MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: MONTANA

PROJECT TITLE: STATEWIDE FISHERIES INVESTIGATION

PROJECT NO.: F-46-R-3

STUDY TITLE: SURVEY AND INVENTORY OF COLDWATER LAKES

JOB NO.: II-a, Segment 1

JOB TITLE: NORTHWEST MONTANA COLDWATER LAKES INVESTIGATIONS

PERIOD COVERED: JULY 1, 1989 THROUGH JUNE 30, 1990

ABSTRACT

Ashley Lake water levels were regulated to minimize impacts from seasonal drawdowns on fisheries. Lake levels and creek flows below the lake outlet were above normal in 1989 and 1990. A summer creel census was conducted at Lake Mary Ronan in 1989. The total estimated fishing pressure and angler harvest was 27,831 anglers and 65,342 fish. The 1990 winter fishing pressure and angler harvest was 11,103 anglers and 81,066 fish. Annual spring and fall gill netting was continued for Lake Mary Ronan to follow trends in size and numbers of trout and salmon. Gill net surveys were conducted for seven small lakes and four large lakes in the region. Six kokanee lakes were sampled to monitor size trends of mature spawning kokanee. Mysis monitoring was continued for five lakes in 1989 and 1990. Two major fishing access sites were acquired in 1990 at Horseshoe Lake near Ferndale and Thompson Chain of Lakes access between Kalispell and Libby.

BACKGROUND

The lake fisheries resource in Region 1 is comprised of 645 lakes totaling 240,000 acres. Included is a total of 412 coldwater lakes. The total estimated fishing pressure of Region 1 (1985-1986) as determined by a statewide mail questionnaire survey was 515,976 mandays of fishing effort. Approximately 67 percent (345,704 days) of the angling pressure was expended on trout lakes. With the increase of fishing pressure in recent years, large trout regulations have been adopted on several lakes to provide anglers the opportunity to catch larger fish. The monitoring of the fisheries resources is an ongoing effort to update the management programs for maintaining or improving the fisheries.

OBJECTIVES AND DEGREE OF ATTAINMENT

1. To manage lake and reservoir water levels to minimize impacts on fish populations. Objective accomplished utilizing state funding.

2. To maintain water quality at present levels as measured by Water Quality Bureau. Objective accomplished utilizing state funding.

3. To maintain aquatic habitat at a level capable of sustaining existing populations. Objective accomplished using state funding.

4. To increase the opportunity to catch larger trout (14" at 0.5 fish/hour) in specified lakes. Objective accomplished.

5. Provide lake fisheries to sustain an increase of 32,600 angler days by 1992 through natural reproduction and hatchery plants. Provide kokanee fisheries for 12"-14" fish at a catch rate of 1 fish per hour. Objective accomplished. A supplemental report of the Lake Mary Ronan summer creel census will be completed in FY91.

6. To provide a variety of trout sizes and species for angling and prey on stunted salmon. Objective accomplished. Introduced kamloops trout into Lake Koocanusa and Little Bitterroot Lake. Continued planting kamloops into Lake Koocanusa and Little Bitterroot Lake and brown trout into Noxon Rapids Reservoir.

7. To manage regulations and stocking to protect or expand species of special concern. Objective accomplished with state funding. A supplemental report on fish genetics of westslope cutthroat trout for several high mountain lakes has been completed (F-46-R-2, I-a, Species of Special Concern Segment).

8. To develop management plans to adapt to the introduction of Mysis and other unwanted species. Objective partially accomplished. Mysis population trends are being monitored annually in several lakes where kokanee and mysids co-exist to determine impacts on fish communities.

9. Coordinate with other agencies to maintain fisheries and water quality at or above present levels. Objective was accomplished using state funding.

10. To encourage public participation in understanding the problems and strategies of resource management. Numerous area sportsman's meetings were attended by Department personnel. Objective accomplished.

11. Attempt to acquire and provide facilities on all lakes and reservoirs capable of sustaining more than 300 man days of fishing per year on a priority basis at the rate of one lake per year. In FY90, access was acquired on Horseshoe Lake near Ferndale and donated on the Thompson Chain of Lakes by Champion International Corporation. Objective was accomplished using state funding.

PROCEDURES

A winter creel census was conducted at Lake Mary Ronan to monitor fishing pressure and kokanee harvest trends. Information derived from fishermen interviews included number of anglers per party, hours fished, fish caught, fish

species, and residency of anglers. Traffic counters were installed at two locations to enumerate vehicle traffic by fisherman accessing the lake. Total angling pressure and fish harvest estimates were expanded from traffic counter and angler interview data.

A summer creel census was initiated in May of 1989. Data were collected from angler interviews and expanded using boat counts at 2-hour intervals on weekend days and randomly selected weekdays.

Information collected included the number of fishermen in a party, angler residency, type of trip (complete-incomplete), hours fished, fish caught (kept-released), species, and method of angling. Notes were also recorded on weather conditions and surface water temperatures.

Lake fish population surveys were conducted using both sinking and floating experimental nylon gill nets measuring 6 feet deep by 125 feet in length with a bar mesh size of 3/4, 1, 1 1/2, 1 3/4, and 2 inches. A monofilament net 100 foot by 16 feet deep with bar mesh size of 1/2 and 3/4 inch was used to fish kokanee in Little Bitterroot and Foy lakes. A 300 foot beach seine was employed to collect samples of mature salmon in conjunction with kokanee spawn-taking operations. Kokanee redd counts were conducted on Swan Lake to monitor spawner population trends.

Lake gauge elevations were measured with a standard USGS 6.33 foot staff gauge to determine storage capacity measurements of Ashley Lake. Flow releases from Ashley Lake were measured with a continuous recording gauge.

Zooplankton samples were collected using a conical Wisconsin plankton net of 153 micron nitex mesh with a 0.2921 diameter opening. Replicate 30 meter vertical hauls were taken at each station. Samples were preserved in 4 percent formalin mixed with 40 grams per liter sucrose. Samples were then diluted to obtain 50-100 individuals in one milliliter subsamples. Cladocerans and copepods were identified in a Sedgewick-Rafter counting cell under 40 power magnification.

Mysid samples were collected during the dark phase of the moon in early June approximately 2 hours after sunset. Replicate depth hauls were taken through the entire water column using a conical Wisconsin style net one meter in diameter having a mesh size of 500 microns. Samples were preserved in 10 percent formalin, counted under a microscope and categorized as juveniles or adults (<10 mm and >10 mm in length respectively).

RESULTS AND DISCUSSION

Ashley Lake Water Levels

Ashley Lake water levels are regulated to minimize impacts of seasonal drawdowns on the downstream fishery and lake level fluctuations. Ashley Lake levels and Ashley Creek flows were above normal for the fall of 1989 and spring and summer of 1990.

Above normal precipitation in the fall of 1989, second highest on record, and the spring of 1990 created favorable instream flow conditions for Ashley

Creek. Saturated groundwater levels, aided by heavy rains in May, 1990, filled Ashley lake to capacity in early May. During the dry years of 1986, 1987, and 1988 instream flows became critically low in late summer because of low ground water levels, high demand for irrigation, and high evaporation rates.

In 1990, Ashley Lake reached full pool storage (19,224 acre feet) on May 25 even though downstream releases were higher in previous years. In 1989 downstream releases ranged from 11 to 19 cfs in May as compared to 16 to 38 cfs in May of 1990. The lake reached a seasonal high of 20,276 acre feet, 0.33 feet above the impoundment gates and overflow of the headgate continued about 40 days until early July. Average daily flows released from Ashley Lake for June, 1990, were 43.3 cfs and for July 28.1 cfs.

In the spring of 1990, three new headgates were installed replacing a single center headgate and two boarded gate openings in Ashley Lake Dam. Fish barriers were placed below each gate and trash racks above each gate were installed. The lake outflow was adjusted to 10 cfs according to the Department's Purchase Management Agreement.

Lake Mary Ronan Summer Census - 1989

A summer creel census was initiated at Lake Mary Ronan on May 20, 1989 (opening day), and continued through September 17, 1989, to provide total fishing pressure, fish harvest, and catch rates for the summer fishery. A creel census technician was employed to interview fishermen on all weekend days and holidays plus three week days per week. Boat and shore fishermen counts were made at two-hour intervals during census days to estimate daily fishing pressure. The count data was used to expand fishing pressure for periods of the day not censused and days not censused. A total of 87 days (72.5 percent of the total fishing days) were censused over the 120 days season.

During the summer of 1989, creel interviews were collected from 1,334 fishing parties representing 3,035 anglers. These anglers fished for a total of 11,503 hours and caught a total of 8,479 fish. Ninety percent of fish creeled were kokanee, nine percent westslope cutthroat trout, and one percent rainbow trout. Largemouth bass (20 fish) accounted for less than one percent of the catch. The average catch rate was 2.79 fish per angler and 0.74 fish per angler hour. A summary of the creel interview data is presented in Table 1.

Montana residents comprised 77 percent of the anglers and non-residents 23 percent. Montana residents by county were: Missoula 29 percent, Lake 28 percent, Flathead 25 percent, Sanders 6 percent, and others 12 percent. Non-resident included Idaho 38 percent, Washington 30 percent, California 13 percent, Oregon 6 percent and the remaining 13 percent of the anglers came from 15 other states and Canadian provinces.

The total estimated fishing pressure for the summer of 1989 was 27,831 angler-days. These anglers harvested 65,342 fish which included 59,209 kokanee, 5,159 westslope cutthroat, 878 rainbow trout, and 146 largemouth bass.

Table 1. Summary of Lake Mary Ronan summer creel census data, May 20 through September 17, 1989.

Time Period[1]	No. Parties	No. Anglers	Hours Fished	Total Fish[2]	Species				CPA	CPMH
					Kok	Wct	Rb	LmB		
Opening Day (1)	40	93	487.3	367	310	42	6	9	3.95	0.66
May (8)	121	249	950.3	813	620	167	22	4	3.26	0.86
June (21)	308	730	2716.8	2093	1800	231	56	6	2.89	0.77
July (2)	363	852	2910.0	2169	2088	64	16	1	2.54	0.75
August (22)	332	748	2806.0	1879	1743	119	11	6	2.53	0.67
September	171	363	1633.0	1141	1065	88	0	5	3.14	0.70
Season Total (87)	1334	3035	11503.3	8479	7626	711	111	31	2.79	0.74

[1]Number of days censused for each time period in parenthesis.
[2]Includes fish kept and released.
Legend: Kok = kokanee Wct = westslope cutthroat trout Rb = rainbow trout
LmB = largemouth bass CPA = catch per angler CPMH = catch per man hour

Total length measurements were taken from 594 kokanee, 116 westslope cutthroat trout, and 35 rainbow trout. Kokanee averaged 11.8 inches, ranging in size from 5.8 to 15.1 inches, cutthroat trout averaged 12.6 inches ranging from 10.3 to 15.5 inches and rainbow trout averaged 15.5 inches with a size range of 7.1 to 22.1 inches.

The total estimated annual fishing pressure and harvest (summer and winter) for 1989 is presented in Table 2. Added to the annual harvest figures are the number of adult salmon collected for egg taking purposes to supply hatchery production needs. These fish were donated to the local food bank and distributed to needy people in the Flathead Valley and surrounding communities.

Table 2. Lake Mary Ronan winter and summer fishing pressure and harvest estimates for 1989.

	Anglers	Harvest	Kok	Wct	Rb	Lmb	Harvest /Acre	Anglers /Acre
Winter 1989 Creel	8,132	71,561	70,416	1,145	0	0	47.5	5.4
Summer 1989 Creel	27,831	65,392	59,209	5,159	878	146	43.4	18.5
Oct.1989 Egg-Take	---	15,000*	15,000*	----	---	---	10.0	----
Totals for Entire Year	35,963	151,953	144,625	6,304	878	146	100.9	23.9

*Estimated number of kokanee taken for egg-taking purposes.

Total fishing pressure expended at Lake Mary Ronan in 1989 was 35,963

angler days. Winter anglers accounted for 23 percent of the angling pressure and summer anglers 77 percent. The total annual angler harvest was 136,953 fish. The angler harvest, winter versus summer, was almost equal with winter anglers catching 52 percent compared to 48 percent for summer anglers. Kokanee comprised 94 percent of the harvest, westslope cutthroat trout 5 percent, rainbow trout 0.5 percent and largemouth bass less than 1 percent.

The summer harvest of westslope cutthroat was almost four times greater during the summer as compared to the winter. Largemouth bass and rainbow trout were absent in the winter creel.

The total annual combined fish harvest, both angler harvest and adult kokanee collected for eggs during fall, was 151,953 fish. The combined harvest of kokanee was 144,625 fish of which 49 percent were taken by winter anglers, 41 percent by summer anglers and 10 percent by fall spawn-taking operations. The annual fishing pressure and fish harvest in terms of lake area (1,506 acres) was 23.9 anglers and a harvest of 100.9 fish per surface acre.

Lake Mary Ronan Winter Creel Census - 1990

A winter creel census was conducted at Lake Mary Ronan for the sixth consecutive year. Annual fisherman use and harvest trends can be used to formulate future management strategies to monitor or improve the fishery.

In 1990, a total of nine week days were censused at the state access site for the period of January 4 through March 15 (closing date of winter fishery). A traffic counter was installed at the entrance of the state access road to enumerate angling visits to the lake. However, only one traffic counter was available for use in 1990 and estimates of angling traffic accessing the west side road were derived from previous traffic counts of past winter use. A ratio of state access car counts to the west side access car counts using data from the 1986 winter census was selected for determining total winter fishing pressure. It was estimated that 77 percent of use occurred through the state access as compared to 23 percent use for the west side road. This was considered the most conservative use estimate over the past six years.

Angler interviews were taken from a total of 164 fishing parties representing 320 anglers of which 307 were completed trips. These anglers harvested a total of 2,325 fish of which 99 percent were kokanee with the remaining 1 percent comprising westslope cutthroat and rainbow trout (Table 3). Forty-nine percent of the anglers caught limits (10 fish daily) of kokanee while 95 percent were successful in catching one or more fish. The average catch for all fish species was 7.2 fish per angler at an hourly catch of 2.3 fish.

Total length frequency measurements were made for 1,259 kokanee. Age analysis was determined by scale readings and length frequency measurements. Two-year old fish comprised 56 percent of the catch, averaged 9.6 inches, and ranged between 8.4 and 10.5 inches. Three-year old fish comprised 44 percent of the catch, averaged 11.3 inches, and ranged between 10.6 and 13.0 inches. The average weight of II and III year old kokanee was 0.30 and 0.47 pounds respectively. A length frequency of kokanee measured from angler catch is shown in Figure 1.

Table 3. Summary of Lake Mary Ronan winter creel data, January 4 through March 15, 1990.

Census Day	No. Parties	Anglers	Total Hours Fished	Total Fish Caught	Kok	Wct	Rb	CPA	CPH	Limit Catch (Kok)
1/12	6	13	31.25	10	10	0	0	0.8	0.3	0
1/18	14	26	61.50	134	132	1	1	5.2	2.2	7
1/26	15	33	90.25	201	201	0	0	6.1	2.2	15
2/02	20	38	103.00	373	373	0	0	9.8	3.6	34
2/07	30	54	157.00	384	382	1	1	7.1	2.4	25
2/12	14	30	103.00	272	271	0	1	9.0	2.6	21
2/22	37	71	252.00	565	558	3	4	8.0	2.2	36
3/06	11	21	68.00	142	142	0	0	6.8	2.1	7
3/15	17	34	159.50	244	244	0	0	7.2	1.5	11
Totals/ Avg.	164	320	1025.50	2325	2313	5	7	7.3	2.3	156

Legend: Kok = kokanee Wct = westslope cutthroat trout Rb = rainbow trout
CPA = catch per angler CPH = catch per hour

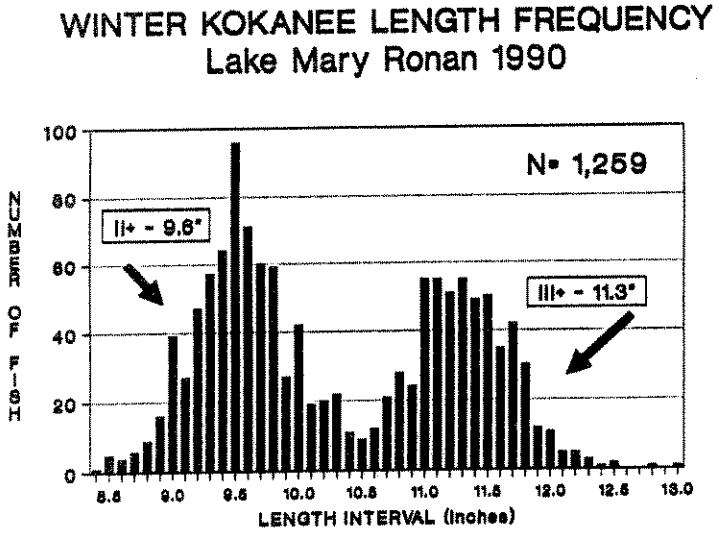

Figure 1. Kokanee length frequency, Lake Mary Ronan, winter, 1990.

The total estimated fishing pressure was 11,103 anglers resulting in a harvest of 81,066 fish. Kokanee comprised 99 percent of the harvest, a total of 80,255 fish. Westslope cutthroat trout and rainbow trout combined comprised the remaining 1 percent of the harvest, an estimated 811 fish. The total estimated fishing pressure and fish harvest is presented in Table 4.

Table 4. Fishermen car counts, fishing pressure, and harvest estimates for Lambeth State Park and west side access areas of Lake Mary Ronan, winter, 1990.

			State Park		Westside Road[1]		Totals	
Month	Interval	Days	No. Cars	No. Anglers	No. Cars	No. Anglers	No. Anglers[2]	No. Fish[3]
Jan	04-12	9	225	439	52	101	540	3942
	13-18	6	184	359	42	82	441	3219
	19-26	8	445	868	102	199	1067	7789
Feb	27-02	7	409	798	94	183	981	7161
	03-07	5	625	1219	144	281	1500	10950
	08-12	5	521	1016	120	234	1250	9125
	13-19	7	519	1012	119	232	1243	9081
	20-22	3	330	644	76	148	792	5782
	23-27	5	673	1312	155	302	1614	11782
Mar	28-01	2	124	242	29	57	299	2183
	02-06	5	293	571	67	131	701	5125
	07-08	2	60	117	14	27	144	1051
	09-10	2	80	156	18	35	191	1394
	11-14	4	111	216	26	51	267	1949
	15-end	1	30	59	7	14	73	533
Totals		71	4629	9028	1065	2077	11103	81066

[1]Estimated count using 23 percent ratio of state park counts.
[2]Estimate using 1.95, average number of anglers per party.
[3]Estimated using 7.3, average catch per angler.

Comparative winter fishing pressure and harvest estimates from 1985 through 1990 are shown in Table 5. Winter fishing pressure and fish harvest has increased by 92 percent and 91 percent respectively over the winter season of 1985. In comparison to the 1989 winter season, fishing pressure increased by 37 percent and fish harvest by 13 percent. In 1990 the average catch per angler decreased by 1.5 fish and the average catch per hour 0.7 fish as compared to 1989. The winter species composition harvest has remained fairly consistent since 1985 with kokanee comprising between 95 and 99 percent of the catch.

Table 5. Lake Mary Ronan winter creel estimates, 1985-1990.

Year	Anglers	Harvest	Catch/Angler	Harvest/Acre
1985	5,770	42,528	7.4	28.3
1986	3,732	19,927	6.0	13.3
1987	5,101	25,505	5.0	17.0
1988	5,230	25,209	4.8	16.8
1989	8,132	71,561	8.8	47.5
1990	11,103	81,066	7.3	53.8

Winter fishing catch rates of kokanee continue to hold up well despite increasing fishing harvest and pressure. Strong year classes of both II+ and III+ kokanee continue to provide the bulk of the fishery without exhibiting a decrease in size. The recent collapse of the Flathead Lake kokanee fishery and subsequent closure of its winter salmon season is believed to be related to accelerated pressure on the winter fishery.

Lake Mary Ronan Gill Net Surveys - Spring and Fall - 1989-1990

Annual gill net surveys are conducted in the spring and fall to monitor population trends and size of trout and kokanee. This has been an ongoing annual monitoring survey since 1965. A total of six gill nets (three floating and three sinking nets) are fished overnight for each sampling period. The catch results from 1987-1990 are presented in Table 6.

The average catch per net night (fall netting) of both I+ and II+ kokanee decreased from 18.7 to 8.7 fish per net night. Both age classes showed a slight decrease in average total length.

A strong year class of I+ kokanee again emerged in the spring of 1990 which would indicate a good survival of fry plants made in 1989. The average size of all these year classes of kokanee exhibited increases in total length as compared to 1989.

The total length of westslope cutthroat trout decreased in average length, both in the fall of 1989 and the spring of 1990. The reduction in growth is believed to be the result of smaller size yearling cutthroat stocked at a later date in 1989. In 1988 cutthroat were stocked in mid-May as 4.9" fish. In 1989, cutthroat were stocked one month later as 3.9" fish.

Rainbow trout numbers decreased in both the spring and fall netting series averaging 1.5 and 1.7 fish per net night respectively. There appeared to be little variation in size in average total length compared to last year's gill net sampling.

Table 6. Comparison of Lake Mary Ronan gill net catch data of kokanee and trout for spring and fall netting series, 1987 through 1990. (Mature spawning kokanee not included in fall netting data.)

	Fall 1987				Fall 1988				Fall 1989			
Spp	No.	Avg. Catch/ Net	Avg. Lgth	Std. Deviation	No.	Avg. Catch/ Net	Avg. Lgth	Std. Deviation	No.	Avg. Catch/ Net	Avg. Lgth	Std. Deviation
Kok I+	18	3.0	8.7	0.35	88	14.7	9.0	0.39	43	7.2	8.7	0.35
Kok II+	5	0.8	10.4	0.34	24	4.0	10.9	0.35	9	1.5	10.8	0.49
Avg. Comb	23	3.8	9.1	---	58	18.7	9.3	---	52	8.7	9.0	---
Rb	9	1.5	15.3	4.99	16	2.6	13.5	3.52	11	1.7	13.9	---
Wct	23	3.8	10.5	0.66	34	5.7	10.5	1.20	10	1.7	9.1	---

	Spring 1988				Spring 1989				Spring 1990			
Spp	No.	Avg. Catch/ Net	Avg. Lgth	Std. Deviation	No.	Avg. Catch/ Net	Avg. Lgth	Std. Deviation	No.	Avg. Catch/ Net	Avg. Lgth	Std. Deviation
Kok I+	19	3.2	7.1	0.35	4	0.7	6.6	0.32	28	4.7	7.1	0.42
Kok II+	16	2.7	9.8	0.44	20	3.3	9.5	0.36	20	3.3	9.8	0.51
Kok III+	17	2.8	11.7	0.54	7	1.2	11.1	0.37	5	0.8	11.7	0.72
Avg Comb	52	8.7	9.4	---	31	5.2	9.1	---	53	8.8	9.5	---
Rb	1	0.2	16.0	0.00	16	2.7	16.2	3.0	9	1.5	15.8	---
Wct	18	3.0	11.9	0.50	5	0.8	11.8	1.40	8	1.3	10.0	---

Legend: Kok = kokanee Rb = rainbow Wct = westslope cutthroat Avg Comb = Average Combination

Lake Monitoring of Kokanee Populations

In 1989, six lakes were sampled to monitor size trends (total length) of mature spawning kokanee. A summary of the average length of mature male and female kokanee collected is presented in Table 7.

Table 7. Average total length of spawning kokanee collected from selected lakes in the fall of 1989.

Lake	Surface Acres	Sampling Method*	Males				Females			
			No. Fish	Avg. Lgth (Inch)	Std. Deviation	Size Range (Inch)	No. Fish	Avg. Lgth (Inch)	Std. Deviation	Size Range (Inch)
Ashley	3244	G	25	11.5	0.40	10.6-12.1	25	10.9	0.33	10.3-11.5
Glen	340	E	16	14.6	1.32	11.0-17.0	25	15.2	0.97	12.4-16.5
Holland	408	G	2	11.8	1.06	11.0-12.5	0	-	-	-
Lake Mary Ronan	1506	S	25	13.2	0.66	11.9-14.5	25	13.0	0.67	11.7-14.4
Lindbergh	725	G	1	10.5	-	-	1	10.3	-	-
Swan	2680	G	25	10.5	0.42	9.8-11.4	25	10.1	0.36	9.5-11.0

*G = gill net E = electrofishing S = seining

Fish were collected by one of three methods: beach seining, gill nets, and electrofishing. The data collected is used in part to formulate future management strategies, primarily adjustment of stocking numbers and creel limits for individual waters.

Swan Lake kokanee (male) averaged 10.5 inches in 1989, an increase of 2.1 inches over 1988. Similarly, Ashley Lake male kokanee increased from 10.6 inches in 1988 to 11.5 inches in 1989. The increase in size may be in response to the liberalization of the kokanee daily bag limit from 35 fish in 1986 to 50 fish in 1988.

Lake Mary Ronan kokanee have shown little variation in size over the past several years. In 1989 male kokanee averaged 13.2 inches, the same as in 1988.

Glen Lake kokanee decreased from 15.5 inches in 1988 to 14.6 inches in 1989. The sample size of kokanee collected from Holland and Lindbergh was too small to make any determination on size structure.

Hubbart Reservoir was initially stocked with 50,000 kokanee fry in the spring of 1989 and again in 1990. A four-year experimental stocking program will continue to determine if kokanee will successfully survive and reproduce in this system. Gill net surveys will be conducted in the fall of 1990 to evaluate the survival of yearling fish stocked in 1989.

Kokanee egg collection efforts for the statewide hatchery production program were concentrated at Lake Mary Ronan in 1990. Electrofishing attempts to collect kokanee were relatively unsuccessful at Ashley, Swan, and Glenn lakes.

A total of 4.7 million eggs were taken during 16 egg collecting trips in 1989, 98 percent of which were spawned at Lake Mary Ronan. Saturated ground water flows at traditional shoreline spawning areas concentrated spawning fish, facilitating the capture of fish. Approximately 15,000 fish were collected, spawned out and donated to the Flathead County Food Bank for distribution to needy people in the area.

Shoreline kokanee redds were counted during late November and early December from 1987 to present in Swan Lake to monitor spawner numbers. Historic shoreline spawning sites were delineated for enumeration. The following totals were derived: 1987 - 1,885, 1988 - 1,555, 1989 - 1,941. A significant decline in the counts might suggest impacts from Mysis or other factors, however none were noted.

Small Lake Surveys

Gill net surveys were conducted for six small lakes in the summer and fall of 1989. Winter dissolved oxygen levels were determined for three lakes in late winter of 1990. Results of gill nets surveys are presented in Table 8.

Table 8. Summary of gill net catches from six small lakes (average total lengths of fish in parenthesis).

Lake	Surface Acres	Max Depth	Bottom Net Sets	Fish Caught	Eb	RSS*	Ps	Yp	LnSu
Track	4.6	20	2	0	-	-	-	-	-
Smokey	6.0	60	2	4	4	*	-	-	-
Upper Sunday	7.9	30	3	18	1 (7.2")	*	17 (3.9")	-	-
Burnt	4.8	40	1	5	5 (8.8")	*	-	1 (11.5")	-
Smokey	6	60	2	4	4 (11.0")	*	-	-	-
Lower Martin	5.3	20	1	8	-	-	-	-	8 (17.4")

Legend: Species: Eb = brook trout RSS = redside shiner PS = pumpkinseed
YP = yellow perch LnSu = longnose sucker
* = numerous fish observed but not netted

Track Lake

This 4.6 acre closed basin lake is located in the Kootenai River drainage near Stryker. It is believed to have winter killed due to low water and oxygen levels during the winter of 1988-89. The lake supported populations of small pumpkinseed and largemouth bass. The lake level rose 4-5 feet in the summer of 1989 and had a maximum depth of 20 feet with an average depth of 10 feet.

Two gill nets set overnight on September 21-22, 1989 yielded no fish confirming the lake had totally winter killed the previous winter. Observations of large Gammarus populations seem to indicate excellent forage potential for rainbow trout introductions. The lake was stocked with 1,500, 6-inch fish in the fall of 1989. However, dissolved oxygen concentrations taken below the ice at two stations in March of 1990 were critically low ranging from 1.5 to 0.2 ppm. A complete winter kill was expected by the spring of 1990. The resource manager for Kootenai National Forest reported a serious winter kill after ice-out in April 1990. However, some fish apparently were caught by anglers later in the season. In 1990, water levels continued to rise to a height of 10 feet higher than the summer of 1989.

Smokey Lake

Smokey Lake is located in Flathead County and approximately 7 miles south of Stryker has a surface area of approximately 6 acres. The maximum depth is 60 feet.

Emergent vegetation (water lilies) borders most of the shoreline. Numerous submerged logs and trees provide excellent shoreline fish habitat. The inlet and outlets have flows of less than 1 cfs.

Gill net surveys were conducted 1983 and 1989. In 1983 two bottom nets were set August 17, 1983, resulting in a catch of 4 brook trout ranging in size of 8.5"-14.1" and averaging 11.0". In 1989 one bottom set yielded no fish. Numerous schools of redside shiners were observed on both occasions.

There appears to be low densities of brook trout in Smokey Lake despite stocking efforts. Brook trout are stocked every third year (approximately 3,000 2-inch brook trout). As in Burnt Lake, redside shiners dominate and are believed to be a competitive factor in survival of brook trout plants.

Upper Sunday Lake

Upper Sunday Lake is located approximately 5 miles south of Stryker. It has a surface area of 7.9 acres with a maximum depth of 30 feet. A series of sounding transects were made and depth contours were plotted. The lake has an average depth of 10-12 feet and a total volume of 768.2 acre feet. It has an intermittent inlet and outlet that flows only during the spring runoff period.

Three bottom gill nets set September 21, 1989, overnight yielded 17 small pumpkinseeds averaging 3.9 inches and one brook trout 7.2 inches. Numerous redside shiners were observed cruising the shoreline.

Lower Martin Lake

Lower Martin Lake is located approximately 3 miles east of Olney. It has a surface area of 5.3 acres with an average depth of about 20 feet. The lake is fed by a small spring stream draining from Upper Martin Lake.

Initial gill net surveys were conducted by helicopter in July of 1969. One gill net yielded 10 finescale suckers. In October of 1989 one gill net set overnight yielded 8 finescale suckers averaging 17.4" and 2.24 pounds.

Several years ago, northern pike were indiscriminately introduced by misinformed fishermen into Upper and Lower Martin lakes. Although northern pike were not captured in the gill net, several small (14"-16") pike were observed cruising the shoreline.

Burnt Lake

Burnt Lake is a closed basin lake located about 7 miles south of Stryker. It has a surface area of 4.8 acres and a maximum depth of 40 feet.

The lake was initially surveyed by helicopter in 1969. One gill net set July 11, 1969 yielded no fish. The lake is moderately alkaline (total alkalinity 144, pH 7.55 and specific conductance of 300 micro MHoS). Following the survey, the lake was stocked with 1" brook trout in 1969, followed by subsequent plants of 2" fish in 1985 and 1986.

One gill net set overnight September 11, 1989 yielded 5 brook trout averaging 8.8" and 1 yellow perch 11.5". The lake also supports an extremely large population of redside shiners.

The brook trout had large heads and elongated body shapes. This indicates poor growth, a result of severe competition by dominate redside shiner populations.

Special Trout Regulation Lakes

A spot creel census was conducted at No-Tellum Lake on 12 weekend days between June 29 and August 5, 1990. Angler contacts were made only four occasions. Four parties were contacted representing 9 anglers, all from Flathead County. Total fishing time expended was 10.5 hours during which time 6 fish were caught and released. These included 3 rainbow trout averaging 12 inches and 3 westslope cutthroat averaging 13 inches. It appears that angler use in mid-summer is low, probably due to warm water temperature and declining fish activity.

Large Lake Surveys

The fish populations of four large lakes, Whitefish, Little Bitterroot, Tally, and McGregor, were sampled in June of 1990. A summary of the netting data is shown in Table 9.

Table 9. Summary of gill net catch data for Whitefish, Little Bitterroot, Tally, and McGregor lakes, June, 1990.

Little Bitterroot Lake

				Avg.	Avg.Catch	Avg.Catch
Kokanee	5	8.3	6.9-9.3	0.18	1.0	0.7
Longnose Sucker	12	14.1	9.5-17.0	1.20	0.0	2.0
Peamouth	15	9.0	7.7-10.0	0.23	2.7	2.3

Whitefish Lake

Species	No. Fish	Avg.Lenth (Inch)	Length Range	Avg. Weight (lbs.)	Avg.Catch Per Net (Surface)	Avg.Catch Per Net (Bottom)
Westslope Cutthroat	1	6.7	-	0.10	0.14	0.0
Bull Trout	4	11.6	10.7-13.7	0.18	0.0	0.6
Lake Trout	19	15.9	9.1-27.6	1.26	0.3	4.5
Lake Whitefish	52	16.1	15.0-18.2	1.24	12.0	1.0
Mountain Whitefish	1	10.6	-	0.38	0.0	0.3
Northern Pike	3	16.9	15.8-17.5	1.31	0.7	0.3
Longnose Sucker	3	10.5	6.3-18.2	0.84	0.3	0.6
Squawfish	46	9.5	6.5-19.4	0.90	13.3	2.0
Peamouth	1	10.4	-	0.34	0.3	0.0
Yellow Perch	1	6.0	-	0.07	0.0	0.1

Tally Lake

Species	No. Fish	Avg.Length (Inch)	Length Range	Avg. Weight (lbs.)	Avg.Catch Per Net (Surface)	Avg.Catch Per Net (Bottom)
Kokanee	5	9.1	7.8-9.7	0.23	0.0	2.5
Lake Trout	2	21.9	12.7-31.0	6.10	0.5	0.0
Rainbow Trout	1	8.5	-	0.25	0.0	0.3
Northern Pike	15	17.9	13.5-26.5	2.01	3.3	1.0
Largescale Sucker	8	15.6	10.5-18.6	1.37	2.0	0.0
Longnose Sucker	9	11.9	6.5-15.6	1.10	2.3	0.0
Squawfish	7	12.6	7.1-16.6	0.83	1.8	0.0

McGregor Lake

Species	No. Fish	Avg.Length (Inch)	Length Range	Avg. Weight (lbs.)	Avg.Catch Per Net (Surface)	Avg.Catch Per Net (Bottom)
Lake Trout	8	18.6	15.0-23.5	2.20	0.0	1.3
Rainbow Trout	2	17.8	17.5-18.0	2.61	0.0	0.3
Mountain Whitefish	19	12.5	9.0-17.0	0.74	0.0	3.2
Largescale Sucker	83	-	-	-	-	13.8

Little Bitterroot Lake

Gill net sampling was accomplished using 3 floating and 3 sinking gill nets in an attempt to determine the status of recent kamloops introductions. Kamloops were introduced for the past three years with 7"-9" fish. None were captured in gill net efforts, but anglers reported catching marked fish 14"-16" long in the winter of 1989 and spring of 1990. A total of 5 kokanee were caught averaging 8.3 inches in floating sets. Other non-game species collected were peamouth and longnose suckers.

Whitefish Lake

Four sinking and three floating gill net sets were used to sample Whitefish Lake. Lake whitefish comprised 68 percent of the game fish catch followed by lake trout with 25 percent. Bull trout, northern pike, westslope cutthroat trout, and mountain whitefish comprised the remainder of the catch.

Lake whitefish numbers were down compared to catch data compiled in 1985. In 1984, the catch per net night (sinking nets) was 12.8 fish increasing to 29.0 fish in 1985. However, the average size increased from 13.0 inches in 1985 to 16.1 inches in 1990. Lake trout numbers increased from 3.7 fish (bottom sets) in 1985 to 4.5 in 1990. The average size remained the same at 15.9 inches. The other game species showed little variation when compared to the 1985 netting data.

Survival of westslope cutthroat trout from annual spring plants of 50,000 yearling fish continues to be a problem. In 1991 yearling cutthroat will be planted out in the fall to release a larger fish less subject to predation.

Tally Lake

Four sinking nets and two floating nets were used to sample fish populations in Tally Lake. Northern pike from unauthorized introductions about five years ago have become the dominant game species occupying the littoral areas of the lake. Two lake trout were captured, a 31 inch, 11.7 pound and a 12.7 inch, 0.5 pound fish. Although occasional lake trout are taken from Tally Lake, this was the first occurrence of fish taken by gill net. In 1985 and 1980, two small plants of 6 inch lake trout from the Bozeman fish hatchery were stocked to enhance the lake trout fishery and utilize small size kokanee and abundant non-game fish as forage.

McGregor Lake

McGregor Lake was sampled with 6 sinking nets in late June. Catch rates of both lake and rainbow trout were low, averaging 1.33 and 0.33 fish per net night respectively. However, rainbow exhibited excellent growth, averaging 17.8 inches and 2.61 pounds. Mountain whitefish were the most abundant game fish caught averaging 3.2 fish per net night. Large numbers of gravid largescale suckers were netted as the fish moved in-shore to spawn.

Of special interest was the initial capture of large crayfish, believed to be Orconectes pacifastacus. Crayfish became entangled on the bottom portion of

gill nets set along the northeast shoreline. A total of 62 crayfish were collected up to 6 inches, total length.

Mysis Monitoring

In Ashley Lake mysid numbers increased substantially from 1985 to 1986 (12.1m^2 to 37.0/m^2) (Table 10). During 1987 densities more than doubled to a high of 86.3/m for the period 1983-1988.

Table 10. Average lakewide June Mysis densities (no./m^2) for selected lakes.

		No./m^2							
Lake	Size	1983*	1984	1985	1986	1987	1988	1989	1990
Ashley	Juveniles (<10mm)	-0-	4.3	3.8	25.8	70.7	57.3	56.1	136.0
	Adults (≥10mm)	1.3	8.7	83	1.2	15.6	19.1	32.8	36.0
	Combined	1.3	13.0	12.1	37.0	86.3	76.4	88.9	172.0
Little Bitterroot	Juveniles	-0-	8.6	12.7	19.4	8.6	6.4	16.2	56.1
	Adults	7.3	15.9	9.2	7.0	13.1	8.0	8.3	16.2
	Combined	6.1	13.7	3.8	11.8	30.3	62.7	52.9	107.7
Swan	Juveniles	-0-	37.9	69.4	108.9	53.2	73.2	46.8	134.4
	Adults	20.1	33.1	25.5	142.7	169.4	51.6	56.7	65.3
	Combined	20.1	71.0	94.9	251.6	222.6	124.8	103.5	199.7
Whitefish	Juveniles	-0-	67.5	207.0	151.9	52.9	80.9	130.4	180.1
	Adults	18.5	18.8	22.0	23.9	12.1	10.5	22.9	22.3
	Combined	18.5	86.3	229.0	175.8	65.0	91.4	153.3	202.4

*30 meter hauls using a larger mesh net were used in 1983.

In 1990 all monitored lakes revealed a substantial increase in mysid densities from the previous year. Ashley, McGregor, and Swan lake mysid numbers nearly doubled from 1989 while Little Bitterroot and Whitefish lakes showed substantial increases.

Zooplankton trends offer little evidence of a predator-prey relationship as shown in Table 11.

Table 11. Mean lakewide zooplankton densities (no.liter) from regional *Mysis* monitoring lakes during June, 1985-1990.

		Cladocerans			Copepods			
Lake	Year	Daphnia	Bosina	Total	Epischura	Diaptomus	Cyclops	Total
Ashley	1985	0.6	0.3	0.9	0.5	-0-	8.0	8.5
	1986	1.4	0.7	2.1	-0-	-0-	14.3	14.3
	1987	-0-	21.6	21.6	-0-	-0-	13.7	13.7
	1988	0.6	15.4	16.0	0.1	-0-	19.2	19.3
	1989	1.3	15.9	17.2	0.1	0.2	18.2	18.5
	1990	0.1	1.7	1.8	-0-	-0-	25.3	25.3
Little Bitterroot	1985	0.1	0.6	0.7	0.5	-0-	6.0	6.5
	1986	-0-	1.6	1.6	0.2	-0-	10.3	10.5
	1987	0.8	26.5	27.3	0.1	-0-	13.4	13.5
	1988	-0-	5.4	5.4	0.4	-0-	6.1	6.5
	1989	0.4	6.1	6.5	-0-	0.1	4.9	5.0
	1990	0.3	10.4	10.7	0.2	0.1	3.9	4.2
Flathead	1985	2.0	0.8	3.7	0.1	25.8	1.8	27.7
	1986	0.1	0.1	0.2	0.1	13.0	0.8	13.9
	1987	0.1	-0-	0.1	0.9	3.1	0.4	4.4
	1988			----------N/A----------				
	1989			----------N/A----------				
	1990			----------N/A----------				
McGregor	1985	4.4	0.1	4.5	0.2	0.2	0.1	0.5
	1986	3.5	-0-	3.5	0.2	-0-	-0-	0.2
	1987	1.7	0.1	1.8	-0-	0.1	-0-	0.1
	1088	1.1	0.1	1.2	-0-	-0-	-0-	-0-
	1989	3.4	0.6	4.0	-0-	0.1	-0-	0.1
	1990	1.3	1.7	3.0	-0-	0.2	-0-	0.2
Swan	1985	-0-	-0-	-0-	0.1	5.2	1.0	6.1
	1986	-0-	-0-	-0-	9.3	1.4	0.9	2.6
	1987	-0-	0.4	0.4	2.3	8.2	-0-	10.5
	1988	0.1	0.8	0.9	1.2	4.7	2.8	8.7
	1989	0.1	0.4	0.5	-0-	3.9	2.5	6.4
	1990	-0-	0.2	0.2	0.4	1.9	2.1	4.4
Whitefish	1985	0.4	0.3	0.7	0.1	-0-	11.0	11.1
	1986	3.3	1.5	4.9	-0-	-0-	11.4	11.4
	1987	3.6	5.7	9.3	5.9	0.1	-0-	6.0
	1988	3.2	3.5	6.7	-0-	-0-	18.1	18.1
	1989	1.2	1.7	2.9	-0-	0.1	18.7	18.8
	1990	0.3	3.1	3.4	0.3	0.1	21.9	22.3

Land Acquisition

In 1990, two major fishing access sites were acquired in Region One: Horseshoe Lake south of Ferndale and the Thompson Chain of Lakes access west of Kalispell.

The Montana Fish and Game Commission purchased a 22.6 acre tract of land on Horseshoe Lake. The site was purchased from Champion International Corp. and development will include a parking area and a boat ramp. Smallmouth bass were first introduced into Horseshoe Lake in 1914 and produced a state record fish in 1975.

The Thompson Chain of Lakes acquisition came in the form of a donation to the Department of Fish, Wildlife and Parks from Champion International Corporation with the assistance of the Conservation Fund, a non-profit organization located in Arlington, Virginia. The land encompasses 3,918 acres scattered over a 23 mile stretch along Highway 2 between Kalispell and Libby. The property involves lakeshore frontage on several large lakes including McGregor, Lower, Middle and Upper Thompson lakes, Loon, Crystal, and Horseshoe lakes, and 14 smaller lakes all vital to the fishing management program in Region One. This acquisition increases the Department lands in Region One by 20 percent and is regarded as one of the finest public lake and forest recreation lands in the country.

RECOMMENDATIONS

1. Continue monitoring winter fishing pressure at Lake Mary Ronan by monitoring traffic counter data at the state park and west shore access.

2. Close monitoring of the winter fishery should continue to keep winter harvest rates in balance with the summer fishery. If mounting winter fishing pressure and harvest continues at the expense of the summer fishery, a reduced bag limit or shortening of the season may be necessitated to balance out the fishery.

3. Continue spring and fall gill net surveys at Lake Mary Ronan.

4. Discontinue annual Mysis monitoring on the five lakes. Intensify monitoring on Ashley and Little Bitterroot lakes to document mysid/kokanee interactions. Monitoring would include: seasonal kokanee food habits, kokanee age and growth, and seasonal zooplankton and Mysis densities for food availability index.

5. Continue monitoring kokanee populations in 16 kokanee lakes every 1-4 years on a scheduled basis to evaluate changes in fish populations and the success of new kokanee introductions in Hubbart Reservoir.

6. Special Trout Regulation Lakes: These lakes include No Tellum, Spencer, Bootjack, and Woods. Initiate creel census in 1991 during the early summer months to determine fisherman use, catch rates, and average size of angler catch. Also included should be an angler attitude survey to measure acceptance of special regulation lakes.

7. Continue regulating water levels at Ashley Lake to provide adequate flow for fisheries downstream.

8. Continue monitoring success of kamloops introductions in Little Bitterroot Lake.

9. Evaluate cutthroat trout stocking methods in Holland and Lindbergh lakes.

10. Small Lake Surveys:
    a. With the added depth in Track Lake, a second attempt will be made to stock rainbow trout in the fall of 1990.
    b. It is recommended that Smokey Lake be rehabilitated with rotenone in fall of 1990 and introduce westslope cutthroat trout. Additional sounding data will be needed to complete a hydrographic map to determine lake volume for rotenone treatment.
    c. Recommendations are to rehabilitate Upper Sunday Lake with rotenone and introduce native westslope cutthroat trout in 1991.
    d. The U. S. Forest Service in conjunction with the Department of Fish, Wildlife and Parks has proposed a future eradication plan to eliminate pike in the Lower Martin Lake drainage and re-establish westslope cutthroat trout in 1991 or 1992. Lake volumes have been plotted for Lower Martin Lake. Additional sounding data is needed to complete a hydrographic map for the upper lake to determine rotenone needs.
    e. Recommendations are to rehabilitate Burnt Lake with rotenone and introduce native westslope cutthroat trout. The rotenone renovation project is a joint venture with the U. S. Forest Service and is scheduled for treatment in September of 1990.
    f. Renovate Banana Lake with rotenone fall of 1990 to remove nongamefish and manage as a stocked lake for rainbow or cutthroat trout using state funding. (Refer to small lake surveys F-46-R-1).
    g. Survey 5-10 lakes each year to update management recommendations for increasing trout fishing opportunities in small coldwater lakes.

LITERATURE CITED

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Waters referred to:

Ashley Lake (07-5220-03)
Burnt Lake (07-5590-03)
Foy Lake (07-6420-03)
Holland Lake (07-6780-03)
Hubbart Reservoir (07-6840-95)
Horseshoe Lake (11-8520-03)
Lake Mary Ronan Lake (07-7700-03)
Little Bitterroot Lake (07-7300-05)
Lower Martin Lake (07-7660-03)
McGregor Lake (05-9216-03)
Noxon Rapids Reservoir (05-9328-05)
Swan Lake (07-9000-05)
Topless Lake (11-9830-03)
Upper Sunday Lake (07-8980-03)
Banana Lake (11-7852-04)
Crystal Lake (11-8180-03
Glen Lake (11-8380-03)
Horseshoe Lake (07-6800-04)
Hungry Horse Resv. (08-8860-05)
Lake Koocanusa (11-8690-05)
Lindbergh Lake (07-7260-03)
Loon Lake (11-8940-03)
Lower Thompson Lake (05-9152-03)
Middle Thompson Lake (05-9232-03)
Smokey Lake (07-8745-03)
Tally Lake (07-9060-03)
Track Lake (07-9110-03)
Upper Thompson Lake (05-9760-03)

Key Words: Cyclops, Daphnia, Bosmina, kokanee, rainbow, Mysis

Fish species referred to:
brook trout - Salvelinus fontinalis
bull trout - Salvelinus confluentus
kokanee - Oncorhynchus nerka
lake trout - Salvelinus namaycush
lake whitefish - Coregonus clupeaformis
largescale sucker - Catostomus macrocheilus
longnose sucker - Catostomus catostomus
mountain whitefish - Prosopium williamsoni
northern pike - Esox lucius
peamouth - Mylocheilus caurinus
pumpkinseed - Lepomis gibbosus
pygmy whitefish - Prosopium coulteri
rainbow trout - Oncorhynchus mykiss
redside shiner - Richardsonius balteatus
squawfish - Ptychocheilus oregonensis
westslope cutthroat trout - Onchorynchus clarki lewisi
yellow perch - Perca flavescens

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