MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
FISHERIES DIVISION
JOB PROGRESS REPORT

STATE: MONTANA PROJECT TITLE: STATEWIDE FISHERIES INVESTIGATIONS

PROJECT NO.: F-46-R-5 STUDY TITLE: SURVEY AND INVENTORY OF COLDWATER STREAMS

JOB NO.: I-a, II-a (Partial) JOB TITLE: NORTHWEST MONTANA COLDWATER STREAM INVESTIGATIONS (SPECIES OF SPECIAL CONCERN SEGMENT)

PROJECT PERIOD: JULY 1, 1991 THROUGH JUNE 30, 1992

ABSTRACT

Electrophoretic identification was made of fish collected from five new streams. Evaluation of efforts to replace non-native Oncorhynchus and trout hybridized with native O. clarki lewisi (westslope cutthroat trout) is described for five lakes and two streams.

BACKGROUND

Historically the westslope cutthroat trout (Wct) was the only Oncorhynchus species present in most of Montana except the Yellowstone River Drainage. This species has been displaced, replaced or hybridized with other fish species throughout much of its original range. Electrophoretic identification of fish populations was started in 1982 when the Department committed to rebuilding its westslope cutthroat trout hatchery broodstock. This genetic work has since developed into a drainage-wide survey of the South Fork Flathead River above Hungry Horse Dam, a continual search for genetically pure aboriginal Wct, a tool to evaluate efforts to restore pure Wct in selected waters within the South Fork Flathead River Drainage and to identify sensitive species potentially affected by land and water resource extraction activities.

OBJECTIVES AND DEGREE OF ATTAINMENT

Objectives included one from the Northwest Montana Coldwater Lakes Investigation (F-46-R-4, I-a) and one from the Northwest Montana Stream Investigations (F-46-R-4, II-a). These objectives were:

Northwest Montana Coldwater Lakes Investigations,

7. Manage regulations and stocking to protect or expand species of special concern.

Northwest Montana Coldwater Lakes Investigations,

7. To maintain or expand populations of species of special concern [westslope cutthroat trout, bull trout (Salvelinus confluentus), and inland (redband) rainbow trout (Oncorhynchus mykiss)].

These objectives were attained.

PROCEDURES

Collection for Electrophoretic Analysis

Collection of fish from streams was accomplished by electrofishing, angling, explosives (M-80 firecrackers) or seining while fish from lakes were caught by angling or gill netting. Fish caught were retained whole, packed in wet ice or dry ice shortly after capture and frozen within 48 hours after capture. The samples were then transported to University of Montana Population Genetics Laboratory, stored in -80° C freezers and analyzed using starch gel electrophoresis by laboratory personnel.

Cost of analysis of fish caught by Department personnel from streams in Kootenai National Forest was paid by Kootenai National Forest. Cost of analysis of other samples was borne by the Department either under contract or part of a Masters Degree program.

Lengths, weights and scales for age-growth analysis were collected from all samples except for Chepat Creek. Abbreviations used in this report include Wct (westslope cutthroat), Yct (yellowstone cutthroat) and Rb (Rainbow trout).

RESULTS AND DISCUSSION

Initial Genetic Surveys

Two samples were collected and analyzed from Fishtrap Creek, tributary to Thompson River. One sample collected about three miles upstream from the Thompson River included rainbow trout, westslope cutthroat trout and hybrids of the two species. Another sample collected near the mouth of Radio Creek, about 9-10 miles upstream from Thompson River was analyzed as pure Wct. No permanent barriers are known to exist although numerous beaver dams exist between the two sample sites. Rainbow trout found in lower Fishtrap Creek probably originated from Thompson River where they have completely replaced Wct.

Fish collected from Chepat Creek, a tributary of the Stillwater River near Stryker, Montana, were analyzed as pure Wct. Fish collected from Whitepine Creek near Thompson Falls, Montana, and East Fork Elk Creek near Heron, Montana, were also pure Wct. The latter two streams have several mile-long stretches of intermittent channel downstream from the sample sites which effectively serve as barriers isolating the upstream fish population from downstream species.

Fish collected from Silver Butte Fisher River near the mouth of Iron Meadow Creek were Rb x Wct hybrids. Genetic material of rainbow trout origin may have included both coastal and inland rainbow strains.

EVALUATION OF "SWAMP-OUT" TECHNIQUE

The genetic survey and results of the "swamp-out" method of genetic restoration of westslope cutthroat trout populations in lakes in the South Fork Flathead River Drainage is the subject matter for a Master's Degree program. It is expected that G. Kevin Sage, University of Montana Population Genetics Laboratory, will finish this thesis by fall, 1992. He is also planning on excerpting selected material and writing articles for publication in appropriate professional journals. The thesis subject matter will also include a description of external and internal parasites found in Rb, Yct, Wct and hybrids thereof.

This job progress report will only include general information on results of the "swamp-out" for Graves Creek Drainage, Graves and Wheeler creeks and Margaret and Sunburst lakes.

A genetic survey of many streams and most lakes within the South Fork Flathead River Drainage was started in 1983 and completed in 1988. A review of the findings indicated that streams without headwater lakes had an excellent chance of containing pure Wct even if the stream had been planted with another trout species. On the other hand, streams with no planting history but with headwater lakes that had non-native or hybridized fish usually contained a hybridized trout population. This indicated that headwater lakes were the key factor regulating hybridized stream populations. Therefore, if headwater lakes could be restored to pure Wct then downstream waters might also be restored.

Chemical treatment of a large number of mountain lakes was deemed impractical, economically unfeasible and controversial. Further review of the genetic survey data did indicate another method worthy of consideration. Analysis of fish collected from two lakes, Wildcat in the South Fork Flathead Drainage and Red Meadow in the North Fork Flathead drainage showed near-pure Wct for Wildcat and pure Wct for Red Meadow. Both these lakes' fish populations had been classified as Yellowstone cutthroat trout by Department personnel in the late 1960s and early 1970s. Red Meadow Lake had been planted with about 300,000 Yct from 1932 through 1963 and with about 3,000 Wct annually in 1968, 1970, 1975 and 1980. Wildcat Lake had been planted with Yct in 1938, 1941 and 1953 and with Wct in 1965, 1978 and 1979. The histories of both Red Meadow and Wildcat lakes changing from Yct to Wct following planting with the latter species led to the formulation of the "swamp-out" theory.

The primary basis for this theory is that Wct is superior to other trouts within its native range and thus in relatively undisturbed habitat will replace non-native species or hybridized populations. Replacement is theorized to occur in the short term through competition and in the long term through interbreeding which will gradually dilute non-native genetic material to a non-detectable level. It is not known how long it will take interbreeding to dilute non-native genetic material to non-detection levels because it depends upon Wct continuing to breed with non-native and hybridized fish. In most cases the time period may be at least 20 years if a supply of Wct is available for breeding purposes. Both the short and long-term processes require frequent plantings of Wct into the subject water.

Region One has been planting 22 lakes in the South Fork Flathead River Drainage. Fourteen of these lakes are outside the Bob Marshall Wilderness and include two lakes with non-native trout populations and 12 with hybridized Wct populations. Thirteen of the lakes were planted annually starting in 1986 and terminating in 1990. One lake containing a hybrid swarm of Wct x Yct was first planted in 1986 and is scheduled for annual plants through 1994. Eight lakes within the Bob Marshall Wilderness have been planted annually starting in 1988 and scheduled to continue through 1994. Adjustments to the planting schedule will be made as genetic data becomes available.

Results of analysis of fish samples from Graves Creek Drainage, Wheeler Creek, Sunburst and Margaret lakes are presented below. A map of the Wheeler, Margaret and Graves Creek drainages is shown in Figure 1.

Sunburst Lake - Sunburst Lake is the headwater of Gorge Creek tributary to Bunker Creek and lies within the Bob Marshall Wilderness. Fish analyzed in 1987 were found to be mostly Yct with a few Yct x Rb. Starting in 1988 an annual stocking of 10,000 eyed Wct eggs have been planted in man-made redds in an outlet area used for spawning. Eyed eggs are used in Sunburst Lake because of the 12-13 mile trip and lack of sufficient Department pack equipment to haul in 10,000 fish.

In 1991 the planting crew was instructed to hook and line sample and keep as many fish 10 inches long or less as they could for genetic analysis. The two man crew left base camp at 4 a.m., planted eggs, caught 14 fish and returned to base camp at about 9 p.m. the same day, August 2. These fish ranged in length from 6.4 to 9.5 inches and were all aged as two years old. Twelve of the fourteen fish were Wct and two were Yct indicating some survival of eggs planted in 1989.

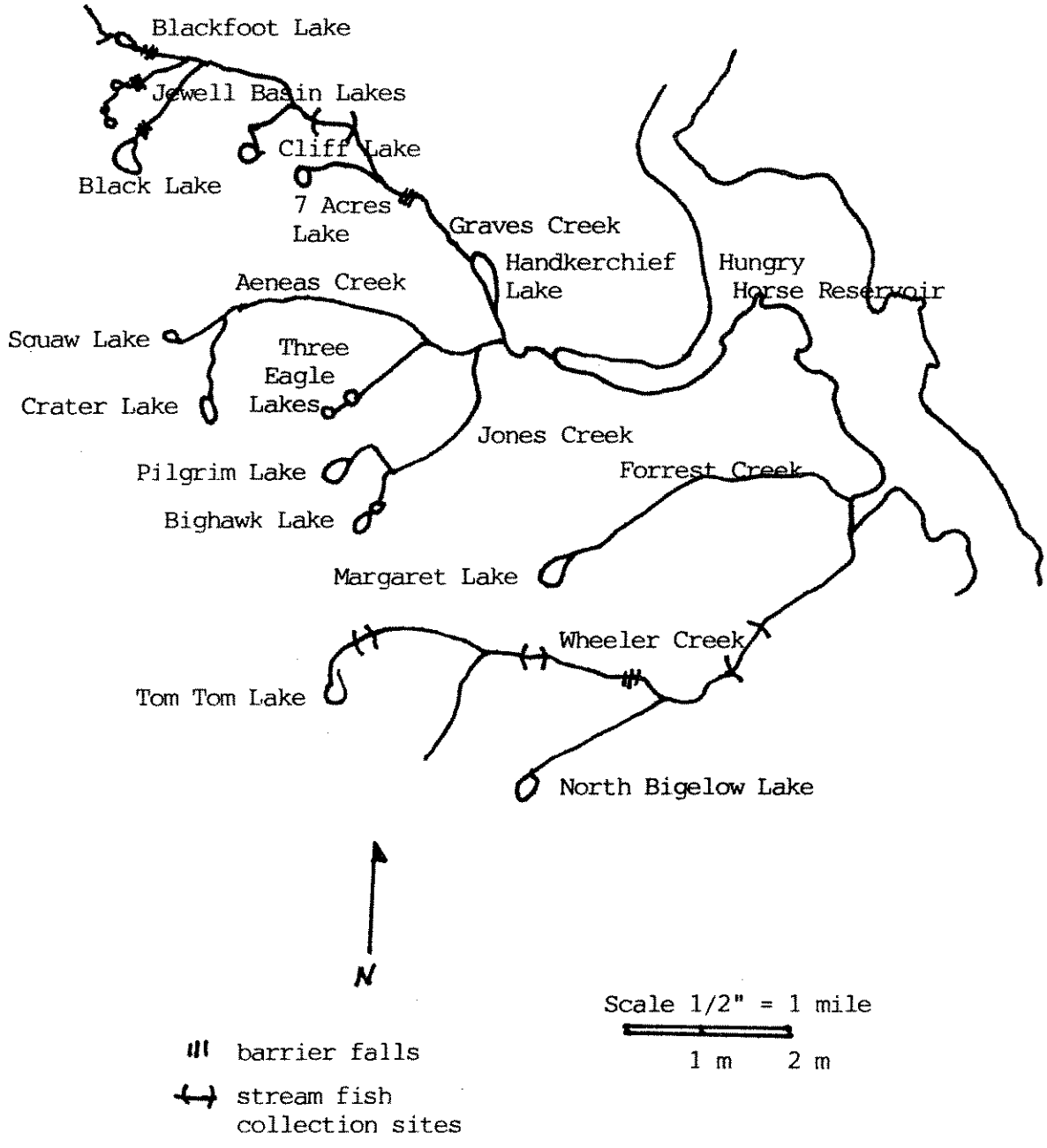

Figure 1. Map of Graves, Wheeler and Forrest creek drainages.

Margaret Lake - Margaret Lake is the headwater of Forest Creek tributary to Hungry Horse Reservoir. When surveyed in 1985 genetic analysis of 26 fish showed that 25 were pure Wct and 1 a Wct x Yct hybrid. The lake was planted in 1985 and 1986 with 1,000 and 2,000 Wct young-of-the-year. A 12 fish sample ranging in size from 8.6 inches to 14.0 inches total length caught September 5, 1991, was analyzed as pure Wct. It is concluded that Margaret Lake has very reasonable chance of being populated by only Wct at the present time.

Wheeler Creek Drainage - Wheeler Creek Drainage consists of upper and lower Wheeler Creek divided by a barrier falls (Figure 1), North Bigelow and Tom Tom lakes. Genetic analysis of fish populations within these four units done in 1984-1986 included: Tom Tom Lake and upper Wheeler Creek - pure Yellowstone cutthroat trout; lower Wheeler Creek - 82 percent Wct and 18 percent Wct x Yct hybrids; North Bigelow Lake - 85 percent Wct and 15 percent Wct x Rb hybrids.

Tom Tom Lake was planted at a rate of 1,000 young-of-the-year Wct per year for the years of 1985 through 1989. Fish caught from the lake in 1990 included 28 percent Yct, 66 percent Wct and 6 percent Wct x Yct F1 hybrids. In upper Wheeler Creek 1984 electrofishing yielded 3 fish, all pure Yct. In 1990 electrofishing the same area yielded 14 Yct, 2 Wct and 14 F1 hybrids. Fish collected from lower Wheeler Creek in 1991 in the same area sampled in 1983-84 consisted of 85 percent Wct and 15 percent Wct x Yct hybrids; no significant change from composition of the 83-84 sample. This would seem to indicate that fish above the falls have not (yet) successfully invaded the area below the falls.

Graves Creek Drainage - This report include data only from that portion of the Graves Creek Drainage including Handkerchief Lake and Graves Creek Drainage upstream from the lake (Figure 1). This portion of the drainage includes Graves Creek, seven lakes and their five outlet streams; 7 Acres Lake and outlet, Cliff Lake and outlet, Blackfoot Lake and outlet, Black Lake and outlet and Jewell lakes (3) and outlets.

Initial genetic survey on Graves Creek and Handkerchief Lake was done in summer 1983 while initial survey of headwater lakes was done in summer 1986. The initial surveys found that of the seven lakes only Cliff and 7 Acres were populated by only westslope cutthroat trout. The remaining lakes and Graves Creek contained non-native trouts, some westslope cutthroat and hybrids between the westslope, rainbow trout and Yellowstone cutthroat trout. Results of the initial survey for the lakes and streams except for Cliff and 7 Acres lakes is given in Table 1.

Starting in 1986 and ending in 1990, Blackfoot and Black lakes have been helicopter planted respectively with 2,500 and 8,000 young-of-the-year westslope cutthroat annually. Handkerchief Lake was planted with 15,000 YOY Wct in 1986, 1988 and 1990. The Jewell lakes were chemically treated with rotenone in early September 1986 and planted with YOY Wct in late October, 1986. Apparently these lakes were still toxic when planted as no fish could be found in July, 1987. North and South Jewell lakes were planted with 1,000 YOY Wct in 1987, 1988, 1989. Hook and line sampling done in 1990 and 1991 indicated survival of all three years' fish.

Follow up analysis was made of fish caught by gill nets and hook and line in 1991 from Black, Blackfoot and Handkerchief lakes and Graves Creek. Results of the genetic analysis of these follow up surveys is compared to the initial survey in

Table 1. Sample site in Graves Creek is shown in Figure 1.

Water	Year	Species	Percent of Sample	Year	Species	Percent of Sample
Black Lake	1986	Wct	74%	1991	Wct	95%
		Hybrids[1/]	26%		Hybrids[2/]	5%
		Sample Size = 42 fish			Sample Size = 44 fish	
Blackfoot Lake	1986	Wct[3/]	22%	1991	Wct	76%
		Rb	78%		Rb	7%
		Hybrids	0%		Hybrids[4/]	17%
		Sample Size = 23 fish			Sample Size = 72 fish	
Graves Creek	1983	Wct	30%	1991	Wct	24%
		Rb	0%		Rb	5%
		Hybrids[1/]	70%		Hybrids[1/]	71%
		Sample Size = 27 fish			Sample Size = 41 fish	
Handkerchief Lake	1983	Wct	10%	1991	Wct	31%
		Hybrids[1/]	90%		Hybrids[1/]	69%
		Sample Size = 21 fish			Sample Size = 16 fish	

[1/]Includes RbxWct and RbxWctxYct
[2/]Includes only RbxWct
[3/]All from 1984 plant
[4/]All F1 RbxWct hybrids

Considerable change has occurred in the two headwater lakes, Black and Blackfoot, since heavy planting of Wct started in 1986. In 1986, Blackfoot Lake was essentially all rainbow trout except for a few Wct from a 1984 planting. In 1991 the population was mostly Wct with a few Rb and some first generation Wct x Rb hybrids. These F1 hybrids were mostly young-of-the-year fish with the remainder yearlings. The yearling and YOY fish were caught from lake tributaries.

In Black Lake it appears that the planted Wct have replaced Wct x Rb x Yct hybrids and some Rb x Wct hybrids. These data may be misleading since no young-of-the-year and few yearlings were collected from Black Lake. Most of the spawning in Black Lake occurs along the shoreline making capture of YOY fish very difficult.

Generally the data in Table 1 suggests that the planted Wct are displacing non-native and hybridized fish from the headwater lakes. The samples from Graves Creek suggest that displacement has occurred. Pure rainbow trout were not found in Graves Creek in 1986 but were present in 1991. Data from Handkerchief Lake indicate an increase in numbers of Wct from 1986 to 1991 probably related to planting that occurred in 1986 and 1988.

RECOMMENDATIONS

It is proposed that the following waters be sampled in fiscal year 1993.

1. Sunburst, Woodward, Lower Necklace and Pyramid lakes. All these lakes are in the Bob Marshall Wilderness and three are planted using horses. The fourth, Lower Necklace Lake, is on the trail into Woodward Lake. Prior to start of planting in 1988 Sunburst Lake contained Rb x Yct, Woodward and Lower Necklace contained Rb and Pyramid contained Yct . Fish planting crews will be requested to hook and line capture fish from Sunburst, Woodward and Pyramid and set gill nets in Lower Necklace as they pass it on their way into Woodward.

2. Stream survey proposed for the Bull River Drainage near Noxon, Montana, includes collection of fish for genetic analysis. The U.S. Forest Service will pay for analysis of fish collected from streams on federal lands and the Department will pay for analysis of fish collected on private of state lands. Department and Washington Water Power Company personnel will do almost all fish collecting.

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Waters Referred to:

Black Lake	08-8160-3
Blackfoot Lake	08-8340-3
Chepat Creek	07-0780-10
East Fork Elk Creek	05-2336-1
Fishtrap Creek	05-2800-1
Graves Creek	08-3100-1
Handkerchief Lake	08-8740-3
Margaret Lake	08-9860-3
Silver Butte Fisher River	11-5980-1
Sunburst Lake	08-0800-3
Tom Tom Lake	08-9860-3
Wheeler Creek	08-7720-1
Whitepine Creek	05-8176-1

Key Words: Genetic analysis, westslope cutthroat trout restoration