A SURVEY OF THE FISHERY RESOURCE IN A SECTION OF THE CLARK FORK RIVER IN WESTERN MONTANA

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Hydroelectric development on streams of western Montana results in important habitat changes which are reflected in changes in the fish populations. The dam itself may act as a barrier to fish movement. The change from a lotic to a lentic environment affects temperature, food supply and reproduction of game fish. Fluctuating water levels, which are a necessary part of the operation of a hydroelectric plant, adversely affect the production of fish-food organisms in the reservoir. The gross effect of these and other modifications in the habitat is usually an increase in rough fish populations accompanied by a decrease in game fish populations.

In April, 1955 the Federal Power Commission approved an application by the Washington Water Power Company for permission to construct a dam and hydroelectric plant on the Clark Fork River at Noxon Rapids approximately two miles upstream from Noxon, Montana. This will be the third such plant constructed on this portion of the river since 1900. The first of these was built at Thompson Falls in 1913-1916 by the Montana Power Company. In 1951, the Washington Water Power Company completed construction of the Cabinet Gorge Dam near the Idaho-Montana border. The Noxon Rapids project will inundate that portion of the Clark Fork River between the backwaters of Cabinet Gorge Reservoir and the tailwaters of the Thompson Falls plant--a distance of 37.5 stream miles.

Little information is available regarding the sport fishery on this portion of the Clark Fork River. In May, 1955 an investigation was initiated to determine the status of the existing fishery and to obtain an index of the potential of this river to provide recreational fishing. The investigation was financed by the Washington Water Power Company and was conducted by the Montana Fish and Game Department.

This portion of the Clark Fork River flows through a narrow valley located between steep heavily-timbered mountain ranges. The river channel is "U"-shaped and consequently very little surrounding meadow land is flooded during high water periods. The average gradient of this section is 4.3 feet per mile. Bottom materials vary from course gravel to large boulders with the larger materials being more common. Bars and riffle areas consisting of gravel and rubble are rendered unstable by fluctuations in flow which occur throughout the year. Bi-weekly records of volume and surface elevation (Figure 2) were obtained from the Montana Power plant at Thompson Falls. Rubble-strewn areas along the shoreline contain considerable quantities of silt. Bottom samples taken in these areas contained only traces of aquatic insects or other food organisms. Because of the nature of the stream, bottom sampling was limited to these shallow areas along the shoreline.

Thirteen tributary streams enter the river in the impoundment area. The physical and chemical characteristics of these streams are summarized in Table 1. A number of these streams provide recreational fishing and also serve as spawning areas for game fish populations in the main river.

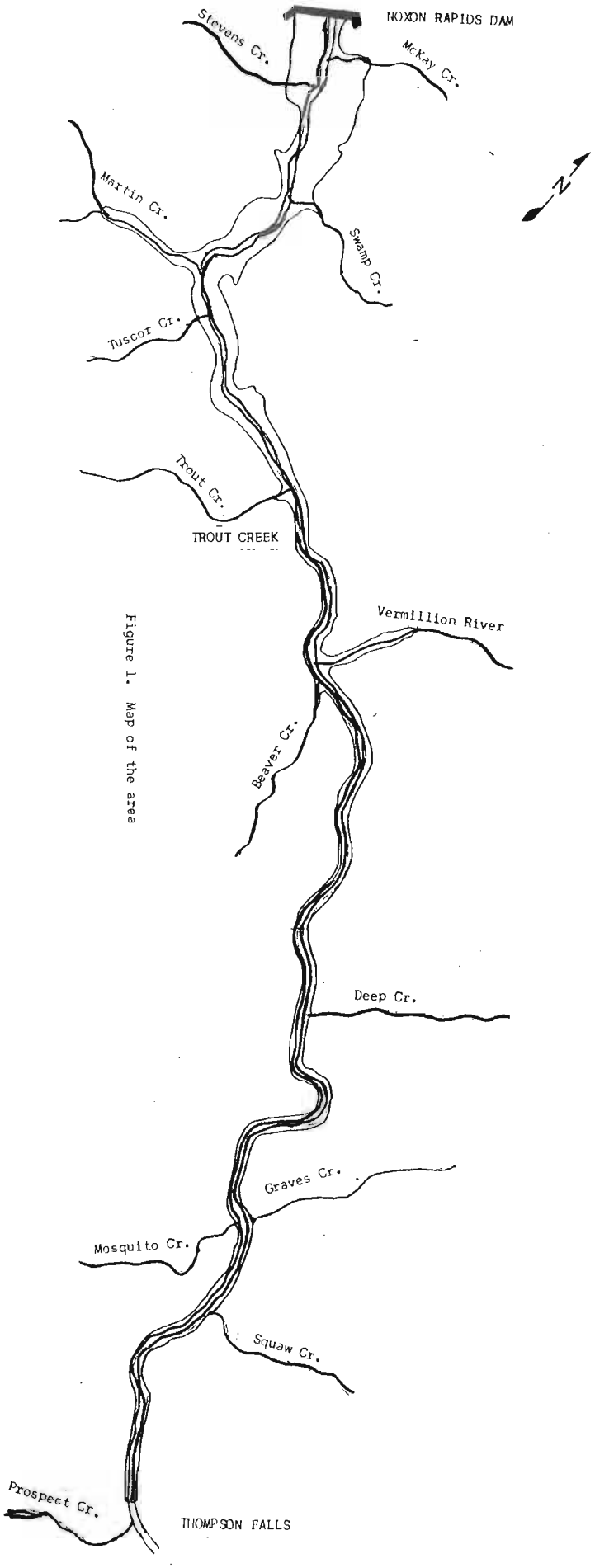

Figure 1. Map of the area

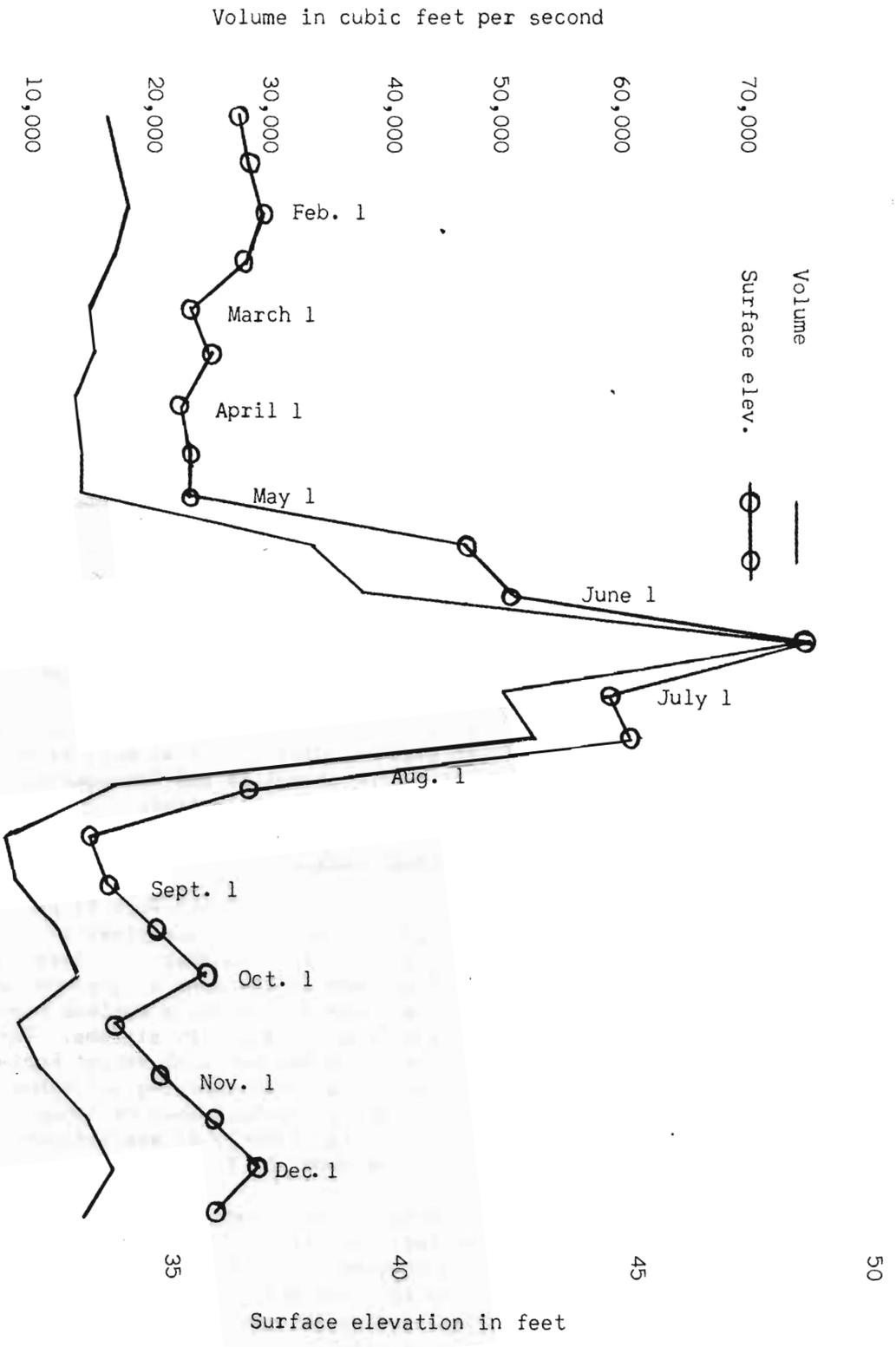

Figure 2. Flow pattern of Clark Fork River at Thompson Falls (1955)

TABLE I.
Characteristics of Streams in Project Area

Stream	Width	Depth	Rate of flow	Volume c.f.s.	Alk. M.O.	Total Dissolved Solids	
	*	*	*	*	**	x	xx
(1) McKay Cr.	15.0	1.1	1.4	19.0	12	-	-
(1) Stevens Cr.	-	-	-	-	-	-	-
Swamp Cr.	30.0	1.7	2.1	86.0	12	-	15
Martin Cr.	46.0	1.3	2.4	105.0	33	-	32
(1) Tuscor Cr.	-	-	-	-	-	-	-
(1) Trout Cr.	46.0	1.0	1.5	54.0	20	-	18
Vermillion R.	67.0	1.6	3.7	317.0	27	35	-
(1) Beaver Cr.	42.0	1.2	1.8	73.0	20	49	-
Deep Cr.	15.0	0.9	3.2	35.0	24	39	31
Graves Cr.	23.0	1.2	3.7	82.0	32	-	49
(1) Mosquito Cr.	-	-	-	-	-	-	-
(1) Squaw Cr.	15.0	0.6	2.3	17.0	25	-	-
Prospect Cr.	56.0	2.4	1.9	204.0	35	47	-

(1) intermittent in 1955
* July 4, 1955
** July 15, 1955
x August 10, 1955
xx December 12, 1955

The Noxon Rapids Reservoir will have a surface area of 8,650 acres and a total storage of 380,000 acre feet. Normal operation of the plant will require a daily fluctuation of two to three feet and a weekly fluctuation of about four feet in water level. During periods of low runoff, the draft on the reservoir may be extended over a period of two or three weeks with an over-all drawdown of as much as ten feet. Gently sloping areas make up a very small part of the shoreline and consequently shallow regions, which are important to fish production, will be limited.

CREEL CENSUS

Highway 10A roughly parallels this section of the Clark Fork River. Two secondary roads and several privately owned roads provide access to the river in a number of places. Because of the size of the area and the large number of access points it was not feasilbe to attempt to contact all fishermen in the area on any one day. A route was established to enable the creel census clerk to contact a maximum number of fishermen on the river, Cabinet Gorge Reservoir and on tributary streams. This route was covered every Sunday and holiday from June 26 to September 25 except September 11. Creel census data were also obtained on weekdays while carrying out other work on the project. All fishermen who had been fishing for one-half hour or longer were recorded. Information on fisherman catch during past years (1948-1954) was obtained from statewide creel census files. All census data are shown in Table II.

Thirty-one (55 percent) of the fishermen interviewed on the Clark Fork River during the regular season 1955 were unsuccessful. Thirty-five percent of the anglers checked on Cabinet Gorge Reservoir took no game fish. These ratios of unsuccessful fishermen are slightly higher than those recorded during previous seasons. Creel census conducted by department personnel during the regular seasons 1948-1951 indicates that 24 percent of the anglers were unsuccessful.

TABLE II

Creel Census from Clark Fork River and Cabinet Gorge Reservoir

	No. F'men	Hrs.	Rough Fish	Rb	Ct	DV	Wh	Eb	LL	SES	Unsuccess-ful F'men	Total No. Game Fish	Catch/hr.
1955 Clark Fork R.													
Summer	54	125.5	81	2	9	4	4	-	-	-	31	19	.15
Winter	23	46.5	-	-	-	-	248	-	-	-	1	248	5.3
TOTAL	77	172.0	81	2	9	4	252	-	-	-	32	267	1.55
Cabinet Gorge													
Summer	34	90.0	15	2	9	15	1	1	1	-	12	29	.31
1951-1954* Clark Fork R.													
Summer	31	51.5	-	10	27	1	3	-	-	-	-	41	.8
Winter	162	839.0	-	10	32	14	2112	-	-	-	-	2168	2.6
TOTAL	193	890.5	-	20	59	15	2115	-	-	-	-	2209	2.5
1948-1951* Clark Fork R.													
Summer	53	122.0	-	44	21	6	49	-	-	-	13	120	.97
Winter	432	1362.0	-	55	-	3	1756	-	-	2338	14	4152	3.0
TOTAL	485	1484.0	-	99	21	9	1805	-	-	2338	27	4272	2.9

* Includes that portion of the Clark Fork River between the mouth of the Flathead River and Thompson Falls.

The fish most frequently taken from the Clark Fork River by fishermen during 1955 was the mountain whitefish. This species made up 21 percent of the summer creels and 94 percent of all creels checked. The catch was influenced by a run of whitefish that concentrated below the Thompson Falls Dam during the latter part of October. This concentration lasted about two weeks and attracted a large number of local anglers. The mountain whitefish also made up a major portion of the catch during previous years. Dolly Varden trout made up 50 percent of the game fish taken by 34 fishermen interviewed on Cabinet Gorge Reservoir during the 1955 regular fishing season.

Total yield of game fish cannot be obtained for these two bodies of water; therefore, the best index of fishing quality is the rate of catch per hour of fishing effort. The statewide creel census for 1954 shows an average catch of 0.6 game fish per hour during the regular season and a catch of 1.0 fish per hour during the winter season. The 1955 rates of catch from the Clark Fork River and Cabinet Gorge Reservoir during the regular season were below this statewide average. The slightly greater rate of catch in Cabinet Gorge Reservoir may be due to the usual increased productivity during early years of impoundment. This initial production is related to the extent of shallow areas that are inundated. Such shallow areas are very limited in Cabinet Gorge Reservoir and therefore the initial increase in production would be limited.

Prospect Creek flows into the Clark Fork River near the town of Thompson Falls. The small bay at the mouth of this creek has been a popular fishing area in past years and still attracts a number of fishermen, especially in the evening on weekdays. Creel census data from this site during the 1955 regular season shows a very low rate of catch per hour (Table III). These fishermen made up 61 percent of all creel census contacts on the Clark Fork River during the regular season and therefore depressed the season average.

TABLE III
Clark Fork River Creel Census - Regular Season 1955

	No. F'men	Hours	Rough Fish	Rb	Ct	DV	Wh	Total No. Game Fish	Catch/ Hour
Prospect Cr. Bay	32	55.5	6	1	1	1	-	3	.005
All Other	21	70.0	75	1	8	3	4	16	.23
TOTAL	54	125.5	81	2	9	4	4	19	.15

The reported catch of rough fish from the river proper was greater than that from the reservoir. This is probably a reflection of fishing methods rather than an index of rough fish abundance. Forty-six percent of the river fishermen used bait and accounted for 96 percent of the rough fish taken from that water (Table IV). The fishermen using artificial lures took only three rough fish in 42 hours of fishing. On Cabinet Gorge Reservoir, bait fishermen made up 32 percent of the fishermen and took 80 percent of the rough fish catch.

Only two fishermen were observed on Thompson Falls Reservoir during the study period. Local anglers report that fishing success has been very poor in past years and consequently sport fishing has been negligible on this body of water.

TABLE IV
Comparison of Rough Fish Taken on Bait and Artificial Lures

	Bait		Lures	
	No. F'men.	No. Rough Fish	No F'men	No. Rough Fish
Clark Fork R.	25	78	29	3
Cabinet Gorge Res.	11	12	23	3

POPULATION INDEX

Series of gill net sets were made in the Clark Fork River and in Cabinet Gorge Reservoir from May 25, 1955 to November 9, 1955 to obtain indices of the existing fish populations. Linen experimental gill nets were used in the river and nylon experimental nets were used in the reservoir. The depth of these sets varied from five feet to twenty feet in the river and from five feet to sixty feet in the reservoir. The fish taken in these sets are shown in Table V. Two species of suckers are combined in this Table and in Figure 3.

TABLE V
Gill Net Catches in Clark Fork River and Cabinet Gorge Reservoir

	Rb	Ct	DV	Eb	Wh	Sq	CRC	Su	Sh	YP	Other	Total
River (76 sets)	2	8	11	-	36	256	55	126	45	2	-	548
Reservoir (32 sets)	2	6	40	1	64	692	119	699	13	29	17	1682

The ratio of game fish to rough fish is higher in the river sets although rough fish were dominant in the catch from both waters. The mountain whitefish was the most abundant game species and the squawfish was the dominant rough fish.

Atton (1955) has shown that nylon gill nets are more efficient than cotton nets in the capture of certain species of fish. If such a differene applies to the sets made in this survey, the catch from the river would be slightly higher. The 32 sets in Cabinet Gorge Reservoir include six 250-foot nets. All other sets in the reservoir were 125-foot nets and all of the river sets were 125-foot nets. This may introduce a small error but it seems unlikely that it would greatly affect the number of game fish taken.

Eight overnight gill net sets in Thompson Falls Reservoir during October, 1955 took 113 fish of which six (5 3 percent) were game species. The two species of suckers common in this area made up 48 percent of all fish taken. These data are probably indicative of future conditions in Cabinet Gorge Reservoir and Noxon Reservoir.

SPAWNING ACTIVITIES

None of the cutthroat trout taken in gill nets during June were in spawning condition. An attempt to collect spawners from Beaver Creek by electric fishing during the latter part of May was unsuccessful, presumably due to high water and low mineral content. A local fisherman reported taking a spawned-out female cutthroat trout from Bull River Bay and one from Martin Creek Bay during the first week in June. These fish were not available for examination.

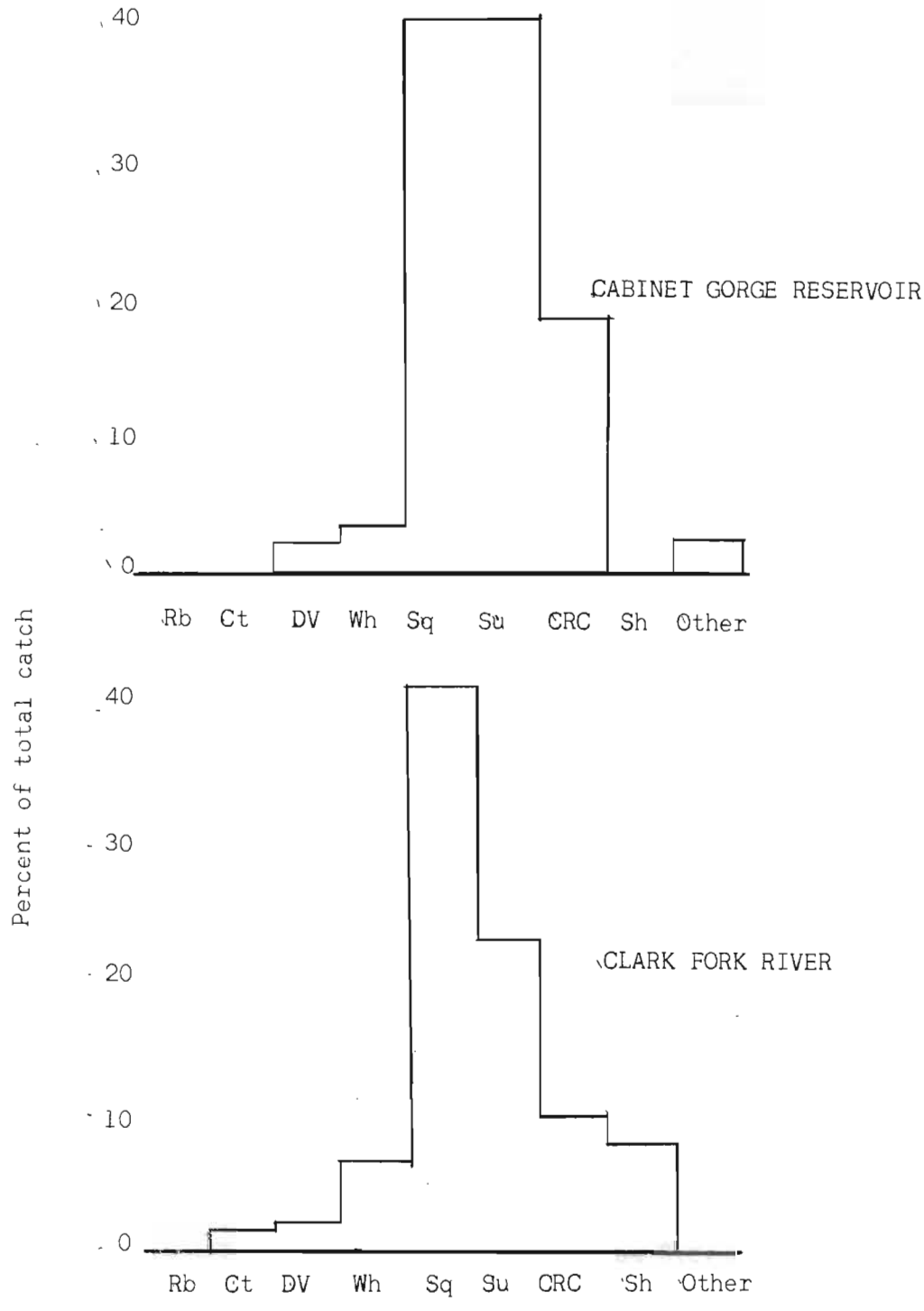

Figure 3. Percent-composition of gill net catches.

Mature Dolly Varden trout were taken in gill nets at the outlets of Beaver Creek, Martin Creek, Pilgrim Creek, Elk Creek and Bull River. A fisherman took a ripe male from Beaver Creek on August 14 and another angler took two ripe males from Vermillion River on September 13. Large Dolly Varden (presumably spawners) were observed in Vermillion River, Prospect Creek and Martin Creek during August and September. On August 6, two pairs of Dolly Varden were observed on a gravel bar in Prospect Creek. These fish were observed for approximately one-half hour but they exhibited no spawning activity nor were any redds found in the area.

Attempts were made to locate Dolly Varden redds in Martin Creek and Vermillion River from September 9 to October 4, but none were observed. However, this does not indicate that no spawning occurred. Road construction and the clearing work caused these streams to be very murky at times during this period. Siltation would undoubtedly obscure the redds in a short time. Although these data do not show the extent of spawning in these tributaries, they do indicate that Dolly Varden spawners use these streams.

In addition to present use by spawning game fish, these streams are of primary importance to any salmonid game fish which may become established in Noxon Rapids impoundment. Inundation of the main river channel will prevent successful spawning of game fish there, and natural recruitment to populations in the reservoir will depend upon spawning facilities in tributary streams. Therefore, any culverts installed on these streams should be designed to insure passage of fish on spawning runs.

The Noxon Rapids project includes the construction of approximately fourteen miles of highway, fifteen miles of railroad grade and an undetermined number of miles of secondary roads. Important streams which may be influenced by this construction are McKay Creek, Swamp Creek, Vermillion River, Beaver Creek, Trout Creek and Martin Creek. Rock Creek, which enters Cabinet Gorge Reservoir below the Noxon Rapids dam, will also be affected by the highway and railroad. The lower portions of McKay Creek, Swamp Creek, Beaver Creek and Trout Creek went dry during mid-August in 1955, but such streams can provide spawning facilities for spring spawning game fish.

OBSERVATIONS ON CABINET GORGE RESERVOIR

Fry and fingerlings were observed in the shallow areas of Cabinet Gorge Reservoir during June and early July. Samples of these fish were collected with a minnow seine and a 20-foot bag seine. The only game species found in these samples was an occasional mountain whitefish. Field examination of these samples indicated that squawfish were very abundant. On July 29, it was noted that these small fish were not in certain areas where they had previously been observed. Extensive seining in the vicinity of the Noxon bridge took no fish. Small fish were observed in Bull River Bay on that date, but they appeared to be less abundant than during previous weeks. The fish observed in Bull River Bay in late July were in deep water and could not be collected. These limited observations suggest a possible seasonal change in distribution of the younger age classes of certain species.

Conditions in Cabinet Gorge Reservoir illustrate the need for some means of controlling rough fish in waters of this type. Such control cannot be achieved until more information is available regarding the habits of these fish. It seems unlikely that successful management of this reservoir will be accomplished until such information is obtained.

Nearly one million cutthroat fry have been planted in Cabinet Gorge Reservoir since 1951. In spite of these introductions, this species made up less than one-third of the game fish taken by anglers and less than one percent of the fish taken

in gill nets. More than one million kokanee fry have been planted during the past three years, but thisspecies was not represented in the gill net catch nor in the anglers catch during 1955.

DISCUSSION

An investigation was conducted on the portion of the Clark Fork River that will be inundated by the Noxon Rapids hydroelectric plant. This section extends from the backwaters of Cabinet Gorge Reservoir to the tailwater of the Thompson Falls plant. The objectives of the project were to determine the status of the sport fishery and to obtain an index of the river's potential to provide recreational fishing. Observations were also made on Cabinet Gorge and Thompson Falls Reservoirs to determine the conditions that might be expected to develop in the new impoundment.

This section of the river flows through a "U"-shaped channel and is subjected to day-to-day fluctuations in flow as a result of upstream operations of hydroelectric plants. Siltation appears to have a limiting effect on production of fish-food organisms in certain areas along the shoreline. The physical characteristics of the stream prevented sampling for food organisms in the main channel.

Fisherman-use of this section of the Clark Fork River is relatively light. This is to be expected as there are no large population centers in the area. The 1955 creel census indicates that the catch per hour on this portion of the river is below the statewide average during the regular season but is higher than that figure during the winter season. The mountain whitefish is the species most commonly taken by sport fishermen. Local anglers report a decline in the catch of salmonid game fish since the construction of Cabinet Gorge Dam. Apparently spawning runs from Lake Pend Oreille provided some of the recreational fishing in this area prior to 1951. Creel census records of 1948-1955 support this contention. The catch per hour of anglers interviewed on Cabinet Gorge Reservoir during the regular season 1955 was slightly higher than that of the river fishermen but it was also below the statewide average.

A series of overnight gill net sets were made in the Clark Fork River and in Cabinet Gorge Reservoir. Game species represented ten percent of fish taken in the river sets and six percent of those taken from Cabinet Gorge. As expected, the average catch per net was greatest in Cabinet Gorge Reservoir. The most abundant species in both samples was the squawfish. The mountain whitefish was the most abundant game fish taken.

Fisherman-use on Thompson Falls Reservoir was negligible during 1955. Angling has been so poor on this water in past years that fishermen are no longer attracted to it in spite of its accessibility. Eight overnight gill net sets in this reservoir during October took six game fish and 107 rough fish. This reservoir is probably indicative of future conditions in Cabinet Gorge and Noxon Rapids Reservoirs unless control of rough fish can be accomplished.

This survey indicates that the present hydroelectric development will have a detrimental effect on sport fishing in the Clark Fork River. Although the Noxon Rapids plant will inundate a stream that supports only a moderate fishery at the present time, it will create an unstable body of water that cannot be managed with present knowledge and techniques for game fish. Local fishermen might expect a few years of fishing comparable to that in Cabinet Gorge Reservoir at the present time, but as rough fish build up the game fish population will diminish. Requests will no doubt be made that the Fish and Game Commission plant larger fish to support a

put-and-take fishery. Such a program would be economically unfeasible and would tend to mask the basic problem of a need for control of rough fish populations.

PROPOSED MANAGEMENT

Fishery managers have used toxicants for partial or complete removal of fish populations in past years, but this use has been primarily on lakes or ponds. Some recent work indicates that toxicants can also be a very useful management tool on streams and rivers. It is recommended that an investigation be made to determine the feasibility of removing the fish population from this section of the Clark Fork River. If the river could be treated with a rotenone product prior to closure of the Noxon Rapids Dam in 1958, a dominant population of game fish could be established in the reservoir before the rough fish became reestablished. Such a project could not be undertaken unless preliminary work is done to select a toxicant and to develop a technique of applying the product in a river of this size. Although a kill in Cabinet Gorge Reservoir would be desirable, it is of utmost importance that all toxic effects are dissipated before such material passes through the Cabinet Gorge plant.

Reinfestation of rough fish in the Noxon Rapids Reservoir would undoubtedly occur from upstream. If the rough fish were also removed from Thompson Falls Reservoir, this body of water may serve as a buffer-zone to delay the invasion of rough fish in the larger reservoir. Repeated treatment of the Thompson Falls Reservoir may further delay the build up of undesirable fish in the new reservoir.

If preliminary investigations indicate that this proposed project is feasible, provision should be made to determine the changes in fish populations during the post-impoundment period. This could be accomplished by periodic gill net sets or any other sampling method that is deemed applicable at the time.

It is impossible to calculate the cost of such a program at the present time. The amount of toxicant needed in the river cannot be determined with any degree of accuracy until preliminary investigations are made. The cost of the toxicant will represent the major portion of the expenditure. The cost of rehabilitating the Thompson Falls Reservoir can be estimated from the volume of the reservoir at low water or maximum drawdown.

LITERATURE CITED

Atton, F. M.
1955. The relative effectiveness of nylon and cotton gill nets. The Canadian Fish Culturist. Issue 17: 18-26.

APPENDIX

The following is a list of the fishes referred to in the text.

Symbol	Common Name	Scientific Name
Rb.	Rainbow trout	*Salmo gairdnerii*
Ct.	Cutthroat trout	*Salmo clarkii*
Eb.	Eastern brook trout	*Salvelinus fontinalis*
LL.	Brown trout	*Salmo trutta*
DV.	Dolly Varden	*Salvelinus malma*
SES.	Kokanee	*Oncorhynchus nerka kennerlyi*
Wh.	Mountain whitefish	*Prosopium williamsoni*
Sq.	Columbia squawfish	*Ptychocheilus oregonensis*
Su.	Columbia large-scaled sucker	*Catostomus macrocheilus*
	Columbia small-scaled sucker	*Catostomus syncheilus*
CRC.	Columbia River chub	*Mylocheilus caurinus*
Sh.	Redside shiner	*Richardsonius balteatus*
YP.	Yellowperch	*Perca flavescens*
Other	Pumpkinseed	*Lepomis gibbosus*
	Largemouth black bass	*Micropterus salmoides*
	Black bullhead	*Ameirus melas*