams were the primary egg source to supply kokanee management needs for restocking lakes prior to 1980. However, in recent years kokanee populations declined in the Flathead system and Lake Mary Ronan now provides the major egg source. Annual production ranges from 1,500,000 to 3,000,000 eggs. At the present time 11 lakes are maintained by hatchery stocking. A total of 7 lakes including Flathead and Lake Koocanusa are being managed for naturally reproducing fish. In 1986 initial plants of kokanee were made in Foy, Lower Thompson, and Lake Five. These lakes will be included in the fall sampling schedule of 1987 to check for growth and survival.

For the past several years, annual gill netting has been conducted to monitor the average size of mature spawning kokanee from 16 lakes. Fish are collected by one of three methods: beach seining in conjunction with hatchery egg-take operations, overnight gill net sets, or electrofishing. The information derived from these data is used in part to develop management strategies, primarily adjustment in stocking numbers and creel limits for individual waters.

In 1987, several adjustments were made to the stocking program. Stocking reductions were made 1) to meet hatchery production numbers, 2) eliminate management programs that were unsuccessful in maintaining a suitable fishery, or 3) in some cases natural reproduction was found to be sufficient to maintain kokanee populations. In 1987, Lake Five, Dickey, Little Bitterroot, Lower Thompson and Holland lakes were deleted from the stocking schedule. In addition, stocking numbers were reduced in Bull, Glenn, and Spar lakes. A summary of the average length of mature kokanee collected during the fall of 1986 is presented in Table 11.

Table 11. Average length of male and female spawning kokanee collected in the fall of 1986.

Lake	Surface Acres	a/ S/N	Males No. Fish	Males Avg. Length	Males Size Range	Females No. Fish	Females Avg. Length	Females Size Range
Ashley	3244	N	105	10.7	9.6-11.5	37	10.4	9.6-11.1
Blaine	372	N	53	9.8	9.2-10.4	23	9.5	9.2-10.0
Bull	1250	S	29	13.7	12.1-14.8	6	13.4	12.5-14.2
L.Bitterroot	2925	S*	104	11.1	10.3-11.8	23	10.7	10.1-11.2
Crystal	178	S	28	14.4	13.6-16.6	5	14.0	13.4-15.2
Dickey	579	S	45	8.6	7.4-09.4	34	8.3	7.8- 9.1
Glen	340	S	22	13.2	12.2-14.3	14	12.8	12.2-13.5
Holland	408	S	Not sampled in 1986					
Lindbergh	725	S	Not sampled in 1986					
L.Mary Ronan	1505	S	25	14.5	13.6-15.5	25	13.7	13.0-14.7
Mid.Thompson	602	N	14	13.4	12.9-15.2	15	12.8	12.4-13.7
McGregor	1328	S	Not sampled in 1986					
Spar	392	S	2	18.4	16.0-20.7	20	17.8	14.4-19.8
Swan	2690	N	226	9.5	8.5-11.2	110	9.1	8.0-11.0
Tally	1326	N	91	9.4	8.7-10.0	7	9.4	9.0- 9.7
Whitefish	3350	S	Not sampled in 1986					

a/N = naturally reproduced
S = Stocked population
* = Normally natural reproduction; stocked during low water level years.

STREAM AND LAKE ALTERATION PROJECTS

A total of 67 stream alteration projects affecting fish habitat were reviewed under the Stream Protection Act in Region I during the report period. A breakdown of projects submitted for review by various government agencies is as follows: U. S. Forest Service--39; County Highway Department--7; State Lands--19; Federal Highway Department--2. In addition 108 stream alteration projects involving the private sector were reviewed under the Natural Streambed and Land Preservation Act. These include 55 projects in Flathead County, 31 in Lincoln County, 17 in Sanders County, and 5 in Lake County. A total of 48 Corps of Engineer 404 permits were reviewed during the project period. Recommendations for one lakeshore alteration project were submitted to the Flathead County Commissioners office.

MICRO-HYDRO PROJECTS

As in 1986, preliminary permit applications for micro-hydro projects have continued to decline. At the present time only four projects are being pursued with one project in final consulting stage.

The Boulder Creek project in Lake County is the third stage of the consultation process and all major concerns and responses related to increased sediment generated by construction activity of the penstock, powerhouse and intake structures have been addressed. Boulder Creek is a high gradient non-trout stream and will have no fisheries impact.

The Federal Energy Regulatory Commission (FERC) issued a license to construct, operate, and maintain the Prospect Creek project in Sanders County in May of 1986. However the applicant has not yet submitted a plan to control erosion, turbidity, and sedimentation from construction and operation of the project, design plans on intake structures or the tailrace to protect the fishery, fish passage designs, or plans to prevent supersaturation of gas in the water discharge. These provisions must be approved by FERC before construction can proceed.

Preliminary permits were filed for both Stanton (Flathead County) and Tony (Sanders County) creeks. Stream profile measurement data were collected for Stanton Creek and wetted perimeter measurements were plotted in relation to stream flow measurements. Recommended minimum flow measurements were plotted for 17 cfs. Preliminary concerns and recommendations have been submitted to the applicant, but thus far there has been no response from the applicant.

A field review of the Tony Creek project was made in July of 1987. The creek is a small high gradient stream which does not support a fish population. A culvert drop of approximately 5 feet, 75 feet from the confluence with the Clark Fork River, precludes the upstream movement of spawning migrations from the Clark Fork River. Late summer flows at the diversion point were estimated to be between 0.5 and 1 cfs. Summer flow data is presently being collected by the applicant to determine feasibility of the project. Concerns and recommendations will be proposed regarding construction of the project and submitted to the applicant.

THE ECHO LAKE BASS FISHERY

In response to inquiries about the decline of quality largemouth bass fishing in Echo Lake by the Echo Lake Homeowners Association and the Western Montana Bass Club members, a creel census and electrofishing surveys were conducted to evaluate the current status of the largemouth bass fishery. These data plus catch records from 16 scheduled bass tournaments conducted by the Bass Club from 1981 through 1986 and individual interviews with local bass fishermen will be used to present a preliminary overview of the largemouth bass fishery.

An average of 2-3 bass tournaments were conducted annually. Over the 6-year period of record, 128 man days totaling 2,604 hours of fishing effort resulted in a catch of 358 largemouth bass (Table 12). The average catch per

angler was 2.8 fish at a catch rate of 0.14 fish per hour. Trends over 5-year period (1981-1985) showed a declining catch rate in both the number of bass per angler and per hour effort. The catch per angler dropped from 3.5 fish in 1981 to 1.8 fish in 1985. However, in 1986 the catch rate increased to 3.8 fish.

Table 12. Five-Year Catch Rate of Largemouth Bass at Echo Lake by Western Montana Bass Club members.

Year	No. of Tournaments	Man Day	Total Hours	No. Bass	Bass/ Angler	Bass/ Hour
1981	3	22	220	77	3.5	0.35
1982	2	14	273	56	4.0	0.41
1983	3	29	474	65	2.2	0.14
1984	3	22	596	54	2.5	0.09
1985	3	25	641	46	1.8	0.07
1986	2	16	400	60	3.8	0.15
TOTALS/AVG.	16	128	2,604	358	2.8	0.14

Weekend creel census surveys were conducted by Department personnel on three holiday and weekend days in May of 1986 at Echo, Peterson, and Abbott Lakes (Table 13). The three lakes are interconnected. A total of 117 boat anglers (both complete and incomplete trips) were interviewed. These anglers caught a total of 57 largemouth bass for a catch rate of 0.2 bass per hour effort. Sixty-three percent of the bass, most of which were greater than 10 inches, were kept by anglers. In addition to largemouth bass, 10 northern pike up to 6 pounds were creeled.

Table 13. Summary of 3-Day Creel Day Creel Census at Echo, Peterson, and Abbott Lakes. Conducted May 23, 26, and 31, 1986.

No. Anglers = 117
Total hrs. fished = 307
No. fish caught = 57
No. bass kept = 36
No. pike caught = 3

Avg. catch/man hour(all fish) = 0.20
Avg. catch/man hour (bass) = 0.19

Average Length (Bass)
Number = 18
Average length = 14.3
Standard deviation = 2.79
Range (11.6" - 19.5")

Average Weight (Bass)
Number = 18
Average weight = 1.90
Standard deviation = 1.17
Range (.80 - 4.6 lbs)

Weights, length measurements, and scale samples were taken from fish measuring 11.6-19.5 inches, averaging 14.3 inches.

The most effective fishing method was using live leeches and nightcrawlers over spawning bass redds. Black plastic worms simulating leeches were the most effective artificial lure.

Night electrofishing was conducted on June 3, 1986, from the hours of 10:00 p.m. to 1:00 a.m. along the west shore of Echo Lake. A total of 39 bass were collected ranging from 5.2-16.2 inches. Fish larger than 9 inches were tagged with numbered floy tags. A length frequency of bass caught is presented in Table 14. Several bass from 6-16 inches were observed but escaped capture. Small pumpkinseed ranging from 4-6 inches were the most abundant fish observed followed by yellow perch ranging from 4-7 inches. A few small northern pike were also observed. To date, 2 tagged bass have been reported caught. These fish were observed by the owner of the Echo Lake Resort, but no data on these fish was obtained. Additional tagging efforts are needed to obtain further information on bass explotation rates.

Table 14. Length Frequency of largemouth bass collected by electrofishing.

Size	Number	Size	Number
5.0 - 5.9	4	9.0 - 9.9	7
6.0 - 6.9	13	10.0 - 10.9	3
7.0 - 7.9	2	11.0 - 11.9	2
8.0 - 8.9	2	12.0 - 12.9	4
		13.0 and over	2

In view of the findings thus far, it appears that:

1. Bass are quite vulnerable to bait fishing with leeches and worms during the spawning season.
2. Small to intermediate size bass from 5-12 inches are abundant indicating adequate bass recruitment.
3. Although more than 50 percent of the bass caught were released, the larger bass over 10 inches are being kept.

RAINBOW TROUT STRAIN ASSESSMENT

Metcalf Lake

Metcalf Lake is an 18 acre closed basin lake located approximately 15 miles south of Swan Lake. The lake was rehabilitated in 1983 to remove

stunted populations of pumpkinseed and largemouth bass. In June of 1984 the lake was restocked with 900 Arlee rainbow trout identified with a left pelvic clip and 3,000 ArleexEagle Lake rainbow trout. The lake was restocked with only Eagle Lake rainbow in 1986.

In June of 1986, the fish population was sampled using 3 bottom gill net sets. A total of 17 fish were collected of which 16 were identified as Eagle LakexArlee rainbow crosses and 1 as an Arlee rainbow. The hybrid crosses averaged 11.7 inches and weighed 0.56 pounds. The single Arlee rainbow was 11.0 inches long and weighed 0.48 pounds. A cursory examination of the stomach contents indicated that the fish fed primarily on chironomids and odonata larvae. It would appear that the Eagle LakexArlee rainbow exhibited a higher survival rate in the system compared with the Arlee rainbow even though the stocking ratio was about 4:1 Eagle Lake fish. However, it has not been ascertained whether fish mortality was associated with a short life span of the Arlee strain, vulnerability to angling, poor survival of hatchery plants, or a combination of these factors.

Woods Lake

Woods Lake is a closed basin lake with a surface area of 19.5 acres having an average depth of 12 feet. This lake was designated as a catch and release fishery using artificial flies and lures only effective with the 1984-1985 fishing regulations beginning May 1, 1984.

This study lake was selected to evaluate the Arlee vs Eagle Lake rainbow strain in a catch and release lake. Prior to 1982, Woods Lake was managed for westslope cutthroat trout. The lake also supports an abundant population of redside shiners. Hatchery plants since 1980 are presented in Table 15.

Table 15. Fish stocked in Woods Lake 1980-1986.

Year	Species	No. Fish	Size	Planting Date
1980	---	None	---	---
1981	Wct	2,000	3"	5/6
1982	---	None	---	---
1983	Rb(Arlee)	1,000	5"	5/6
	Rb(Eagle Lake)*	1,000	4"	5/23
1984	Rb(Arlee)	65	7.7 lb.	10/18
1985	None	---	---	---
1986	Rb(Arlee)	500	6"	9/12
	Rb(Eagle Lake)**	500	6"	9/30

*Adipose clip
**Right pelvic clip

Creel information was collected on four occasions from May through October, 1984. A total of 50 fish were caught and released of which 40 were Arlee rainbow, 8 Eagle Lake rainbow, and 2 westslope cutthroat trout.

Gill net data was collected on five occasions from October, 1984, through August, 1986. Collectively this represented 17 gill net sets resulting in a catch of 40 fish. A summary of the catch data is presented in Table 16.

Table 16. Summary of gill net catch data from Woods Lake, 1984-1986.

	Net Type		Fish	Arlee	Avg.	Eagle Lk	Avg.		Avg.
Date	Floater	Sinker	Caught	Rainbow	Length	Rainbow	Length	Wct	Length
10/10/84	1	1	12	9	12.7	1	15.8	2	14.4
05/06/86	1	1	7	2	15.4	4	15.7	1	16.1
06/03/86	0	4	9	3	14.8	6	15.6	0	----
08/05/86	3	1	2	0	----	3	14.5	0	----
08/26/86	3	2	9	2	16.4	7	16.0	0	----
TOTALS	8	9	40	16	----	21	----	3	----

All the rainbow trout captured in gill nets originated from the 1983 plant. None of the retired brood stocked in 1984 were found in gill net sampling and the 1986 plant was stocked after gill net samples were taken. Despite increased netting efforts in 1986, only 7 Arlee rainbow were captured. Conversely, 1 Eagle Lake rainbow was collected in 1984 and 20 fish were taken during netting efforts in 1986. From this preliminary study, one might conclude that Eagle Lake rainbow remained in the lake for a relatively longer period of time than the Arlee strain.

Dollar Lake

Dollar Lake has a surface area of 8.2 acres and it located approximately 10 miles northwest of Whitefish. Dollar Lake is a closed basin lake dependant on stocking for maintaining a trout population. Prior to 1982, Dollar Lake was stocked with westslope cutthroat trout and grayling. The lake also supports a large population of redside shiners. Stocking records of species planted since 1980 are presented in Table 17. Eagle Lake rainbow trout were identified with an adipose fin clip in 1983 and a right pelvic fin clip in 1984.

Table 17. Fish stocked in Dollar Lake, 1980-1986.

Year	Species	No. Fish	Size	Date
1980	Wct	1,000	4"	5/12
1981	Wct	1,000	3"	5/06
1982	Rb(Arlee)	1,000	5"	5/12
1983	Rb(Arlee)	518	4"	5/04
	Rb(Eagle Lake)*	500	4"	5/23
1984	Rb(Arlee)	500	4.7"	6/28
	Rb(Eagle Lake)**	500	3.5"	6/28
1985	None			
1986	Rb(Arlee)	500	6"	9/12
	Rb(Eagle Lake)	500	6"	9/30

*Adipose clip
**Right pelvic clip

Gill net data was collected on four different occasions from June, 1984 through June, 1986. Collectively this represented 11 gill net sets resulting in a catch of 48 fish. A summary of the catch data is shown in Table 18.

Table 18. Summary of gill net catch data from Dollar Lake, 1984-1986.

	Net Type		Fish	Arlee	Avg.	Eagle L.	Avg.		Avg.
Date	Floater	Sinker	Caught	Rainbow	Length	Rainbow	Length	Grayling	Length
06/02/84	0	3	14	11[e]	11.3	0	--	1	15.5
				2[1]	14.3				
10/16/84	1	1	27	15[a]	7.8	1[e]	14.2	--	---
				4[e]	13.1	7[a]	7.3	--	---
05/06/86	1	1	3	0	---	3[a]	11.8		
06/03/86	0	4	4	2[a]	12.7	2[a]	12.9		
TOTALS	2	9	48	34	--	13		1	---

[1]1982 plant
[e]1983 plant
[a]1984 plant

A cursory examination of stomach contents indicated that scuds were the most important food item followed by snails and zooplankton. Both rainbow trout strains seemed to prefer aquatic invertebrates to forage fish even though redside shiners were in great abundance.

Woods and Dollar lakes are a paired experiment to sample a harvest, no harvest management in two small adjacent lakes.

The creel data collected from Woods Lake seems to suggest that Arlee rainbow are more vulnerable to angling than the Eagle Lake strain. The gill net data indicates that the catch rate of Eagle Lake rainbow was greater than Arlee rainbow in 1986 suggesting that the Eagle Lake strain remained in the system for a longer period of time. However, the combined gill net catch rate was low, less than 2.0 fish per net night. Even though catch and release regulations apply, poaching may be a factor in the low number of rainbow netted after 1984. The lake is in a remote area making it difficult to enforce regulations.

Likewise in Dollar Lake, Arlee rainbow may be more vulnerable to angling than the Eagle Lake strain. The gill net catch of Eagle Lake rainbow in 1986 exceeded that of the Arlee rainbow. However, the sample size of fish netted was too small to draw conclusive evidence that the longevity of Eagle Lake fish excels that of the Arlee strain.

RECOMMENDATIONS

1. A. It is recommended that a winter creel census and fish population monitoring be continued for Lake Mary Ronan.

   B. Conduct a quantitative creel census in 1988 if budget allows. It is believed that fishing pressure and salmon harvest has increased considerably over the past two years.

   C. Continue the traditional opening day creel census and sample periodically through the summer.

2. Continue Mysis monitoring efforts on an annual basis during the month of June to follow population trend fluctuations.

3. Continue bull trout redd inventories for selected tributaries/streams in the Flathead and Swan River drainage to monitor spawning use.

4. Monitor kokanee populations in 16 lakes every 1 to 4 years on a scheduled basis by gillnetting, seining, and electrofishing to evaluate the effects of changes in fishing regulations, stocking rates, and spawning conditions.

5. Continue reviewing lake and stream alteration projects as required by the state and federal law. Make appropriate mitigation recommendations to the project sponsors.

6. Continue to recommend minimum stream flow requirements and other mitigation measures for aquatic life in streams where proposed micro hydro development permit applications have been received.

7. Continue collecting fish population estimates on two sections of the Thompson River on an annual basis to evaluate differing fishing

regulations. Monitor at least two sections of the South Fork Flathead River to evaluate regulation impacts.

8. Continue evaluation of rainbow trout strains for Dollar and Woods lakes through 1988.

In 1988 the survey and inventory project will be restructured under three separate base projects which will include: 1) coldwater streams, 2) coldwater lakes and reservoirs, and 3) warmwater lakes and reservoirs.

Prepared by: Robert Domrose
Date: August 31, 1987

Waters referred to:

Lakes--water code	Rivers/Streams--water code
Abbott--07-5180	
Ashley--07-5220	Big Creek--08-0680
Bull--11-8040	Boulder--07-0520
Crystal--11-8180	Cedar--07-1400
Dickey--11-8220	Clark Fork--05-1440
Dollar--07-6000	Coal Creek--08-1620
Echo--07-6180	Elk--07-1340
Flathead--07-6400	Deerhorn--05-1984
Foy--07-6420	Fisher--11-2320
Glen--11-8380	Flathead River--07-1560
Holland--07-6780	Middle Fork--08-4700
Hungry Horse Reservoir 08-8860	North Fork--08-5100
	South Fork--08-6580
Lake Blaine--07-5380	Goat--07-1720
Lake Five--08-8550	Granite--08-3080
Lake Koocanusa--11-8690	Harrison--08-3280
Lake Mary Ronan--07-7700	Kootenai River--11-3500
Little Bitterroot--07-7300	Libby Creek--11-3660
Lindbergh--07-7260	Lion--07-2420
Lower Thompson--05-9152	Little Thompson--05-4112
McGregor--05-9216	Lodgepole--08-4940
Metcalf--07-7820	Meadow Creek--08-4680
Middle Thompson--05-9232	Morrison--08-4940
Peterson--07-8245	Ole--08-5150
Spar--11-9640	Prospect--05-5648
Swan--07-9000	Squeezer--07-4340
Tally--07-9060	Stanton--08-6980
Whitefish--07-9540	Stillwater--07-4420
Woods--07-9580	Swan River--07-2371
	Thompson--05-7264
	Thompson,W.Fk.--05-8080
	Tony--no code
	Trail--08-7330
	Whale--08-7700

Fish species referred to:

artic grayling Thymallus arcticus
kokanee Oncorhynchus nerka
westslope cutthroat trout Salmo clarki lewisi
rainbow trout Salmo gairdneri
bull trout Salvelinus confluentis
lake whitefish Coregonus clupea formis
lake trout Salvelinus namaycush
largemouth bass Micropterus salmoides
redside shiner Richardsonius balteatus
pumpkinseed Lepomis gibbosus

LITERATURE CITED

Domrose, R. J. 1982. Mysis introductions into western Montana lakes, Dept. of Fish, Wildlife, and Parks, Kalispell, MT, 5p unpublished.

1983 Statewide mail creel census, Dept. of Fish, Wildlife and Parks, Helena, MT.

1986 Statewide mail creel census, Dept. of Fish, Wildlife and Parks, Helena, MT.