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REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS

Job No. 6 (IF)-c^2. Region 6 (Idaho Falls) Rivers and Streams Investigations -- Big Lost and Little Lost Rivers, and Birch and Medicine Lodge Creeks Survey

By

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TABLE OF CONTENTS

Page

ABSTRACT 1

INTRODUCTION 3

OBJECTIVES 3

RECOMMENDATIONS 3

STUDY AREA DESCRIPTION 4

TECHNIQUES 4

Fish Sampling and Population Estimates 4
Age And Growth 7
Angler Surveys 7

FINDINGS 7

Distribution And Densities of Game Fish 7
Big Lost River Drainage 7
Little Lost River 18
Birch Creek Drainage 30
Medicine Lodge Creek Drainage 35
Age And Growth 44
Big Lost Near Mackay 44
Rainbow trout 44
Brook trout 44
Little Lost River 49
Rainbow trout 49
Bull trout 49
Birch Creek 49
Rainbow trout 49
Medicine Lodge Creek Drainage 53
Rainbow trout **53**
Cutthroat trout 53
Brook trout 53
Mortality Estimates 57
Big Lost Near Mackay 57
Rainbow trout 57
Brook trout 57
Little Lost River 57
Rainbow trout 57
Bull trout 57
Birch Creek 57
Rainbow trout 57
Medicine Lodge Creek Drainage 63
Rainbow trout 63

TABLE OF CONTENTS

Page

Angler Surveys 63
Medicine Lodge Creek 63
Birch Creek 68
Little Lost River Drainage 68

ACKNOWLEDGEMENTS 70

LITERATURE CITED 71

APPENDICES 74

LIST OF TABLES

Table 1. Distribution of fishes in the Sinks drainages, Idaho . 6

Table 2. Densities of game fish (fish/100 m^2) in selected size groups from the big Lost River downstream from Mackay Dam 8

Table 3. Comparison of wild rainbow trout densities in the Big Lost River near Mackay with densities from other areas 10

Table 4. Percentage of sampled wild rainbow trout identified as male or female occurring in designated length groups, Big Lost River near Mackay 12

Table 5. Percentage of brook trout identified as male or female occurring in designated length groups, Big Lost River near Mackay 13

Table 6. Percentage of sampled fish in designated length groups exhibiting hook scars, Big Lost River near Mackay. . . 14

Table 7. Comparison of brook trout population densities from tributaries to the Big Lost River drainage 16

Table 8. Densities of trout (fish/100 m^2) from two sections of the upper East Fork Big Lost river located in the newly formed riparian pasture 20

Table 9. Fish population densities (fish > age 1+) and species composition in the Little Lost River, 1987 22

LIST OF TABLES (Continued)

Page

Table 10. Fish population densities (fish >1) and species composition from tributaries to the Little Lost River, 1987 23

Table 11. Fish population densities (fish ≥ age 1) and species composition in Sawmill Creek and tributaries, Little Lost River drainage, 1987 24

Table 12. Comparison of 1987 electrofishing data from lower Sawmill Creek with previous year's data 32

Table 13. Fish population densities and species composition from selected sampling sites in the Birch Creek drainage . 34

Table 14. Comparison of electrofishing results for Birch Creek during 1987 with previous years 36

Table 15. Estimated densities and species composition of game fish from selected sampling sites in the Medicine Lodge drainage, 1987 39

Table 16. Comparison of fish densities observed in the Medicine Lodge Creek drainage during 1982 and 1987 40

Table 17. Back-calculated lengths at age for wild rainbow trout of different year classes captured from the Big Lost River near Mackay, 1987 45

Table 18. Comparison of lengths at age of rainbow trout from the Big Lost River near Mackay with other waters. . .. 46

Table 19. Back-calculated size at annulus (mm) for brook trout from the lower Big Lost River, 1987 47

Table 20. Comparison of back-calculated lengths (mm) at annulus for brook trout from the lower Big Lost River with selected sites 48

Table 21. Comparison of back-calculated lengths (mm) at annulus for rainbow trout sampled from the Little Lost River drainage during 1984 and 1987 50

Table 22. Back-calculated length (mm) at annulus and annual growth increments for wild rainbow trout from Birch Creek, 1987 51

Page

Table 23. Comparison of length (mm) at age of bull trout from the Little Lost River drainage with bull trout from other systems 52

Table 24. Comparison of growth rates of wild rainbow trout from Birch Creek with other Region 6 waters 54

Table 25. Back-calculated length (mm) at annulus and annual growth increments for wild rainbow trout from the Medicine Lodge Creek drainage 55

Table 26. Back-calculated length (mm) at annulus for cutthroat trout collected from the Medicine Lodge drainage. Comparisons are made with other eastern Idaho drainages 56

Table 27. Catch and mortality (> age 3) data for wild rainbow trout from the Big Lost River downstream from Mackay Dam 58

Table 28. Catch data mortality rates (> age 1) for brook trout from the lower Big Lost River, 1987 59

Table 29. Catch and mortality data (> age 2) for wild rainbow trout from the Little Lost River and Sawmill Creek. Age 2 fish were assumed to be fully recruited to the electrofishing gear 60

Table 30. Catch and mortality (> age 2) data for bull trout from the Little Lost River system 61

Table 31. Estimated mortality for wild rainbow trout from different reaches of Birch Creek 62

Table 32. Catch and mortality (> age 2) data for wild rainbow trout from Medicine Lodge Creek, Warm Creek, and Indian Creek, 1987 64

Table 33. Estimated effort (hours) by section, in Medicine Lodge Creek during 1987. Data from 1982 are shown for comparison 65

Table 34. Fishing pressure breakdown, by stream reach for Medicine Lodge Creek, 1987 66

LIST OF TABLES (Continued)

Page

Table 35. Estimated catch rates, by species, for Medicine Lodge Creek, 1987 67

Table 36. Creel survey data for tributaries to Medicine Lodge Creek and in the Little Lost River drainage 69

LIST OF FIGURES

Figure 1. Location of the Sinks drainages in the upper Snake River Plain (Andrews 1972) 5

Figure 2. Length frequency distribution of game fish captured from the Big Lost River near Arco, 1987 9

Figure 3. Length frequency distribution of game fish captured from the Big Lost River near Mackay, September, 1987. 11

Figure 4. Length frequency distribution of game fish captured from Antelope Creek, August, 1987 15

Figure 5. Length frequency distribution of brook trout captured from Pass Creek, August, 1987 19

Figure 6. Length frequency distribution of game fish captured from the newly created riparian pasture on the East Fork of the Big Lost River, August, 1987 21

Figure 7. Length frequency distributions of rainbow trout captured from tributaries to the Little Lost River, 1987 25

Figure 8. Length frequency distribution of rainbow trout captured from the Little Lost River, 1987 29

Figure 9. Length frequency distribution of bull trout captured from the Sawmill Creek drainage and the upper Little Lost River, 1987 31

Figure 10. Length frequency distribution of brook trout from selected waters of the Little Lost River drainage, 1987 33

LIST OF FIGURES (Continued)

Page

Figure 11. Length frequency distribution of wild rainbow trout captured from various locations in the Birch Creek system ... 37

Figure 12. Length frequency distribution of brook trout from upper Birch Creek 38

Figure 13. Length frequency distribution of rainbow trout captured from Medicine Lodge Creek, 1987 41

Figure 14. Length frequency distribution of rainbow trout from Medicine Lodge Creek tributaries 42

Figure 15. Length frequency distribution of cutthroat, hybrid, and brook trout captured from the Medicine Lodge Creek drainage, 1987 43

LIST OF APPENDICES

Appendix A. Stream characteristics and population estimates at sampled areas in the Big Lost River drainage. . . . 75

Appendix B. Stream characteristics and population estimates at sampled areas in the Little Lost River drainage . . 76

Appendix C. Stream characteristics and population estimates at sampled areas in the Birch Creek drainage 78

Appendix D. Stream characteristics and population estimates at sampled areas in the Medicine Lodge drainage. . . 79

JOB PERFORMANCE REPORT

State of: **Idaho**

Name: **REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS**

Project No.: **F-71-R-12**

Job No.: **6 (IF)-c^2**

Title: **Region 6 (Idaho Falls) Rivers and Streams Investigations--Big Lost and Little Lost Rivers, and Birch and Medicine Lodge Creeks Survey**

Period Covered: **July 1, 1987 to June 30, 1988**

ABSTRACT

Streams of the Sinks drainages (Big Lost River, Little Lost River, Birch Creek, and Medicine Lodge Creek) were studied during 1987 to: (1) obtain information on fish populations, (2) identify stream reaches in need of habitat improvement, (3) evaluate responses of fish populations to habitat improvement projects, (4) assess angler use and harvest in Medicine Lodge Creek following a change in management to eliminate catchable plants, and (5) monitor catch rates and species composition in the Little Lost River and Birch Creek.

Densities of rainbow trout in the Big Lost River near Mackay are high (7.7 per 100 m^2) with fish larger than 600 mm in length present. Mortality rates are indicative of light exploitation; and the large number of fry observed indicates natural recruitment, rather than downstream emigration of fingerlings from Mackay Reservoir, is supporting the fishery. Brook trout are also present (2.6 per 100 m^2) and may exceed 400 mm in length. Further downstream near Arco, brook trout comprise the majority of the fish with a population structure similar to that observed near Mackay. Brown trout and rainbow trout are also present in lesser numbers. Annual dewatering during the irrigation period and habitat damage resulting from agricultural impacts limit the potential of the downstream fishery. Brook trout outnumbered rainbow trout in Antelope and Pass creeks, while rainbow trout were the most abundant species in the East Fork within the new riparian pasture.

Rainbow trout are the most widely distributed species in the Little Lost drainage followed by bull trout and brook trout. Fish densities appear to be dependent on habitat quality and flow regimes. Rainbow trout may reach lengths of 300 mm or greater, but maturation appears to occur at smaller sizes (150-200 mm) and mortality is high on older fish. Several bull trout larger than 300 mm were sampled, and one fish larger than 500 mm was observed. Sawmill Creek is the only stream with large numbers of bull trout. Dry Creek was the only stream sampled where brook trout were the most abundant species. Angler catch rates for the entire drainage exceeded 1.2 fish per hour.

Wild rainbow trout are the most abundant and widely distributed game fish in the Birch Creek drainage. Densities are high in the upper reaches where habitat is in relatively good condition and fishing pressure is light. Catchable rainbow trout are maintaining the fishery downstream from Blue Dome, and harvest data suggest a decline in wild fish numbers. Mortality rates for wild rainbow trout are also higher in lower Birch Creek than in the upper reaches. Brook trout were not observed downstream from Kaufman Guard Station and are only present in limited numbers in the upper reaches. Cutthroat trout were found to have overwintered in Pass Creek Lake.

Streams in the Medicine Lodge Creek drainage support rainbow trout, brook trout, and cutthroat trout. Cutthroat x rainbow hybrids are also common. Rainbow trout are present in most streams in the drainage and in Medicine Lodge Creek occasionally exceed 450 mm in length. Cutthroat trout are also widely distributed but densities are typically low, indicating remnant populations. Brook trout were found in only two subdrainages but were abundant where they were dominant. Comparison with 1982 data suggests that wild trout numbers have increased since elimination of catchable rainbow trout stocking. Estimated fishing effort declined about 30% since the 1982 census, but catch rates remained nearly the same at 1.1 fish per hour. Harvest rates showed a decline of 36%. The small pond on the bench above West Indian Creek proved to be suitable year-round habitat for cutthroat trout, and fry planted in 1984 were in the 350 to 450 mm length range.

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INTRODUCTION

In 1985, the Idaho Department of Fish and Game identified a number of fisheries in the state about which insufficient information was available to make informed management decisions (Idaho Department of Fish and Game Management Plan 1985). Of those systems lacking adequate information in the upper Snake Subregion, the Sinks drainages were given high priority for study. Investigations began in 1986 on the upper Big Lost River (Corsi 1988) and were continued in 1987 on the lower Big Lost, Little Lost, Birch Creek, and Medicine Lodge Creek drainages. This report discusses the findings of the 1987 field season.

OBJECTIVES

1. Assess fish densities and species compositions in Medicine Lodge Creek, Birch Creek, Little Lost River, and lower Big Lost River drainages.

2. Examine life history aspects of wild salmonid populations including age structure, growth rates, size at maturity, and mortality rates.

3. Evaluate the success of habitat improvement projects.

4. Monitor the response of the sport fisheries on Medicine Lodge Creek to a cessation of hatchery trout stocking.

5. Obtain creel data from anglers fishing the Little Lost and Birch Creek.

6. Identify areas in need of habitat improvement.

RECOMMENDATIONS

1. Obtain additional information on bull trout in the Little Lost River. Current data suggest that numbers are low and mortality is high. As more information on bull trout populations is gathered statewide, it should be possible to develop a management plan for the species. Additional knowledge of the isolated population in the Little Lost drainage will be necessary to ensure that any plan is suitable for that population.

2. Continue to manage the Little Lost and Medicine Lodge drainage fisheries as wild trout fisheries. Discontinue stocking Big Springs Creek (Little Lost River drainage) as number of wild fish are adequate to maintain high catch rates. Continue to manage lower Birch Creek with hatchery fish.

3. Develop additional habitat improvement structures on lower Birch Creek. Work with landowners on upper Birch Creek to protect riparian areas from grazing.

4. Work with land management agencies and private landowners to restore habitat in degraded areas. Priority should be given to Sawmill Creek and lower Summit Creek in the Little Lost drainage, the lower Big Lost near Arco, and Fritz, Irving, and Warm creeks in the Medicine Lodge drainage.

STUDY AREA DESCRIPTION

The Sinks drainages are a series of streams which flow in southerly direction from the high mountains of southcentral and southeastern Idaho, across high desert valleys and then sink into the lava beds of the Snake River plain (Figure 1). Andrews (1972) provides descriptions of these streams in some detail. Overton (1977) provides a detailed description of the lower Big Lost River. Descriptions of specific study sites are provided in Appendices A through D. Andrews also discusses the origin of native fish species in the Sinks drainages, as did Hubbs and Miller (1948). Both sources include bull trout (Salvelinus confluentus), sculpin (Cottus spp.), and cutthroat trout (Salmo clarki) in their list of endemic species. Andrews also includes mountain whitefish as an endemic species but they are found only in the Big Lost River. Headwater capture by the Salmon River accounts for the presence of bull trout and shorthead sculpin. By the same reasoning, however, rainbow trout (Salmo gairdneri) could also be native to the Sinks streams, provided headwater capture occurred after speciation of rainbow trout from cutthroat trout. Hatchery introductions during this century have included rainbow trout, cutthroat trout, and brook trout (Salvelinus fontinalis). Cutthroat trout are nearly absent from the drainages although a remnant population exists in Medicine Lodge Creek. Rainbow trout are the most widely distributed species in the Sinks drainages (Table 1).

TECHNIQUES

Fish Sampling And Population Estimates

Fish populations in the Sinks drainages (Big Lost River, Little Lost River, Birch Creek, and Medicine Lodge Creek) were inventoried during 1987 to obtain baseline data, or to augment a previously existing but limited data base. We were also interested in assessing the response of the Little Lost and Medicine Lodge drainages to the cessation of hatchery stocking. Fish in all four drainages were collected primarily by electrofishing with Coffelt BP-1 generator-powered units. Some fish were collected by hook and line sampling. Population estimates were made using either multiple-pass or mark-recapture techniques (Platts et al. 1983;

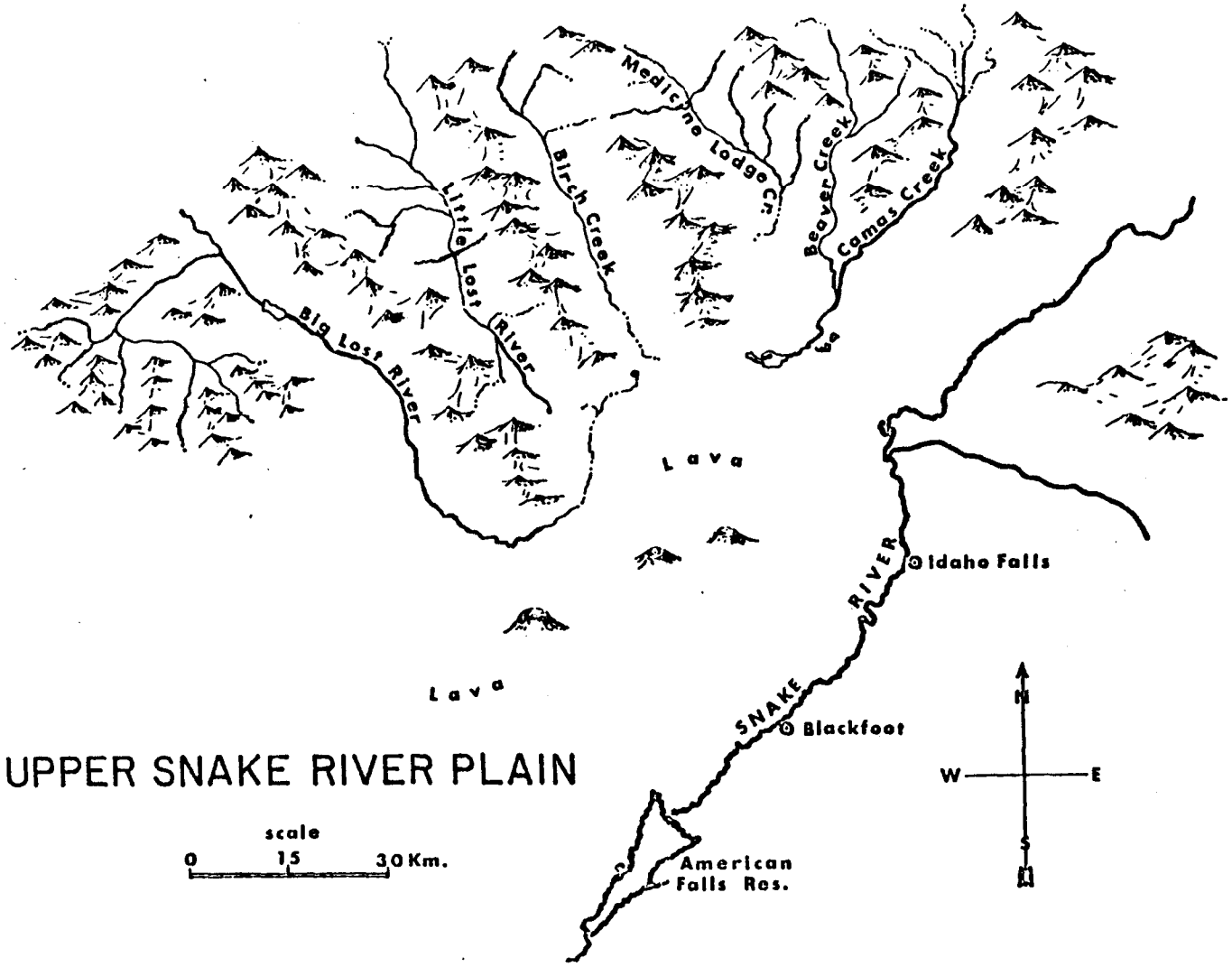


Figure 1. Location of the Sinks drainages in the upper Snake River Plain (Andrews 1972).

Table 1. Distribution of fishes in the Sinks drainages, Idaho.

Species	Drainage (1986-1987)					Hubbs & Miller[a]	Andrews[a]
	Big Lost	Little Lost	Birch	Medicine Lodge	Camas	All drainages	All drainages
Cutthroat trout	H	H	H	N,H	N	N	N
Bull trout	0	N	0	0	0	N	N
Rainbow trout	U	U	U	U	U	0	H
Brook trout	H	H	H	H	H	0	I
Brown trout	H	0	0	0	0		
Whitefish	N	0	0	0	0	0	N
Sculpin	N	N	N	N	0	N	N
Cyprinids	I	0	0	0	0	I	I
Catostomids	0	0	0	0	0	I	0

[a]Some species not found in each drainage.

KEY:

N = bElleved to be native

H = bElleved to be of hatchery origin

U = origin uncertain
I = illegal introduction

0 = not found

Lackey and Hubert 1977). Density estimates were made by estimating the surface area of each sampling site and dividing the population estimate by that value. Mortality estimates were made by developing. catch curves (Ricker 1975) from the electrofishing data in conjunction with age and growth data.

Age And Growth

Scales were collected from fish above the lateral line and slightly posterior to the dorsal fin. Samples were then mounted on acetate and impressions made using a scale press. Impressions were viewed at 45X on a microfiche reader and measurements made along the anterior scale radius (ASR) to the outside edge of each annulus and to the outer edge of the scale. Linear and third-degree polynomial regression curves were tested to see which provided the best fit for the length of fish to length of the ASR relationship. Lengths at annulus were then back-calculated using the best fitting regression.

Angler Surveys

A stratified random creel census was established for Medicine Lodge Creek similar to that described by Moore et al. (1983). One weekday and one weekend day per two-week period were sampled. Holidays were treated as weekend days.

Anglers were interviewed to document hours fished, number of fish (by species) caught and creeled, fish lengths, and gear types. Catch rates were applied to effort estimates (Corsi 1988) to estimate total harvest. Angler counts were conducted from May 23 through September 11. Occasional angler interviews were conducted during the fall months.

We also checked anglers fishing Birch Creek and in the Little Lost drainage to document catch rates. As in the Medicine Lodge Creek study, anglers were interviewed to document individual effort, catch and harvest, lengths of creeled fish, and gear type.

FINDINGS

Distribution And Densities of Game Fish

Big Lost River Drainage

Despite periodic flow reductions and livestock impacts, the Big Lost River near. Arco supports a viable population of brook trout (Table 2). Wild rainbow trout, hatchery brown trout, and whitefish are the other game species present. Brook trout in this reach ranged in length from 130 mm to 405 mm (Figure 2). No fry were collected, probably because of the

Table 2. Densities of game fish (fish/100 m^2) in selected size groups from the Big Lost River downstream from Mackay Dam.

Species	Location	
	Near Arco (4/87)	Near Mackay (9/87)
Wild rainbow trout ≥180 mm	0.4	7.7
Wild rainbow trout ≥300 mm	0.1	2.5
Wild rainbow trout >≥40 mm	0	0.6
Brook trout ≥130 mm	3.6	2.6
Brown trout ≥120 mm	0.9	a
Whitefish >	5.2	b

[a]None present.
[b]Present but not estimated.

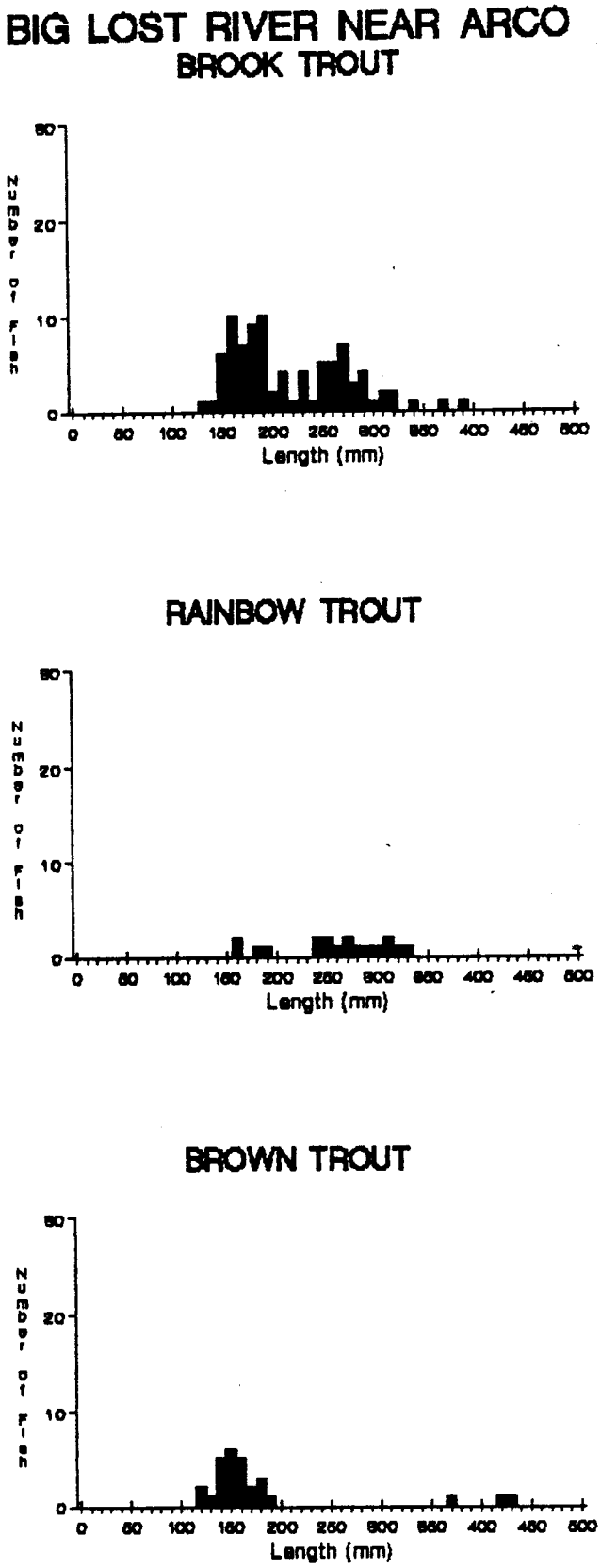


Figure 2. Length frequency distribution of game fish captured from the Big Lost River near Arco, April, 1987.

Table 3. Comparison of wild rainbow trout densities in the Big Lost River near Mackay with densities from other areas.

Location	Size	Density (fish/100 m^2)	Percent ≥ 400 mm
Big Lost River near Mackay	≥180 mm	7.7	7.8
Henrys Fork - Box Canyon	≥175 mm	4.9	11.3
Big Wood River - Hulen Meadows		2.5	6.0
East Fork Big Lost River	≥150	0.3	9.1

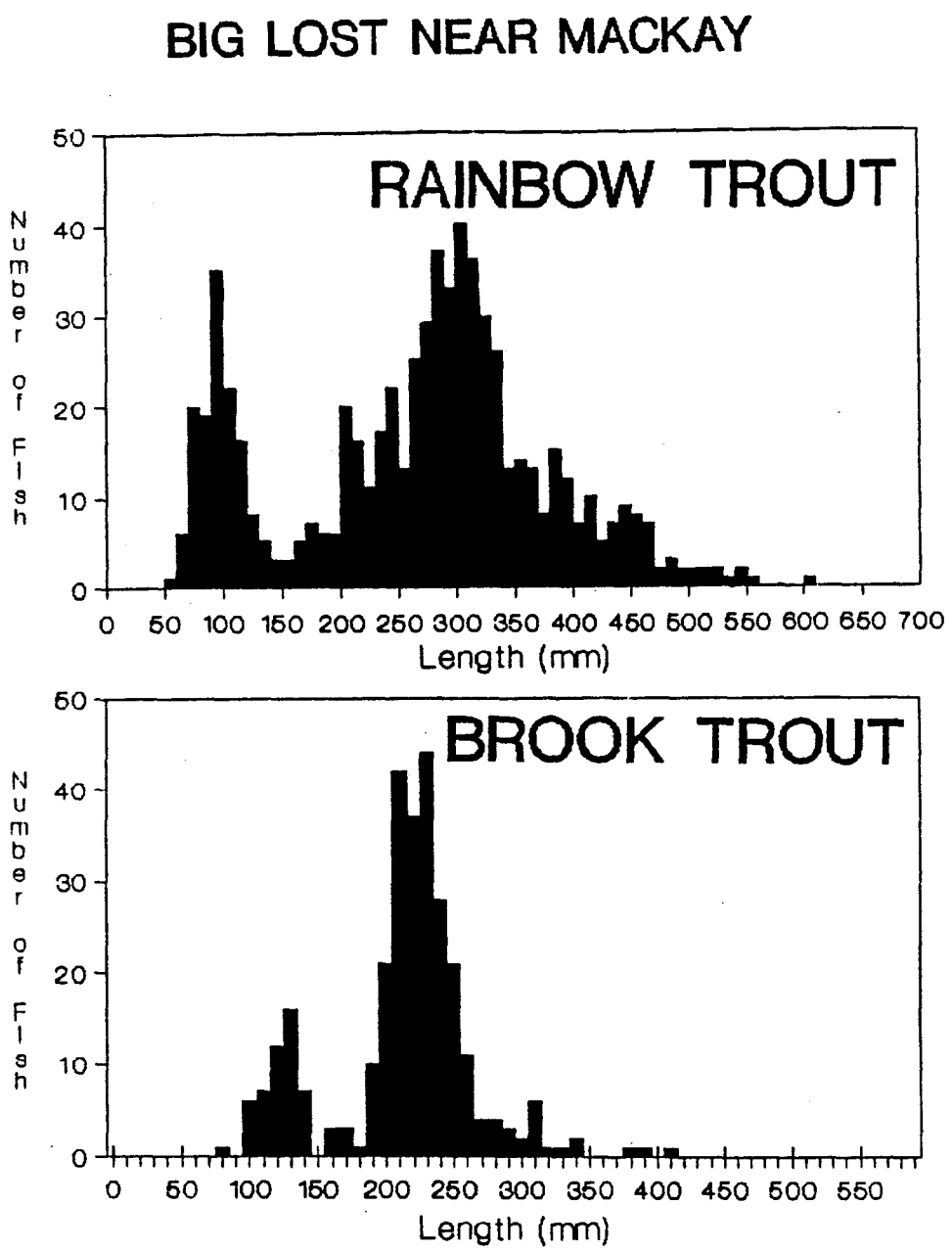


Figure 3. Length frequency distribution of game fish captured from the Big Lost River near Mackay, September, 1987.

Table 4. Percentage of sampled wild rainbow trout identified as male or female occurring in designated length groups, Big Lost River near Mackay.

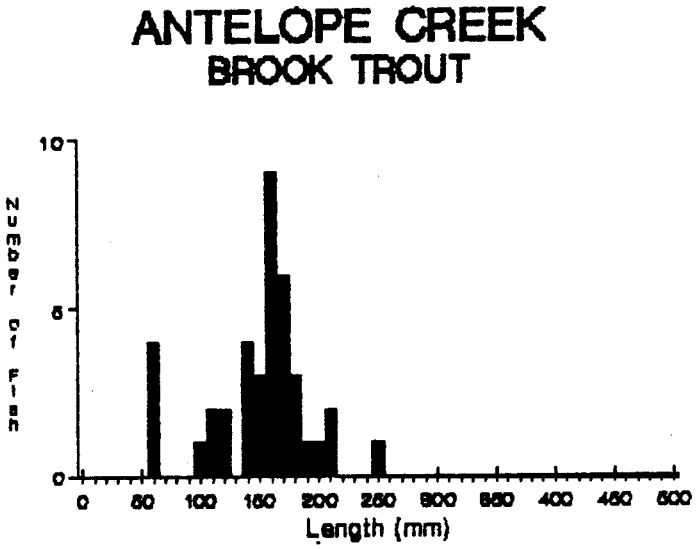
Length group (mm)	Percent		Total percent sexed
	Males	Females	
<250	0	0	0
250-299	1.5	2.9	4.4
300-349	8.3	19.3	27.6
350-399	11.3	50.0	61.3
400-449	18.4	71.1	89.5
≥450	18.8	81.3	100.0

Table 5. Percentage of brook trout identified as male or female occurring in designated length groups, Big Lost River near Mackay.

Length group (mm)	Percent		Total percent sexed
	Males	Females	
100-149	6.3	0.0	6.3
150-199	5.9	70.6	76.5
200-249	48.2	44.0	92.2
≥250	66.7	31.6	98.3

Table 6. Percentage of sampled fish in designated length groups exhibiting hook scars, Big Lost River near Mackay.

Length group (mm)	Percentage of fish	
	Wild rainbow	Brook trout
<150	0	0
150-199	3.7	17.6
200-299	16.7	7.2
300-399	9.2	0
≥400	5.7	0



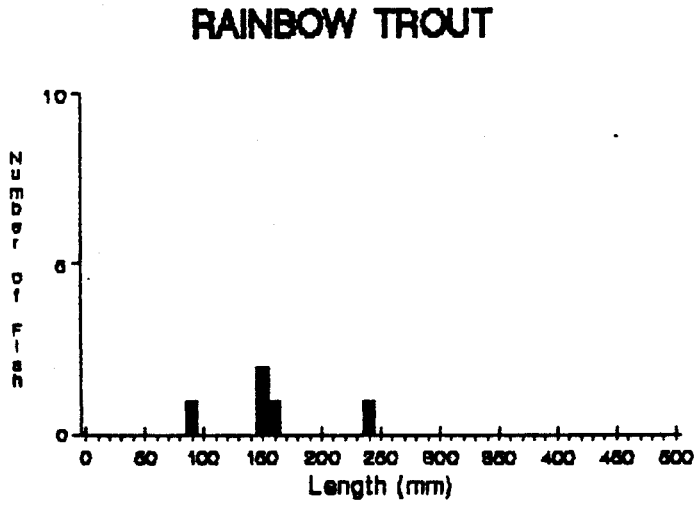


Figure 4. Length frequency distribution of game fish captured from Antelope Creek, August, 1987.

Table 7. Comparison of brook trout population densities from tributaries to the Big Lost River drainage.

Stream	Date	Density (fish/100 m^2) All 1+ & older	>150 mm
Antelope Creek	8/87	10.8	8.0
Pass Creek	8/87	13.8	4.6
Starhope	9/86	1.6	1.0
Muldoon Canyon	9/86	2.2-8.3	0.1-2.0
Lake Creek	9/86	6.0-20.9	3.4-18.2
Upper North Fork	8/86	24.9	3.6
Summit Creek	8/86	13.8-55.3	3.2-5.8

April sampling date. Two brown trout were captured which exceeded 420 mm in length, but the other brown trout captured appeared to be from the 1986 fingerling introduction (Figure 2). Several year classes of wild rainbow trout appear to be present (Figure 2) despite low densities. Whitefish densities were similar to those observed in portions of the upper Big Lost River (Corsi 1988).

Flow reductions also occur in the Big Lost River between Mackay Dam and the Moore Diversion as a result of dam maintenance operations following the irrigation season. Habitat in this reach is good to excellent with clean substrate, overhanging cover, good pool and riffle structure, and mostly stable banks. Some rip-rap placement exists and subsequent downstream cutting has occurred.

Densities of rainbow trout in this section are high (Table 2), and exceed those found in the special regulation reaches of the Henrys Fork (Craig Contor, Idaho State University, personal communication) and Big Wood River (Russ Thurow, IDFG, personal communication) as well as those observed in upstream main stem reaches (Corsi 1988) (Table 3). The percentage of large fish present in the population (Table 2) suggests only light exploitation. Although no estimate was conducted on YOY fish, the large numbers observed (Figure 3) indicate that natural recruitment is high. Fingerling hatchery rainbow trout moving downstream from Mackay Reservoir may also be contributing to recruitment, but lack of fin deformities in fish stocked as fingerlings make this difficult to ascertain. Fish were sexed based on external characteristics, and females outnumbered males by more than three to one (Table 4). It should be noted that fish were not in spawning condition and identification accuracy may have been affected.

Brook trout densities in this reach of the Big Lost River are moderate (Table 2), with fish exceeding 400 mm in length (Figure 3). Ripe fish were noted during the September portion of the sampling. The smallest mature brook trout observed was a 116 mm long male, but most fish under 200 mm were not mature (Table 5). Fifty-four percent of the mature fish observed were males.

Hook scars were noted on 57 wild rainbow trout and on 18 brook trout. Both species showed a decline in the percentage of fish with hook scars with increasing size, possibly indicating a higher harvest rate on larger fish (Table 6). Hook scar data suggest that harvest rates on wild rainbow increase at approximately 300 mm and on brook trout at 200 mm, and also that brook trout become vulnerable at a smaller size. Creel data will be necessary to confirm this.

In Antelope Creek, brook trout were the predominant species found with several age classes present (Figure 4). Most brook trout (77%) larger than 140 mm long were mature (0.8:1.0, M:F). Densities are relatively high (Table 7) when compared with other high elevation Big Lost River tributaries (Corsi• 1988). Wild rainbow trout were present in limited numbers, but three age classes appeared to be represented (Figure 4). The 240 mm long rainbow was identified as a mature male. Two hatchery rainbow trout were observed. The low number of hatchery trout present close to the Iron Bog Campground may indicate that utilization of stocked fish is high.

With the exception of two hatchery rainbow trout, all of the fish sampled in Pass Creek were brook trout. Estimated densities were similar to other Big Lost tributaries (Table 7), and several age groups were represented (Figure 5). As in Antelope Creek, the low number of hatchery rainbow trout near a release site indicate high utilization on these fish. The lower density of brook trout larger than 150 mm may indicate a higher harvest level on the Pass Creek population than is occurring in Antelope Creek.

In the newly formed riparian pasture on the upper East Fork of the Big Lost River, we found densities of game fish to be relatively low, with wild rainbow trout the predominant species (Table 8) in both sections. Rainbow trout fry were abundant, indicating the importance of the area for spawning (Figure 6). Adult and juvenile fish were also present, as were all age groups of brook trout (Figure 6). One cutthroat trout, probably a downstream migrant from an alpine lake, was also present in the lower section.

Improvements to fish habitat resulting from the riparian pasture are expected to increase the density of wild trout; however, fishing pressure is also probably limiting fish densities. One of the objectives of the riparian pasture is to increase fish densities by 50 to 100X. Monitoring will continue in the future to assess the response of the fishery to improved habitat.

Little Lost River

Population estimates were obtained from 44 locations in the Little Lost River drainage. Several other sites were qualitatively sampled to assess species presence. Descriptions of sampling sites and population estimates are in Appendix B.

Rainbow trout are the most abundant and widely distributed species in the drainage but were not found in Dry Creek or in some portion of the Sawmill Creek subdrainage (Tables 9, 10, and 11). The highest densities of rainbow trout tend to occur in reaches with good habitat (Tables 9, 10, and 11; Appendix B). For example, densities of rainbow trout in Summit Creek are higher in three ungrazed sections than in a grazed section with unstable banks and more limited riparian vegetation. Resident populations occurring in tributaries seldom have specimens longer than 275 mm total length (Figure 7). Rainbow trout seldom exceed 300 mm in the Little Lost River (Figure 8). Rainbow trout fry were first observed during late July and were present in most sections.

Bull trout exist in remnant numbers in many areas of the drainage, but a viable population occurs in the Sawmill Creek subdrainage (Table 11). Sawmill Creek differs from other streams in the drainage in that much of the headwater reaches are heavily forested and water conductivities appear to be low. The percent composition and densities of bull trout are higher in the upper portions of Sawmill Creek where steeper gradients occur, and habitat is considerably different than in other areas of the drainage with large pocket water and small pools. Thurow (1987) observed that bull trout in the South Fork Salmon River tended to occupy colder streams in that drainage. No temperature data were recorded for

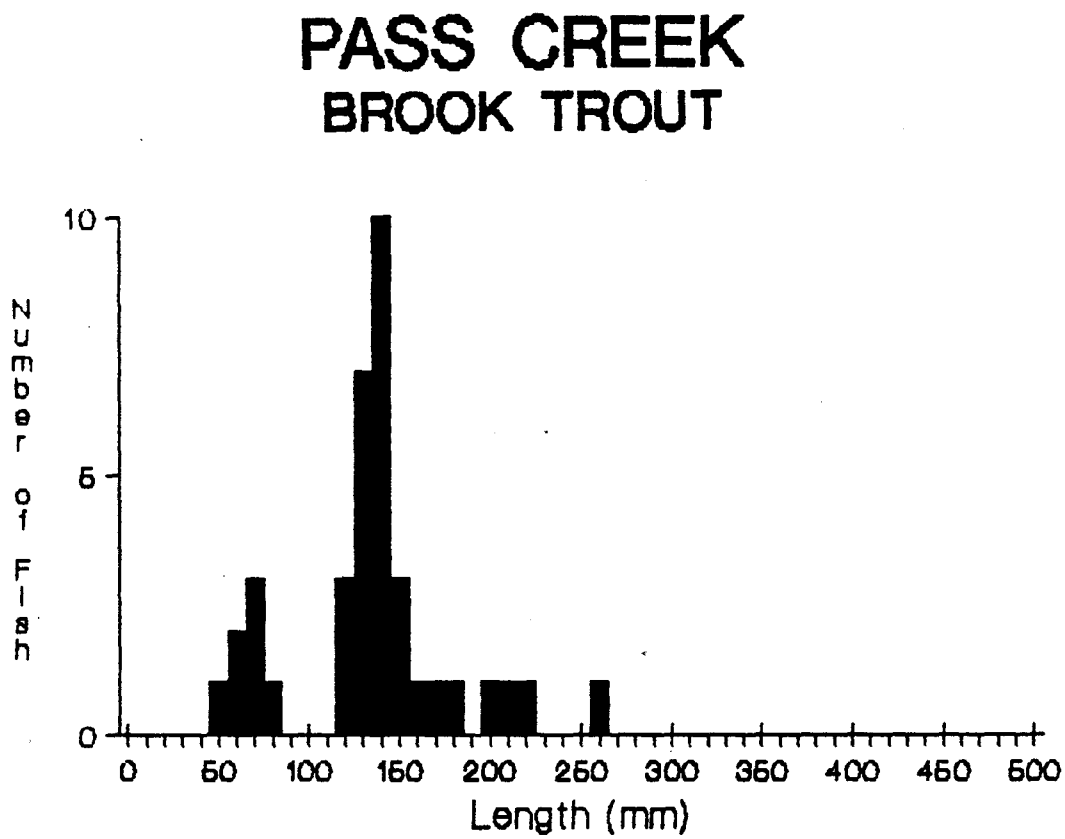


Figure 5. Length frequency distribution of brook trout captured from Pass Creek, August, 1987.

Table 8. Densities of trout (fish/100 m^2) from two sections of the upper East Fork Big Lost River located in the newly formed riparian pasture.

Section	Species WRB	HRB	BRK	WCT	Comments
Upper section	1.5	0.7	0.8	0.0	Numerous YOY WRB; some BRK YOY
Lower section	3.6	1.1	1.2	0.1	Some YOY WRB

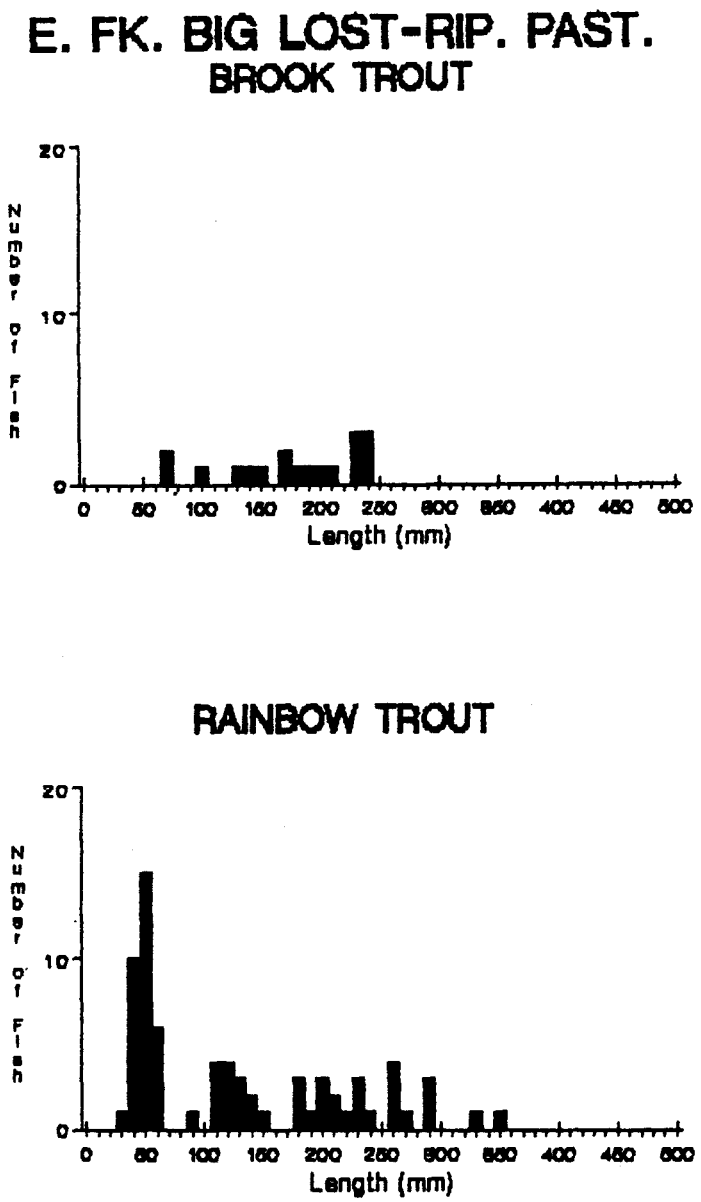


Figure 6. Length frequency distribution of game fish captured from the newly created riparian pasture on the East Fork of the Big Lost River, August, 1987.

Table 9. Fish population densities (fish > age 1+) and species composition in the Little Lost River, 1987.

Site	Sampling date	Fish/ 100 m^2	Species composition (%) WRB	BRK	BLT	Comments
Upstream from Clyde School	7/87	28.2	95	1	4	WRB YOY present
	11/87	No estimate	64	34	2	BRK spawning
At Deer Creek Road	8/87	11.1	100	0	0	WRB YOY present
Upstream from Fallert Spring Creek	8/87	35.9	100	0	0	WRB YOY present
Near the Howe gaging station	8/87	3.7	100	0	0	HRB present
Near the old Hartmann house	8/87		100	0	0	Only 1 fish captured

Table 10. Fish population densities (fish >1) and species composition from tributaries to the Little Lost River, 1987.

Location	Site	Sampling date	Fish/ 100 m²	Species composition (%) WRB	BRK	BLT	Comments
Summit Cr.	BLM Exclosure #1	8/87	18.7	91	9	0	
Summit Cr.	BLM Exclosure #2	8/87	26.4	82	18	0	WRB YOY present
Summit Cr.	BLM land at county line	8/87	8.8	98	0	2	WRB YOY present
Summit Cr.	Private ground near mouth	8/87	40.4	99	1	0	WRB YOY present
Wet Cr.	BLM #1	8/87	10.9	100	0	0	WRB YOY present
Wet Cr.	BLM #4	8/87	14.3	100	0	0	WRB YOY present
Wet Cr.	BLM #7	8/87	7.0	100	0	0	WRB YOY abundant
Wet Cr.	BLM #9	8/87	5.9	100	0	0	WRB YOY abundant
Wet Cr.	BLM #14	8/87	8.8	100	0	0	WRB YOY present
Wet Cr.	BLM #20	8/87	5.5	96	0	4	WRB YOY present
Wet Cr.	Upstream from hydro project	8/87	6.9	97	0	3	
Wet Cr.	Downstream from Dry Cr.	8/87	5.4	100	0	0	WRB YOY present
Wet Cr.	On CNF near upper road crossing	8/87	12.1	100	0	0	WRB YOY present
Dry Cr.	On CNF in beaver pond meadows	8/87	3.9	0	87	0	13% CT; BRK YOY present
Squaw Cr.	BLM #1	8/87	36.7	97	0	1	2% WRB x CT hybrids
Squaw Cr.	BLM exclosure	8/87	22.2	99	0	1	
Badger Cr.	Near cabin in lower section	8/87	26.3	96	0	4	WRB YOY present
Badger Cr.	On CNF in basin	8/87	33.1	100	0	0	
Bunting Cr.	Near fork w/ Badger Cr.	8/87		67	0	33	Only 3 fish captured
Deer Cr.	BLM #2	8/87	15.3	100	0	0	WRB YOY present
Deer Cr.	BLM #3	8/87	11.7	100	0	0	
Big Cr.	Upstream from road	8/87	14.4	100	0	0	WRB YOY present
Big Spring Cr.	Near road crossing (#1)	8/87	35.1	93	7	0	WRB YOY present
Big Spring Cr.	Upstream from #1	8/87	20.1	94	6	0	1 HRB in sample; WRB YOY present
Fallert Spring Cr.	@ closed bridge	8/87	0.8	80	20	0	
Warm Cr.	Below highway culvert	8/87	29.4	100	0	0	

Table 11. Fish population densities (fish > age 1) and species composition in Sawmill Creek and tributaries, Little Lost River drainage, 1987.

Location	Site	Sampling date	Fish/ 100 m^2	Species composition (%) WRB	BRK	BLT	Comments
Timber Cr.	Upstream from campground	7/87	7.5	0	0	100	Juvenile fish
Iron Cr.	@ .5 km from mouth	7/87	6.6	4	0	96	3 YOY BLT captured
Sawmill Cr.	Near Moonshine Creek	7/87	3.9	0	0	100	
Sawmill Cr.	Near Bear Creek	7/87	7.8	51	16	33	Several age classes of BLT
Sawmill Cr.	Near Guard Station	7/87	10.1	63	16	21	WRB YOY present
Sawmill Cr.	USFS boundary	7/87	7.1	89	2	9	WRB YOY present
Sawmill Cr.	BLM exclosure--upper	7/87	6.2	77	17	6	
Sawmill Cr.	BLM exclosure	7/87	1.5	43	57	0	
Sawmill Cr.	BLM exclosure	7/87	2.2	68	18	14	
Sawmill Cr.	BLM exclosure--near gage	7/87	4.1	45	33	22	BRK & WRB YOY present

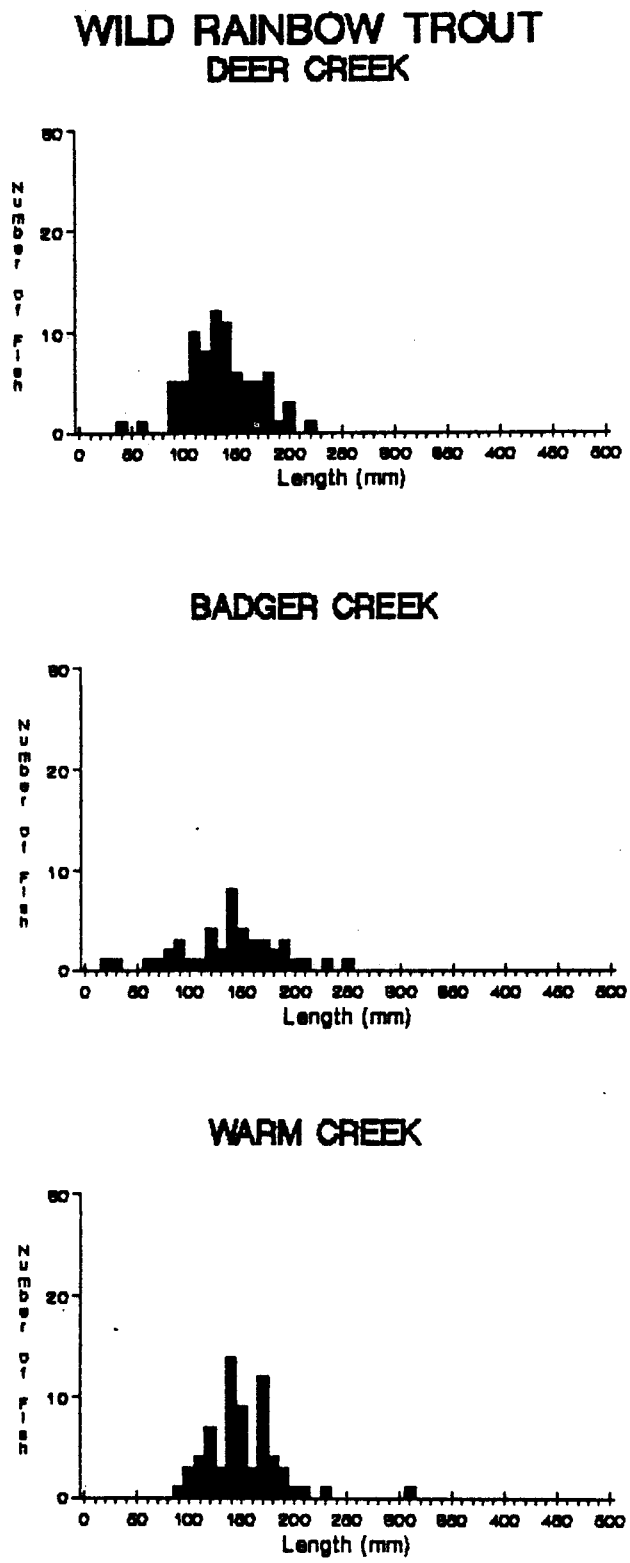
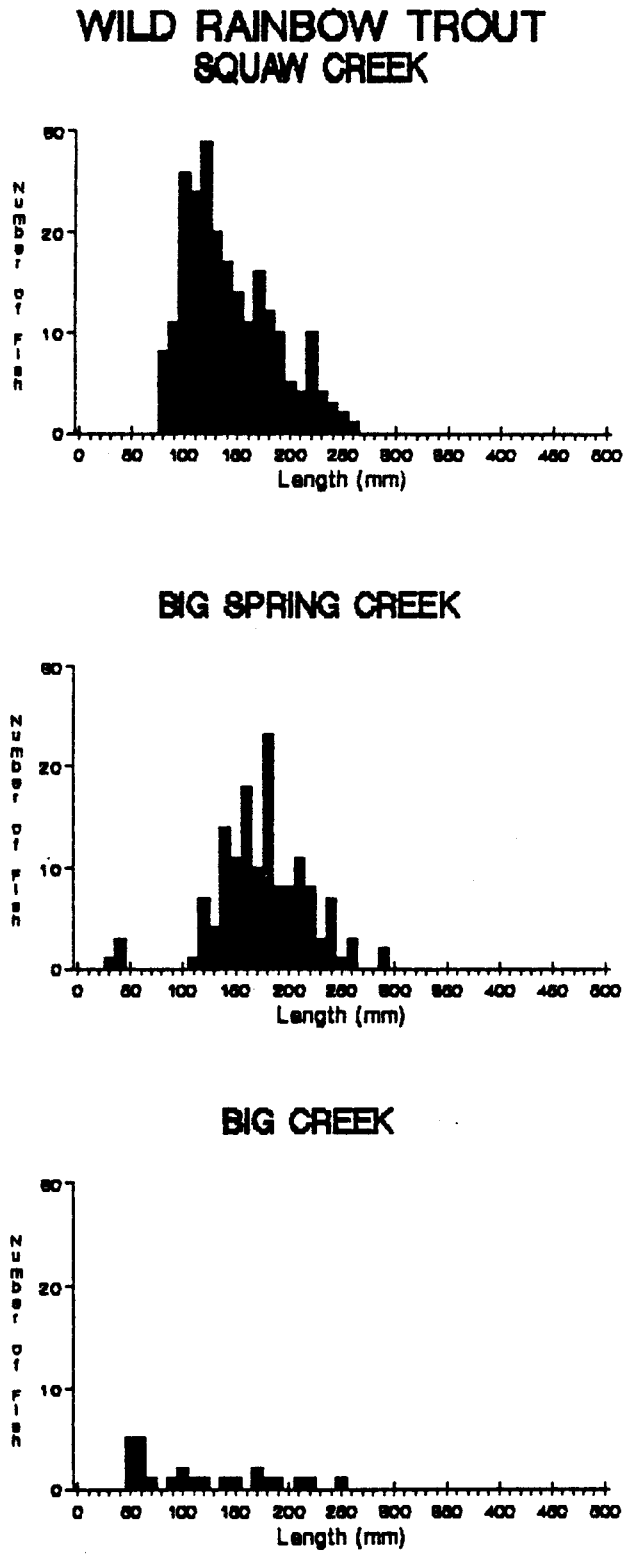


Figure 7. Length frequency distributions of rainbow trout captured from tributaries to the Little Lost River, 1987.



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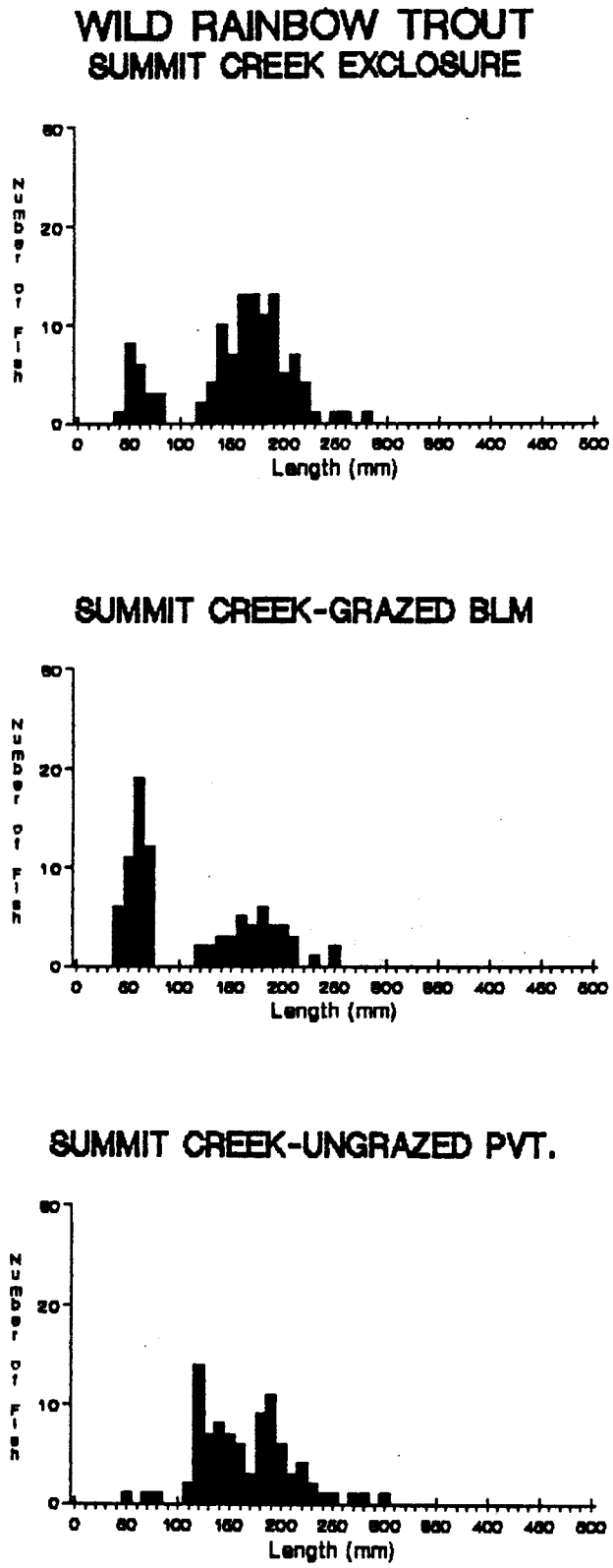

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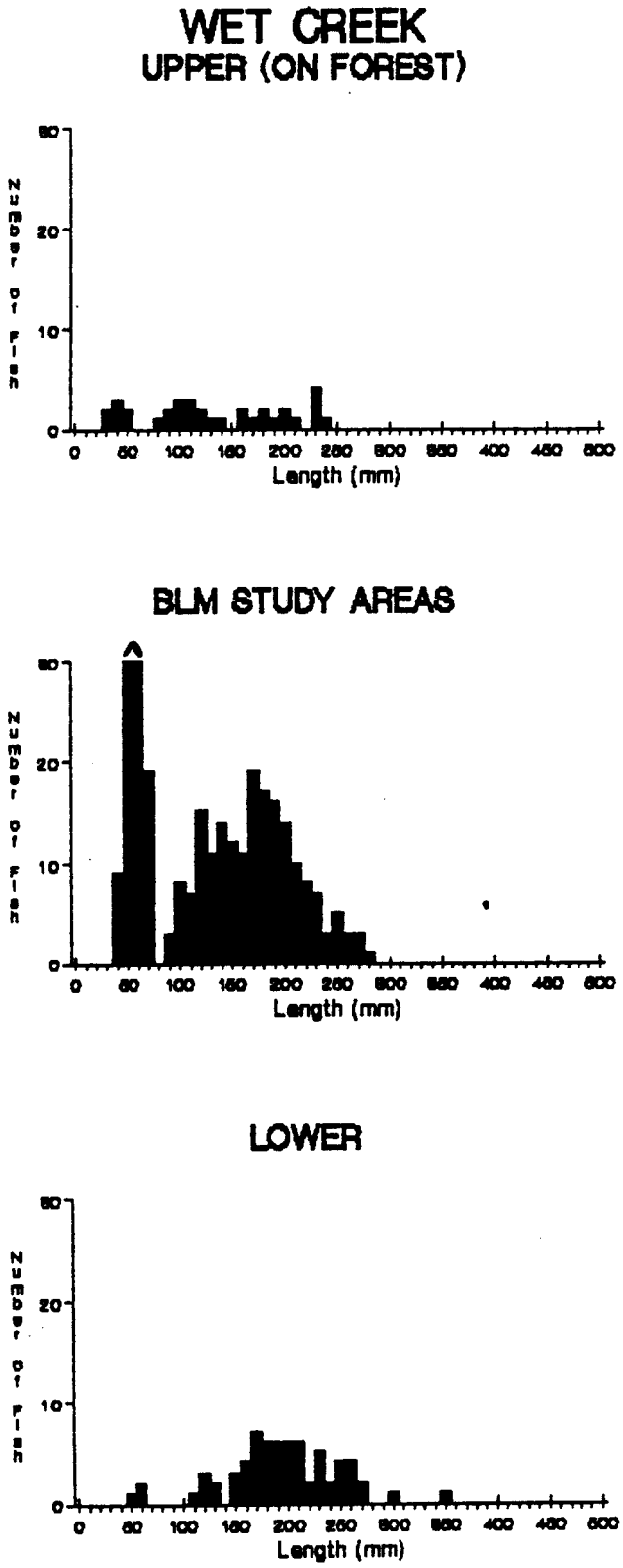

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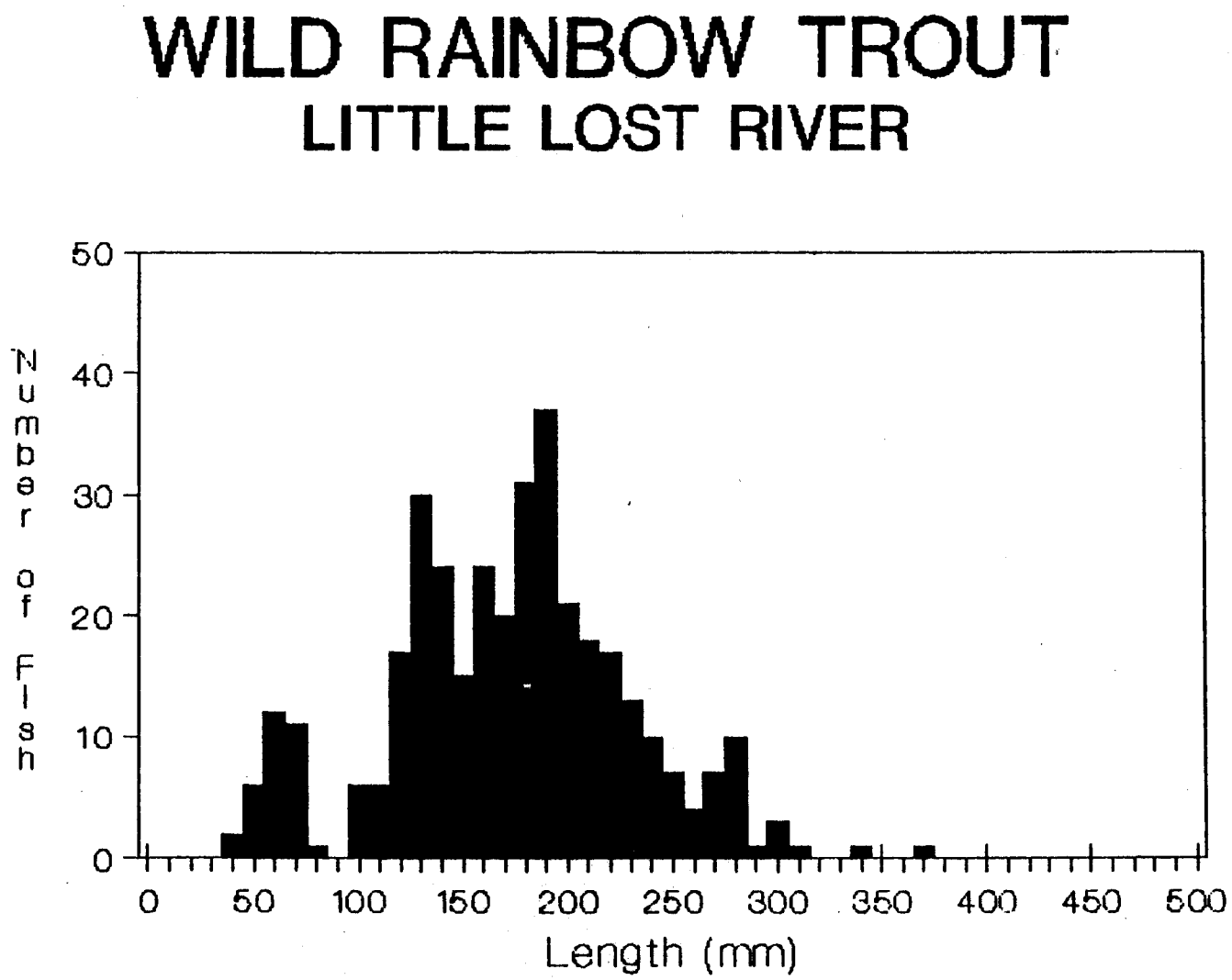

Figure 8. Length frequency distribution of rainbow trout captured from the Little Lost River, 1987.

Sawmill Creek, but the high degree of shading, lack of prolonged exposure to sunlight due to its location, and limited spring inflow suggest that water temperatures may be similar to those observed in central Idaho waters. Bull trout measuring 300 mm to 350 mm are relatively common and larger fish are occasionally observed (Figure 9). BLM personnel electrofished a 505-mm long specimen in lower Sawmill Creek during 1987 and bull trout larger than 600 mm have been documented (Region 6, file data) in the past. Most bull trout captured in smaller tributaries and headwater reaches were less than 250 mm (Figure 9). Densities of bull trout observed in Sawmill Creek are similar to those observed in the South Fork Salmon River drainage (Thurow 1987) and in the Flathead River drainage in Montana (Fraley et al. 1981). Comparison of numbers in lower Sawmill Creek with previous year's data suggest that bull trout numbers may be declining (Table 12). Large bull trout (>300 mm) in the Little Lost River may be migratory fish which spawn in Sawmill Creek.

Brief sampling in upper Sawmill Creek and in Iron Creek during November revealed no spawning bull trout. Thurow (1987) and others have observed that bull trout tend to spawn in September and October. Bull trout fry were observed during the November sample, so spawning may be early.

Brook trout are not present in high densities in any steam in the drainage but are the predominant species in Dry Creek (Tables 9, 10, and 11). Although their distribution is limited, it appears that occasional hybridization with bull trout may occur. Brook trout seldom exceed 250 mm but one 365 mm specimen was captured in Sawmill Creek (Figure 10). Occasional reports of brook trout longer than-400 mm caught by anglers in Dry Creek have been received (Gary Hompland, IDFG, personal communication). We did observe an apparent increase in numbers of brook trout in the Little Lost River above Clyde during a brief pass through that section in November (Table 10). Most of the brook trout were in spawning condition, and several redds were observed. These brook trout were not apparent in the summer sample. Probably, brook trout used this reach as a spawning area and then move to other areas.

Small numbers of cutthroat trout were captured in Dry Creek, and some rainbow trout in Deer Creek displayed evidence of hybridization with cutthroat trout. Presumably, cutthroat trout in Dry Creek have emigrated from Swanger Lakes where they are stocked.

Birch Creek Drainage

Wild rainbow trout are the most abundant game fish present in the Birch Creek drainage and were found at every sampling site except for one (Table 13). Brook trout are confined to headwater reaches. The highest densities of fish occur in Birch Creek upstream from Kaufman Guard Station, an area where habitat is good and fishing pressure is light. Lateral channels in the upper Birch Creek area also support good densities of fish. Further downstream, fish densities decline but still remain high in the Wagoner Ranch reach where habitat condition is excellent and limited angling effort occurs. On the BLM reaches, numbers decline considerably. Habitat is in good condition within the exclosure, but the steeper gradient and higher velocities limit the number of holding areas.

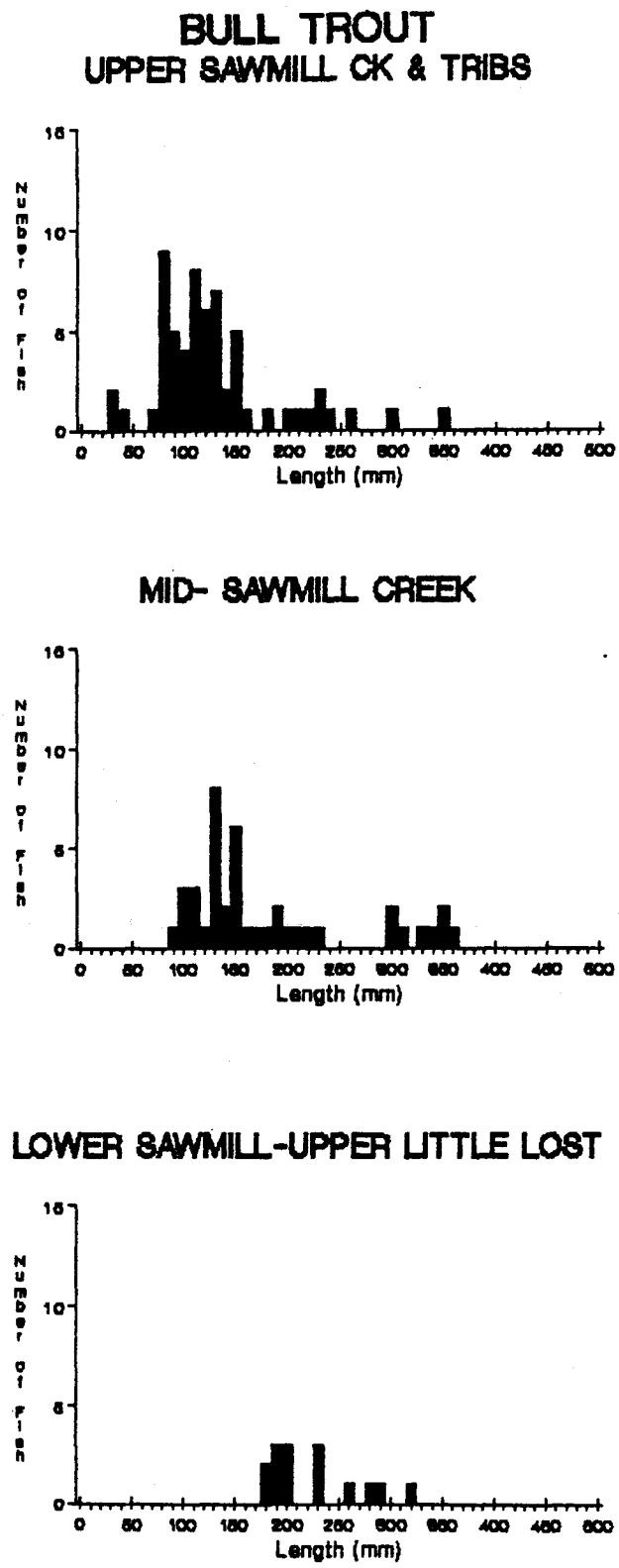

Figure 9. Length frequency distribution of bull trout captured from the Sawmill Creek drainage and the upper Little Lost River, 1987.

Table 12. Comparison of 1987 electrofishing data from lower Sawmill Creek with previous year's data.

Station	Date	Fish/ 100 m^2	Species composition (2) WRB	BRK	BLT
Uppermost	10/84	41	72	11	17
	7/85	26	48	11	41
	7/87	44	77	17	6
Next uppermost	10/84	20'	80	13	7
	7/85'	21	50	12	38
	7/87	7	43	57	0
Next lowermost	10/84	28	60	12	30
	7/85	15	22	56	22
	7/87	20	68	18	14
Lowermost	10/84	4	67	0	33
	7/85	4	100	0	0
	7/87	17	45	33	22

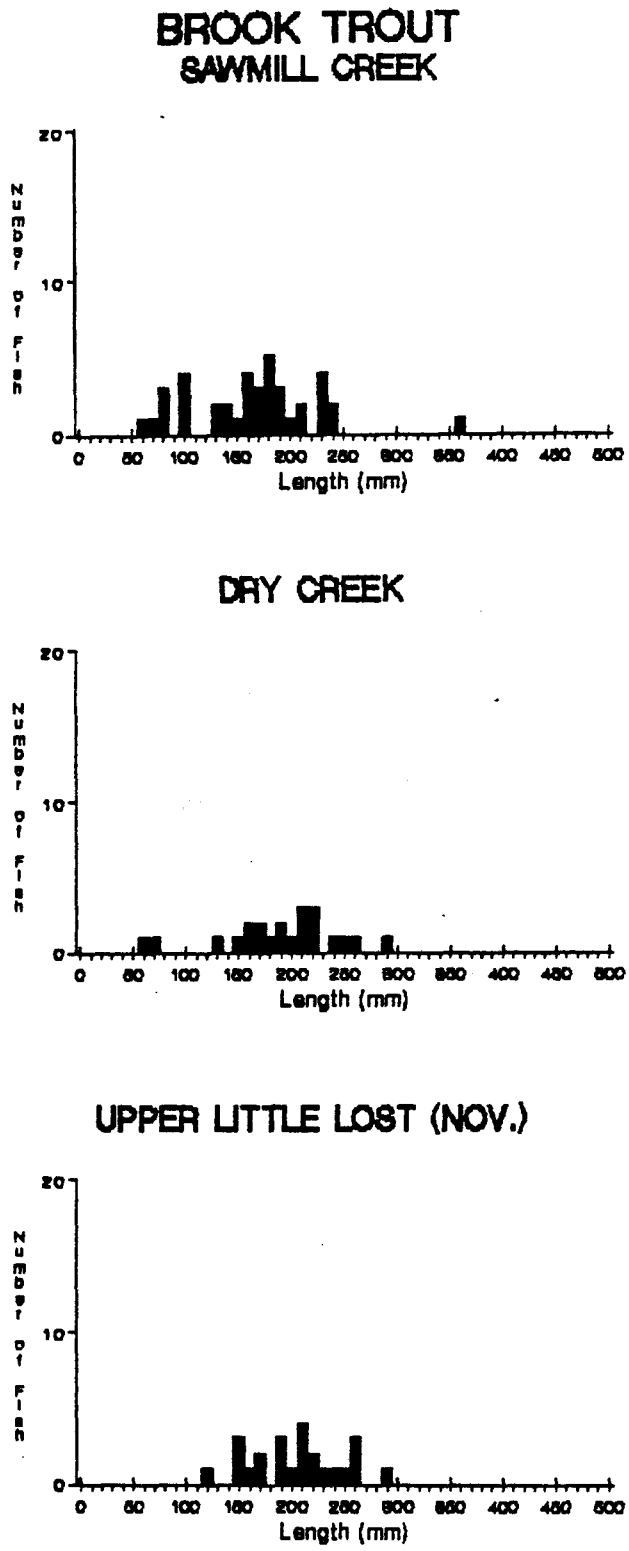

Figure 10. Length frequency distribution of brook trout from selected waters of the Little Lost River drainage, 1987.

Table 13. Fish population densities and species composition from selected sampling sites in the Birch Creek drainage.

Location	Site	Sampling date	Wild[a] fish/100 m^2	Species composition (%) WRB	BRK	Comments
Birch Cr.	Near hydro project	7/87	7.2	100	0	HRB made up 18% of catch
Birch Cr.	K-dams	7/87	Insufficient recaptures	100	0	Total catch = 46 WRB, 30 HRB, 1 WRB fry
Birch Cr.	BLM exclosure	7/87	8.8	100	0	HRB made up 23% of catch
Birch Cr.	Wagoner Ranch	7/87	26.2	100	0	HRB made up 1% of catch
Birch Cr.	Above Kaufman G.S.	7/87	48.0	96	4	35.2/100 m^2 ≥ 150 mm; YOY present
Birch Cr.	E. channel above Kaufman G.S.	7/87	No estimate	0	100	100% YOY
Birch Cr.	Above Kaufman G.S.--channel immed. E. of main	7/87	39.5	61	39	BRK YOY present
Birch Cr.	Above Kaufman G.S. channel next to HWY	7/87	44.3	92	8	WRB YOY abundant; BRK YOY present
Pass Cr.	@ 1 km below lake	7/87		100	0	Appear to be good densities of small fish

[a]Fish ≥ age 1+.

Outside of the exclosure, -habitat is more limited. We were unable to complete an estimate due to insufficient recaptures in the grazed reach where K-dams have been placed to provide habitat. Most of the fish captured in that reach were associated with the structures but densities did not appear to be high. Similar observations have been made in previous years (Corsi and Elle 1986). Estimated densities of wild fish in the vicinity of the hydro diversion were higher in 1987 than in 1982 (Table 14), but differences in sampling dates may account for the differences in estimates. Rod-and-reel sampling in Pass Creek Lake showed cutthroat trout are overwintering.

Fishing pressure is high throughout the BLM reaches because of the easy access and developed campgrounds. Grazed areas result in loss of cover and holding water as well as making the entire stream fishable from the bank. Harvest, along with limited habitat, probably are significant factors limiting wild fish populations in lower Birch Creek. Improvements to instream habitat resulting from structure placement and rejuvenation of the riparian zone would probably result in more fish being produced in the lower reach. Stream channelization during the 1950s and subsequent overgrazing problems have left Birch Creek with limited habitat in the lower reaches.

Despite the apparently productive nature of Birch Creek, fish do not reach large sizes. The largest wild rainbow captured measured 351 mm and few fish exceeded 300 mm (Figure 11), similar to observations made by Jeppson during 1970 and Andriano in 1954 (Region 6, file data). Brook trout seldom exceed 250 mm in length in the drainage (Figure 12).

Medicine Lodge Creek Drainage

Fish population sampling in the Medicine Lodge Creek drainage indicates that, with few exceptions, densities of wild trout are high (Table 15). Comparison of 1987 data with data collected in 1982 (Moore et al. 1983) from the same or nearby locations show that densities have remained fairly stable or increased following implementation of wild trout management (Table 16). Rainbow trout are the most widely distributed species in the Medicine Lodge drainage. Densities of rainbow trout observed in Warm Creek, a spring fed system, are comparable to those observed in spring fed systems of the Big Lost River (Corsi 1988). Cutthroat trout and cutthroat x rainbow hybrids are also widely distributed but are rarely predominant. Brook trout are confined to a few small tributaries and exhibit moderate densities in comparison with upper Big Lost River tributary populations (Corsi 1988).

Rainbow trout in Medicine Lodge Creek occasionally reach large sizes (Figure 13), providing anglers with an opportunity to catch a large fish. In tributaries, we seldom observed rainbow trout larger than 300 mm, but resident populations with fish up to 250 mm total length are common (Figure 14).

Cutthroat trout evidently exist in remnant migratory and resident populations and seldom exceed 250 mm in length (Figure 15). It is uncertain whether cutthroat trout sampled are the result of recent

Table 14. Comparison of electrofishing results for Birch Creek during 1987 with previous years.

Location	Trout/100 m Initial	1985	1987	Comments
1967 improvement area (K-dams)[a]	9.8	53.4	26.8	K-dams heavily utilized
1984 improvement area	-	105.6	103.3	Boulder placement; exclosure
Near hydro diversion	18.0	-	43.2	Different sampling dates

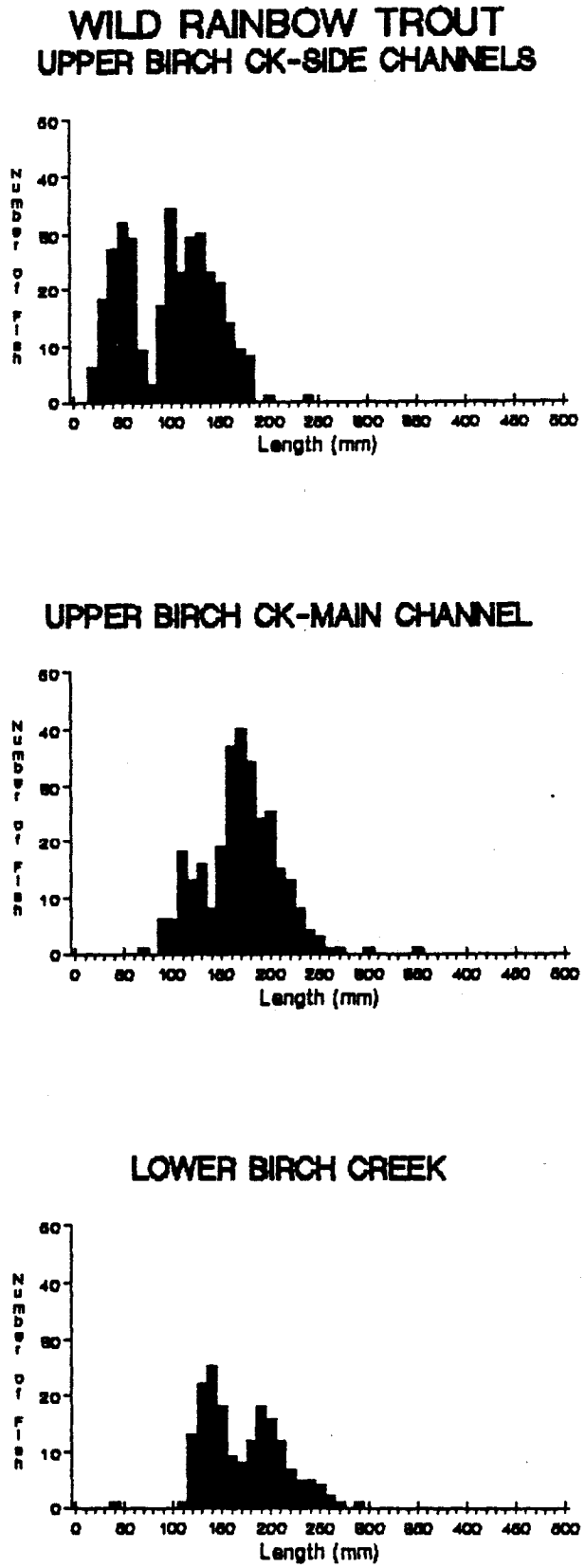

Figure 11. Length frequency distribution of wild rainbow trout captured from various locations in the Birch Creek system, 1987.

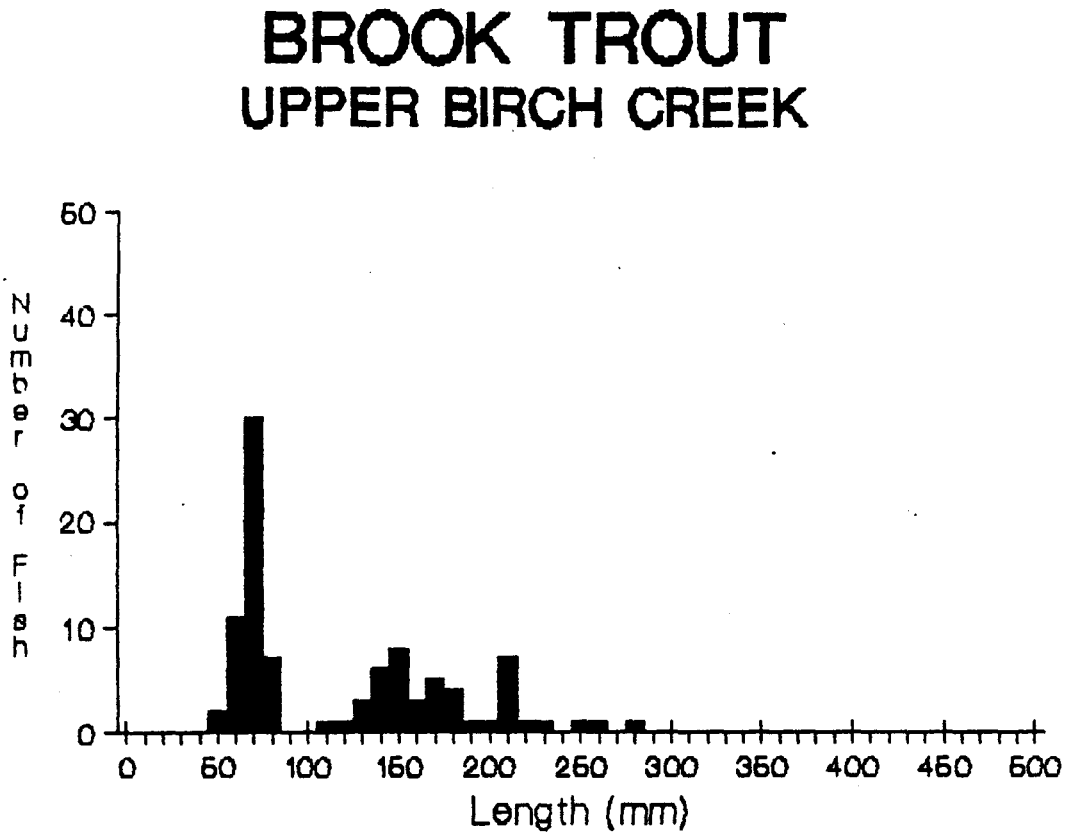

Figure 12. Length frequency distribution of brook trout from upper Birch Creek.

Table 15. Estimated densities and species composition of game fish from selected sampling sites in the Medicine Lodge drainage, 1987.

Stream	Site	Sampling date	Fish 100 m²	Species composition (%) WRB	BRK	CT	Hybrid	Comments
E. Fk. Irving Cr.	On TNF	6/9/87	11.4	0	77	15	8	Cutthroat ripe
Irving Cr.	By hunting camp	6/9/87	11.5	8	15	70	8	Cutthroat ripe
Fritz Cr.	On TNF near upper road	5/22/87	24.6	4	0	79	14	Cutthroat YOY present
Webber Cr.	Road 192 Bridge	6/2/87	15.2	26	67	5	2	Brook YOY present
Warm Cr.	BLM	5/28/87	77.7	100	0	0	0	WRB YOY present
Warm Cr.	TNF	5/2/87	88.2	99	0	0	1	Rainbow ripe or spent
Indian Cr.	#1 Canyon	6/2/87	28.3	94	0	0	6	
Indian Cr.	#2 Canyon	6/2/87	19.2	95	0	0	5	
Indian Cr.	West Fork	6/2/87	2.9	0	0	100	0	No fry; 1 ripe CT
Medicine Lodge	BLM Campground	6/87[b]	11.9	100	0	0	0	
Medicine Lodge	Gneiting Ranch	6/86[b]	8.5	97	0	1	2	Fish ≥ 150 mm
Medicine Lodge	Upstream from Gneiting Ranch	6/87[b]	21.0	82	0	8	10	Fish ≥150 mm

[a]Estimates are for age 1+ and older fish.

[b]Mark-recapture estimates conducted during first two weeks of June.

Table 16. Comparison of fish densities observed in the Medicine Lodge Creek drainage during 1982 and 1987.

Location	Density (fish/100 m^2) 1982	1987	Comments
Medicine Lodge Cr.-- BLM Campground	1.5	11.9	No CT observed in 1987; 1982 estimate considered minimum
Medicine Lodge Cr.-- BLM above Gneitings	0.5	21.0	30% HRB in 1982; 1982 estimate considered minimum
Warm Cr.--BLM	16.7	77.7	1982 and 1987 estimates @ 1 km apart
E. Fk. Irving Cr.	13.9	11.4	1982 and 1987 estimates @ 1 km apart
Fritz Cr.	8.8	24.6	1982 and 1987 estimates @ 1 km apart; CT dominant in 1987, WRB in 1982

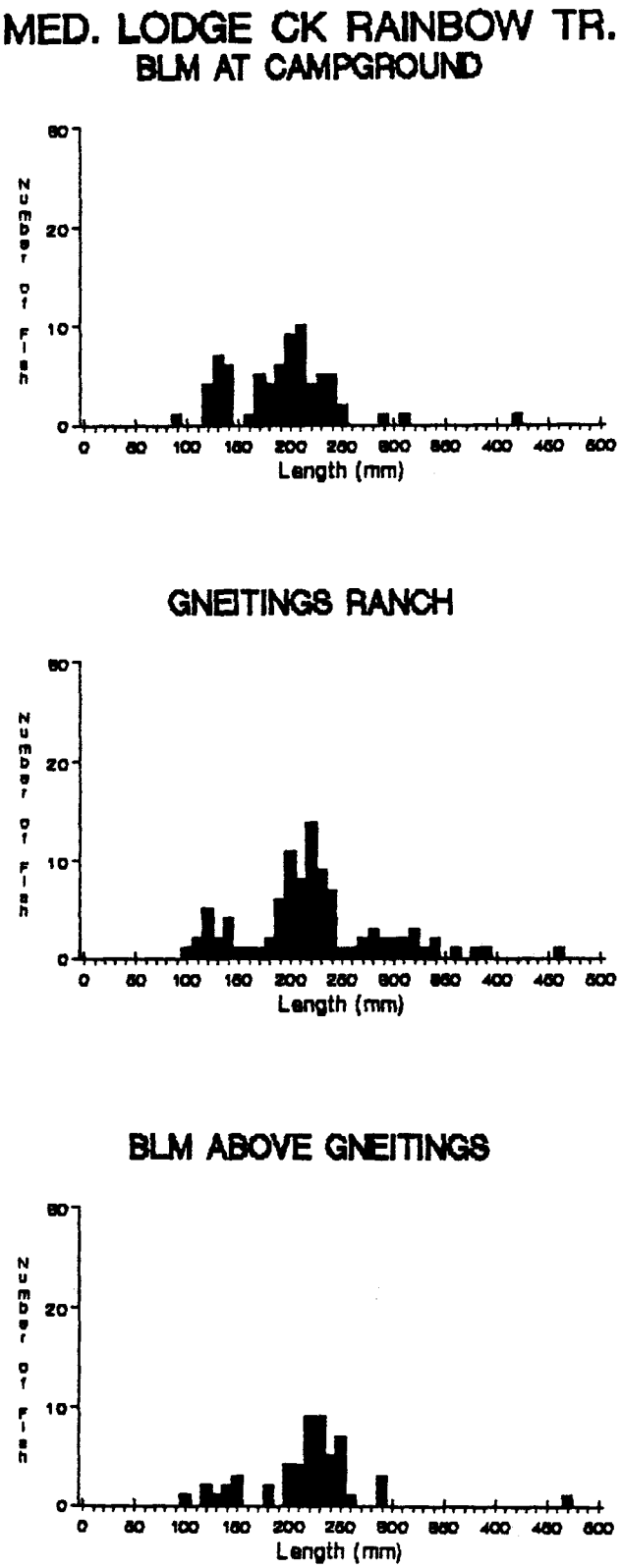

Figure 13. Length frequency distribution of rainbow trout captured from Medicine Lodge Creek, 1987.

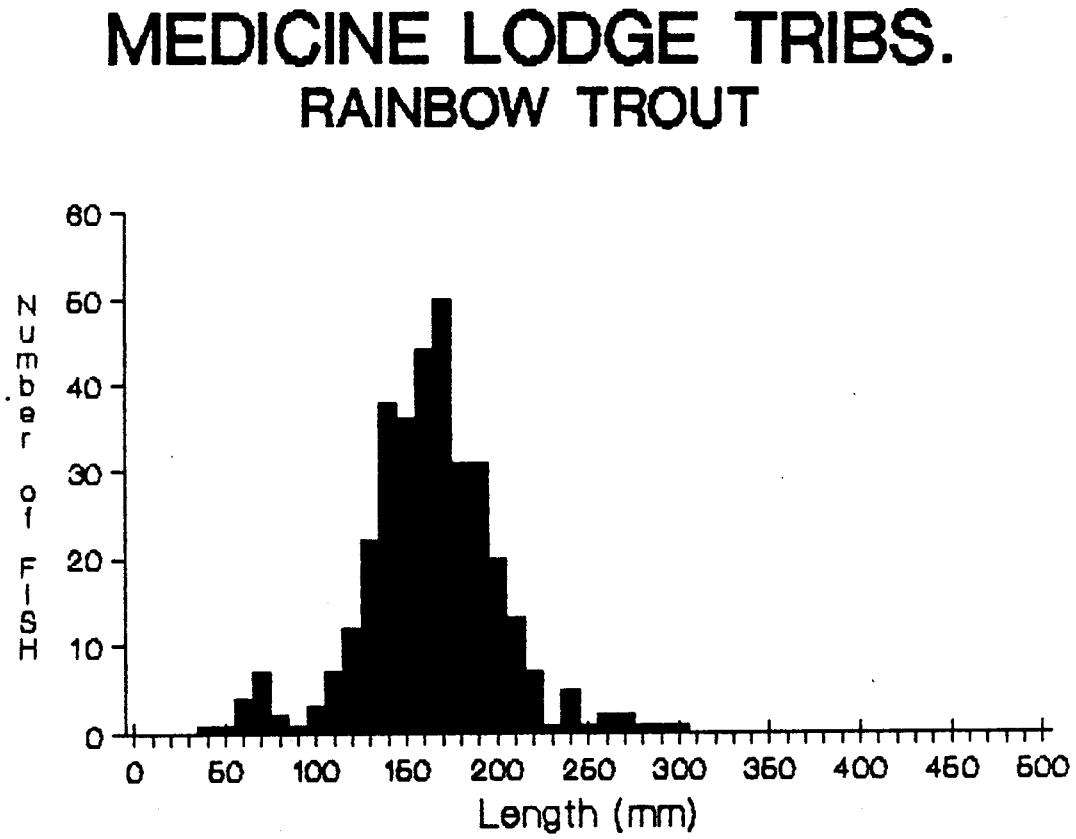

Figure 14. Length frequency distribution of rainbow trout from Medicine Lodge Creek tributaries, 1987.

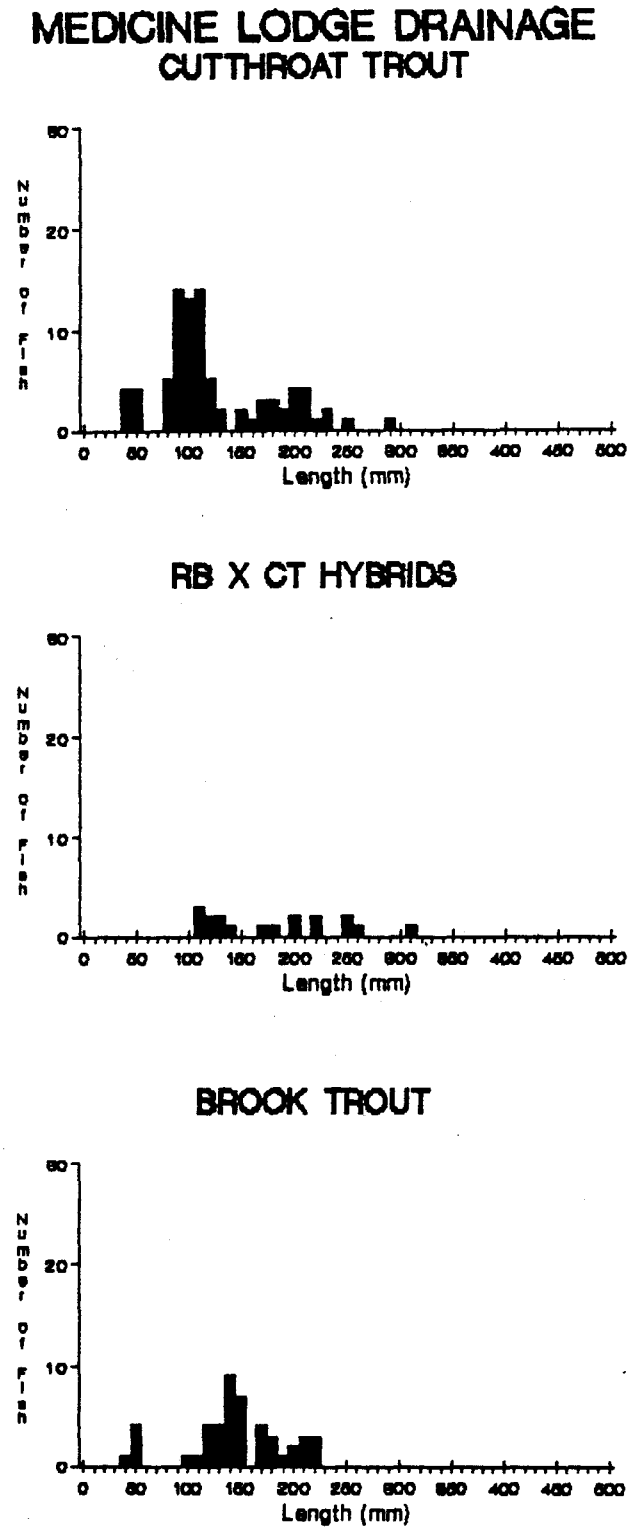

Figure 15. Length frequency distribution of cutthroat, hybrid, and brook trout captured from the Medicine Lodge Creek drainage, 1987.

stocking of fry, naturalized populations, or wild populations. The strong year class (age 1+) in the cutthroat population in Fritz Creek is probably a result of fry stocking in 1986, while other cutthroat trout are the result of natural recruitment. The presence of other year classes in Fritz Creek suggests it may be a spawning tributary. Cutthroat x rainbow hybrids most often occur where both species are present in some numbers (Table 15) and occasionally exceed 300 mm in length.

Brook trout longer than 200 mm are uncommon (Figure 15), and size structure of brook trout populations in the Medicine Lodge drainage is similar to that of other small stream populations in eastern Idaho (Corsi 1988; Spateholts and Moore 1985).

Rainbow x cutthroat trout hybrids are found throughout the drainage. Specimens we sampled were similar to cutthroat trout in size (Figure 15), and there is no evidence that they are an important component of the sport fishery.

Age And Growth

Big Lost River Near Mackay

Rainbow trout. Scales were analyzed from 32 wild rainbow trout captured between Mackay and Mackay Dam. The body-scale relationship is described by the linear equation $L = 25.06 + 5.68(ASR)$ ($r^2 = 0.97$).

Wild rainbow trout exhibit rapid growth in this reach of the river (Table 17), with most fish probably maturing at age 4. Rainbow trout from the other desert streams and from the upper Big Lost grow more slowly than those below Mackay Dam. Mackay Dam probably provides more stable temperature regimes and longer growing seasons, allowing for the more rapid growth rates. Rainbow trout growth below Mackay Dam is probably more representative of that found in other tailrace fisheries. Mean growth increments from the lower Big Lost River are nearly identical to those observed in the South Fork Boise River downstream from Anderson Ranch Dam and the Big Wood River (Table 18).

Brook trout. Scales were analyzed from 12 brook trout resulting in a calculated body-scale relationship of $L = 5.76 + 13.64(ASR)$ ($r^2 = 0.93$). Despite the small sample size, the back-calculated lengths at annulus show little variation among year classes (Table 19) and growth is quite rapid.

Brook trout in the lower Big Lost River exhibit growth rates similar to those observed by Spateholts (1984) for brook trout in Henrys Lake (Table 20). The productive nature of the stream plus the tempering effects of Mackay Dam probably contribute to the rapid growth of brook trout in the lower Big Lost.

Table 17. Back-calculated lengths at age for wild rainbow trout of different year classes captured from the Big Lost River near Mackay, 1987.

		Length at annulus (mm)							
N	Age	I	II	III	IV	V	VI	VII	VIII
3	1	99							
5	2	98	175						
8	3	100	188	252					
6	4	110	187	286	350				
3	5	112	16	288	317	417			
2	6	116	196	275	349	395	443		
1	7	105	213	343	423	480	508	531	
1	8	93	196	326	395	446	474	537	559
29									
$\bar{x}$	length	104	185	277	351	424	467	534	559
Growth	increment	81	92	74	73	43	67	25	

Table 18. Comparison of lengths at age of rainbow trout from the Big Lost River near Mackay with other waters.

Location	Length (mm) at I	II	III	IV	V	VI	VII	VIII	Comments
Big Lost near Mackay	104	185	277	351	424	467	534	559	This study.
East Fork Big Lost	91	149	204	177	349	-	-	-	Corsi (1988).
South Fork Boise R.	105	193	286	357	414	471	528	-	Moore et al. (1979).
Henrys Fk.--Box Canyon	155	277	364	431	493	532	-	-	Angradi and Contor (1988).
Big Wood River	100	176	279	358	461	-	-	-	Thurow (1987).

Table 19. Back-calculated size at annulus (mm) for brook trout from the lower Big Lost River, 1987.

		Length at annulus			
N	Age	I	II	III	**IV**
6	1	165			
2	2	156	258		
1	3	169	265	360	
1	4	169	265	360	401
10					
$\bar{x}$ length		164	262	360	401
Growth increment			98	98	41

Table 20. Comparison of back-calculated lengths (mm) at annulus for brook trout from the lower Big Lost River with selected sites.

Location	Length at annulus (mm)					
	I	II	III	IV	V	VI
Lower Big Lost River	164	262	360	401	-	-
Henrys Lake-naturalized	128	242	359	426	492	556
Henrys Lake-Assinica	167	374	-	-	-	-
West Fork Big Lost[a]	95	148	190	228	367	-

[a]From Corsi (1988).

Little Lost River

Rainbow trout. Scales were analyzed from 48 wild rainbow trout collected from Sawmill Creek and the upper Little Lost River. The equation: Length = 24.6(ASR) + 5.55 best fit the data (r^2 = 0.88). Although scales were taken from several rainbow trout larger than 250 mm, they were unreadable, and I was unable to age any fish older than 3+. Back-calculated lengths at annulus were similar to those observed by Corsi et al. (1986) for rainbow trout from Sawmill Creek and are probably not representative of growth in the main Little Lost River (Table 21).

Bull trout. A total of 85 bull trout scales were analyzed. The third-degree polynomial equation:

$$L = 41.28 + 4.83(ASR) + 0.25(ASR)^2 - 7.22 \times 10^{-4}(ASR)^3$$

best described the body-scale relationship (r^2 = 0.95). Fish aged ranged from 0+ to 4+ years old and from 78 mm to 362 mm long. Back-calculated length at annulus and growth increments are presented in Table 22.

Bull trout growth in the Little Lost drainage is similar to that observed in the Pend Oreille Lake system for the first three years of life but greater than that observed in the South Fork Salmon or Flathead River systems (Table 23). Unlike other bull trout populations which have been studied (Thurow 1987; Pratt 1985; Shepard et al. 1984), bull trout in the Little Lost system do not have access to a lake or large river system and do not normally show the rapid growth at older ages exhibited by other populations. Occasionally, large bull trout are observed in the Little Lost system. BLM personnel captured a 510 mm fish in lower Sawmill Creek in 1987. In 1983, an angler caught a 635 mm fish which was aged at 5+ (personal observation). Evidently, bull trout in the Little Lost have the potential to reach large sizes but some factor, or combination of factors, prevents all but a few from doing so.

Birch Creek

Rainbow trout. Scales were analyzed from 163 wild rainbow trout captured from Birch Creek. The linear equation L = 21.07 + 5.75(ASR) best described the body-scale relationship (r^2 = 0.87). Most fish aged were one to three years old, with a small number of age 0+ and age 4+ fish present in the sample. Fish successfully aged ranged from 68 mm to 305 mm long. Because of differences in habitat and fishing pressure, the sample was divided into three groups: lower Birch Creek, Wagoners Ranch, and upper Birch Creek for back-calculation purposes. Back-calculated lengths at annulus and annual growth increments for each section are presented in Table 22. There does not appear to be any major differences in annual growth among the three sections.

Back-calculated lengths of annulus for wild rainbow trout were similar to those observed in the Little Lost River (this report; Corsi et al. 1986) and upper Warm River (Brostrom and Spateholts 1985). Evidently, rainbow trout from Birch Creek are short lived and unable to reach large

Table 21. Comparison of back-calculated lengths (mm) at annulus for rainbow trout sampled from the Little Lost River drainage during 1984 and 1987.

Location	Year	Length at annulus (mm)			
		I	II	III	IV
Sawmill Cr. & upper Little Lost	1987	78	139	197	-
Sawmill Creek	1984	79	138	-	-
Little Lost River	1984	97	171	229	271
Summit Creek	1984	104	158	197	-

Table 22. Back-calculated length (mm) at annulus and annual growth increments for wild rainbow trout from Birch Creek, 1987.

A. Upper Birch Creek

		Length at annulus			
N	Age	I	II	III	IV
34	1	93			
24	2	88	135		
36	3	98	160	196	
4	4	96	153	207	241
98					
$\bar{x}$ length		94	150	197	241
Growth increment		56	47	44	

B. Wagoners Ranch

		Length at annulus (mm)		
N	Age	I	II	III
10	1	99		
14	2	95	148	
10	3	94	157	192
34				
$\bar{x}$ length		96	152	192
Growth increment		56	40	

C. Lower Birch Creek

		Length at annulus (mm)			
N	Age	I	II	III	IV
4	1	96			
19	2	91	157		
5	3	94	160	202	
1	4	84	148	205	251
29					
$\bar{x}$ length		92	157	202	251
Growth increment		65	45	49	

Table 23. Comparison of length (mm) at age of bull trout from the Little Lost River drainage with bull trout from other systems.

Location	I	II	III	IV	V	VI	VII	VIII	Source
Little Lost River	99	155	240	314					present study
Pend Oreille Lake	91	164	272	403	497	578			Pratt (1985)
S. Fk. Salmon R.	68	110	154	217	284				Thurow (1987)
M. Fk. Flathead R. (MT)	48	97	174	286	389	484	575	636	Fraley et al. (1981)

sizes. The largest wild rainbow trout observed in Birch Creek was a 351 mm fish, which we were unable to age. Presumably, it was an age 4+ or 5+ fish. Early maturity (fish mature as small as 135 mm total length) may be one factor limiting growth and survival.

Medicine Lodge Creek Drainage

Rainbow trout. Analysis of 104 rainbow trout scales from the Medicine Lodge drainage provided a body-scale relationship of:

$$L = 24.63 + 5.57(ASR) \quad (r^2 = .85).$$

In Medicine Lodge Creek, several age 4+ and older fish were sampled, but readable scales were obtained from only a few fish. The largest fish aged measured 468 mm. Some age 0+ fish were also aged. Fish from Indian Creek were treated differently from Medicine Lodge Creek fish and from upper Medicine Lodge Creek tributary fish for purposes of back-calculating size at annulus.

Rainbow trout in Medicine Lodge Creek exhibited faster growth and greater longevity than rainbow from either Birch Creek or the Little Lost (Table 24). Indian Creek rainbow trout grow at a somewhat slower rate, and no fish older than 4+ were observed (Table 25). Tributaries to upper Medicine Lodge Creek held fish which grew at a similar rate to fish from the main stem, but no fish older than age 3+ were sampled. This suggests that at least a portion of the fish may be of a migratory stock.

Cutthroat trout. Readable scales were collected from 40 cutthroat trout sampled from the Medicine Lodge Creek drainage during 1987. A third-degree polynomial equation:

$$L = 34.63 + 6.59(ASR) + 0.29(ASR)^2 - 0.01(ASR)^3 \quad (r^2 = 0.74)$$

describes the body-scale relationship. No fish over age 3+ were examined, and the largest fish analyzed was 290 mm.

Cutthroat trout growth in the Medicine Lodge Creek drainage is similar to that observed in other eastern Idaho waters (Table 26). The small sample size for each of the areas fish were collected from makes meaningful comparisons unlikely.

Brook trout. Scales from 12 brook trout collected in the Medicine Lodge drainage were analyzed. The body-scale relationship was described by the linear equation, $L = 42.96 + 8.57(ASR)$. All fish in the sample were either age 1+ or 2+ and ranged in length from 112 mm to 227 mm. Annual growth increments are high enough that *many* fish probably mature in their first year ($\bar{x}$ length = 114 mm) and almost all by the second year ($\bar{x}$ length = 162 mm).

Table 24. Comparison of growth rates of wild rainbow trout from Birch Creek with other Region 6 waters.

Site	Length at annulus (mm)				
	I	II	III	IV	V
Upper Birch Creek	94	150	197	241	-
Wagoners Ranch (Birch Cr.)	96	152	192	-	-
Lower Birch Creek	92	157	202	251	-
Little Lost River	97	171	229	271	-
Upper Warm River	107	160	199	217	223
Medicine Lodge Creek	109	189	227	283	325

Table 25. Back-calculated length (mm) at annulus and annual growth increments for wild rainbow trout from the Medicine Lodge Creek drainage.

A. Medicine Lodge Creek

		Length at annulus (mm)				
N	Age	I	II	III	IV	V
7	1	107				
28	2	112	200			
17	3	107	174	225		
3	4	106	171	227	279	
2	5	108	189	242	289	325
57						
$\bar{x}$	length	109	189	227	283	325

B. Upper Medicine Lodge Tributaries

		Length at annulus (mm)		
N	Age	I	II	III
9	1	122		
8	2	106	158	
3	3	138	193	231
20				
$\bar{x}$	length	118	168	231

C. Indian Creek

		Length at annulus (mm)			
N	Age	I	II	III	IV
3	1	93			
13	2	10	157		
5	3	10	155	191	
2	4	94	147	211	264
23					
$\bar{x}$	length	10	156	197	264

Table 26. Back-calculated length (mm) at annulus and annual growth increments for wild rainbow trout from the Medicine Lodge Creek drainage.

Water	Size (mm) at annulus I	II	III	IV	V	VI	VII	Reference
Medicine Lodge drainage	100	166	217					
Blackfoot River	117	213	321	403	442	473		Thurow (1982).
S. Fk. Snake River	86	184	277	343	410	450	480	Moore and Schill (1984).
Teton River	99	151	214	270	334			Irving (1979).
Willow Creek	79	142	219	299	380	437		Corsi (1986).

Mortality Estimates

Big Lost River Near Mackay

Rainbow trout. Total annual mortality was estimated at 67% for ages 3 through 8. Survival is good to age 4 but declines rapidly thereafter (Table 27). Presumably, this is a result of postspawning stress, and angling mortality appears to be negligible.

Brook trout. Brook trout mortality occurs at a high rate from age 1+ on (Table 28), but because growth is so rapid, most fish probably mature before forming a second annulus (age 2 fish). Postspawning stress probably accounts for the high mortality. The fact that no fish over age 4+ were encountered suggests that Big Lost River brook trout, like other eastern Idaho brook trout, are short lived.

Little Lost River

Rainbow trout. Total annual mortality for rainbow trout from the Little Lost River and Sawmill Creek was estimated at 77Z for ages 2 through 5. As with rainbow trout in Birch Creek, rainbow trout in the Little Lost River system appear to be short lived and early maturing, and survival is probably good to age 2 (Table 29).

Bull trout. Bull trout mortality was estimated at 61Z annually for fish aged 2 through 4. The catch data, however, suggest high mortality from ages 2 to 3 (Table 30). Since I was unable to determine size at maturity for bull trout, it is uncertain whether postspawning mortality is contributing to the high mortality rate after age 2 or whether angling pressure or some other factor is responsible. Scott and Crossman (1973) indicate that sexual maturity is not achieved until fish are three years old at the earliest, so it seems likely that some other factor is limiting numbers of older bull trout. Age 2 fish are large enough to be susceptible to harvest; and locally, heavy fishing pressure may be contributing to the increased mortality.

Birch Creek

Rainbow trout. Wild rainbow trout in Birch Creek are short lived, and in the more heavily fished lower reach of the stream seldom reach three years of age. In upper Birch Creek, where fishing mortality is probably negligible, survival is high to age 3 with high mortality occurring afterwards (Table 31). Since many fish mature at age 3, postspawning mortality is probably high.

Table 27. Catch and mortality (> age 3) data for wild rainbow trout from the Big Lost River downstream from Mackay Dam.

	Age group											
	0	1	2	3	4	5	6	7	8	Z	A	S
N	108	36	59	243	164	28	19	4	1			
Length	-	-	-	5.493	5.100	3.332	2.944	1.386	0	1.11	0.67	0.33

Table 28. Catch data mortality rates (≥ age 1) for brook trout from the lower Big Lost River, 1987.

	Age group							
	0	1	2	3	4	Z	A	S
N	4	235	9	5	1			
Length	-	5.460	2.197	1.609	0	1.70	0.18	0.82

Table 29. Catch and mortality data (> age 2) for wild rainbow trout from the Little Lost River and Sawmill Creek. Age 2 fish were assumed to be fully recruited to the electrofishing gear.

	Age group								
	0	1	2	3	4	5	Z	A	S
N	36	72	245	83	20	3			
Length	-	-	5.501	4.419	2.996	1.099	1.46	0.77	0.23

Table 30. Catch and mortality (> age 2) data for bull trout from the Little Lost River system.

	Age group							
	0	1	2	3	4	Z	A	S
N	17	60	47	9	7	0.95	0.61	0.39
Length	-	4.094	3.850	2.197	1.946			

Table 31. Estimated mortality for wild rainbow trout from different reaches of Birch Creek.

Location	Length of catch at age					Annual mortality at ages	
	0	1	2	3	4	2-3	3-4
Lower Birch Creek	0	3.135	4.605	2.833	0	0.83	1.00
Wagoners Ranch	0	4.317	4.263	4.043	1.397	0.20	0.93
Upper Birch Cr.--main channel[a]	0	3.784	4.522	4.984	2.485		0.92
Upper Birch Cr.--side channels[a]	4.779	4.727	4.357	3.091	0	0.72	1.00

[a]Side channels in upper Birch Creek contain primarily spawning habitat with little holding area for large fish. The main channel contains excellent holding water for large fish, but limited in spawning area.

Medicine Lodge Creek Drainage

Rainbow trout. Total annual mortality (A) was estimated for wild rainbow trout in two tributaries to Medicine Lodge Creek (Warm Creek and Indian Creek) and for Medicine Lodge Creek in one privately owned reach and two BLM reaches (Table 32). Calculated A for age 2+ and older fish in Warm Creek was 0.87 and in Indian Creek, 0.67. In Warm Creek, fishing pressure probably accounts for greater mortality than in Indian Creek because of differences in accessibility. Resident fish mature at age 2 in Warm Creek, and spawning mortality may be high. Also, juvenile fish may be migrating out of Warm Creek and not necessarily dying. Some emigration may occur from Indian Creek, but that population appears to be primarily resident fish.

On Medicine Lodge Creek, A was higher on two reaches within BLM boundaries (0.73) that are heavily fished than within a reach of private ground (Gneitings) which is located between the two BLM reaches (A = 0.47). Habitat was similar in all three sections; thus, it appears that fishing pressure accounts for the disparity. Since most of Medicine Lodge Creek is situated in private holdings and fishing pressure is concentrated around only **a** few locations, overall mortality of rainbow trout on Medicine Lodge Creek is probably not excessive.

Angler Surveys

Medicine Lodge Creek

Anglers fished an estimated 3,743 hours on Medicine Lodge Creek from Memorial Day Weekend through September 12 during 1987. This represents a 302 decline in effort since the 1982 estimate (Moore et al. 1983). However, effort in the lower section was actually higher in 1987 than in 1982. During 1987, effort in the lower section was similar to that observed in the upper section (Table 33). Further breakdown of the location of fishing effort indicates that more than half of the effort occurs in about 202 of the creek (Table 34). Jeppson (1963) observed that utilization in Medicine Lodge was higher in more accessible areas, something we also observed. He also estimated effort during 1963 at 10,823 hours, thus effort in Medicine Lodge Creek appears to be on a long-term decline.

Overall catch rate of trout in Medicine Lodge Creek was 1.11 fish per hour, virtually the same as that observed in 1982. Catch rates were based on interviews of 91 anglers who had fished a total of 158.1 hours during the season. Catch rates showed a considerable amount of fluctuation through the sampling period (Table 35). Harvest rates, however, declined by 36%. I attribute this primarily to cessation of catchable rainbow trout stocking. In 1982, catchable rainbow trout comprised 21% of the harvest.

Harvested wild rainbow trout had a mean total length of 235 mm and ranged from 155 mm to 453 mm in length. Moore et al. (1983) found a mean of 233 and a range of 160 to 330 mm in 1982. Based on length of fish

Table 32. Catch and mortality (> age 2) data for wild rainbow trout from Medicine Lodge Creek, Warm Creek, and Indian Creek, 1987.

Location	Ag group 0	1	2	3	4	5	Z	A	S
Medicine Lodge Cr.--BLM	-	27	60	35	2	2	1.31	0.73	0.27
Medicine Lodge Cr.--Greiting	-	15	40	23	11	6	0.64	0.47	0.53
Warm Creek	13	108	117	4	2	-	2.03	0.87	0.13
Indian Creek	-	5	46	14	5	-	1.11	0.67	0.33

Table 33. Estimated effort (hours), by section, in Medicine Lodge Creek during 1987. Data from 1982 are shown for comparison.

Interval	Section 1 (Lower)	Section 2 (Upper)	Total
1	355	786	1,141
2	354	285	639
3	516	46	562
4	152	236	388
5	148	15	163
6	300	236	536
7	0	206	206
8	108	0	108
Total 1987	1,933	1,810	3,743
Total 1982	1,320	4,003	5,323

Table 34. Fishing pressure breakdown, by stream reach, for Medicine Lodge Creek, 1987.

Location	Km of strea	No. anglers counted	#/km
Start to Middle Creek	1.9	0	0
Mouth of Middle Creek	1.3	12	9.2
BLM Campground Area	3.9	48	12.3
Whitaker and Grieting ranches	6.1	16	2.6
Upper BLM area	1.3	27	20.8
Hogan and May ranches	7.6	30	3.9
Mouth of Webber and Edie creeks	1.0	7	7.0
Webber Creek - Irving Creek	5.1	1	0.2
Mouth of Irvin Creek	1.0	43	43.0
Mouth of Fritz Creek	0.8	9	11.3
Mouth of Warm Creek to Divide Creek	4.1	34	8.3
TOTAL	34.1	227	6.7

Table 35. Estimated catch rates, by species, for Medicine Lodge Creek, 1987.

Interval	Species			Total
	WRB	BRK	WCT	
1	1.33	0.04	0.02	1.39
2	2.47	0	0	2.47
3	0.45	0	0	0.45
4	1.39	0	-0	1.39
5	0.29	0	0	0.29
6	1.51	0	0	1.51
7	0	0	0	0
8	0.61	0	0	0.61
Total				1.11

observed in the creel, anglers start to keep fish as they move into the 150 to 200 mm size group, similar to what was observed on the Big Lost River (Corsi 1988). Over 902 of the fish observed in the creel were less than 300 mm long, but the opportunity to catch large fish is still available as evidenced by the large fish that were caught.

Anglers were also checked at Irving Creek, Webber Creek, Horse Creek, and Warm Creek. Based on the limited number of contacts, fishing in the tributaries was good with high catch rates (Table 36). Brook trout make up an important component of the tributary fishery. Despite the fact that cutthroat trout are widely distributed around the drainage, none were observed in angler creels during 1987.

Birch Creek

Project personnel interviewed 163 anglers on Birch Creek who had fished a total of 211.6 hours. Overall catch and harvest rates were 1.54 and 1.01 fish per hour, respectively. Hatchery rainbow trout comprised 88% of the harvest. In 1982 (Moore et al. 1983), hatchery rainbow made up 532 of the harvest, and harvest rates were 0.93 fish per hour. This is probably indicative of a decline in wild rainbow trout populations. Catch rates in 1982 were 2.30 fish per hour, primarily due to a high release rate of 1.36 fish per hour, most of which were small (≤150 mm) wild fish. It may also indicate a higher utilization of hatchery fish. Wild rainbow trout and brook trout comprised 11% and 12, respectively, of the harvest. The mean length of wild rainbow trout in the creel was 221 mm, compared with 217 mm in 1982.

Little Lost River Drainage

Forty-seven anglers who had fished a total of 73.5 hours were interviewed on four streams in the Little Lost drainage (Table 36). Rainbow trout were the most frequently caught species around the drainage with the exception of Sawmill Creek, where bull trout dominated the catch. Brook trout were also present in the creel (Table 36). Catch rates drainagewide are exceeding the 1.2 fish per hour goal designated in the current management plan.

Wild rainbow trout in the creel averaged 265 mm and ranged from 176 mm to 346 mm in length. Twenty-four percent of the wild rainbow trout were larger than 299 mm. Bull trout had an average length of 293 mm, with a range of 162 mm to 445 mm. Forty-three percent of the bull trout creeled were larger than 299 mm and 21% were larger than 400 mm. Occasional reports of bull trout which exceed 500 mm are received, and a 635-mm long specimen from Sawmill Creek was checked at the Regional Office in 1983. It appears that bull trout have the potential to provide a trophy aspect to the fishery, but based on population structure and the size of fish harvested, few are reaching large sizes.

Table 36. Creel survey data for tributaries to Medicine Lodge Creek and in the Little Lost River drainage.

Stream	Hours fished	Catch rate (fish/hour)	No. of fish checked (catch/harvest)		
			BRK	WRB	BLT
Irving Creek[a]	2.0	1.0		2/2	
Webber Creek[a]	1.0	7.0	6/6	1/1	
Horse Creek[a]	4.0	2.8	9/9	2/2	
Warm Creek[a]	0.3	6.7		2/2	
Little Lost River[b]	35.0	1.6	1/1	54/32	2/2
Big Spring Creek[b]	4.5	2.0	1/1	8/7	
Summit Creek[b]	6.5	2.8	3/1	15/3	
Sawmill Creek[b]	27.5	1.2	2/2[c]	13/5	17/12

[a]Medicine Lodge drainage.
[b]Little Lost drainage.
[c]BRK x BLT hybrids.

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A P P E N D I C E S

Appendix A. Stream characteristics and population estimates at sampled areas in the Big Lost River drainage.

Stream	Section	Length	Width	Gradient	Sub-strate	Bank cond.	Rip. Veg.	Stream characteristics	Access	Population estimate (95% C.I.)
Big Lost R.	Near Arco	490.0	9.1	0.4	S,B	P	P	Dead falls creating habitat	F	222 (142-400)
Big Lost R.	Near Mackay	1,238.1	24.2	0.4	G,R,B	G	G	Good pool-riffle structure	G	3,024 (2,310-4,137)
Antelope Cr.	USFS Research Natural Area	64.0	5.1	1.5	R,B	E	E	Mostly pocket water, 1 pool	G	40 (38-42)
E. Fk. Big Lost	Riparian pasture, lower	132.0	5.5	1.1	G,R	G	G	Good pool-riffle	G	37 (32-42)
E. Fk. Big Lost	Riparian pasture, upper	175.0	4.9	1.1	G,R	G	G	Good pool-riffle	G	21 (18-24)
Pass Cr.	In canyon	78.0	2.8	1.8	G,B	E	E	Some good pools; stream channelized	E	37 (35-39)

Appendix B. Stream characteristics and population estimates at sampled areas in the Little Lost River drainage.

Stream	Section	Length	Width	Gradient	Sub-strate	Bank	Rip. Veg.	Stream characteristics	Access	Population estimate (95% C.I.)
Little Lost R.	Above Clyde School	327.1	8.4	0.4	S,G,R	G	E	Good pool-riffle structure	F	776 (397-2,197)
Little Lost R.	@ Deer Cr. Rd.	207.9	4.7	0.6	S,G,R	G-E	E	Channel fairly straight; limited channel diversity	G	108 (60-257)
Little Lost R.	Above Fallert Spr. Cr.	144.0	6.7	0.3	S,G,R	G-E	E	Some pools; channel fairly straight	F	348 (203-736)
Little Lost R.	Howe Gage	224.0	6.6		S,G	G	G	Some pools; channel fairly fairly straight	E	55 (27-179)
Sawmill Cr	Near Moonshine Cr.	94.5	4.6	3.1	S,G,R,B	E	E	Pools, drops, large woody debris; shaded	E	17 (12-22)
Sawmill Cr.	Near Bear Cr.	100.0	5.9	1.9	G,R,B	G	E	Short riffles w/ long pools and glides	G	46 (41-53)
Sawmill Cr.	Near Guard Station	303.2	9.5	1.7	R,B	P	P	Good pocket water habitat	E	290 (173-590)
Sawmill Cr.	Near USFS Boundary	109.7	7.3	1.4	R,B	G	G	Good diversity	E	57 (52-62)
Sawmill Cr.	BLM, upper	110.0	7.1	1.0	R,B	F	G	Pocket water	F	48 (43-53)
Sawmill Cr.	BLM	94.0	4.9	1.1	R,B	F	G	Pocket water	F	7 (7-7)
Sawmill Cr.	BLM	118.9	9.3	0.7	R,B	G	G	Pocket water	F	24 (18-30)
Sawmill Cr.	BLM, lower	104.5	4.2	0.8	S,G	P	P	Riffle/pool	F	18 (16-20)
Summit Cr.	BLM upper exclosure	63.0	4.2	1.0	S,G	E	E	Undercuts; dead falls; vegetation mats	F	52 (36-68)
Summit Cr.	BLM lower exclosure	89.0	3.0	1.0	S,G	E	E	Undercuts; vegetation mats	F	71 (65-77)
Summit Cr.	BLM @ county line	105.0	4.3	0.4	S,G	F	F	Broad, shallow channel	G	40 (38-42)
Summit Cr.	Private land @ mouth	102.0	2.5	0.4	S,G	E	E	Narrow; deep; vegetation mats	F	104 (84-124)
Wet Cr.	BLM #1	91.6	3.9	1.4	S,G	G	E	Pools and riffles	G	39 (32-46)
Wet Cr.	BLM #4	103.3	3.6	1.4	G,R	F	F	Good pool-riffle structure	G	53 947-56)

Appendix B. Continued.

Stream	Section	Length	Width	Gradient	Sub-strate	Bank cond.	Rip. Veg.	Stream characteristics	Access	Population estimate (95% C.I.)
Wet Cr.	BLM #7	87.8	3.9	1.5	G,R	P	P	Riffles, some pool habitat	G	24(22-26)
Wet Cr.	BLM 19	93.4	3.8	1.5	G,R	F	F	Riffles, some pool habitat	G	21 (19-23)
Wet Cr.	BLM #14	96.3	4.4	1.5	G,R	F	G	Good pool habitat	G	37 (30-44)
Wet Cr.	BLM #20	95.7	4.2	1.5	G,R	G	G	Big pools and undercuts	G	22 (20-24)
Wet Cr.	Above hydro project	106.1	5.8	0.8	G,R	F	F	Riffles; some pools	G	42 (35-49)
Wet Cr.	Below Dry Cr.	108.5	4.6	1.0	G,R	G	G	Riffles and pools	G	27(25-29)
Wet Cr.	CNF near road crossing	73.0	3.1	3.8	G,R,B	G	G	Pools, riffles, pocket water	G	27 (26-28)
Dry Cr.	On CNF in meadows	136.0	4.3	2.5	S,G	G	G	Drained beaver ponds; deep runs	P	23 (21-25)
Squaw Cr.	BLM #1	192.0	2.1		S,G'	F	F	Pool-riffle-run	E	150 (112-211)
Squaw Cr.	BLM exclosure	184.7	3.1		G	G	G	Pool-riffle-run	E	128 (92-191)
Badger Cr.	Lower section on CNF	73.2	1.4	5.1	G,R,B	G	E	Pocket water, small pools	F	26 (22-30)
Badger Cr.	On CNF in basin	42.5	1.1	6.1	G,R,B	G	E	Pocket water, small pools	F	16 (13-19)
Deer Cr.	BLM #2	118.9	2.6	3.1	G	E	E	Pools, runs		48 (29-94)
Deer Cr.	BLM #3	151.8	3.4	2.4	G,R	G	G	Pool, riffle, pocket water		60 (33-143)
Big Cr.	Up from road	45.0	2.0	2.6	G	G	G	Narrow w/ good cover	E	13 (12-14)
Big Spring Cr.	Near road crossing (#1)	44.0	4.5	0.8	S,G	G	G	Pools and glides	E	70 (67-73)
Big Spring Cr.	Upstream from #1	117.7	4.4	0.8	S,G	G	G	Pools and glides	E	105 (84-136)
Fallert Spr. Cr.	@ closed bridge	139	4.8	0.6	S,G	G	E	Channel weed-choked	E	5 (5-5)
Warm Cr.	Below HWY culvert	59.6	9.6	0.5	S	E	E	Channel weed-choked	E	169 (93-400)
Timber Cr.	Near campground	104.3	3.7	2.6	G,R,B	G	G	Pocket water	G	29 (14-44)
Iron Cr.	0.5 km from mouth	132.0	3.6	5.1	S,G,R	G	G	Small pools, pocket water	E	31 (24-38)

Appendix C. Stream characteristics and population estimates at sampled areas in the Birch Creek drainage.

Stream	Section	Length	Mean width	Gradient	Sub-strate	Bank cond.	Rip. Veg.	Stream characteristics	Access	Population estimate (95% C.I.)
Birch Cr.	Just upstream from hydro project	206.0	6.0	1.1	S,G	E	G	Steep; limited holding water	G	89 (48-228)
Birch Cr.	K-dams	171.4	8.7	1.1	S,G	F	F	Limited holding water, except for K-dams	E	46 ---
Birch Cr.	BLM exclosure	112.3	11.7	1.1	S,G,B	E	E	Some good holding water	E	116 (64-274)
Birch Cr.	Wagoners Ranch	293.7	9.9	0.8	S,G	E	E	Excellent habitat w/ large woody debris creating holding areas	F	760 (485-1,368)
Birch Cr.	Upper section, main channel	202.0	7.4		S,G	F	F	Pools and riffles; some overhanging cover	F	714 (542-984)
Birch Cr.	Upper--east channel	68.2	3.9		S,G	F	F	Very shallow; little holding cover	P	9 ---
Birch Cr.	Upper--spring channel	42.0	1.4		S	E	G	Slow, with small pools	P	23 (22-24)
Birch Cr.	Below confluence of Mud and Willow creeks	190.0	11.5		G	G	G	Broad, shallow; mostly riffles	G	972 (602-1,844)

Appendix D. Stream characteristics and population estimates at sampled areas in the Medicine Lodge drainage.

Stream	Section	Length	Mean width	Gradient	Sub-strate	Bank cond.	Rip. Veg.	Stream characteristics	Access	Population estimate (95% C.I.)
Medicine Lodge	BLM Campground	224.0	6.2	0.8	S,G,R,B	G	E	Riffle-pool; riprap at road	E	164 (96-348)
Medicine Lodge	Greiting Ranch	279.0	8.4	1.0	S,G,R	G	G	Riffle-pool	F	198 (121-410)
Medicine Lodge	BLM above Gneitings	153.0	5.8	1.0	S,G,R,B	G	E	Riffle-pool; some pocket water	E	186 (90-604)
Warm Creek	Below TNF	65.0	2.4	1.9	S,G	P	P	Spring fed w/ dense rooted aquatics for good habitat	G	124 (119-129)
Warm Creek	On TNF	48.0	2.9	1.9	S,G	F	F	Spring fed w/ dense rooted aquatics for good habitat	G	121 (109-133)
Fritz Creek	On TNF near upper road	48.0	7.1	3.1	S,G,R	F	F	Beaver ponds, small ponds; riffles	F	84 (59-109)
Webber Creek	@ USFS Road 192	68.0	4.6	2.6	G,R	G	E	Mostly riffles w/ pools and aquatic vegetation	E	47 (35-59)
Irving Creek	Main fork near hunting camp	82.0	2.1	3.1	S,G	F	G	Overhangs; runs, good riffle-pool structure	G	20 (18-22)
Irving Creek	E. Fk. near TNF Boundary	76.5	1.5	5.1	G	G	G	Mostly riffles, limited holding water	G	13 (13-13)
Middle Creek	Near mouth	28.0	2.7	1.9	G	G	E	Dense overhangs, riffle-pool	G	15 (14-16)
Indian Creek	In canyon	27.5	4.5	1.7	G,R,B	E	E	Deep pools, riffles; overhangs	P	35 (34-36)
Indian Creek	In canyon	37.0	5.6	1.7	G,R,B	E	E	Deep pools, riffles; overhangs	P	40 (38-42)
Indian Creek	W. Fk. @ ford	80.0	2.6	2.2	G	F	P	Mostly riffle, some small pools	E	6 (5-7)

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