

MONTANA DEPARTMENT OF FISH AND GAME REPORT

In Cooperation with U.S. Army Corps of Engineers

Contract No. DACW 67-73-C-0004

FISHERIES DIVISION

Job Progress Report

LAKE KOOCANUSA TRIBUTARY DEVELOPMENT

Lake Koocanusa, Montana 1972-1974

By

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Reservoir Investigation Project

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MONTANA DEPARTMENT OF FISH AND GAME
FISHERIES DIVISION

JOB PROGRESS REPORT
Project No. 2275

Project Title: Development of Lake Koocanusa Tributaries
Period Covered: July 1, 1972 through June 30, 1974

ABSTRACT

The impounding of the Kootenai River by Libby Dam has inundated about 60 miles of the historic spawning and nursery areas in the United States of westslope cutthroat, Dolly Varden, rainbow trout and mountain whitefish. To help mitigate these losses, a management plan was devised to establish spawning runs of game fish from Lake Koocanusa (Libby Reservoir) into suitable tributaries. The development and evaluation work completed to date are presented in this report. Problem areas are discussed and recommendations for future management presented.

INTRODUCTION

Libby Reservoir will inundate 48 miles of the mainstem Kootenai River in the United States, about 42 miles in Canada and about 14 miles of tributary streams in the United States. Large parts of the historic spawning grounds of mountain whitefish (Prosopium williamsoni), rainbow trout (Salmo gairdneri), cutthroat trout (Salmo clarki) and Dolly Varden (Salvelinus malma) are no longer available. The quality stream habitat in the impoundment area has been replaced with a fluctuating reservoir having a projected average annual drawdown of 119 feet. This type of environment eliminates most benthic aquatic organisms which live in the littoral zone and is much more suitable for rough fish than game fish. Largescale suckers (Catostomus macrocheilus), longnose suckers (Catostomus catostomus), redbelt shiners (Richardsonius balteatus), peamouth chubs (Mylocheilus caurinus) and northern squawfish (Ptychocheilus oregonensis) will compete vigorously with game fish, especially juveniles, for food and space.

The development and maintenance of a satisfactory sports fishery in Lake Koocanusa will require annual plantings of hatchery-reared fish and recruitment of wild fish from the tributary streams. The tributaries and reservoir will be managed primarily for a migratory strain of westslope cutthroat which has proven its suitability in a fluctuating reservoir environment for more than 20 years in Hungry Horse Reservoir. Development of the tributaries will also benefit Dolly Varden, rainbow trout and mountain whitefish by opening more stream miles for spawning purposes.

BACKGROUND

The pilot study for determining the feasibility of converting tributary streams of Lake Koocanusa into spawning and nursery areas for migratory game fish was begun in 1969 at Young Creek. The development program consisted of three parts; (1) removal of potential barriers to fish migration, (2) chemical suppression of resident fish populations to reduce competition and (3) annual imprint plants. Survival of planted fish was excellent, averaging close to 30 percent (May and Huston, 1973). This was attributed largely to a lack of competition from resident fish. The number of outmigrant juveniles in 1973 was over 2,000 fish and the number of returning spawners in 1974 was close to 300 fish.

The initial data from the Young Creek project indicate that the tributary streams of the reservoir could be managed as spawning and nursery streams for migratory game fish. The methods utilized at Young Creek to establish the adfluvial cutthroat were then applied to other streams. The streams were divided into three categories depending on habitat and barrier characteristics; (1) those streams most valuable as spawning and rearing areas for adfluvial westslope cutthroat trout, (2) those streams with some value for cutthroat but with greater value for other species such as mountain whitefish and Dolly Varden and (3) those streams with no value for spring spawners but with value for fall spawners such as mountain whitefish and Dolly Varden (Figure 1).

OBJECTIVES

The primary objective of this project is to develop and maintain spawning runs of migratory game fish from Lake Koocanusa in suitable tributary streams. The specific objectives are to: (1) remove barriers preventing upstream movement of fish in Big Creek, Sullivan Creek, Pinkham Creek, Grave Creek drainage, Therriault Creek, Deep Creek and tributaries of Fortine Creek; (2) suppress resident fish populations with chemicals in Big Creek, Sullivan Creek, Pinkham Creek and Clarence Creek; (3) make imprint plants of westslope cutthroat and mountain whitefish; and (4) evaluate development accomplished in previous years.

PROCEDURES

Potential barriers to fish migration were removed, or altered with hand tools, primarily chain saws, axes and shovels.

Rotenone was utilized to suppress resident fish populations. A concentration of about 2.0 ppm was maintained in the stream for at least 8 hours. The rotenone was detoxified with potassium permanganate (3 ppm) in Clarence Creek only. The other streams treated run directly into the reservoir and dilution was sufficient to prevent mortalities of non-target fish.

Fish populations were sampled with standard Montana Department of Fish and Game electrofishing gear. Methods outlined by Vincent (1971) were used in the collection and analysis of data.

Mountain whitefish eggs were collected from fish spawning in tributary streams of Hungry Horse Reservoir and incubated in the hatchery to the advanced eyed stage before being planted. High water prevented efficient collection of whitefish in the fall of 1973 and the egg quota was not obtained.

A series of ten samples of whitefish eggs was taken to determine relative abundance of naturally spawned eggs wherever scattered sampling indicated the presence of whitefish eggs. Eggs were collected by stirring gravel and collecting the eggs in a small net as they drifted downstream.

Methods outlined in "Standard Methods..." (APHA 1965) were followed in the water quality analysis. Following Moyle's criteria (1949), streams with total alkalinities of less than 50 ppm were considered to be of low fertility and streams over 100 ppm were considered high in productivity.

FINDINGS

Canyon Creek

Barriers were removed from the full pool elevation upstream to Highway 37 where a several hundred foot long culvert blocks fish migration. The section of this stream available to fall spawning mountain whitefish is less than one quarter mile and the flows are less than one cfs in the fall. Therefore, management was limited to barrier removal only.

Murray Creek

Barriers were removed from full pool elevation, about 1/4 mile to the source, in 1972. This stream has good October flows and should support considerable spawning for mountain whitefish.

Sutton Creek

A natural falls stops fish migration about 3/4 mile from the reservoir. This stream should support a small run of mountain whitefish. An imprint plant of 70,000 mountain whitefish eggs was made in 1972 and the section to the falls was cleared of barriers.

Jackson Creek

A resident population of stunted brook trout (Salvelinus fontinalis) with very few fish over seven inches was found in the Jackson Creek. A falls below the reservoir level prevents spring spawners from ascending the stream and the stream will be managed primarily for fall spawners. It is of limited value because high gradient limits access. Barriers to fish migration were removed in 1972 below the Forest Service Development road, but since that time a beaver colony has built an impassable barrier just above full pool. The access problems in this stream associated with the high gradient and beaver activity in conjunction with the dense brook trout population make the success of management for fall spawners unlikely.

Barron Creek

This is a moderately productive stream (Table 1) having a dense population of stunted brook trout with few fish over seven inches in total length. A series of small falls 3 to 5 feet high, and high water velocities may limit access for spring spawners. This stream will be managed primarily for mountain whitefish. Barriers to fish migration were removed from the lower three miles in 1972. The gradient above the reservoir is moderate and autumn flows should be sufficient to attract mountain whitefish, although no eggs were collected in the 1973 survey (Table 2).

Bristow Creek

Brook trout are the dominant fish in this stream above the forest access road. Near the mouth, rainbow and cutthroat dominate the species complex. Low flows in late summer and fall, plus low basic productivity limit salmonid production in the stream.

Barriers were removed from the lower three miles of the stream in 1972 and an imprint plant of 70,000 mountain whitefish eggs made (Table 3). Mountain whitefish eggs were found near the mouth in 1973, but they were comparatively rare. The comparatively low value of this stream dictates that management be limited to barrier removal and imprint plants only.

Cripple Horse Creek

This stream is populated by a slow-growing brook trout population with few fish over seven inches. A falls below the high water elevation prevents access for spring spawners and the stream is being managed for fall spawning whitefish. Low flows in late summer and fall and low basic productivity (Table 1) limit trout production.

Barriers were removed from the lower three miles in 1972 and an imprint plant of 100,000 mountain whitefish eggs made in 1972. Whitefish eggs were common near the mouth in 1973 and this stream could eventually attract a substantial spawning run.

Five Mile Creek

Five Mile Creek is a moderately productive stream (Table 1) with flows ranging from about 3 to 5 cfs during the summer and fall. This stream has a moderate gradient in the section developed. Willow and alder provide good bank stability and excellent drainage from about 2 miles above the mouth. Prior to development, this stream supported an excellent population of brook trout with many fish in the ten to fourteen inch category.

The lower two miles of the stream was developed for cutthroat and mountain whitefish in 1972. The management included removal of potential barriers to fish migration, suppression of the brook trout population and making imprint plants of cutthroat in 1972 and 1973 and plants of whitefish in 1972. Beaver were removed from the developed section in 1973.

Two sections were sampled in October of 1973 to evaluate the success of the imprint plants. The section near the mouth had a fish population consisting of 74 percent cutthroat, 19 percent mountain whitefish and 7 percent brook trout, whereas the fish population in the section about 1.3 miles upstream was comprised of 46 percent cutthroat, 12 percent whitefish and 42 percent brook trout. The growth of the 1972 imprint plants was good with cutthroat ranging in size from 4.0 to 5.2 inches total length. The re-population of the upper part of the developed section by brook trout will limit the production of cutthroat. Future management may entail mechanical removal of brook trout followed immediately by imprint plants of cutthroat trout.

Big Creek

Big Creek is an infertile stream (Table 1) with flows ranging from 10 to over 1,000 cfs. The habitat of the stream varies from steep sections with rubble and boulder bottom to low gradient meadow sections with sand and gravel substrate and excellent willow and alder cover. Prior to development, the fish population consisted primarily of small resident rainbow with few

fish over seven inches in total length. The density of the fish population is low, but the overall numbers the stream can support is high because of its length.

Approximately 28 miles of Big Creek and its major tributaries were developed in 1973 for cutthroat trout. The program included barrier removal, suppression of resident fish with rotenone and making an imprint plant of 70,000 westslope cutthroat sub-fingerlings. Approximately 100,000 whitefish eggs were planted in January of 1974. Future management will involve maintenance of fish passage, annual plants of sub-fingerlings and fish population sampling to evaluate survival and growth of imprint plants and development of spawning runs.

Sullivan Creek

Sullivan Creek is a fertile stream which has a moderate to steep gradient. Bank cover and bank stability are excellent and the stream has a stable flow which doesn't drop below 3 cfs. A 20-foot high falls blocks fish passage about 3 miles from the mouth. A good population of resident cutthroat occupied the stream below the falls and the section above the falls was without fish. Prior to treatment in 1973, about 300 resident cutthroat were collected below the falls and moved to the fishless section.

The lower three miles were developed in 1973 for westslope cutthroat. The program involved barrier removal, suppression of resident fish with rotenone and making an imprint plant of 24,080 westslope cutthroat sub-fingerlings. Future management will be similar to the Big Creek plan.

A potential barrier to fish migration exists below the culvert on the forest development road. Corrective action is needed here.

Pinkham Creek

This is a moderately fertile stream (Table 1) with a moderate gradient except near the mouth where it plunges through a small gorge. Bank cover and stability are good in most sections except where cattle grazing has denuded the banks. Low flows in the summer and fall and turbidity in the spring may limit salmonid production in this otherwise fertile stream. The area treated contained a good population of rainbow with many fish in the 7 to 12 inch size group. A high falls block fish passage about 6 miles upstream from the mouth.

The lower 6 miles of the stream was developed in 1973 with the same program outlined for Big and Sullivan Creeks. Future management will be similar to that proposed for Big Creek with some modification. The steep canyon area blocks access to mountain whitefish and precludes management for this species. Cattle management in the drainage should be reviewed with the Forest Service with the goal of eliminating over-grazing of riparian vegetation.

Several large pieces of shot rock below Montana Highway 37 Bridge were found to be blocking fish passage. These were dynamited in the spring of 1974 and it appeared that fish passage might be possible. However, a brief survey in early July 1974 showed that fish passage was still blocked by the shot rock.

Clarence Creek

Clarence Creek and Stahl Creek, its major tributary, are moderately fertile streams (Table 1) which enter Grave Creek about 14 miles from the Tobacco River (Figure 1). Bank cover and stability are generally good except for some problem areas in the upper two miles of Clarence Creek where the stream flows through a spruce basin which was logged about 15 years ago. Summer and fall flows are excellent in Clarence Creek, seldom dropping below 15 cfs at the mouth. Prior to treatment, numerous resident cutthroat and Dolly Varden populated this stream with a few migratory Dolly Varden present near the mouth. A mature Dolly Varden 22.0 inches long, captured and tagged near its mouth in September, 1972, was recaptured in Lake Koccanusa near Sullivan Creek in May, 1973, a movement of over 30 miles.

The initial development work of barrier removal and suppression of resident fish populations was completed in the Clarence Creek drainage in 1973 with the first imprint plant of 14,890 cutthroat made in September, 1973. Future management will be similar to that described for Big Creek with the exception that mountain whitefish eggs will not be planted.

Grave Creek

Grave Creek is a comparatively fertile stream (Table 1) which joins with Fortine Creek to form the Tobacco River about 10 miles southeast of Eureka. Grave Creek has at least 30 miles of suitable spawning and nursery habitat for westslope cutthroat and Dolly Varden. Water quality is excellent and summer and fall flows are adequate for salmonid production. The lower three miles below the Glen Lake Irrigation District diversion dam contains few resident fish but is used for spawning by Dolly Varden, mountain whitefish, cutthroat and rainbow trout from Lake Koccanusa. The drainage upstream from the diversion dam, historically, supported excellent spawning runs of cutthroat, Dolly Varden and mountain whitefish. The dam located on Forest Service land is a partial barrier to spawning migrations of Dolly Varden and completely blocks cutthroat, rainbow and mountain whitefish runs. The potential value of the drainage above the diversion as spawning and nursery area for migratory game fish from Lake Koccanusa dictates that fish passage be provided as soon as possible.

Removal of potential barriers to fish migration was accomplished in 1973 and imprint plants of westslope cutthroat made in the lower end. Future management will center around maintenance of fish passage, coordinating logging operations with the Forest Service to protect water quality and riparian vegetation, monitoring the growth and survival of imprint plants, and the development of spawning runs. Cutthroat trout will not be introduced above Clarence Creek, because Dolly Varden presently use the drainage upstream from this point for spawning.

Therriault Creek

Therriault Creek is a productive stream which drains into the Tobacco River about 8 miles southeast of Eureka. This is a silty stream which receives considerable run-off from agricultural land and irrigation returns. Development work has been limited to removal of debris and log jams in the lower two miles.

Deep Creek

This stream is scheduled for barrier removal in 1974.

Table 1. Water quality parameters of streams tributary to Lake Koocanusa collected and analyzed September 21, 1972

Stream	Location	Water Temperature Fahr.	Dissolved Oxygen ppm	pH	Total Alkalinity ppm	Standard Conductance (Micromhos)
Jackson Creek	Mouth	48°	9.9	8.1	132	250.0
Barron Creek	Mouth	50°	9.1	8.0	82	151.0
Bristow Creek	Mouth	46°	9.6	7.3	25	43.3
Big Creek	Mouth	49°	10.3	7.5	26	42.5
Sullivan Creek	Mouth	44°	10.2	8.1	128	225.9
Young Creek	Mouth	45°	10.3	8.1	134	220.7
Cripple Horse Creek	Mouth	48°	9.6	7.7	48	96.3
Five Mile Creek	Mouth	52°	9.7	7.7	61	119.3
Pinkham Creek	Mouth	46°	10.2	8.2	151	270.5
Therriault Creek	Hwy 93	46°	10.1	8.3	162	291.3
Grave Creek	Dam	46°	10.2	8.3	114	199.6
Williams Creek	Mouth	44°	10.3	8.2	124	228.5
Clarence Creek	Mouth	44°	10.1	8.1	96	188.5
Blue Sky Creek	Mouth	42°	10.0	8.2	98	191.5
Fortine Creek	Mouth	50°	9.2	8.0	188	304.5

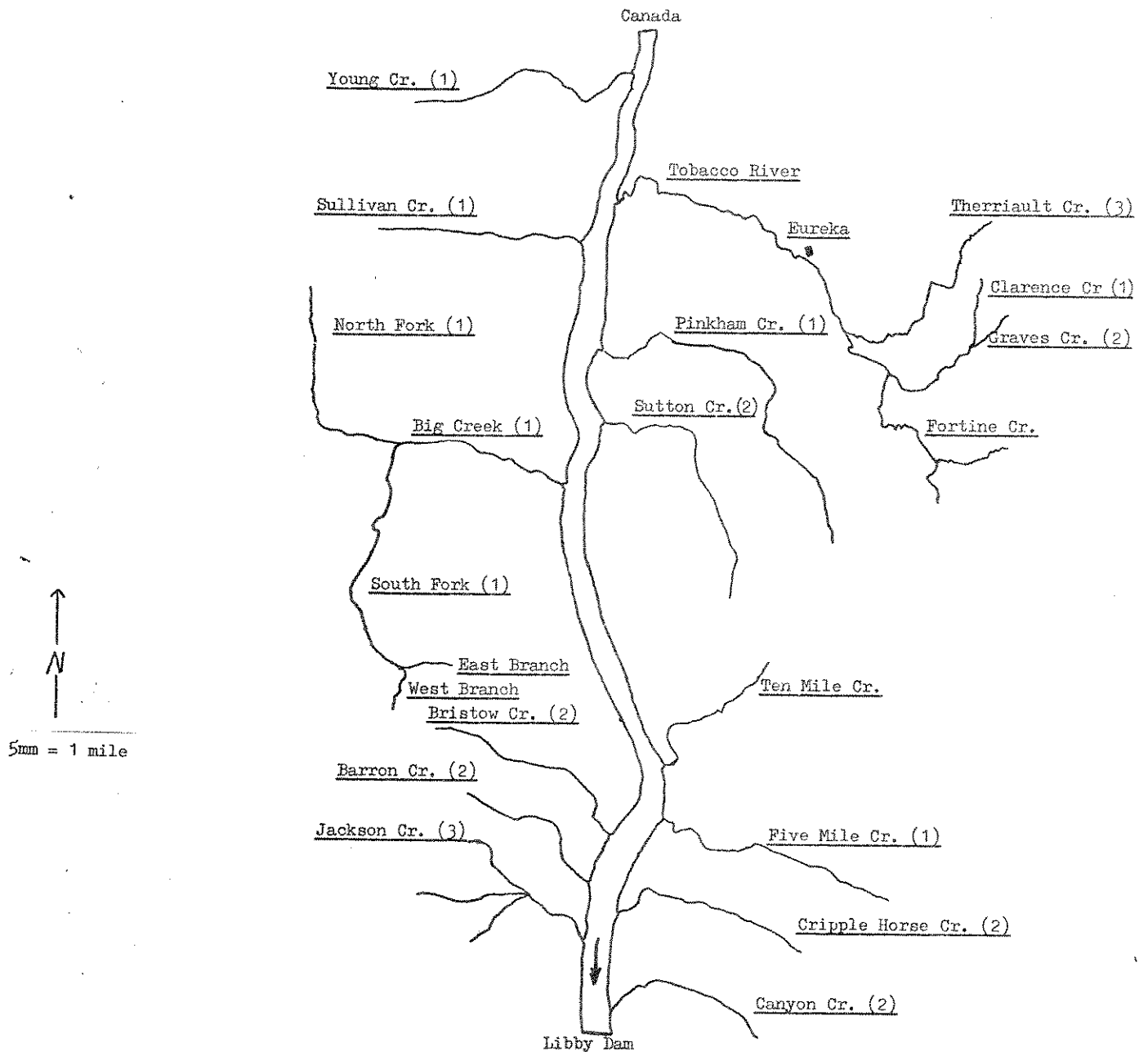
Table 2. Summary of mountain whitefish egg reconnaissance in tributary streams of Lake Kooacanusa, November, 1973

Stream	Location	Relative Abundance
Barron Creek	Near Mouth	None
Bristow Creek	Near Mouth	Rare
Big Creek	Mouth to Steep Creek	None
Young Creek	Trap to Mouth	None
Five Mile Creek	Near Mouth	None
Cripple Horse Creek	Near Mouth	Common
Tobacco River	Rexford Bridge	Common
	Eureka	Common
	Junction of Grave 2	Common
	Clarence Creek	Common
Grave Creek	Mouth	Common
	Hwy 93 Bridge	Common
	Below Diversion Dam	None
	Above Diversion Dam	None
Therriault Creek	Mouth	None (Very silty)
Fortine Creek	Fortine	None (Very silty)

Table 3. Imprint plant record for tributary streams of Lake Koocanusa

Stream	1972	1973
Bristow Creek	Mwf 70,000	--
Big Creek	--	Wct 70,000 Mwf 125,000
Sullivan Creek	--	Wct 24,080
Young Creek	Wct 54,200 Mwf 40,000	Wct 32,000
Cripple Horse Creek	Mwf 100,000	--
Five Mile Creek	Wct 14,700 Mwf 100,000	Wct 11,000
Pinkham Creek	--	Wct 10,000
Grave Creek	Wct 72,000	--
Clarence Creek	--	Wct 14,890
Sutton Creek	Mwf 70,000	--

Figure 1. Map of project area adjacent to Lake Kootenai showing management plan for each tributary, 1974



1. Barrier removal, suppression of resident fish and imprint plants of westslope cutthroat
2. Barrier removal and imprint plants of westslope cutthroat or mountain whitefish
3. Barrier removal only
4. Imprint plants only

Fortine Creek

Fortine is a comparatively fertile stream which meanders through agricultural land. The stream below Steward Creek is low gradient and the bottom is quite silty from erosion from agricultural activity and the relocated railroad right-of-way which was completed in 1971. Trout reproduction was poor in this stream in 1970 and 1971 (May, 1972) because of erosion from the railroad grade. This stream should be resurveyed in 1974 to determine if conditions are suitable for salmonid reproduction, before any development work is started.

Wigwam River

This is a comparatively large drainage which flows from the United States into Canada where it joins the Elk River then enters Kootenai Reservoir north of the international boundary. Cutthroat trout and Dolly Varden from the Kootenai River have utilized this drainage for spawning. Barriers should be removed from this drainage to insure access for spawners. The spawning run should be monitored to determine if the fluvial strain of cutthroat is able to maintain and reproduce itself in the reservoir environment. Imprint plants of adfluvial cutthroat may be necessary in the future years if the fluvial cutthroat doesn't adapt to the reservoir environment.

RECOMMENDATIONS

1. Imprint plants of mountain whitefish eggs should be extended to 1976, because our quota was not met in 1974. Extension of imprint plants one year past the termination of this contract will be done by Montana Department of Fish and Game.
2. Barrier problems resulting from road construction should be inspected periodically at Pinkham and Sullivan Creeks. The barrier in Pinkham Creek situated about 33 yards below Montana Highway #37 bridge resulted from "shot rock" tumbling into the creek during road construction. At this time two attempts have been made to remove this barrier by blasting and they have not succeeded. A third attempt will be made in mid-July and if not successful, installation of a steep-way fish ladder is recommended. Evaluation of the third blasting effort cannot be made until late summer 1974.

A potential barrier exists immediately below the lower most hardpoint constructed on the downstream side of the FD road - Sullivan Creek culvert. The streambed below this hardpoint has eroded creating a low falls. The hardpoint capped with concrete has been undercut and is threatening to collapse. If the hardpoint collapses a high falls leading into the culvert will be created and this falls is expected to preclude further upstream fish movement. Repair of the undercut hardpoint is still possible at this time and should be done before the 1975 spring high stream flows.

The Department calculates that an expenditure of about \$650 will be needed to prevent the collapse of the hardpoint and insure fish passage if project people do the work. This estimate includes wages and benefits, equipment rental and operation and maintenance funds.

The supplemental report dealing with final estimates of work needed and costs involved for repair of barriers, real or potential, in Sullivan Creek and Pinkham Creek will be submitted in fall, 1974.

3. Habitat problems caused by logging and cattle grazing should be reviewed with Forest Service and corrective action taken where deemed necessary.
4. The Grave Creek drainage includes almost all the potentially excellent spawning area for Dolly Varden in the Montana portion of the Lake Koocanusa drainage. An abundant Dolly Varden population in the reservoir is deemed very desirable since this species will be the only large predator fish in the system and its abundance could have an effect upon prey species abundance.

It is recommended that construction of a barrier dam, upstream-downstream fish trap, be initiated in Grave Creek. The Department biologist responsible for site selection and basic design of the Young Creek barrier dam has inspected Grave Creek for the best site and installation design. Field review of his findings with appropriate Corps of Engineers personnel should be done as soon as possible. The fish barrier-trap could easily be constructed to replace the Glen Lake Irrigation District's Grave Creek diversion dam. This diversion dam is located on Forest Service land under a special-use permit. Proper design would allow for both fish barrier and trap facilities and water diversion capabilities.

Prepared by: Bruce May

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Waters referred to:	Barron Creek	11-0200-01
	Big Creek	11-0420-01
	Bristow Creek	11-0640-10
	Canyon Creek	11-0920-10
	Clarence Creek	11-1100-10
	Cripple Horse Creek	11-1520-01
	Deep Creek	11-1740-01
	Five Mile Creek	11-2340-01
	Fortine Creek	11-2460-01
	Gregg Creek	11-2740-01
	Jackson Creek	11-3260-01
	Murray Creek	11-4560-01
	Pinkham Creek	11-5140-01
	Sullivan Creek	11-6620-10
	Sutton Creek	11-6700-10
	Therriault Creek	11-6860-01
	Young Creek	11-7780-01

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