MONTANA DEPARTMENT OF FISH AND GAME
FISHERIES DIVISION

JOB PROGRESS REPORT

State Montana

Project No. F-7-R-23 Title Northwest Montana Fisheries Investigation

Job No. I-a Title Inventory of waters of the project area

Period Covered April 1, 1973 through March 31, 1974

ABSTRACT

Fish population surveys were conducted in 28 lakes and 8 streams in Region One to provide information for the management of these waters. Water chemistry data (total alkalinity, standard conductance, pH) were collected for most waters. Summer dissolved oxygen-temperature profile data were collected for several lakes.

Fish population estimates were calculated for a 9,000 foot section of the Thompson River.

BACKGROUND

This is a continuing project designed to accumulate and update physical, chemical and biological data on lakes, streams and reservoirs and to prescribe management practices where needed.

PROCEDURES

Experimental gill nets 125 feet long and 6 feet deep of 3/4- to 2-inch graduated mesh were used to sample fish populations in lakes. A mite-lite 110 volt generator in conjunction with a variable voltage pulsator was the power source used for electrofishing to sample stream fish populations. Individual total length and weight of fish were recorded and scale samples collected. Lake depths were measured with a Lowrance Fish-Lo-K-Tor. All data contained in this report are kept on file at Region One Headquarters.

FINDINGS

The following fish species were collected from lake and stream surveys conducted between April 1, 1973 and March 31, 1974. Game species collected were rainbow trout (Salmo gairdneri), cutthroat trout (Salmo clarki), brook trout (Salvelinus fontinalis), Dolly Varden (Salvelinus malma), mountain whitefish (Prosopium williamsoni), kokanee (Oncorhynchus nerka), and largemouth bass (Micropterus salmonides). Non-game species found were: yellow

perch (Perca flavescens), pumpkinseed (Lepomis macrochirus), northern squawfish (Ptychocheilus oregonensis), largescale sucker (Catostomus macrocheilus), longnose sucker (Catostomus catostomus), peamouth (Mylocheilus caurinus), redside shiner (Richardsonius balteatus), longnose dace (Rhinichthys cataractae) and slimy sculpin (Cottus cognatus).

Fish population surveys were conducted on 28 lakes and 8 streams in the Region where additional data were needed for management. A summary of the lake and stream data, along with identifying codes, are shown in Tables 1 and 2. Water chemistry data, pH, alkalinity and specific conductance were collected for most waters surveyed and are presented in Table 3. Summer dissolved oxygen-temperature data for several lakes is presented in Figure 1.

Lake Surveys

Flathead River Drainage

Lake population surveys conducted in the Flathead River drainage include: Bull, Bunyan, Chinook, Dog, Fish, Halfmoon, Hidden, Hubbart Reservoir, Lake Five, Lake Mary Ronan, Little Bitterroot, Louis, Lupine, Meadow, Mud and Upper Sunday.

Bull Lake

Bull Lake, 107 acres with a maximum depth of 52 feet, was netted in late June of 1973 to determine the status of the game fish population. Two overnight gill net sets caught a total of two cutthroat trout, 75 pumpkinseed and several redside shiners.

The only access by road to Bull Lake is through land leased by the State Forest Service to a private boat and cabin rental concession. It is recommended that negotiations be made with the State Forest Service to provide unrestricted road access to Bull Lake. After public access is made available, the lake should be rehabilitated and stocked with westslope cutthroat trout.

Bunyan Lake

Bunyan Lake is located approximately 1/4 mile below Meadow Lake and is fed by the outlet tributary stream of Meadow Lake. Bunyan Lake has a surface area of 9.2 acres with a maximum depth of 44 feet. Suitable gravel areas are present in the inlet stream and numerous fry and trout fingerlings were observed. However, over head streambank cover between the two lakes has been removed by clear-cut logging. One overnight gill net set yielded 16 westslope cutthroat trout ranging between 7.6 and 12.4 inches. Natural reproduction and possible downstream movement of fish from Meadow Lake have maintained fish populations in Bunyan Lake. No further recommendations are anticipated other than restoring streambank cover through natural revegetation.

Chinook Lake

Chinook Lake, a small closed basin lake of 8 acres with a maximum depth of 30 feet, is located in the Stillwater River drainage, three miles northeast of Tally Lake. An initial fish population survey was conducted in August of 1973 to determine the status of the cutthroat population following a reported winter fish kill. No fish were captured from a 4-hour gill net set.

Table 1. Summary of gill netting data collected from lakes in Region One between April 1, 1973 and March 31, 1974

Lake (IBM Code No.)	Surface acres	Number sets	Species[1] (number)	Percent game species	Size Range (inches) (game species)	Average Length (inches) (game species)
Flathead River Drainage						
Bull Lake 7-5540-03	106.5	2	Ct (2) Ps (75) RSS (1)	3	Ct (6.7-17.2)	Ct (12.0)
Bunyan Lake 7-5560-03	9.2	1	Wct (16)	100	Wct(6.5-12.4)	Wct(9.9)
Chinook Lake 7-5700-03	10	1[2]	None	--	--	--
Dog Lake 7-5980-03	98.6	2	Wf (21) LNSu(11) Eb (7) Sq (5)	64	Wf (6.8- 9.1) Eb (6.7-10.6)	Wf (7.4) Eb (8.5)
Fish Lake 7-8940-03	32.1	2	Eb (92) RSS (19)	83	Eb (6.0-17.0)	Eb (10.8)
Halfmoon Lake 8-8700-03	54.2	1	Wct (3) Ps (6) Yct (6) LNSu(32)	12	Wct(9.2-10.2) Yct(9.8-13.5)	Wct(9.6) Yct(11.6)
Hidden Lakes 7-5620-03	22.1	1[2]	Yp (4) Pm (14) LNSu(32	0	--	--
Hubbart Reservoir 7-6840-05	482.9	4	Rb (1) LNSu(68) Yp (2) Pm (137) Sq (11)	0.2	Rb (12.1)	Rb (12.1)
Lake Five 8-8550-03	156.1	2	Wct (3) LNSu(19) Yct (3) Ps (18) Yp (11)	11	Wct(6.5- 9.2) Yct(14.0-18.8)	Wct(7.6) Yct(17.0)
Lake Mary Ronan 7-7700-03	1,506	5[3]	KOK (108) Ps (21) Rb (5)	84	KOK(9.5-15.7) Rb (12.1-18.2)	KOK(12.5) Rb (15.2)

Table 1. Continued

Lake (IBM Code No.)	Surface acres	Number sets	Species (number)	Percent game species	Size Range (inches) (game species)	Average Length (inches) (game species)
Lake Mary Ronan 7-7700-03	1,506	6[2/]	KOK (95) Ps (138) Rb (8)	47	KOK(8.7-17.1) Rb (8.8-18.9)	KOK(12.9) Rb (15.1)
Little Bitterroot Lake 7-7300-03	2,925	7[1/]	Rb (8) LNSu(18) KOK (3) Pm (57) Wct (72)	10	Rb (10.0-14.3) KOK(7.6-12.3)	Rb (12.6) KOK(11.9)
Little Bitterroot Lake 7-7300-03	2,925	6[2/]	Rb (3) LNSu(24) KOK (19) Pm (57) Wct (3)	24	Rb (10.4-11.4 KOK(7.6-12.3 Wct(8.5-10.8)	Rb (11.7) KOK(11.9) Wct(9.8)
Louis Lake 7-7495-03	15.6	1	None	--	--	--
Lupine Lake 7-7640-03	11.9	1[5/]	Yct (8)	100	Yct(8.2-13.5)	Yct(11.0)
Meadow Lake 7-7780-03	14.7	1	Wct (18)	100	Wct(5.7-12.2)	Wct(9.2)
Mud Lake 809320-03	5.5	1	Eb (7) Ps (1) Yct (1) LNSu(40)	16	Eb (6.8- 8.8) Yct(11.6)	Eb (7.7) Yct(11.6)
Upper Sunday Lake	6.4	1	Eb (8) LMB (6) LNSu(13) RSS (6)	42	Eb (9.3-12.0) LMB(7.7-13.4)	Eb (11.1) LMB(10.0)
Kootenai River Drainage						
Baree Lake 11-7855-03	8.3	1	Ct (2)	100	Ct (6.2-12.0)	Ct (9.1)
Big Bear Lake 11-7880-03	10.6	1	Yct (7)	100	Yct(16.1-17.9)	Yct(17.0)
Cibid Lake 11-8130-03	11.0	1	Ps (1)	0	--	--

Table 1. Continued

Lake (IBM Code No.)	Surface acres	Number sets	Species (number)	Percent game species	Size Range (inches) (game species)	Average Length (inches) (game species)
Deep Lake 11-8210-03	6.4	1	Eb (2) LNSu(17) Wf (3) Rb (1)	26	Eb (8.2- 8.7) Wf (9.5-13.0) Rb (13.3)	Eb (8.5) Wf (11.2) Rb (13.3)
Glen Lake 11-8380-03	301	2	KOK (2)	100	KOK(9.3- 9.8)	KOK(9.5)
Howard Lake 11-8520-03	33.9	2	Rb (148)	100	Rb (5.8-16.4)	Rb (8.5)
Horseshoe Lake 11-8520-03	144.2	3	Wf (1) CSu (37) Sq (36)	1	Wf (8.2)	Wf (8.2)
Little Bear 11-8845-03	1.5	1	None	--	--	--
Lost Lake 11-9020-03	16.5	1	None	--	--	--
Myron Lake 11-9290-03	4.5	1	None	--	--	--
Rock Lake 11-9460-03	34	1	None	--	--	--
Swisher Lake 11-9710-03	8.8	1	Eb (2) RSS (10)	17	Eb (14.9-17.0)	Eb (16.0)

1/ Species Abbreviations: Wct= westslope cutthroat, Yct= yellowstone cutthroat, Ct= cutthroat (undesignated), Rb= rainbow trout, Eb= brook trout, KOK= kokanee, Wf= mountain whitefish, LMB= largemouth bass, DV= Dolly Varden, Sq= squawfish, LNSu= longnose sucker, CSu= largescale sucker, RSS= redside shiner, Yp= yellow perch, Ps= pumpkinseed, Pm= peamouth

2/ Four-hour net set

3/ Spring netting series

4/ Fall netting series

5/ Two-hour net set

Table 2. Summary of stream population data collected by electrofishing from Region One, April 1, 1973 through March 31, 1974

Stream (IBM Code No.)	Date	Stream length	Percent game species	Species[1/] (number)	Size Range (inches) (game species)	Average Length (inches) (game species)
Flathead River Drainage						
Big Creek 8-0680-01	7/16	1,200'	100	Wf (33) Wct(3) DV (8)	Wf (8.6-13.7) Wct(3.8-10.9) DV (2.8-31.4)	Wf (11.5) Wct(7.6) DV (11.0)
Canyon Creek 8-1160-01	7/25	600'	100	Wct(4)	Wct(5.7- 8.0)	Wct(6.7)
Coal Creek (Upper Section) 8-1620-01	7/17	600'	100	Wct(26) DV (4)	Wct(5.0-11.1) DV (4.1-22.0)	Wct(7.4) DV (8.8)
Coal Creek (Middle Section) 8-1620-01	7/17	600'	100	Wct(26) DV (4) Wf (7)	Wct(3.8-11.5) DV (4.7-18.0) Wf (8.9-11.8)	Wct(7.0) DV (8.4) Wf (10.2)
Coal Creek (Lower Section) 8-1620-01	7/17	600'	100	Wct(2) DV (3) Wf (2)	Wct(4.1- 4.6) DV (5.6- 6.0) Wf (10.4-14.1)	Wct(4.4) DV (5.8) Wf (12.3)
Cyclone Creek 8-1840-01	7/25	600'	100	Wct(44) DV (4)	Wct(4.0- 8.6) DV (3.6- 5.7)	Wct(6.3) DV (4.6)
Hallowat Creek 8-3240-00	7/16	600'	100	Wct(7) DV (6) Wf (4)	Wct(7.6-11.7) DV (4.1- 6.2) Wf (9.6-12.4)	Wct(9.5) DV (5.5) Wf (10.8)
Hay Creek (Middle Section) 8-3334-00	7/19	600'	100	Wct(15) DV (5)	Wct(4.1- 6.8) DV (3.5-10.7)	DV (6.7)
Hay Creek (Lower Section) 8-3334-00	7/19	600'	100	Wct(20) DV (19)	Wct(4.0- 8.5) DV (4.0- 6.0)	Wct(5.7) DV (5.0)

Table 2. Continued

Stream (IBM Code No.)	Date	Stream length	Percent game species	Species (number)	Size Range (inches) (game species)	Average Length (inches) (game species)
Red Meadow (Upper Section) 8-5760-01	7/18	600'	100	Wct (9) DV (21) Wf (13)	Wct (4.5- 7.5) DV (3.5-26.0) Wf (8.2-12.2)	Wct (5.5) DV (8.0) Wf (9.7)
Red Meadow (Middle Section) 8-5760-01	7/18	600'	100	Wct (3) DV (14)	Wct (4.7-10.6) DV (3.0-13.6)	Wct (7.2) DV (5.8)
Red Meadow (Lower Section) 8-5760-01	7/18	600'	100	Wct (9) DV (21) Wf (13)	Wct (4.5- 7.3) DV (3.5-26.0) Wf (8.2-12.2)	Wct (5.5) DV (8.0) Wf (9.7)

1/ Species Abbreviations: Wct= westslope cutthroat, DV= Dolly Varden, Wf= mountain whitefish

Table 3. Water quality data, (pH, alkalinity and standard conductance) for streams and lakes surveyed in Region One

Lake or Stream	Date	pH units	Total alkalinity (ppm)	Standard conductance (micromhos/cm)
Flathead River Drainage				
Bull Lake	6/28/73	7.65	112	183
Bunyan Lake	7/ 2/73	7.25	35	46
Canyon Creek	7/25/73	8.05	140	227
Chonook Lake	8/ 3/73	8.05	252	354
Coal Creek	7/17/73	7.8	105	162
Cyclone Creek	7/25/73	7.75	29	49
Dog Lake	7/12/73	8.30	107	162
Fish Lake	6/28/73	8.75	55	86
Hay Creek	7/19/73	7.9	100	191
Hallowatt Creek	7/16/73	8.05	75	148
Halfmoon Lake	6/20/73	8.30	144	248
Hidden Lake	8/ 7/73	7.35	75	112
Hubbart Reservoir	6/11/73	7.4	58	101
Lake Five	6/20/73	8.45	120	235
Lake Mary Ronan	5/ 1/73	7.4	66	124
Louis Lake	6/26/73	8.25	137	238
Lupine Lake	8/ 2/73	8.5	65	116
Little Bitterroot Lake	6/13/73	7.4	53	87
Meadow Lake	7/ 2/73	6.6	12	10
Mud Lake	6/20/73	8.1	145	251
Red Meadow Creek	7/18/73	7.75	76	144
Upper Sunday Lake	7/ 9/73	8.2	147	235
Kootenai River Drainage				
Baree Lake	8/26/73	6.0	4	10
Big Bear Lake	6/30/73	6.0	4	10
Cibid Lake	6/19/73	8.45	106	192
Deep Lake	6/26/73	8.3	300	453
Glen Lake	5/18/73	8.0	135	218
Howard Lake	5/ 3/73	7.6	85	155
Horseshoe Lake	6/18/73	7.75	127	208
Little Bear Lake	6/30/73	6.1	7	10
Lost Lake	5/17/73	8.45	950	1,368
Myron Lake	8/ 9/73	6.85	28	36
Rock Lake	5/17/73	8.7	960	1,298
Swisher Lake	5/18/73	8.15	114	145

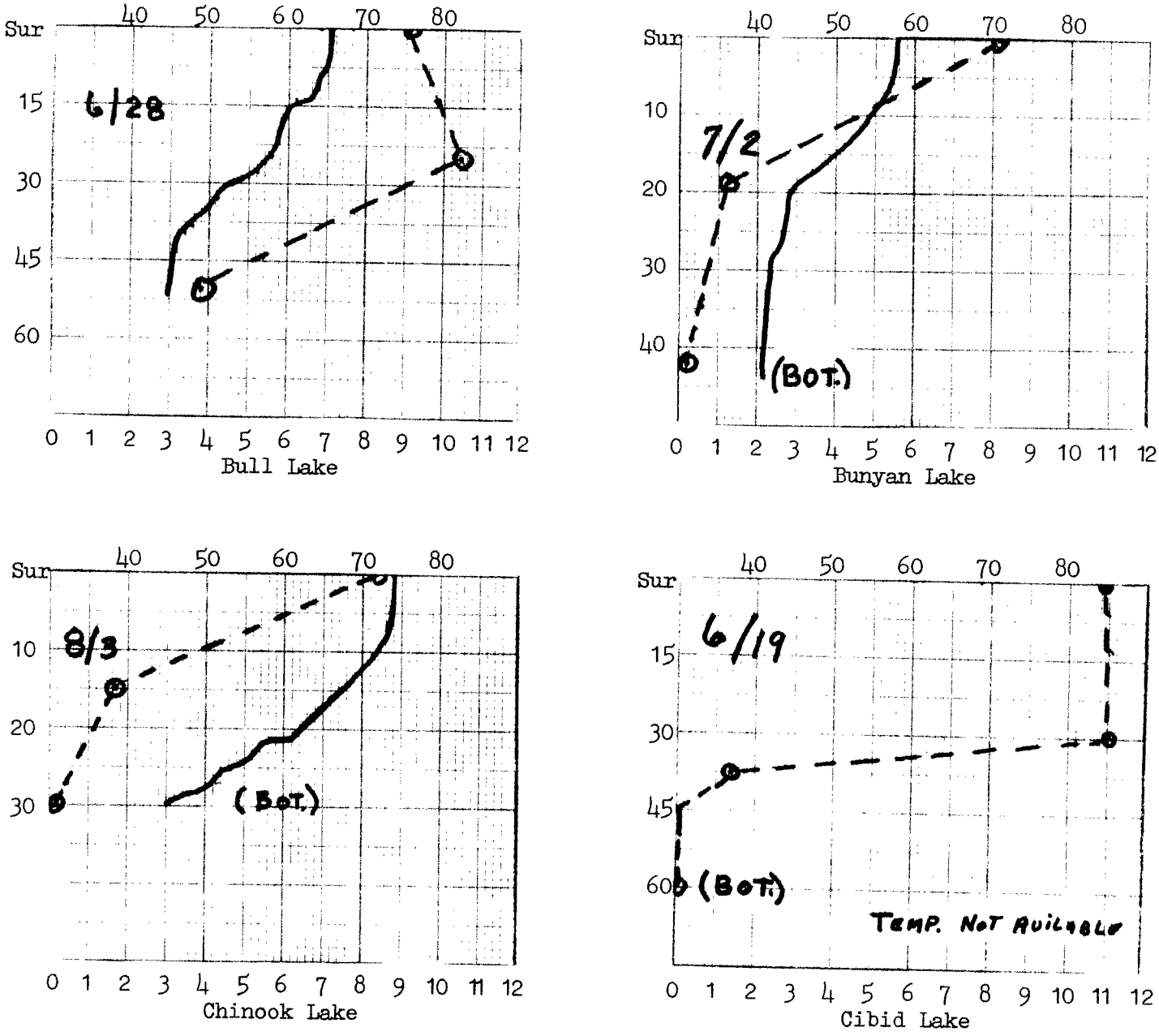
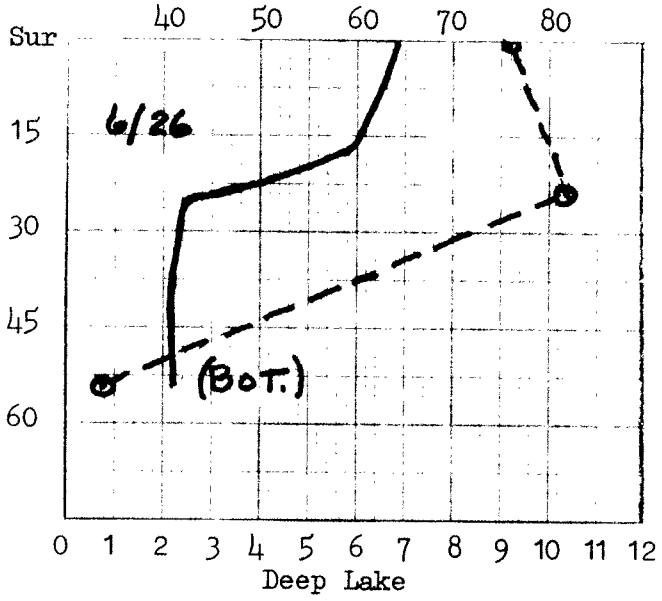
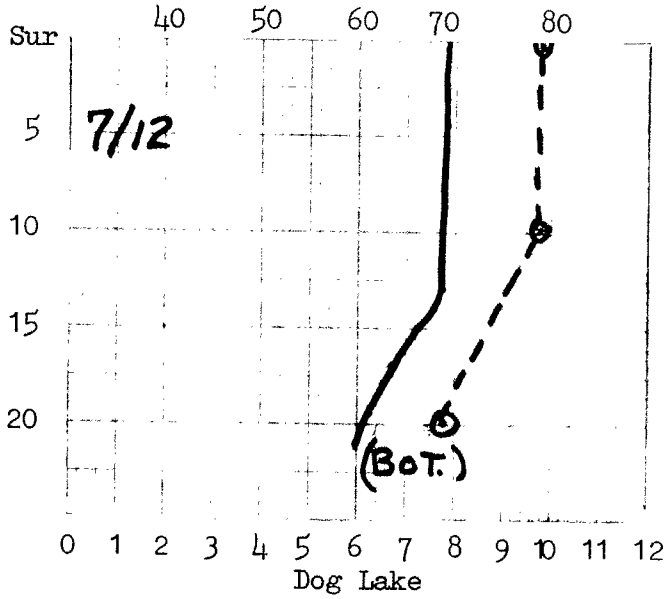
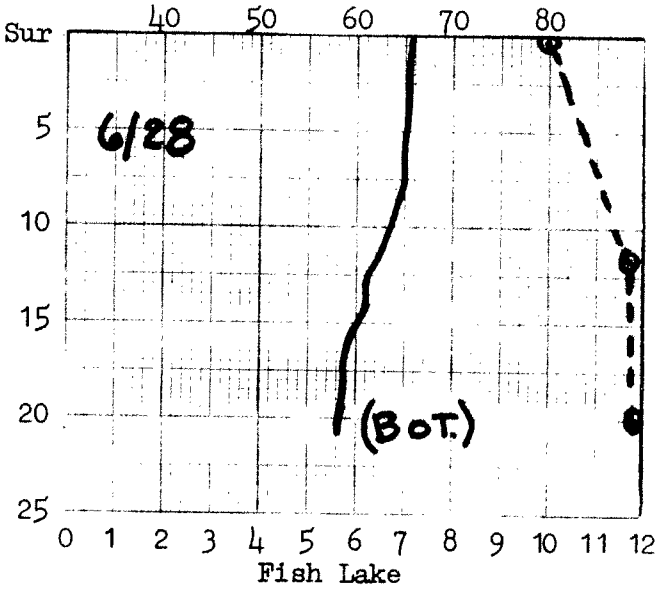


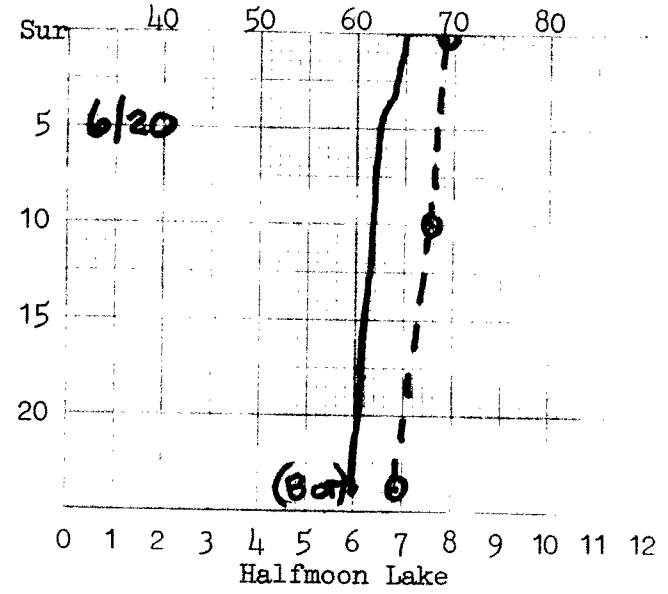
Figure 1. Summer oxygen-temperature profile of several lakes surveyed in 1973.

——— = temperature, ----- = dissolved oxygen









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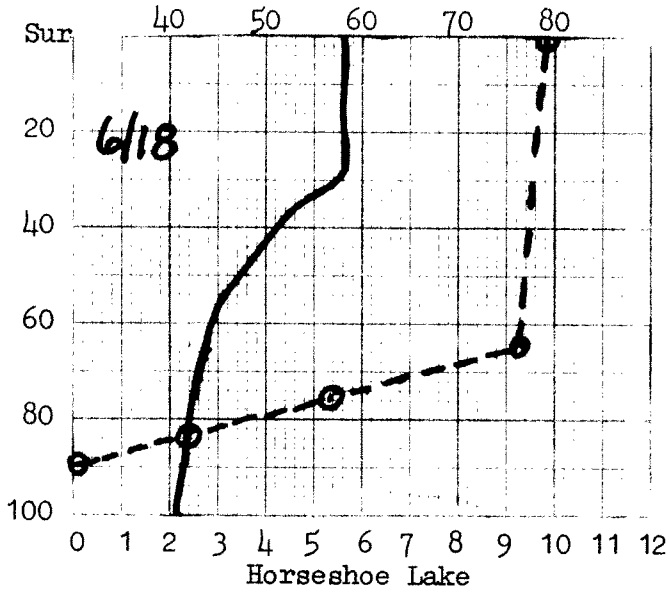

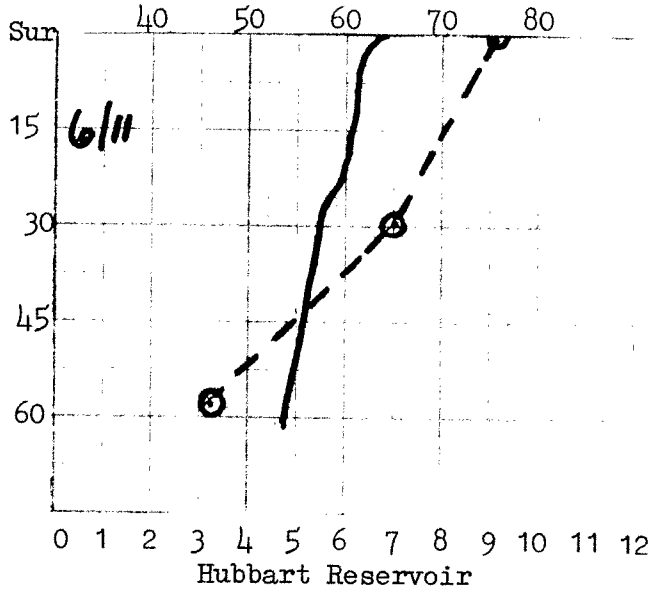

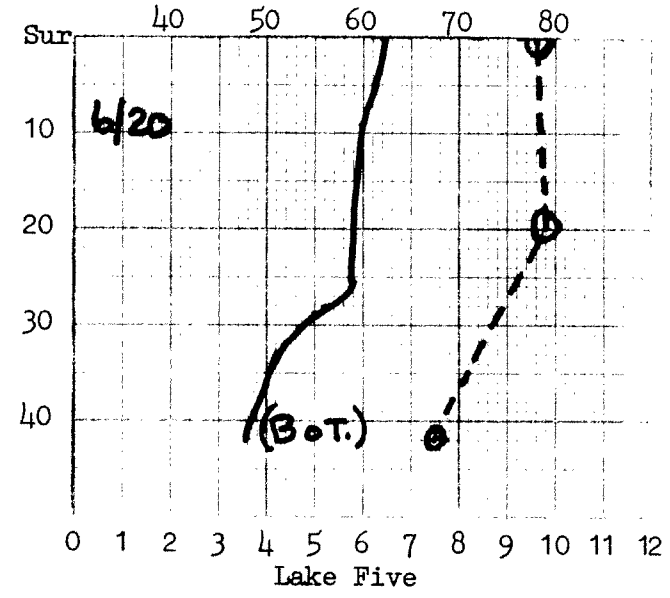

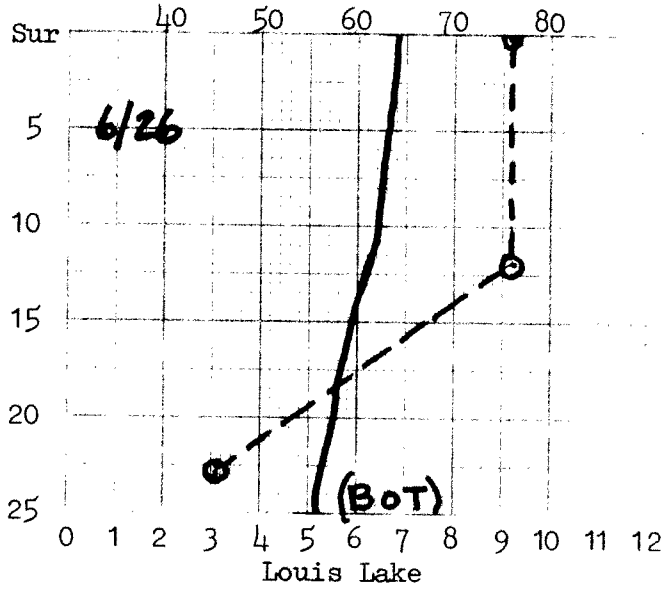

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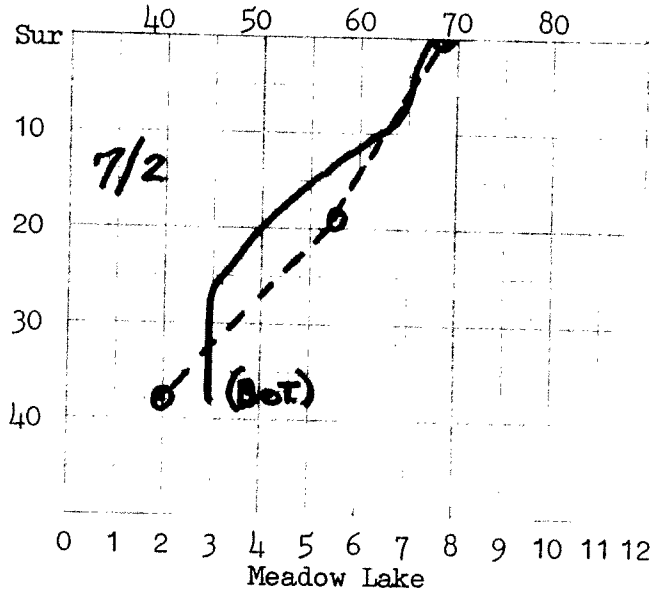

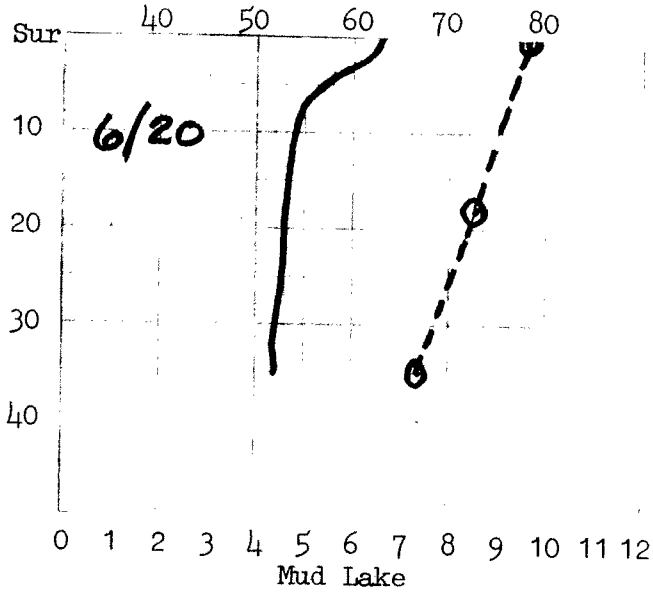

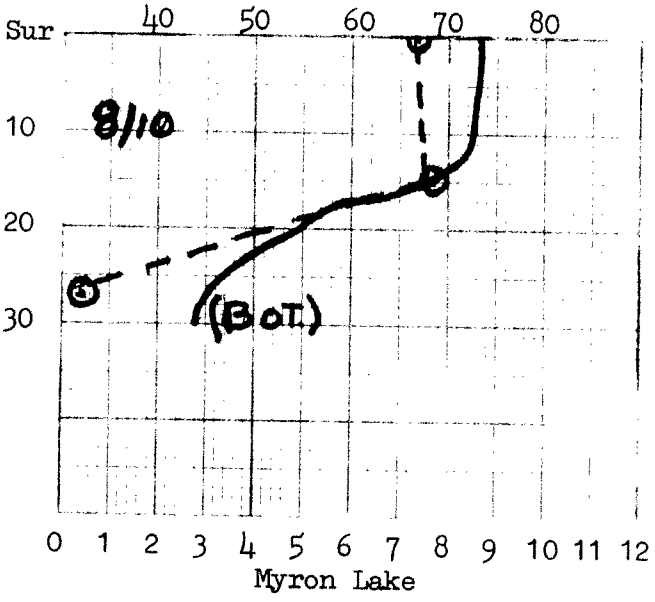

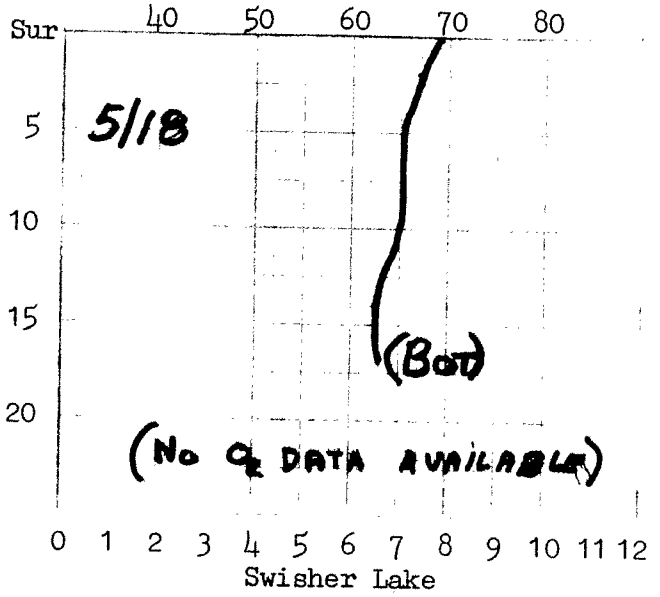

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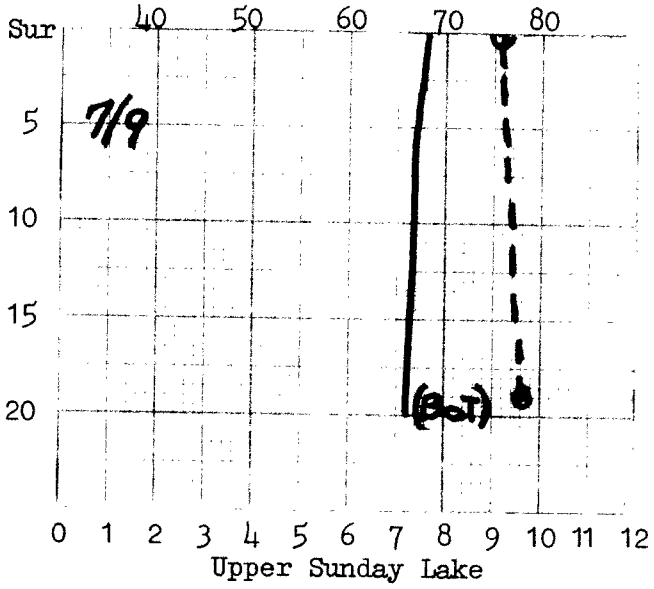

Figure 1. Continued

From this limited netting data, it would appear that the cutthroat trout population is low or non-existent. Winter dissolved oxygen concentrations collected through the ice in March of 1974 were less than 1 ppm at all depths. It is recommended that trout not be reintroduced into Chinook Lake.

Dog Lake

Dog Lake is located approximately two miles north of Olney and is fed by a small low-gradient tributary stream (Dog Creek) with a mid-summer flow of 2-3 cfs. Dog Lake has a surface area of 98.6 acres with a maximum depth of 25 feet. Public access to the lake exists; however, boating access is poor because of the steep shoreline terrain. Dog Lake was netted in July of 1973 and found to have an abundance of small mountain whitefish with lesser numbers of brook trout, longnose sucker and squawfish.

Severe bank erosion problems and silt deposits on the stream bottom exist in the lower portion of Dog Creek. This is a result of excessive grazing along a leased section of stream. Good spawning gravel exists above influence of livestock grazing north of Highway 93. It is recommended that the lower stream corridor of Dog Creek be fenced, and a public fishing access area be developed on state-owned land.

Fish Lake

Fish Lake, a 32-acre lake located near Stryker, was netted in June of 1973 to determine the status of the brook trout population. A total of 92 brook trout were collected from 3 gill net sets ranging from 6.0 to 17.0 inches. The lake has a maximum depth of 21 feet and is fed by a small inlet stream with a summer flow 2-3 cfs. This lake has a self-sustaining population of brook trout and is considered one of the better brook trout lakes in northwestern Montana. No further management recommendations are anticipated other than preserving the present habitat of the stream-lake system.

Hidden Lake

Hidden Lake, also known as Canyon Lake, was netted in August of 1973 to determine relative numbers and species composition of non-game fish. Hidden Lake is located approximately four miles upstream from Hubbart Reservoir in the Little Bitterroot River drainage. The only access to the lake is by foot down steep canyon walls. One four-hour gill net set from shore across a small bay caught 14 peamouth, 4 yellow perch and one longnose sucker.

Hubbart Reservoir

Hubbart Reservoir, a 483 acre irrigation reservoir, was netted in June of 1973 to determine the relative abundance of non-game species since the reservoir was rehabilitated in 1958. A total of 373 fish were collected from 4 overnight gill net sets resulting in a catch of 44 percent squawfish, 37 percent peamouth, 18 percent longnose suckers and one percent yellow perch. Rainbow trout comprised less than one percent of the catch.

A heavy demand for downstream irrigation water drew water levels down to a surface area of less than 5 percent of the full pool elevation in late August. This provided an opportune time for the Flathead Irrigation service to make badly needed repairs to the outlet structure. When reservoir levels were drawn down to the original stream channel, the discharge gates were closed. Ninety gallons of pro-noxfish were applied to the drainage from above Hidden Lake to the dam of Hubbart Reservoir. The treatment of the Little

Bitterroot drainage above Hubbart Reservoir should delay the return of non-game fish to Hubbart Reservoir for several years. Hubbart Reservoir was stocked with rainbow trout in November of 1973 after the reservoir had partially filled and detoxified.

Lake Five, Halfmoon and Mud Lakes

Lake Five, Halfmoon and Mud Lakes are inter-connected lakes and were surveyed in June of 1973 to determine relative numbers of game fish inhabiting these waters since rehabilitated in 1968. A complete kill was not achieved. Since then, longnose suckers and pumpkinseed populations have become re-established. In 1971, the catch composition from Lake Five was made up of 41 percent longnose suckers, 56 percent cutthroat trout and 3 percent pumpkin-seed. A similar marked increase in longnose sucker and pumpkinseed population has also developed in Halfmoon and Mud Lakes. It is recommended that the stocking of sub-catchable cutthroat trout be discontinued. Competition by non-game species has reduced the quality of cutthroat fishing. It is recommended that the species management be changed to largemouth bass and that fingerling bass be introduced in 1974.

Lake Mary Ronan

The fish population in Lake Mary Ronan was monitored in spring and fall to determine the relative abundance and survival of kokanee year classes. A total of 108 kokanee were collected from five floating gill net sets in the spring of 1973 for an average of 21.6 fish per net night. The fall catch totaled 95 kokanee (53 immature and 42 mature spawners) from six net sets (3 floating and 3 bottom) for an average catch of 15.8 fish per net night.

The age composition of both spring and fall catches was made to determine present age composition and growth rates. The spring catch was comprised of 17 percent II+ fish, averaging 10.4 inches; 80 percent III+ fish, averaging 12.9 inches; and 3 percent age class IV+, averaging 13.6 inches. Approximately 94 percent of the age III+ fish taken in May were mature.

The fall catch was represented by 38 percent age I+, averaging 9.1 inches; 33 percent age II+, averaging 12.4 inches; 28 percent III+, averaging 14.4 inches; and 1 percent IV+ averaging 14.8 inches. Approximately 65 percent of the age III+ fish taken in October were sexually mature.

The average growth increment for age II+ kokanee during the period of May through October was 2.0 inches, while the average growth increment for age III+ was 1.5 inches.

Little Bitterroot Lake

The fish population of Little Bitterroot Lake was sampled with both floating and bottom gill net sets in the spring and fall of 1973 to determine the success of kokanee and cutthroat trout introductions. Catch success with floating nets proved most successful for salmonid species (mature kokanee excepted) averaging 1.5 fish per net night. The catch from bottom sets consisted largely of peamouth, longnose sucker and mature kokanee. Mature kokanee averaged 3.2 fish per net night (fall of 1973) compared to 11.0 fish per net night during the fall of 1971. The average size of mature kokanee ranged from 11.3 inches in 1971 as compared to 11.9 inches in 1973. The catch of cutthroat trout was only 0.5 fish per net night.

The salmonid population of Little Bitterroot Lake is sustained almost exclusively by hatchery-reared trout and kokanee salmon. Up until 1968,

emphasis has been orientated toward the management of rainbow trout. In 1968, kokanee salmon fry were initially introduced and annual introductions averaged 200,000 kokanee fry. The introduced kokanee have provided a fair fishery and has taken up the slack of the declining rainbow fishery.

Since 1968, the westslope cutthroat trout and yellowstone cutthroat trout were introduced into the lake and inlet tributaries in an attempt to establish a quality trout fishery. It is believed these species, particularly yellowstone cutthroat trout, are more sedentary in habit and will be less apt to migrate out of the lake. Yellowstone cutthroat trout can utilize small tributary streams for spawning. Emerging fry return to the lake shortly after hatching and are exposed to environmental stresses of the stream environment for a limited period. Rainbow trout spend from one to two years in tributary streams before returning to the lake and during years of low precipitation and run-off, low stream flows and high water temperatures could have an effect on fingerling survival in the creek.

Some evidence of downstream movement was suggested in a tagging experiment conducted in September of 1972 when 2,200 jaw tagged, 7-inch rainbow trout were released in Little Bitterroot Lake. Tag returns were extremely low with only three tags returned to date. One of the three returns was taken below the outlet of the lake.

Historically, large runs of rainbow trout ascended Herrig Creek several miles to spawn. In more recent years, spawning potential diminished because of poor water-shed management. Excessive logging in the drainage increased peak run-off flows. Overgrazing of the streambanks created severe erosion and silting of the stream channel and bank tranpling caused receding of stable bank channels. It is recommended that logging in the drainage be modified to the extent that the stream could recover to its previous quality. Streambanks should be stabilized by reducing the number of grazing animal units and fencing the lower portions of the stream corridor. It is further recommended that the introductions of yellowstone cutthroat be evaluated to determine survival, growth and reproductive success.

Louis Lake

An initial survey of Louis Lake in the Stillwater River drainage was conducted to determine the fishing potential of the lake. Louis Lake has a maximum depth of 25 feet with surface area of 15.6 acres. It is a headwater basin lake fed by springs and surface run-off and with an intermittent outlet to Lewis Creek. Leeches and fresh-water shrimp are abundant food organisms. One overnight gill net set in late June of 1973 yielded no fish. The lake was recommended for stocking westslope cutthroat trout. The lake was stocked in August of 1973.

Lupine Lake

Lupine Lake, an 11.9 acre mountain lake, is located in the Griffin Creek drainage near the Ashley Creek Divide. The lake is accessible by trail 1-1/4 miles from the Meadow Creek road. Lupine Lake is fed by a small stream averaging 2 to 4 feet in width containing excellent spawning gravel. Numerous trout fry were observed in the creek.

One mountain gill net, set for two hours, caught 8 yellowstone cutthroat trout ranging from 8.2 to 13.5 inches. This lake contains an excellent self-sustaining population of yellowstone cutthroat trout. Logging activity in this drainage should be carefully monitored to maintain high water quality standards in this inlet spawning tributary.

Meadow Lake

Meadow Lake is located on the edge of the Mission Mountain Wilderness Candidate Area in the Swan River drainage. It has a depth of 38 feet with a surface area of 14.7 acres. The lake is accessible by Forest Service logging road to within 150 yards of the lake. The inlet stream has an estimated flow of 1-2 cfs with excellent spawning gravel. Numerous westslope cutthroat fry were observed. One gill net set caught a total 18 westslope cutthroat trout ranging in size from 5.7 to 12.4 inches. Natural recruitment of westslope cutthroat trout has been successful in maintaining trout populations. No further management recommendations are anticipated other than maintaining lake and stream habitat in its present condition.

Upper Sunday Lake

An initial fish population survey was made of Upper Sunday Lake in the Stillwater River Drainage. Upper Sunday Lake has a surface area of 6.4 acres with a maximum depth of 20 feet. One overnight gill net set in July of 1973 caught 8 brook trout averaging 11.1 inches, 6 largemouth bass averaging 10.0 inches, 6 redside shiners and 13 longnose suckers. Summer water temperatures ranged from 68° on the surface to 66° at the bottom. Spawning areas are limited to one small inlet creek with a summer flow of less than 1 cfs, yet brook trout are successful in reproducing and maintaining their numbers. No change in management recommendations for Upper Sunday Lake is anticipated.

Kootenai River Drainage

Lake population surveys conducted in the Kootenai River drainage include: Baree, Big Bear, Cibid, Deep, Glen, Howard, Horseshoe, Little Bear, Lost, Myron, Rock and Swisher.

Baree Lake

An initial fish population survey of Baree Lake in the Cabinet Mountain Wilderness Area was conducted in August of 1973. One overnight surface gill net set was set from shore across small bay areas in each lake. No fish were captured from Little Bear Lake. Little Bear Lake was reported by local anglers to be stocked with brook trout many years ago.

A total of 7 yellowstone cutthroat ranging from 16.1 to 17.9 inches were collected from Big Bear Lake. Little Bear Lake has an intermittent outlet while Big Bear Lake has an outlet stream which apparently provides a limited spawning area for yellowstone cutthroat. Big Bear Lake has a self-sustaining population of yellowstone cutthroat trout and no change in management plans is anticipated. It is recommended the Little Bear Lake be stocked with westslope cutthroat trout fry.

Cibid Lake

Cibid Lake, a closed basin lake located in the vicinity of Happy's Inn, has a surface area of 11.0 acres with a maximum depth of 60 feet. One gill net set in June of 1973 caught one pumpkinseed. Several largemouth bass were observed and species up to five pounds have been reportedly taken. The lake has sufficient oxygen and suitable temperature in the thermocline to support trout species. If fishing demands become greater in the future, this lake could be rehabilitated and converted to a trout lake. Late in 1973, unallocated catchable rainbow trout from the Creston National Fish Hatchery became available and were stocked in Cibid Lake. It is recommended that the lake be netted in the fall of 1974 to determine the success of this plant.

Deep Lake

Deep Lake is located approximately 7 miles from Fortine and is connected to Marl Lake by a series of small swamps. The lake has a surface area of 6.4 acres with a maximum depth of 55 feet and is fed by a small tributary stream, the bottom materials of which are made up of fine silts. An initial fish population survey was conducted in June of 1973. The species composition from one overnight gill net set was 74 percent longnose suckers and 26 percent game fish (mountain whitefish, brook trout and rainbow trout). The land surrounding Deep Lake is in private ownership. No further management of this lake is anticipated.

Glen Lake

Glen Lake was netted in May of 1973 to evaluate the success of kokanee fry introductions made in 1970, 1971 and 1972. Two floating gill net sets in the pelagic zone of the lake caught two kokanee averaging 9.5 inches. These fish were probably from the introduction made in the spring of 1972. In the fall of 1973, two gill nets were set to capture mature spawning kokanee concentrated near the mouth of Lick Creek. A total of 50 males averaging 11.6 inches and 47 females averaging 11.2 inches were captured. Otilith bones were extracted from this sample and will be used to age fish at a later date.

It is recommended that kokanee fry stocking and sampling of kokanee population be continued. It is further recommended that efforts be made to obtain information on kokanee fishing success.

Howard Lake

Howard Lake, a 40-acre lake with a maximum depth of 58 feet in the Libby Creek drainage, was netted in May of 1973 to determine the status of the rainbow trout population. Two overnight gill net sets caught 148 rainbow trout ranging in size from 5.8 to 16.4 inches. Howard Lake is presently on an alternate year stocking schedule. It is recommended that Howard Lake be deleted from the stocking schedule for a one-year period. It is further recommended that natural reproduction in both inlet and outlet be evaluated to determine the contribution of wild trout to the total trout fishery.

Horseshoe Lake

Horseshoe Lake, a 144-acre closed basin lake with a maximum depth of 133 feet, is located approximately 50 miles west of Kalispell in the vicinity of Happy's Inn. The fish population of Horseshoe Lake was sampled with 3 overnight gill net sets in June of 1973. Squawfish and largescale suckers comprised 99 percent of the catch while whitefish made up the remaining 1 percent. A few largemouth bass were observed in the shoal areas but did not enter the catch. A high incidence of gill lice (Ergalasis caeroleus) and tapeworm (Ligula) was observed in both the squawfish and largescale suckers. Thermocline development began at 30 feet at a temperature of 57° with dissolved oxygen concentration above 9.0 ppm. Dissolved oxygen concentrations remained high through a depth of 65 feet and began to decrease rapidly as depth decreased. Dissolved oxygen concentrations at 83 feet were 2.3 ppm with total oxygen depletion occurring at 90 feet. An odor of hydrogen sulfide was detected at 128 feet.

Previous attempts to provide a rainbow trout fishery failed because of competition and predation from non-game species.

It is recommended that Horseshoe Lake be rehabilitated to remove rough fish species and restore it to a trout fishery. Two unimproved campgrounds now exist on the north shore of the lake and provide good access to the lake. Although the land is in private ownership (U.S. Plywood), these areas are open to public use.

Lost Lake

Lost Lake, a shallow high alkaline lake near Eureka, was netted in May of 1973, to determine the success of an experimental grayling fry plant made in 1970. No grayling were captured from one overnight net set. This lake has been stocked with rainbow trout since 1961. However, in recent years lake levels have receded and rainbow trout failed to survive over winter. It is recommended that trout stocking be discontinued until water levels increase to levels of the early 60's.

Myron Lake

An initial fish population survey was made of Myron Lake, a 5-acre lake in the Fisher River drainage. No fish were collected from an overnight set. The lake has a maximum depth of 30 feet and probably has sufficient depth to support a trout population. Recommendations were made to stock the lake with 2-inch westslope cutthroat trout and these were introduced in August of 1973.

Rock Lake

Rock Lake, a high alkaline closed basin lake in the vicinity of Eureka, was netted in May of 1973, to determine the extent of reported winter fish kill. No fish were collected from one overnight net set. Several dead rainbow ranging from 10 to 18 inches were observed on the lake bottom. It is recommended that grayling, a species more tolerant to low winter oxygen concentration, be introduced in an attempt to establish a fishery in Rock Lake.

Swisher Lake

Swisher Lake, also known as Spring Lake, is located along the west shore of Lake Koocanusa and was surveyed in May of 1973. Swisher Lake is a closed basin lake and has a surface area of 8.8 acres with a maximum depth of 18 feet. The lake has an abundant population of redside shiners and a remnant population of brook trout. Bottom temperatures in mid-May exceeded 63° and it is likely that the lake becomes homothermic by mid-summer. Access to the lake is excellent and land ownership is public (Corps of Engineers). It is recommended that an experimental plant of subcatchable brook trout be made in an attempt to establish a trout fishery.

Stream Population Surveys

North Fork Flathead River Drainage

Fish populations were sampled for seven tributary streams in the North Fork of the Flathead River drainage with electrofishing gear in July of 1973 (Table 2). Information regarding population structure and relative abundance were obtained. Streams sampled include Big, Canyon, Coal, Cyclone, Hay, Red Meadow and Hallawat Creeks.

A total of 12 stream sections, ranging in length from 600 to 1,200 feet were sampled (Table 1). Shocking success ranged from poor to good dependent on

volume stream flows, conductivity and the ability to shock and capture fish underneath log jams and uprooted trees.

Westslope cutthroat trout were found to be the most abundant species and comprised 43 percent of the total number of fish captured in the tributary streams. Approximately 26 percent of the total number of cutthroat caught (168) were 7.0 inches or larger, the largest being 11.7 inches. A total of 59 of the larger cutthroat trout were tagged with plastic numbered jaw bands to determine movement in the drainage system.

Mountain whitefish were found to be present in all the streams sampled with the exception of Hay, Cyclone and Canyon Creeks. They comprised 29 percent (116 fish) of the total number of fish caught. Juvenile and young of the year were absent from the catch. The size of whitefish collected ranged from 8.2 to 14.1 inches. No whitefish smaller than 8.2 inches were found in these upper stream sections. It would appear that whitefish larger than 8 inches, but not associated with the migrating fall spawners, enter these stream sections as sub-adults or adults and become stream residents. Possibly a downstream migration of emerging fry occurs and these inhabit the North Fork of the Flathead River as fingerling and juvenile fish.

Dolly Varden comprised 28 percent of the total number of fish captured from the tributary streams and were found to be present in all streams sampled with the exception of Canyon Creek. A steep gradient near the mouth of Canyon Creek may constitute a barrier for migrating Dolly Varden. Approximately 6 percent of the Dolly Varden collected were mature adults ranging in size from 18.0 to 31.9 inches. This represents approximately one mature adult captured for every 1,000 feet of stream shocked. A total of 11 mature fish were jaw tagged with plastic bands to determine movement and migration patterns in the drainage.

Tributary streams of the North Fork of the Flathead are vital to the recruitment of Dolly Varden and westslope cutthroat trout to the intra-connecting lake and river system. Extensive clear-cut logging practices in the early 60's at the upper ends of these drainages has undoubtedly increased peak run-off periods and decreased stream stability and in places caused debris dams. The resultant habitat loss has decreased spawning potential and recruitment of migratory and resident stream populations of cutthroat trout and Dolly Varden. Just recently, a strip mine coal development project in the North Fork River drainage, in the Sage Creek-Cabin Creek drainages in British Columbia was announced. If mines are developed, it poses a potential threat to the fisheries of the entire drainage. In view of the possible environmental stresses to native fish populations, it is recommended that a water quality data collection program and fish population study for the North Fork and mainstem of the Flathead River be initiated to collect base-line data prior to the Canadian coal development.

Clark Fork Drainage

A 9,000 foot section of the Thompson River (Meadow Creek Section), approximately 15 miles below the outlet of Lower Thompson Lake, was sampled with electrofishing equipment to provide game fish population estimates and determine the present status of wild rainbow trout populations. The Thompson river has been planted with 4,000 to 8,000 catchable size rainbow trout annually for the past four years and with greater numbers in previous years.

Mark and recapture shocking runs were conducted in late March and early April of 1973. Estimates of rainbow trout, brook trout and mountain whitefish were made using the Peterson mark and recapture formula as modified by Chapman[1]:

$$N = (M+1)(C+1)/(R+1) - 1$$

In this formula: N = Population estimate
M = Number of fish marked
C = Number of fish in recapture sample
R = Number of marked fish in recapture sample (C)

A summary of the data collected and calculated fish population estimates for fish, 4.0 inches and larger, is presented in Table 4. Species collected in numbers too small for making estimates were: Dolly Varden, cutthroat trout, sculpins, longnose dace, yellow perch and redside shiners.

Table 4. Game fish population estimates from a 9,000 foot section of the Thompson River (05-7248-01, T24N R27W S12&13, Meadow Creek Section)

Species	Marking run	Recapture run	Recapture run (marked fish)	Estimated number
Rainbow trout (> 4.0")	235	187	60 (25%)	727
Brook trout (> 4.0")	120	196	29 (24%)	795
Mountain whitefish (> 5.0")	196	218	35 (18%)	1,198
Totals	551	601	124 (23%)	2,720

This section of the Thompson River supports excellent populations of self-sustaining rainbow trout, brook trout and mountain whitefish. Approximately 60 percent of the rainbow trout and 22 percent of the brook trout collected (over 4.0 inches) exceeded 7 inches, the largest being 19.0 inches. Ninety-seven percent of the whitefish collected (over 5.0 inches) were larger than 7 inches.

Supplemental stocking of hatchery reared fish could be detrimental to the survival of wild trout populations. The introduction of catchable rainbow trout in this section of the Thompson River has been discontinued. Further trout population estimates should be made further downstream in the vicinity of the mouth of Fishtrap Creek and West Fork of the Thompson River to determine the status of wild trout populations in those areas.

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[1] Chapman, D. G. 1951. Some properties of the hypergeometric distribution with applications to zoological sample censuses. Univ. Calif. Publ. Stat. 1(7):131-160.

RECOMMENDATIONS

It is recommended that the project be continued to obtain additional information on chemical, physical and biological characteristics of waters in the project area for the purpose of evaluating present and instigating new management practices.

Prepared by: Robert J. Domrose

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Waters referred to: Code identification of lakes and streams are presented in Tables 1, 2 and 4.