Volume 068
Article 10

IDAHO
DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

FEDERAL AID IN FISH RESTORATION

Job Performance Report

Project F-71-R-11

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS

Job No. 1-a. Region 1 Mountain Lakes
Job No. 1-b. Region 1 Lowland Lakes Investigations
Job No. 1-c. Region 1 Rivers and Streams Investigations
Job No. 1-d. Region 1 Technical Guidance

by

Ned J. Horner, Regional Fishery Manager
Larry D. LaBolle, Regional Fishery Biologist
Cynthia A. Robertson, Regional Fishery Biologist

August 1987

TABLE OF CONTENTS

LIST OF TABLES

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

Page

LIST OF FIGURES (Continued)

Page

TABLE TO CONTENTS

LIST OF TABLES

R9FS233AH

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

Page

LIST OF FIGURES (Continued)

LIST OF TABLES

JOB PERFORMANCE REPORT

State of: Idaho

Project No.: F-71-R-11

Job No.: 1-a

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Title: Region 1 Mountain Lakes Investigations

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

During 1986, management personnel coordinated with the Forest Service, conservation officers, hatchery personnel and sportsmen to manage mountain lakes in Region 1. Westslope cutthroat fry were stocked in 27 lakes. Domestic Kamloops and rainbow fry were not available. Limited numbers of grayling and golden trout were available and two lakes were stocked. Mountain lake releases in the region are summarized for the last 10 years.

Author:

Ned J. Horner
Regional Fishery Manager

R9FS228BM

OBJECTIVES

1. To develop improved management plans for fish populations of mountain lakes in Region 1.

2. To evaluate selected mountain lakes, their fish populations, angler satisfaction and preferences. To use new and existing information on angler use, water quality, species history, spawning potential, stocking success and lake morphology to develop the potential of these waters for providing diverse angling experiences.

RECOMMENDATIONS

1. Follow recommendations in Table 2 regarding even or odd-year stocking. Stock lakes that have been missed for several years and temporarily discontinue stocking lakes where stunted fish populations are known to exist.

2. Obtain late egg takes (spring spawning) from domestic Kamloops rainbow trout so that fry of the proper size are available for mountain lake stocking. If this is not possible, switch rainbow stocking to a different stock of fish.

3. Continue species diversity program by utilizing westslope cutthroat and Kamloops rainbow. Obtain grayling and golden trout so unique mountain lake fisheries can become a reality.

4. Use brown trout to control stunted brook trout populations.

TECHNIQUES USED

Information on mountain lakes in Region 1 was reviewed with hatchery personnel and individuals from other agencies and groups to coordinate releases of fish in 1986. The stocking program was based on previous history, reports of fishing quality and availability of fish for release in 1986.

FINDINGS

In 1986, 27 lakes were stocked with westslope cutthroat, four with catchable rainbow, one with brook trout, one with golden trout and one with grayling (Table 1). Two lakes scheduled for westslope cutthroat in 1986 were missed (Callahan and Little Harrison) and Perkins Lake was stocked in place of Little Harrison. Domestic Kamloops rainbow trout were scheduled for three lakes during 1986, but fry of the proper size were not available. Westslope cutthroat were substituted in Hidden and Heart lakes and Tin Lake was missed. Requests for brown trout in Estelle and Beaver lakes were also missed because fry are too big by midsummer stocking time. Limited numbers of golden trout and grayling were available in 1986 and Parker Lake received golden trout while Steamboat Lake received grayling. Speciality stocks continue to be in short supply statewide. Stocking histories for all mountain lakes in Region 1 are summarized in Table 1 for the period of 1977 to 1986.

Limited creel census information from voluntary angler checks and hatchery personnel indicated catch rates varied from 0 to 5 fish/hour (Table 2). Length data was not sufficient to evaluate growth rates at the new 250 fry/acre stocking rate. An evaluation of the new stocking rate will probably not be valid until 1988 based on presumed age of larger fish in the catch.

The stocking schedule for Region 1 mountain lakes attempts to balance the number of each species of fish and the number of lakes to be stocked each year (Tables 3 and 4). Deviations from the schedule have most often been caused by lack of fish, lack of fish of proper size (too large at stocking time), or conflicts with other hatchery programs. Lakes in the Little North Fork Clearwater drainage will be stocked by plane from the McCall Hatchery in the future.

Species diversity will be maintained by utilizing westslope cutthroat and domestic Kamloops rainbow for most lakes, golden and grayling (when available) for specialty lakes and brown trout for attempted control of stunted brook trout. We are no longer stocking any rainbow in mountain lakes in the Pend Oreille drainage to avoid diluting the wild Gerrard rainbow gene pool and we will only stock westslope cutthroat in lakes specified for cutthroat.

Table 1. Number and species of fish [fry except where noted) stocked into mountain Lakes in Region 1 from 1977 to 1986.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Kootenai	Hidden (1-103)	50	1977	5,800	232	Henrys Lake cutthroat	
			1979	5,486	109	Henrys Lake cutthroat	
			1979	5,300	106	Kamloops rainbow	
			1981	15,922	318	Westslope cutthroat	
			1982	15,656	313	Kamloops rainbow	
			1983	12,107	242	Henrys Lake cutthroat	
			1984	12,768	255	Kamloops rainbow	
			1985	12,512	250	Westslope cutthroat	
			1986	6,000	120	Westslope cutthroat	
	Lake Mountain (cutoff) (1-104)	7	1977	2,910	416	Henrys Lake cutthroat	
			1979	3,424	346	Henrys Lake cutthroat	
			1983	1,723	246	Henrys Lake cutthroat	
			1985	1,748	250	Westslope cutthroat	
	West Fork (1-109)	12	1978	7,704	642	Henrys Lake cutthroat	
			1979	3,184	265	Kamloops rainbow	
			1981	6,704	559	Westslope cutthroat	
			1982	3,648	304	Kamloops rainbow	
			1983	3,016	251	Henrys Lake cutthroat	
			1984	3,010	251	Kamloops rainbow	
			1985	2,990	250	Westslope cutthroat	
			1986	4,495	375	Westslope cutthroat	
	Long Mountain (1-112)	3	--	--	--	Grayling	
	Parker	3	1979	2,220	740	Golden trout	
			1986	1,225	408	Golden trout	
	Smith [Long Canyon)	6	--	--	--	Grayling	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number	Stocking rate (fisbfacre)	Stock of fish	Comments
Kootenai	Big Fisher	10	1977	6,295	630	Henrys Lake cutthroat	
	(1-117)		1979	0,030	303	Henrys Lake cutthroat	
			1981	3,352	335	Westslope cutthroat	
			1983	2,486	248	Henrys Lake cutthroat	
			1985	2,530	253	Westslope cutthroat	
	Myrtle	20	1977	6,240	312	Henrys Lake cutthroat	
	(1-122)		1979	6,060	303	Henrys Lake cutthroat	
			1983	5,189	259	Westslope cutthroat	
			1985	5,100	255	Westslope cutthroat	
	Trout	7	1977	2,562	366	Kamloops rainbow	
	(1-124)		1979	2,120	303	Kamloops rainbow	
			1981	2,514	359	Westslope cutthroat	
			1982	3,296	471	Kamloops rainbow	
			1983	1,720	247	Henrys Lake cutthroat	
			1984	1,733	248	Kamloops rainbow	
			1985	1,748	250	Westslope cutthroat	
			1986	1,721	246	Westslope cutthroat	
	Pyramid	11	1977	3,860	333	Kamloops rainbow	
	(1-125)		1977	81	7	Henrys Lake cutthroat	
			1979	3,710	337	Kamloops rainbow	
			1981	4,190	381	Westslope cutthroat	
			1982	3,296	300	Kamloops rainbow	
			1983	2,702	246	Henrys Lake cutthroat	
			1984	2,736	248	Kamloops rainbow	
			1985	2,760	251	Westslope cutthroat	
			1986	2,741	249	Westslope cutthroat	
	Ball Creek	6	1978	3,184	531	Henrys Lake cutthroat	
	(1-126)		1980	2,136	356	Westslope cutthroat	
			1983	1,513	255	Henrys Lake cutthroat	
			1984	1,000	167	Westslope cutthroat	
			1986	1,498	250	Westslope cutthroat	

R9FS231BM

Table 1. Continued.

rainage	Lake	Surfac e	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Kootenai	Little Ball Creek (1-127)	4	1980	1,424	356	Westslope cutthroat	
			1984	1,500	375	Westslope cutthroat	
			1986	956	239	Westslope cutthooat	
	Snow (1-434)	10	1878	3,184	318	Henrys Lake cutthroat	
			1979	3,030	303	Henrys Lake cutthroat	
			1982	3,008	301	Westslope cutthroat	
			1983	2,872	287	Henrys Lake cutthroat	
	Roman Nose #3 (1-137)	12	1977	2,080	168	Catchable rainbow	
			1977	3,072	256	Henrys Lake cutthroat	
			1978	3,360	280	Henrys Lake cutthroat	
			1979	5,300	442	Kamloops rainbow	
			1983	2,320	193	Domestic Kamloops (3-6 in. size)	
			1985	3,000	250	Westslope cutthroat	
			1986	3,000	250	Westslope cutthroat	
	Solomon (1-146)	9	1977	3,120	347	Henrys Lake cutthroat	
			1978	4,704	523	Henrys Lake cutthroat	
			1979	5,062	562	Kamloops rainbow	
			1982	3,040	338	Kamloops rainbow	
			1983	2,162	240	Henrys Lake cutthroat	
			1984	2,268	252	Kamloops rainbow	
			1985	2,250	250	Westslope cutthroat	
			1986	2,500	278	Westslope cutthroat	
	Spruce (1-147)	5	1977	6,292	1,258	Henrys Lake cutthroat	
			1978	5,136	1,027	Henrys Lake cutthroat	
			1980	2,509	502	Westslope cutthroat	
			1982	2,432	486	Kamloops rainbow	
			1983	1,297	258	Henrys Lake cutthroat	
			1984	2,520	504	Kamloops rainbow	
			1985	1,250	250	Westslope cutthroat	
			1986	1,250•	250	Westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Kootenai	Queen [1-148)	5	1978	3,184	637	Henrys Lake cutthroat	
			1980	1,770	354	Westslope cutthroat	
			1983	1,296	259	Henrys Lake cutthroat	
			1986	1,250	250	Westslope cutthroat	
	Debt (1-150)	5	1985	1,250	250	Westslope cutthroat	
	Copper (1-154)	5	1978	2,016	403	Henrys Lake cutthroat	
			1980	2,091	418	Westslope cutthroat	
			1983	1,297	259	Henrys Lake cutthroat	
			1984	1,390	278	Westslope cutthroat	
			1986	1,250	250	Westslope cutthroat	
	Callahan (Smith) (1-166)	10	1978	2,688	269	Henrys Lake cutthroat	
			1979	3,636	364	Henrys Lake cutthroat	
			1984	2,500	250	Westslope cutthroat	
Pend Oreille	Hunt (2-101)	12	1977	4,000	333	Golden trout	
			1979	3,180	265	Kamloops rainbow	
			1982	3,648	304	Kamloops rainbow	
			1985	3,000	250	Westslope cutthroat	
			1986	3,000	250	Westslope cutthroat	
	Standard (2-103)	16	1978	7,074	442	Henrys Lake cutthroat	
			1980	5,472	342	Westslope cutthroat	
			1983	4,021	251	Henrys Lake cutthroat	
			1985	4,000	250	Westslope cutthroat	
	Two Mouth #1 (2-106)	?	1978	2,456 '	—	Henrys Lake cutthroat	
			1981	2,258	—	Westslope cutthroat	

R9FS231BM

Table 1. Continued.

Drainage	Lake	Surface	Year stocked	Number stocked	Stocking' rate (fish/acre)	Stock of fish	Comments
Pend Oreille	Two Mouth #2 (2-107)	5	1979	2,456	491	Henrys lake cutthroat	
			1981	2,258	452	Westslope cutthroat	
			1983	2,054	411	Henrys Lake cutthroat	
			1985	1,285	253	Westslope cutthroat	
	Two Mouth #3 (2-108)	20	1977	9,444	472	Henrys Lake cutthroat	
			1979	8,140	307	Henrys Lake cutthroat	
			1981	6,774	339	Westslope cutthroat	
			1983	4,973	249	Henrys Lake cutthroat	
			1984	5,280	264	Westslope cutthroat	
			1986	5,000	250	Westslope cutthroat	
	Mollies (2-114)	2	1978	2,016	1,008	Henrys Lake cutthroat	
			1981	3,352	1,672	Westslope cutthroat	
			1983	648	324	Henrys Lake cutthroat	
			1985	506	253	Westslope cutthroat	
	Caribou (near West Fk. Mt.) (2-116)	8.8	1980	2,052	302	Westslope cutthroat	
			1984	1,752	258	Henrys Lake cutthroat	
			1986	1,750	257	Westslope cutthroat	
	Fault (Hunt Peak #1) (2-121)	6	1978	2,016	336	Henrys Lake cutthroat	
			1979	3,184	531	Kamloops rainbow	
			1981	2,258	378	Westslope cutthroat	
			1983	2,872	478	Henrys Lake cutthroat	
			1985	1,500	250	Westslope cutthroat	
	McCormick (Hunt Peak #2) (2-122)	3.1	1977	2,544	B32	Henrys Lake cutthroat	
			1979	1,592	513	Kamloops rainbow	
			1981	2,258	728	Westslope cutthroat	
			1985	780	252	Westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Pend Oreille	Little Harrison	6.5	1977	3,148	484	Henrvs Lake cutthroat	
	(2-126)		1979	2,424	373	Henrys Lake cutthroat	
			1981	2,258	347	Westslope cutthroat	
			1983	1,651	254	Henrys Lake cutthroat	
	Beehive	7	1977	3,148	450	Henrys Lake cutthroat	
	(2-128)		1979	2,424	346	Henrys Lake cutthroat	
			1981	2,258	323	Westslope cutthroat	
			1983	1,723	246	Henrys Lake cutthroat	
			1985	1,740	248	Westslope cutthroat	
			1986	1,803	258	Westslope cutthroat	
	Harrison	29	1978	10,272	354	Henrys Lake cutthroat	
	(2-129)		1979	3,184	110	Kamloops rainbow	
			1881	9,218	318	Westslope cutthroat	
			1982	6,972	240	Kamloops rainbow	
			1983	7,243	250	Henrys Lake cutthroat	
			1984	7,296	250	Kamloops rainbow	
			1985	7,200	248	Westslope cutthroat	
			1986	6,870	237	Westslope cutthroat	
	Beaver	5	1977	3,840	770	Brook trout	Natural reproduction
	(2130)		1980	1,936	387	Brook trout	
	Dennick	8	1977	3,144	393	Henrys Lake cutthroat	
	(2-171)		1978	2,568	321	Henrys Lake cutthroat	
			1980	2,509	314	Westslope cutthroat	
			1881	5,800	725	Westslope cutthroat	
			1983	1,939	242	Henrys Lake cutthroat	
			1984	2,060	258	Westslope cutthroat	
			1985	2,010	251	Westslope cutthroat	
			1986	2,500	312	Westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Pend Oreille	Send (2-172)	5	1977	2,096	419	Henrys Lake cutthroat	
			1978	3,184	637	Henrys Lake cutthroat	
			1980	2,509	502	Westslope cutthroat	
			1981	3,480	696	Westslope cutthroat	
			1982	8,360	1,672	Kokanee	
			1983	1,221	244	Henrys Lake cutthroat	
			1984	1,254	251	Westslope cutthroat	
			1985	1,260	252	Westslope cutthroat	
			1986	1,250	250	Westslope cutthroat	
	Bloom (2-173)	20	1977	7,852	392	Brook trout	
			1978	10,304	515	Brook trout	
			1979	13,880	684	Westslope cutthroat	
			1981	24,402.	1,220	Brook trout	
			1982	10,620	531	Brook trout	
			1984	5,041	252	Brook trout	
			1985	4,599	230	Brook trout	
			1986	5,360	268	Brook trout	
	Porcupine (2-182)	13	1977	1,040	80	Catchable rainbow	
			1978	2,000	154	Catchable rainbow	
			1979	4,200	223	Catchable rainbow	
			1979	4,560	351	Kamloops rainbow	
			1980	4,440	342	Catchable rainbow	
			1982	1,296	100	Kamloops rainbow	
			1983	2,872	220	Domestic Kamloops (3-6 in. size]	
			1984	1,016	78	Catchable rainbow	
			1985	1,000	77	Catchable rainbow	
			1986	1,075	83	Mt. Lessen rainbow (>6 in.]	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Pend Oreille	Antelope	18	1977	4,000	250	Catchable rainbow	Access problems,
	(2-190)		1977	5,924	370	Henrys Lake cutthroat	stocking discont.
			1978	2,890	181	Catchable rainbow	
			1979	8,459	404	Catchable rainbow	
			1979	4,484	280	Kamloops rainbow	
			1980	4,970	311	Catchable rainbow	
			1981	5,000	312	Westslope cutthroat	
			1982	5,032	314	Westslope cutthroat	
	Caribou	8.8	1977	3,148	463	Henrys Lake cutthroat	
	(near Keokee Mt.)		1978	2,568	378	Henrys Lake cutthroat	
	(2-196)		1883	2,872	422	Henrys Lake cutthroat	
			1984	1,750	257	Westslope cutthroat	
			1885	1,700	250	Westslope cutthroat	
			1986	1,500		Westslope cutthroat	
Spokane	Mirror	5	1979	5,195	1,039	Henrys Lake cutthroat	Winter kill Lake,
	(3-117)		1981	5,000	1,000	Westslope cutthroat	evaluate before
							further stocking.
	Elsie	10	1977	1,505	151	Catchable rainbow	Stock catchable
	[3-119)		1978	2,020	202	Catchable rainbow	rainbow annually,
			1979	1,665	166	Catchable rainbow	other fish were
			1979	21	-–	Dolly Varden (SP)	show pond [SP)
			1980	3,190	319	Catchable rainbow	fish from Mullen
			1981	3,875	388	Catchable rainbow	Hatchery.
			1981	49	-–	Rainbow (SP)	
			1981	48	-–	Cutthroat [SP)	
		10	1981	53	-–	Brook trout [SP)	
			1981	14	-–	Kokanee (SP)	
			1981	1	-–	Dolly Varden (SP)	
			1982	1,440	144	Catchable rainbow	
			1983	1,500	150	Catchable rainbow	
			1984	2,865	286	Catchable rainbow	
			1985	3,005	300	Catchable rainbow	
			1986	3,024	302	Catchable rainbow	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocke	Stocking rate [fish/acre)	Stock of fish	Comments
Spokane	Lower Glidden (3-123)	12	1977	1,680	' 140	Catchable rainbow	
			1878	2,486	207	Catchable rainbow	
			1979	4,240	353	Catchable rainbow	
			1980	2,030	169	Catchable rainbow	
			1981	1,950	162	Catchable rainbow	
			1982	1,880	157	Catchable rainbow	
			1983	1,000	83	Catchable rainbow	
			1984	4,945	412	Catchable rainbow	
			1985	3,018	251	Catchable rainbow	
			1986	3,011	251	Catchable rainbow	
	Upper Glidden (3-124)	10	1978	2,000	200	Kamloops rainbow	Evaluate Kamloops control of stunted brook trout.
			1980	992	99	Kamloops rainbow	
	Gold (3-125)	3	1978	500	167	Kamloops rainbow	
			1979	384	128	Brook trout	
			1981	1,000	333	Westslope cutthroat	
			1983	1,005	335	Henrys Lake cutthroat	
	Revett	12	1980	992	83	Kamloops rainbow	Evaluate Kamloops control of stunted brook trout.
	Crater [3-133)	5	1979	5,000	1,000	Grayling	Reserve for grayling.
			1983	5,000	1,000	Grayling	
	Dismal (3138)	?	1979	2,670	-—	Catchable rainbow	Reduce stocking to 250 fish and evaluate.
			1980	870	-—	Catchable rainbow	
			1983	1,500	-—	Catchable rainbow	
			1984	537	-—	Catchable rainbow	
			1985	490	--	Catchable rainbow	
			1986	253	-—	Catchable rainbow	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Spokane	Bacon	9	1978	4,156	462	Henrys Lake cutthroat	
	(3-144)		1981	4,000	444	Westslope cutthroat	
			1985	2,255	250	Westslope cutthroat	
	Forage	13	1977	4,000	308	Golden trout	Reserve for goldens
	(3-146)		1879	3,330	256	Golden trout	or grayling.
	Halo	12	1979	5,195	433	Henrys Lake cutthroat	
	(3-'147)		1981	5,000	417	Westatope cutthroat	
			1985	3,010	251	Westslope cutthroat	
	Crystal	10	1978	4,830	483	Henrys Lake cutthroat	
	(3-160)		1979	4,848	485	Henrys Lake cutthroat	
			1981	9,988	999	Westslope cutthroat	
			1983	4,380	438	Henrys Lake cutthroat	
			1985	2,510	251	Westslope cutthroat	
Little North	Devils Club	4	1981	3,014	753	Westslope cutthroat	
Fork Clearwater		(6-113)		1986	1,000	250	Westslope cutthroat
	Big Talk	?	1986	1,500		Westslope cutthroat	
	[6-114)						
	Larkins	12	1979	3,117	280	Henrys Lake cutthroat	
	[6-117)		1981	3,014	251	Westslope cutthroat	
			1986	3,000	250	Westslope cutthroat	
	Mud	6	1979	3,117	520	Henrys Lake cutthroat	
	[6-118)		1981	3,014	502	Westslope cutthroat	
	Hero	4	1979	3,117	779	Henrys Lake cutthroat	
	[6-119)		1981	3,014	753	Westslope cutthroat	
			1986	1,000	250	Westslope cutthroat	

R9FS231BM

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stacking rate [fish/acre)	Stock of fish	Comments
Little North Fork Clearwater	Heart [5-1221	40	1979	3,117	'78	Henrys Lake cutthroat	
			1981	3,014	75	Westslope cutthroat	
			1986	10,000	250	Westslope cutthroat	
	Northbound [6-123)	12	1979	3,117	260	Henrys Lake cutthroat	
			1981	3,014	251	Westslope cutthroat	
			1986	3,000	250	Westslope cutthorat	
	Sky Land (6125)	13	1979	3,117	240	Henrys Lake cutthroat	
			1981	3,014	232	Westslope cutthroat	
	Fawn (6-126)	13	1979	3,117	240	Henrys Lake cutthroat	
			1981	3,014	232	Westslope cutthroat	
			1986	3,250	250	Westslope cutthroat	
	Noseeum (6-130)	4	1977	1,500	375	Henrys Lake cutthroat	
			1978	1,900	475	Henrys Lake cutthroat	
			1981	1,174	294	Rainbow/cutthroat hyb.	
			1985	1,008	251	Westslope cutthroat	
	Steamboat (6-131)	9	1979	4,000	444	Grayling	Reserve for grayling.
			1981	1,174	130	Rainbow/cutthroat hyb.	
			1986	2,000	222	Grayling	
	Copper (6-201)	3	1978	1,000	333	Henrys Lake cutthroat	
			1981	1,000	333	Westslope cutthroat	
			1981	1,000	333	Rainbow/cutthroat hyb.	
			1985	765	255	Westslope cutthroat	
	Gold (6-202)		1986	2,000	667	Westslope cutthroat	

Table 1. Continued.

Drainage	Lake	Surface acres	Year stocked	Number stocked	Stocking rate (fish/acre)	Stock of fish	Comments
Little North Fork Clearwater	Silver (6-205j	10	1978	2,000	200	Rainbow	
			1981	2,00	200	Westslope cutthroat	
			1981	888	89	Rainbow	
			1985	999	100	Mt. Lassen rainbow	

R9FS231BM

Table 2. Region 1 mountain lake creel census data from voluntary angler reports and hatchery personnel, 1986.

Lake	Number anglers	Hours fished	Species	Number caught	Fish/ hour	Comments
Kootenai drainage						
Solomon	3	3	Ct	0	--	--
Copper	1	1	Ct	5	5.0	5-8"
Pend Oreille drainage						
Hunt	1	1	?	3	3.0	fry
Fault	1	1	--		--	
McCormick	1	1	Rb	1	1.0	6"
Dennick	3	3	Ct	2	.67	6-7"
Sand	3	3	Ct	2	.67	8, 16"
Spokane drainage						
Bacon	3	12	--	--	--	--
Forage	3	18	Ct	3	.17	12-14"
Halo	3	22	Ct	46	2.1	9-17 1/2"
Little North Fork Clearwater drainage						
Larkins	2	6	Ct	3	.50	10-13"
Copper	2	2	Ct	1	.50	8"
Gold	3	6	Rb/Ct	5	.83	8-10"
Silver	3	6	Rb	7	1.17	8-11"

Table 3. Odd-year stocking schedule for Region 1 mountain lakes.

Lake	Code No.	Surface acres	No. stocked	Species	Substitute species
Kootenai					
Hidden	01-103	50	12,500	C2	K1
Lake Mtn.	01-104	7	1,750	C2	None
West Fork	01-109	12	3,000	K1	C2
Long Mtn.	01-112	3	1,500	GR	None
Parker	01-113	3	1,000	GN	GR
Smith	01-115	6	3,000	GR	None
Big Fisher	01-117	10	2,500	C2	None
Myrtle	01-122	20	5,000	C2	None
Trout	01-124	7	1,750	K1	C2
Pyramid	01-125	11	2,750	K1	C2
Snow	01-134	10	2,500	C2	None
Roman Nose #3	01-137	12	3,000	K1	C2
Solomon	01-146	9	2,250	C2	K1
Spruce	01-147	5	1,250	K1	C2
Debt	01-150	5	1,250	C2	None
Pend Oreille					
Hunt	02-101	12	3,000	C2	None
Standard	02-103	16	4,000	C2	None
Two Mouth #2	02-107	5	1,250	C2	None
Mollies	02-114	2	500	C2	None
Fault	02-121	6	1,500	C2	None
McCormick	02-122	3.1	775	C2	None
Beehive	02-128	7	1,750	C2	None
Harrison	02-129	29	7,250	C2	None
Dennick	02-171	8	2,000	C2	None
Sand	02-172	5	1,250	C2	None
Bloom	02-173	20	5,000*	BK*Size 2	None
Caribou (near Keokee Mtn.)	02-196	6.8	1,700	C2	None
Spokane					
Gold	03-125	3	750	K1	None
Crater	03-133	5	2,500	GR	None
Bacon	03-144	9	2,250	C2	GR
Forage	03-146	13	3,250	GN	None
Halo	03-147	12	3,000	C2	None
Crystal	03-160	10	2,500	C2	None

Table 3. Continued.

Lake	Code No.	Surface acres	No. stocked	Species	Substitute species
Little North Fork Clearwater					
Mud	06-118	6	1,500	K1	None
Skyland	06-125	13	3,250	K1	None
No Seeum	06-130	4	1,000	C2	None
Steamboat	06-131	9	4,500	GR	None
Copper	06-201	3	750	C2	None
Silver	06-205	10	2,500	K1	None

Total number of fish to be stocked:
C2 - 62,225
K1 - 19,750
GR - 11,500
GN - 4,250 (Grayling can be substituted for goldens)
BK - 5,000 Size 2

Table 4. Even-year stocking schedule for Region 1 mountain lakes.

Lake	Code No.	Surface acres	No. stocked	Species	Substitute species
Kootenai					
Hidden	01-103	50	12,500	K1	C2
West Fork	01-109	12	3,000	C2	K1
Long Mtn.	01-112	3	1,500	GR	None
Parker	01-113	3	1,000	GN	GR
Smith	01-115	6	3,000	GR	None
Trout	01-124	7	1,750	C2	K1
Pyramid	01-125	11	2,750	C2	K1
Ball Creek	01-126	6	1,500	C2	None
Little Ball Cr.	01-127	4	1,000	C2	None
Roman Nose #3	01-137	12	3,000	C2	K1
Solomon	01-146	9	2,250	C2	K1
Spruce	01-147	5	1,250	C2	K1
Queen	01-148	5	1,250	C2	None
Copper	01-154	5	1,250	C2	None
Callahan	01-166	10	2,500	C2	None
Estelle	01-167	5	1,250	BN	None
Pend Oreille					
Hunt	02-101	12	3,000	C2	None
Two Mouth #3	02-108	20	5,000	C2	None
Caribou .(near West Fk. Mtn.)	02-116	6.8	1,750	C2	None
Little Harrison	02-126	6.5	1,625	C2	None
Harrison	02-129	29	7,250	C2	None
Beaver	02-130	5	1,250	BN	None
Dennick	02-171	8	2,000	-C2	None
Sand	02-172	5	1,250	C2	None
Bloom	02-173	20	5,000*	BK *Size 2	None
Moose	02-185	16.5	4,200	BN	None
Caribou (near Keokee Mtn.)	02-196	6.8	1,700	C2	None
Spokane					
Crater	03-133	5	2,500	GR	None
Forage	03-146	13	3,250	GN	GR

R9FS228BM

Table 4. Continued.

Lake	Code No.	Surface acres	No. stocked	Species	Substitute species
<u>Little North Fork Clearwater</u>					
Devils Club	06-113	4	1,000	C2	None
Big Talk	06-114	?	2,500	C2	None
Larkins	06-117	12	3,000	c2	None
Hero	06-119	4	1,000	C2	None
Heart	06-122	40	10,000	K1	None
Northbound	06-123	12	3,000	C2	None
Fawn	06-126	13	3,250	C2	None
Steamboat	06-131	9	4,500	GR	None
Gold	06-202	8	2,000	C2	None
Tin	06-204	3	750	K1	None

Total number of fish to be stocked:
C2 - 60,825
K1 -23,250
GR -11,500
GN - 4,250 (Grayling can be substituted for goldens)
BK - 5,000 Size 2
BN - 6,700

JOB PERFORMANCE REPORT

State of: Idaho

Project No.: F-71-R-11

Job No.: 1-b

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Title: Region 1 Lowland Lakes Investigations

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

Research on Priest Lake continued to focus on population dynamics of westslope cutthroat trout and lake trout and on evaluation of enhancement strategies. Graduate research by the University of Idaho evaluated the success of large releases of cutthroat fry in tributary streams and potential for increased cutthroat production through removal of brook trout. Estimated kokanee abundance in 1986 was 85,000 fish--ages-0+ and 1+. High predation is still limiting enhancement. Catch rates for lake trout continue to be high and modeling data should be used to characterize their population dynamics under different effort regimes.

Cooperative research on Gerrard rainbow in Lake Pend Oreille was continued in 1986 in an attempt to characterize rearing densities of young rainbow, describe habitat quality and quantity and estimate potential production. These data will be used in evaluating current seeding rates and the potential impacts of tributary angling.

Nine mature Gerrard rainbow were captured in Spring Creek in 1986, including one adipose-clipped male. Greater returns of ad-clipped fish should materialize in 1988 to 1989 from releases in 1983 or 1984. Abundance of kokanee in Pend Oreille declined slightly to 4.27 million, reaching the lowest mark since trawling was initiated in 1977. Over 3.4 million fry were released in the Clark Fork River, but small fish and inadequate flushing flows from Cabinet Gorge Dam resulted in the poorest return rates estimated from release to fall sampling. The kokanee egg take at Granite Creek totaled 7.3 million, far below the goal of 20 to 30 million annually. A detailed evaluation of the kokanee population and the influence of Cabinet Gorge Hatchery was initiated in 1985 through BPA funding. That research will continue through 1989. Redd counts for bull trout were about half that observed in preceding years. It is unknown whether reduced escapement from low flows or inexperienced observers accounted for this reduction.

Angling effort and harvest was again evaluated on the north end of Lake Coeur d'Alene. Anglers fished an estimated 172,000 hours to catch 164,000 kokanee and 76 chinook. Interest in the chinook fishery declined sharply in 1986.

Nearly 30,000 chinook post-smolts were released in Wolf Lodge Bay in 1986. Mean size was 114 mm, the second smallest of all release groups to date. Results of chinook-kokanee feeding experiments demonstrated that chinook smaller than 105 mm may not eat kokanee upon release. Average size of chinook at release should be at least 140 mm to eliminate the stocking of small (<105 mm) chinook. Estimated kokanee abundance in Lake Coeur d'Alene was 7.31 million, down from 1985. Mean length of kokanee spawners was similar to that in 1985, but average length of the sport catch increased 28 mm.

Kokanee abundance in Spirit Lake was estimated at 467,000 fish, down slightly from that in 1985. Survival of fry to fall trawling was estimated at 0.07%, far below the five-year mean of 0.32%. Recruitment in 1986 was bolstered by a release of 50,000 hatchery-reared fry.

The officer creel census was continued in 1986 to provide information on effort and harvest throughout the region. Evaluation of the catchable rainbow trout program was continued in conjunction with the census. Stocking rates recommended in 1986 for lakes of Region 1 provided catch and return rates generally consistent with goals of the management plan.

Gerrard rainbow were again stocked in Hayden Lake in 1986. Smallmouth bass appear to be doing well in the lake and their abundance and growth rates will be quantified in 1987.

Physical characteristics of Anderson, Blue and Thompson lakes were surveyed in 1986. The fishery portion of the lowland lakes survey schedule will be conducted on those lakes in 1987. Surveys of fish populations were conducted in Sinclair, Jewell, Bonner, Solomon and Dawson lakes. The physical portion of the survey program will be conducted on these lakes in 1987 to 1988.

Channel catfish were collected in Cocolalla Lake where they appear to be doing well. Growth has been well above the average for channel cats in western waters and the lake appears to be well suited to the species.

Performance of largemouth bass in Kelso Lake was evaluated in 1986. Growth rates for largemouth were similar to those for other lowland lakes in the region and the current 12-inch minimum size limit should provide fishing consistent with goals of the management plan.

Authors:

Larry D. LaBolle
Regional Fishery Biologist

Ned J. Horner
Regional Fishery Manager

OBJECTIVES

1. To obtain biological and limnological data on selected lowland lakes in Region 1 to provide baseline information for species and stock modeling and management programs.
2. To assess performance and contribution of existing trout stocks.
3. To evaluate success of kokanee rehabilitation projects on Region 1 lakes and evaluate introductions of new species.
4. To describe patterns of angling effort and success in evaluating management programs.

RECOMMENDATIONS

1. Continue opening day creel census information gathering for effort, catch and catch rates on Hauser, Jewell, Kelso, Mirror, Spirit and Lower Twin lakes to provide trend information to evaluate the objectives of the fishery management plan.
2. Maintain stocking rates of 300 and 50 catchable rainbow/hectare for lakes <50 hectares and >50 hectares in surface area, respectively.
3. Conduct officer creel census in 1987 on Pend Oreille, Kelso and Hayden lakes. Return to creel data are needed on Day and Day. Rock ponds and on Elsie Lake.
4. Collect length frequency data on tournament-caught bass to provide trend information on specific populations.
5. Work with bass clubs to minimize the negative impacts of tournament activity on certain bass populations.
6. Evaluate release of kokanee (10 to 15/hectare) in Brush, Cocolalla, Fernan, Hauser, Jewel, Kelso, Mirror and Smith lakes to determine if they provide anglers with catches of relatively large fish. Larger releases of kokanee (350/hectare) in Lower Twin Lake should be made to continue the popular fishery that has developed there.
7. Release kokanee fry in Granite Creek of Lake Pend Oreille at or above 3 million annually to ensure adequate egg supplies in the future.
8. Hatchery-reared Gerrard rainbow stocked in Spring Creek should be fin-clipped and limited to 20,000 fish or less to further evaluate returns.
9. Collect information on Juvenile rainbow abundance and habitat quality-quantity on Lightning and Grouse creeks to estimate potential smolt production to Lake Pend Oreille. The significance of angling in the tributaries can then be evaluated with respect to limiting the lake fishery.

10. Release of 35,000 fall chinook salmon in Lake Coeur d'Alene by early July at a mean size exceeding 140 mm. Determine potential wild smolt production from Wolf Lodge Creek and for spawning adults in the Coeur d'Alene and St. Joe rivers.

11. Limit the spawning run of fall chinook in Wolf Lodge Creek to the lower portion (at or below Wolf Lodge campground) by a block weir to prevent competition of juvenile chinook with young cutthroat. All future chinook releases should be ad-clipped to determine the contribution of wild fish to the population.

12. Evaluate survival, growth rates, food habits and spawning success of smalimouth bass released in Hayden Lake.

TECHNIQUES AND FINDINGS

Priest Lake

Cutthroat

Research was continued on cutthroat trout in 1986 to further characterize their population dynamics and evaluate the contribution of hatchery fish (Mauser et al., in preparation). Total mortality in 1986 was not significantly different from previous years and still appears to be excessively high (60 to 70%). Return of mature cutthroat to Tango Creek was small in 1985 and no fish returned in 1986. Fishing mortality and exploitation are low, with only about 100 legal-sized fish harvested in 1986. Even while accounting for illegal harvest of cutthroat on the lake, predation by lake trout still appears to be the dominant factor limiting cutthroat stocks.

Purse seine gear was built in 1986 for use on Priest and other large lakes in the region. Population size of cutthroat was estimated near 3,000 fish, showing a slow but continuing decline in their total abundance. Larger cutthroat (>300 mm) also declined in abundance to about 1,100 fish.

Genetic integrity of westslope cutthroat from Upper Priest Lake, and from Clark Fork Hatchery and Fish Lake broodstocks, was characterized by electrophoresis in 1986. No introgression was evident in samples from Upper Priest, but purity of brood fish at Clark Fork and Fish Lake was 99.3% and 98%, respectively. Rainbow characteristics were visible in cutthroat from Fish Lake, however, indicating that introgression may actually approach 30 to 40% throughout the population (Robb Leary, University of Montana, Department of Zoology, personal communication). Restoring the genetic integrity of our cutthroat trout broodstock will require infusion from wild (pure) fish over several generations.

Evaluation of large releases of cutthroat fry and the effect of brook trout removal were evaluated in tributaries to Priest Lake by University of Idaho research in 1986. Removal of brook trout increased rearing densities of cutthroat fry, but it was unclear whether stocking cutthroat trout in waters with existing brook trout populations will be effective. Feasibility and effectiveness of both approaches will be more fully evaluated in 1987 to 1988.

Kokanee

Estimated kokanee abundance declined in 1986 to 85,000 fish. The population was composed of 62,000 and 23,000 age-0+ and 1+ fish, respectively (Fig. 1). The kokanee population continues to be very depressed, with 73% of the population comprised of hatchery fry released in 1986. Predation by lake trout is still limiting kokanee enhancement in Priest Lake. The greater force of mortality is on age-1 kokanee and older and current stocking levels (1 million in 1986) of up to 3 million fry/year are inadequate to restore the kokanee troll fishery. It may be several years before enough kokanee can be released (5 million/year) to evaluate the potential of building and maintaining a viable fishery.

Lake Trout

Tagging of lake trout in Priest Lake was undertaken in 1986 to collect current data for population modeling. Status of the population under current regulations (two fish/day over 16") will be evaluated and the effectiveness of fishing will be investigated as a tool for reducing lake trout abundance and predation pressure on cutthroat and kokanee.

The lake trout fishery on Priest continued to be excellent, but conditions are likely to change if kokanee stocking is curtailed. Lake trout readily use kokanee when available and their average weight in the catch is strongly linked to kokanee availability as forage. Reducing kokanee stocking levels will result in smaller lake trout in the catch and increase the time it takes them to recruit to the fishery (slower growth). Modeling data should provide reasonable scenarios of lake trout performance under different kokanee stocking regimes.

Bull Trout

The fishery for bull trout in Priest Lake remained closed in 1986 as spawning escapement continued to be very low. The population in Upper Priest Lake continues to support a good fishery (nonconsumptive) and adequate escapement. Current research on bull trout in tributaries to Lake Pend Oreille may help isolate factors constraining the Priest Lake population.

Figure 1. Abundance of kokanee salmon estimated by trawling in Priest Lake, Idaho, 1978 to 1986.

Lake Pend Oreille

Gerrard Rainbow

Graduate research on tributaries to Lake Pend Oreille focused on documenting rainbow fry emergence and movement, and on initial description of stream habitat and fish abundance. Estimating potential outmigration of Juveniles for important spawning and rearing streams will be emphasized in 1987. Abundance of Juvenile outmigrants was not adequately determined in 1985 to 1986 research. Without this estimate, it is not possible to assess the harvest impact of juveniles in the tributaries on the population and lake fishery.

Nine mature Gerrard rainbow were trapped in Spring Creek in 1986. Return of marked hatchery-reared fingerlings continues to be very low. Four females and five males returned and one male was adipose fin-clipped, coming from marked releases in either 1983 or 1984. Higher returns of marked rainbow should be expected in 1987 to 1989 and release of marked fish should be continued to provide long-term evaluation of hatchery contribution.

Harvest of large rainbow (>9 kg) in the lake fishery increased substantially in the fall of 1986. Whether more fish were available, or fishing with new types of gear (side boards and trolling flies) increased catch rates, is unknown.

Long-term trend data indicate that fewer large fish are caught' now relative to past years and that the trophy potential of this fishery is not being realized. Incidental harvest of juvenile rainbow by kokanee anglers accounts for 30 to 40% of the total rainbow take annually and total annual mortality exceeds 60%. Over 70% of all rainbow harvested are under 17 inches and 80% are age-4 or less, in a population with average age at maturity of five years. These statistics indicate the need to change management direction to better realize the potential of these fish in providing trophy angling. Potential regulations for Gerrard rainbow will be modeled in 1987 and combined with public input on management goals to form a new management plan.

Kokanee

Abundance of kokanee in Lake Pend Oreille declined slightly in 1986 to 4.27 million, reaching the lowest abundance since trawling was initiated in 1976 (Fig. 2). Abundance of age-0+ and $^{1+}$ fish was 1.66 and 1.15 million, respectively, both lower than those age classes in 1985 (Bowles 1986).

A total of 5.01 million kokanee fry were released into Lake Pend Oreille in 1987. Survival of 3.4 million fry released into the Clark Fork River was the poorest measured from release to fall sampling.

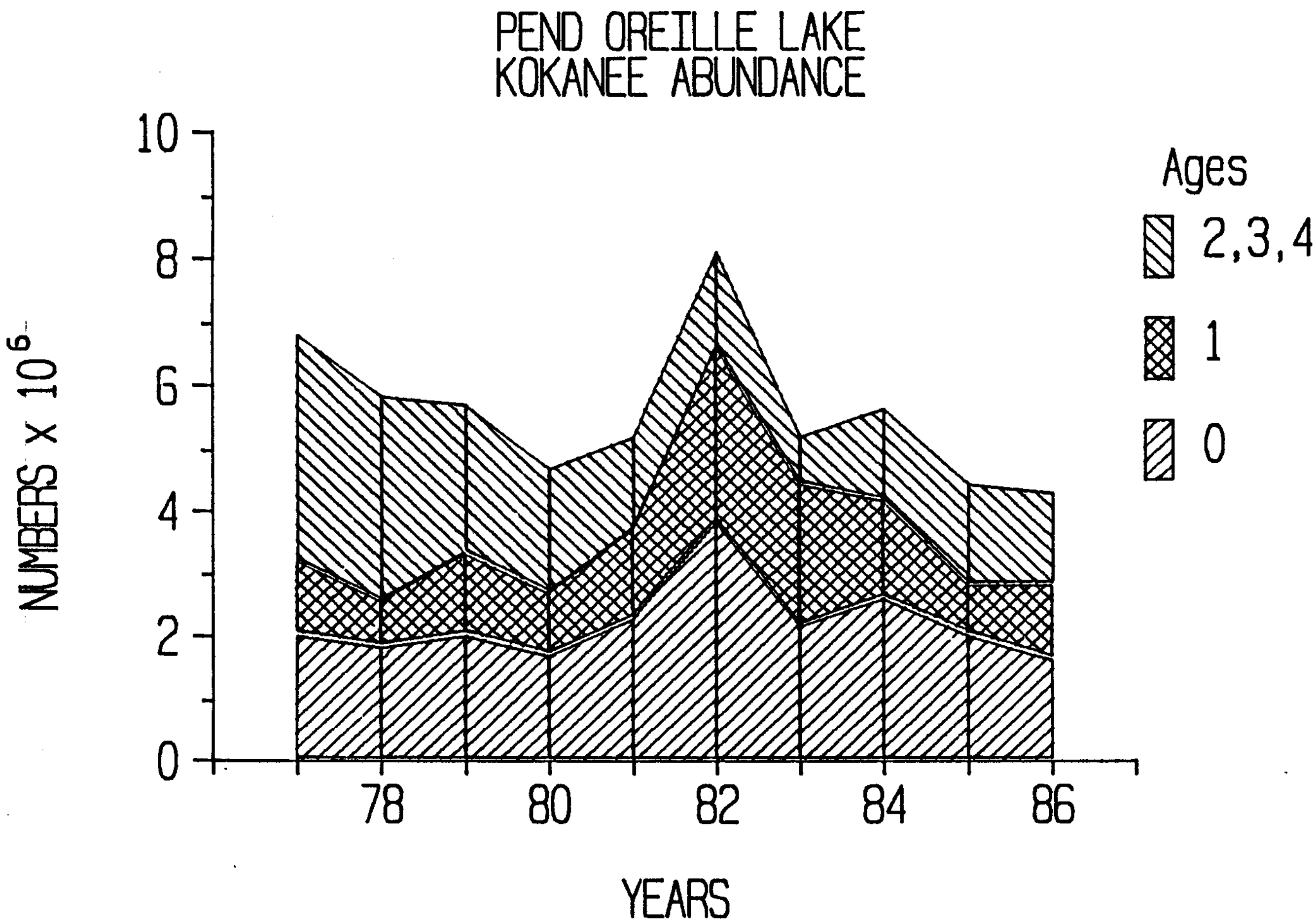


Figure 2. Abundance of kokanee salmon estimated by trawling in Lake Pend Oreille, Idaho, 1976 to 1986. Selected groups are represented by differential shading.

Problems with the operation of Cabinet Gorge Dam resulted in only minimum flows during the study. Fry were also smaller than desired, due to cold rearing temperatures. Over 1.59 million fry were released in Granite Creek in 1986.

The adult return rate of kokanee to Granite Creek was 2% in 1986, resulting in a take of 9.3 million eggs. Reasons for the unusually low spawning runs in 1985 and 1986 have been extensively evaluated (Bowles, in preparation) and no clear patterns are apparent. Unusual weather both years (extreme cold in 1985; midseason flood in 1986) as well as genetic factors may be partially responsible. Hatchery-stock fish have been released and collected at Sullivan Springs in Granite Creek for over 10 years and long-term inbreeding may be influencing their survival. Extensive straying of kokanee salmon during migration runs should help reduce this potential, but their genetic integrity has not been currently quantified.

Totals of 1.4 and 0.4 million kokanee eggs were collected at Spring Creek and Cabinet Gorge Hatchery, respectively, in 1986. The run into the Clark Fork facility was not anticipated. Large releases of fry into the Clark Fork River since 1981 may have provided strays for Spring Creek. The run may have also resulted from a release of 101,000 fry into Spring Creek in 1982. Over 1,000 fish returned to the fish ladder at Cabinet Gorge. Many more fish were observed below the Cabinet Gorge Dam, but they were not captured.

Over 7.3 million kokanee eggs were collected at Granite Creek in 1986, but the total (9.1 million) fell far short of the goal of 24 to 30 million. Some steps can be taken, however, to help meet the goal in 1987 and beyond, such as: (1) seine adults in the Clark Fork River below Cabinet Gorge Dam, (2) collect kokanee spawners in Lake Coeur d'Alene, and (3) stock a least 3 million fry/year at Sullivan Springs instead of the current (1985 to 1986) rate of 1.5 million/year.

Bull Trout

Counts of bull trout redds in tributaries to Lake Pend Oreille were significantly reduced in 1986 (400), with a corresponding drop in estimated escapement (1,560). The summer of 1986 was very dry and fall flows were well below normal, potentially limiting access to the tributaries for fall migrants and making early running bull trout more vulnerable to illegal harvest. The escapement estimates were made by a volunteer crew directed by a graduate student. It is unclear whether escapement had dropped dramatically, or if an inexperienced survey crew resulted in an underestimate. Monitoring of bull trout spawners will be conducted again in 1987.

Lake Coeur d'Alene

Creel Census

Patterns of angling effort and harvest were described on the northern end of Lake Coeur d'Alene to compare angler interest and success in the kokanee and chinook fisheries with those in previous years.

Interest in the chinook fishery had dropped after a slow year in 1985 and of the 584 anglers interviewed, the majority fished for kokanee. Reduced effort for chinook may have been responsible for a slight decline in total effort to 172,452 hours in 1986 (Table 1). Catch rate for kokanee remained little changed in 1986, but harvest increased to over 164,000 fish. Increased interest and effort (up 45%) for kokanee may have resulted from a substantial increase in average size in the catch. Mean length of angler-caught kokanee was. 216 mm in 1986, up significantly from the average in 1985 of 188 mm (Fig. 3). Evaluation of age-specific growth rates of kokanee will be done in 1987 to determine whether increased kokanee size is a growth response and/or shift in age at maturity.

Catch rates for chinook were extremely low in 1986 and harvest was estimated at only 76 fish (Fig. 4). A corresponding decrease in effort for chinook was also observed (down 112%) and the fishery was only marginally viable. Anglers were fishing primarily on a release of 10,000 chinook made in 1984. The small size of the release group and their apparent poor survival probably contributed to the poor fishing conditions in 1986.

A standardized creel census will be conducted on Lake Coeur d'Alene in 1987 to better quantify effort and harvest for kokanee and chinook. More information is needed to adequately gauge the status of both fisheries.

Fall Chinook Salmon

One release of 29,500 Lake Michigan stock chinook post-smolts was made on July 2, 1986 (Table 2). Lake Michigan stock chinook are still being used because of their availability and later mean age at maturity than the Bonneville stock (Table 3). All fish were marked by a right ventral fin clip to facilitate evaluation of return rates and quantify natural smolt production. Mean size of fish at release was 114 mm, far below the requested target of 145 mm and smaller than six of the previous seven release groups. Approximately 60 mature chinook entered Wolf Lodge Creek in September 1986, but they did not move upstream to the trap site. Electrofishing gear was used to capture and spawn 46 fish. Females comprised 41% of the run and averaged 84.7 cm in length, while males averaged 90.3 cm. Mean length of all adults was 88.0 cm, with a range of 60.5 to 100.1 cm. Over 8,600 eggs were collected (557/female) and most fish had already spawned. Age composition of spawners was 47% age-2+ and 53% age-3+ (Fig. 5). The percentage of age-3+ fish was much greater than in past years and is consistent with expected age at maturity for the Lake Michigan stock.

Table 1. Estimated effort on the north end of Lake Coeur d'Alene, Idaho, April 27 through October 30 and estimated catch rate and harvest of kokanee salmon in 1986.

Anglers interviewed	Average angler count		Estimated effort (hours)	Hours Expended for species		Catch Rate fish/hour		Estimated harvest
584	North end	32	98,327	Kokanee	134,652	Kokanee	1.22	164,275
	Wolf Lodge Bay	24.1	74125	Chinook	37,800	Chinook	0.002	76
	TOTAL		172,452					

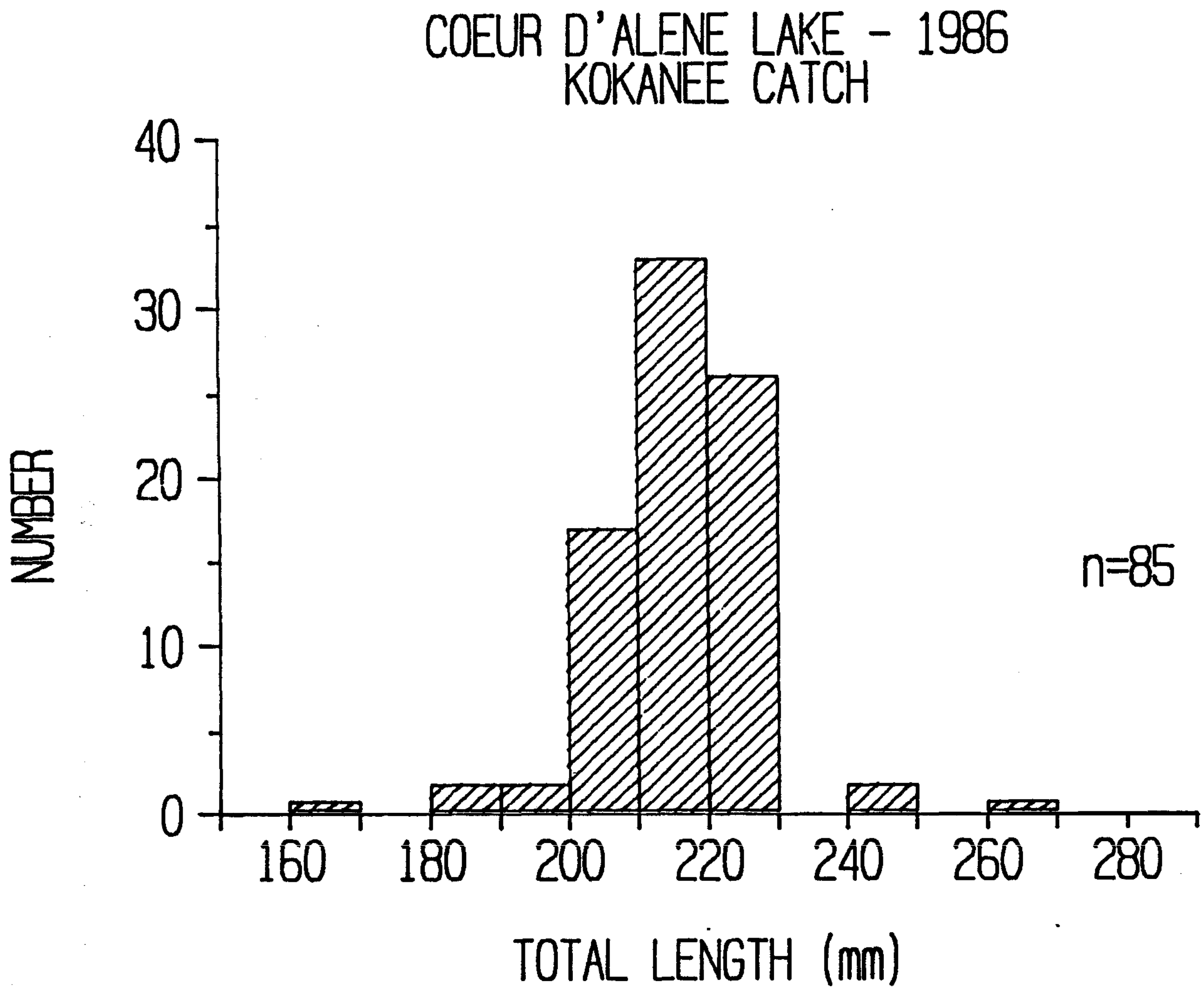


Figure 3. Length frequency of angler-caught kokanee salmon from Lake Coeur d'Alene, Idaho, June and July, 1986.

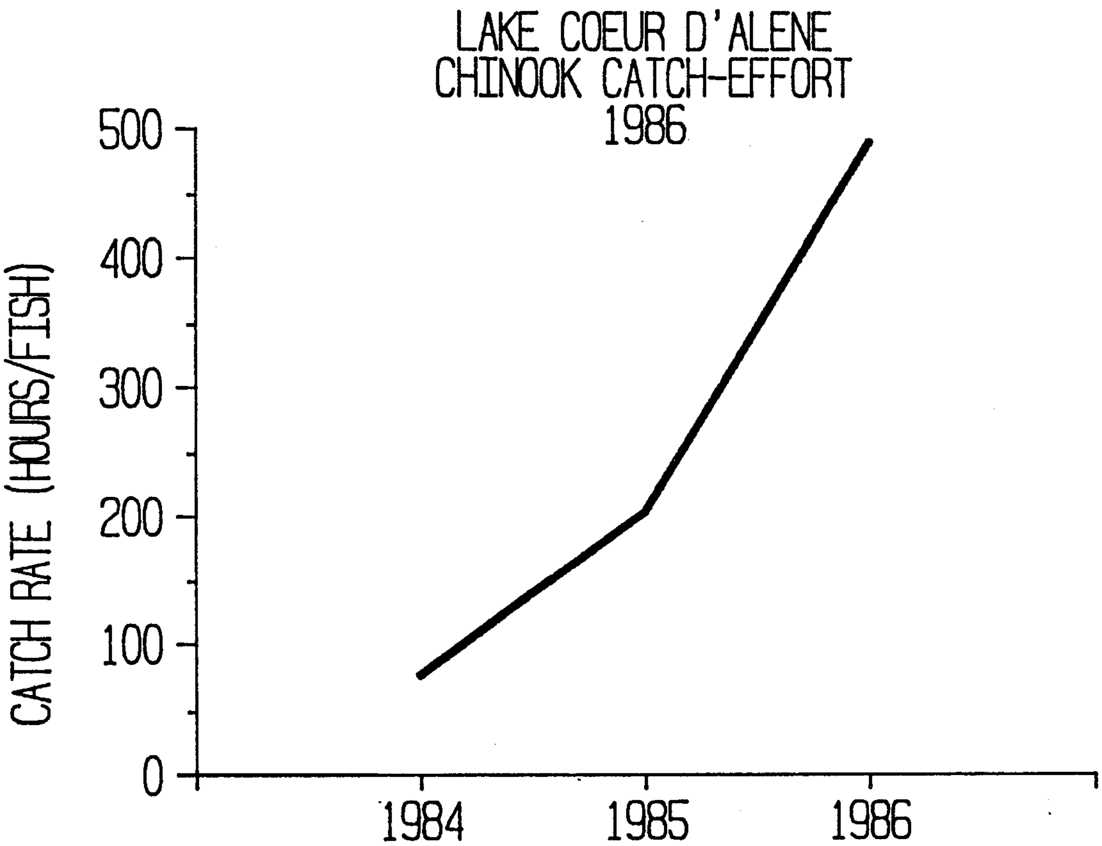


Figure 4. Catch rates for chinook salmon (hours/fish) in Lake Coeur d'Alene, Idaho, 1984 to 1986.

Table 2. Number, pounds and length of fall chinook salmon released into Lake Coeur d'Alene, Idaho, during 1982-86.

Release date	Release location	Number released	Pounds released	Length (mm) Mean	Length (mm) Ranee	Rearing hatchery	Stock of fish	Comments
7/19/82	Mineral Ridge boat ramp	28,700	1,688	137	125-150	Hagerman	Bonneville	
10/5/82	I-90 boat ramp	5,700	600	150	130—170	Hagerman	Bonneville	
TOTAL 1982		34,400	2,288					
8/9/83	I-90 boat ramp	30,100	636	109	80-130	Mackey	Bonneville	
10/26/83	I-90 boat ramp	30,000	1,402	124	80-150	Mackay	Bonneville	
TOTAL 1983		60,100	2,038					
10/29/84	I-90 boat ramp	10,500	820	150	80-190	Mackay & Mullan	Lake Michigan	
TOTAL 1984		10,500	820					
10/16/85	I-90 boat ramp	11,100	900	136	100/110	Mackay & Mullan	Lake Michigan	Left vent, clip
10/17/85	I—90 boat ramp	7,400	600	143			Lake Michigan	Adipose clip
TOTAL 1985		18,500	1,500					
7/2/86	I—90 boat ramp	29,500	825	114	81-145	Mackay	Lake Michigan	Right vent, clip
TOTAL 1986		29,500	825					

R9FS231BM

Table 3. Characteristics of stocks of fall Chinook salmon released in Lake Coeur d'Alene, Idaho, 1982 to 1986.

Stock	Source	% age composition of spawning run				Approx. weight at age of maturity		
		2	3	4	5	3	4	5
Bonneville, Tuls[a] Fall (downriver)	Columbia River Federal Hatchery	6	58	35	<1		$\bar{x}$ = 18	
Lake Michigan[b]	Illinois		35	55	<2	17–18	26–32	35–40

[a]Information on stock characteristics received via personal communication, Harold Hansen, Oregon Department of Fish and Wildlife.

[b]Information on stock characteristics received via personal communication, Jack Hammond, Michigan Department of Natural Resources.

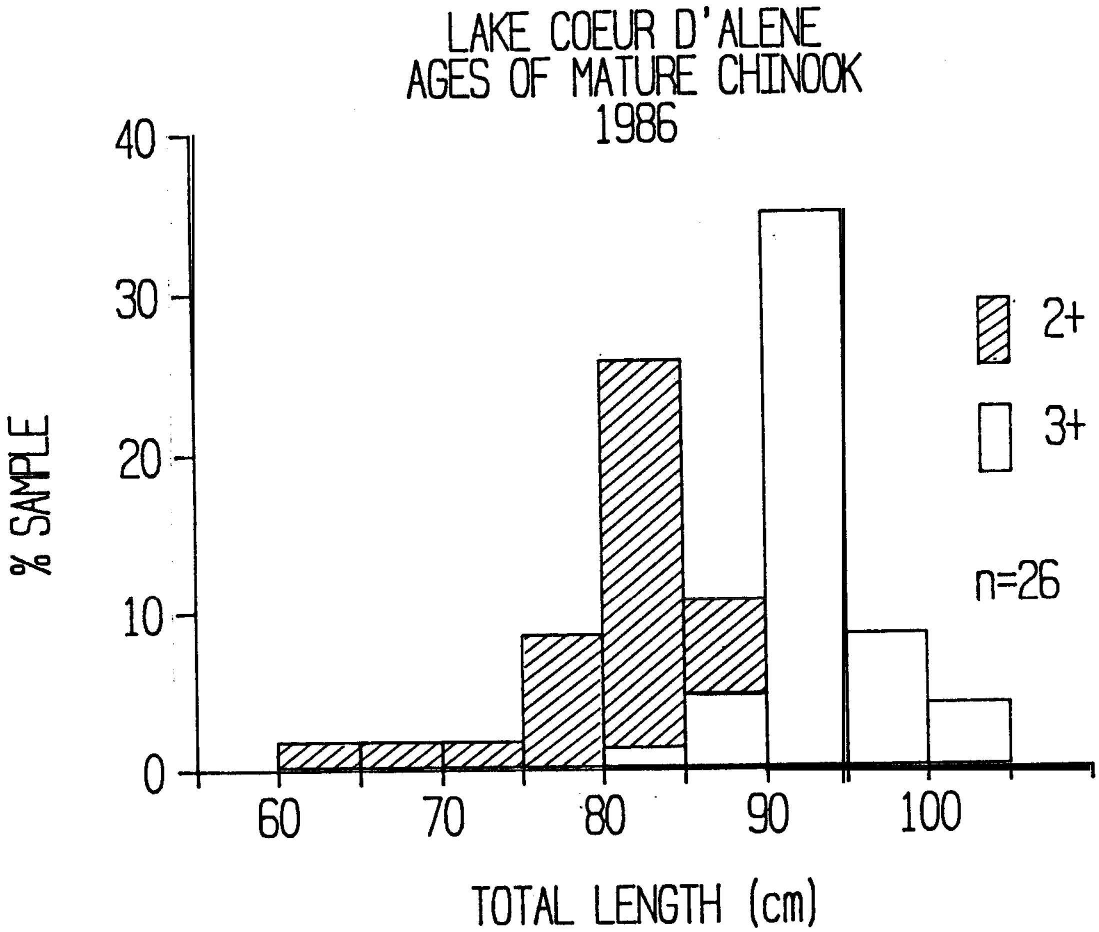


Figure 5. Age composition of spawning fall chinook salmon in Wolf Lodge Creek, Lake Coeur d'Alene, Idaho, 1986.

We have been concerned about the apparent poor survival of released post-smolts and the corresponding collapse in the Lake Coeur d'Alene chinook fishery. If chinook are released at a small size, or too late in the fall, they may be unable to consume age-O+ kokanee (which double in size through summer and become more dispersed) and would have to compete with kokanee for an already limited food supply. Data on best timing and adequate size at release were needed to help restore success to the program.

A series of feeding experiments were conducted at Mullan Hatchery in 1986 using chinook from the 1986 release group and kokanee of the same size distribution as in the lake during early July (Fig. 6). Three replicates of each of two experiments were run in a small concrete raceway (1.5 x 9.1 m) and in a large earthen pond (23 x 30 m).

Size, shape and structural complexity of experimental systems have profound effects on predator-prey interactions (LaBolle 1981). Experimental systems of two sizes and with differential cover and available forage were used to assess the influence of available space on the results. The ratio of prey to predator was held constant at 10:1 during all experiments. The raceway was stocked with 150 kokanee fry during each run and they were allowed to acclimate for at least one hour prior to the introduction of 15 chinook. Mean duration of raceway experiments was 13.5 hours. Ponds were stocked with 30 chinook and 300 kokanee following the same procedure and mean duration was 17.3 hours. Duration of experiments in the pond was extended to account for lower encounter rates than in the raceway.

Results of the raceway experiments demonstrated that within confined space, all sizes of chinook consumed kokanee. About 30% of the stomachs were empty. In the pond experiments, where space was less a factor, chinook less than 105 mm (total length) did not eat kokanee (Fig. 7). Small fish (<105 mm) did feed on insects during the pond experiments, but fry were not taken in any of four trials. The ability of kokanee fry to avoid predation would be greatest in Lake Coeur d'Alene, where they are schooling and limnetic in distribution. Experiments in the pond probably represent an intermediate environment between the raceway and pelagic zones of the lake. Our conclusion is that all chinook released into Lake Coeur d'Alene should exceed at least 105 mm total length. Given the length variation of the hatchery product, a mean length of 145 to 150 mm should be achieved by release.

Timing of release should correspond to the period of peak kokanee emergence in Wolf Lodge Bay. In addition to high mortality, kokanee fry grow and disperse rapidly following emergence, becoming less vulnerable and available to juvenile chinook (Fig. 8). Chinook should be released by July 1 or in mid-June if target size has been met. High water temperature and lower densities of kokanee fry make later releases undesirable.

Data were collected on chinook diet, length, weight, age and maturity during the August derby. A total of 26 fish were checked in during the week averaging 61.7 cm in length, and ranging from 31.1 to 100.3 cm (Fig. 9). Total catch was about 25% of that taken in 1985.

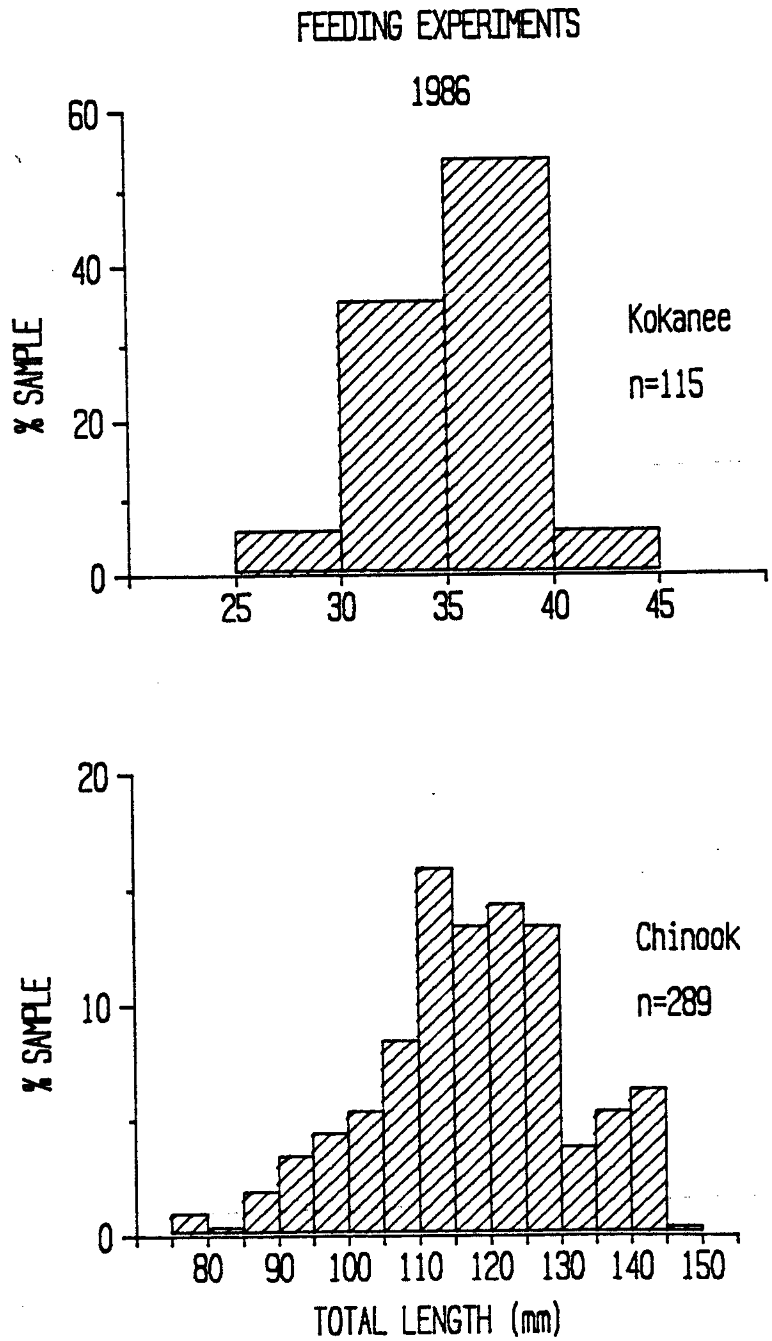


Figure 6. Size distribution of chinook and kokanee salmon used in predator-prey experiments conducted at Mullan Hatchery, Idaho, July 1986.

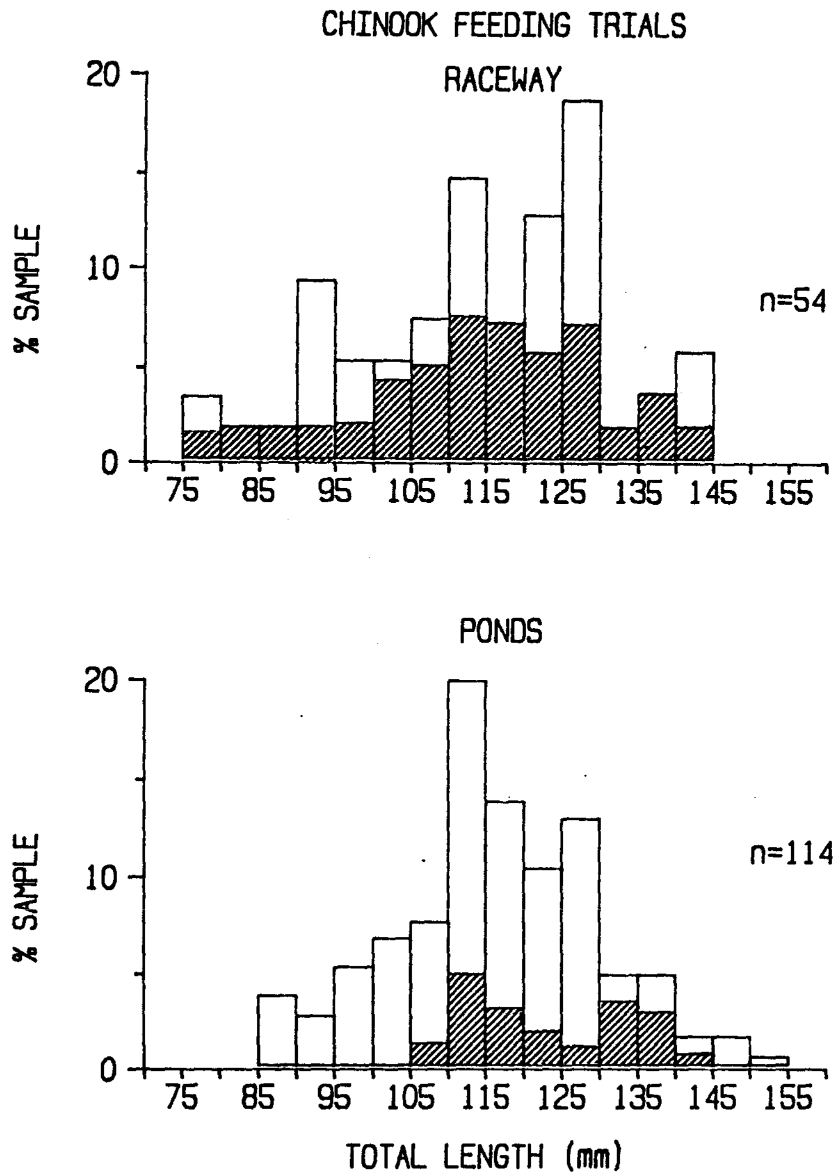


Figure 7. Results of predator-prey experiments conducted with chinook and kokanee salmon at Mullan Hatchery, Idaho, July 1986. Histograms represent the length frequency of chinook used in experiments. Shading in the bars represents the portion of that length class that ate kokanee.

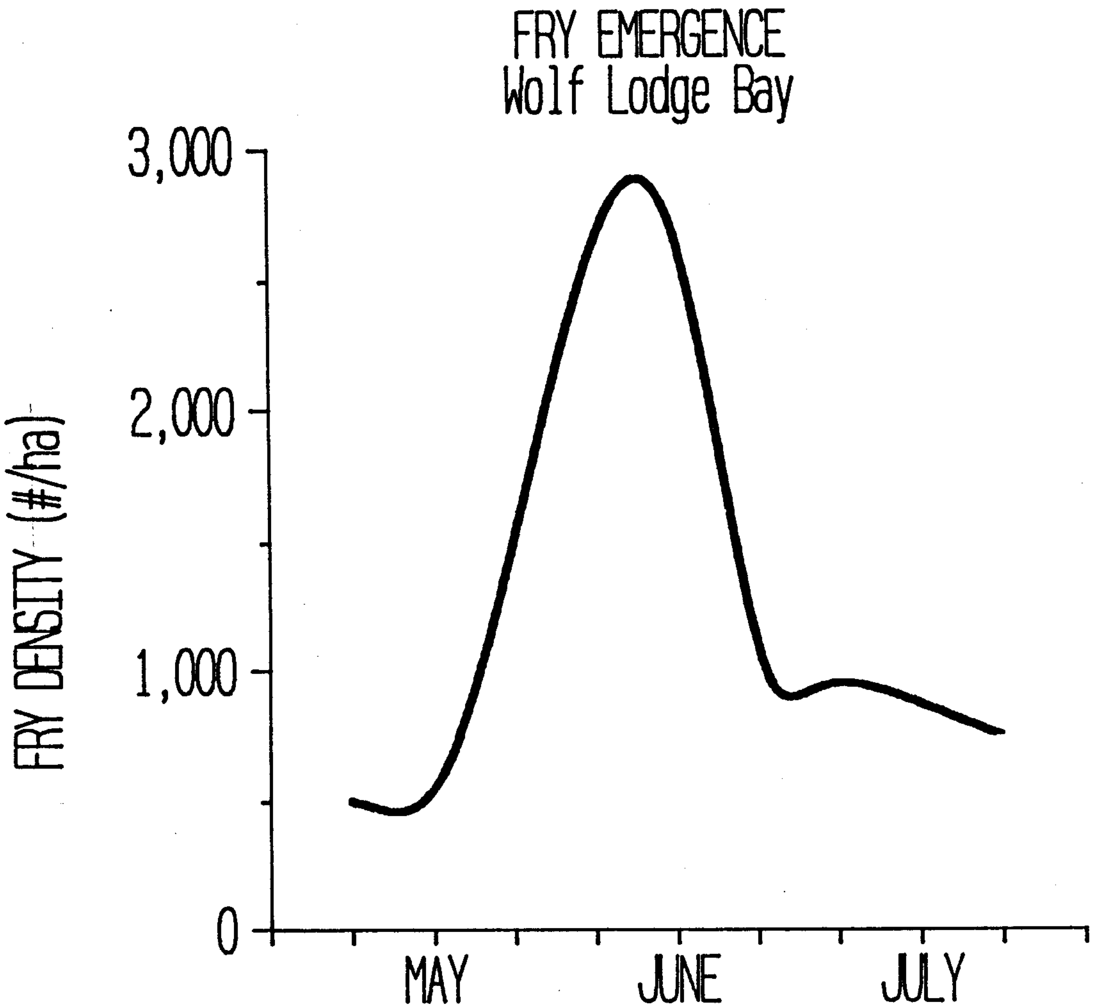


Figure 8. Temporal and numerical distribution of kokanee fry emergence in Wolf Lodge Bay of Lake Coeur d'Alene, Idaho, 1978 to 1980.

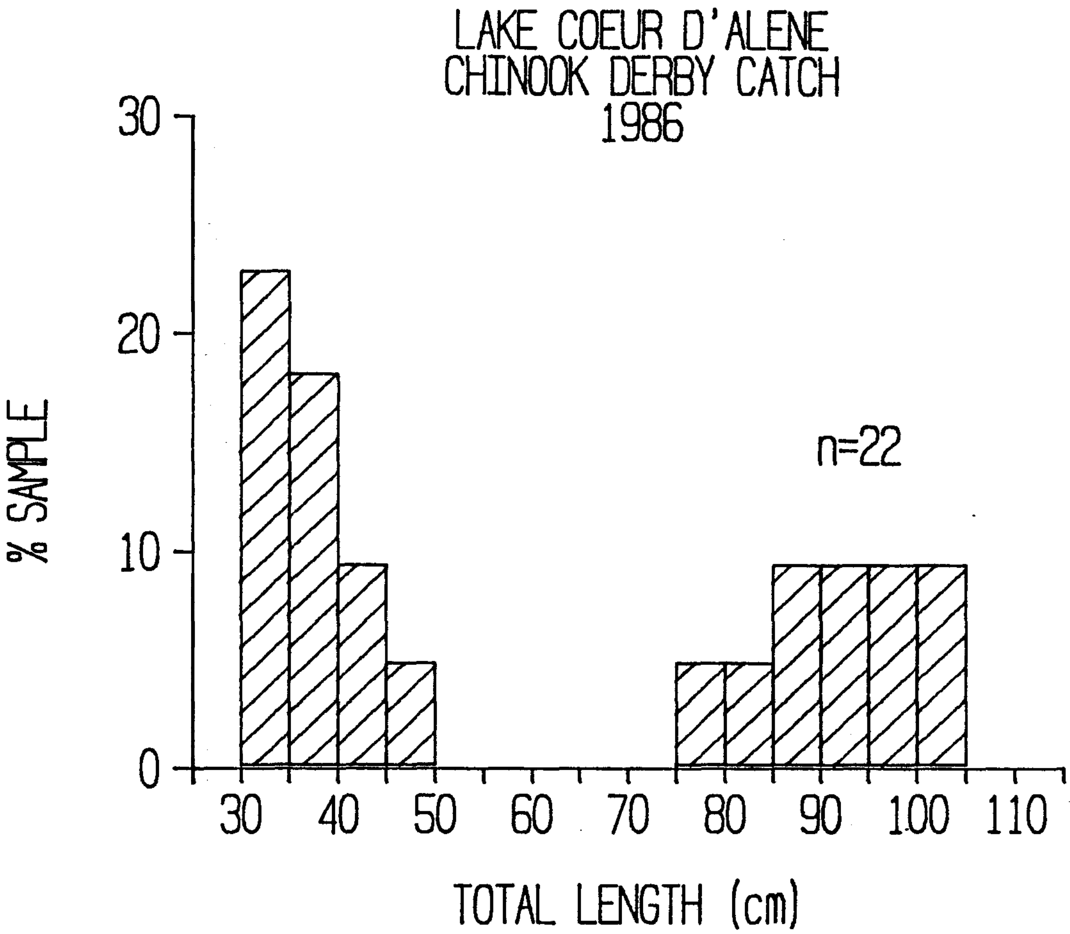


Figure 9. Length composition of fall chinook salmon caught during the August derby in Lake Coeur d'Alene, Idaho, 1986.

Kokanee taken from chinook stomachs were measured and total length estimated. Prey length was then correlated with predator length to characterize age-specific predation on kokanee by chinook of varying size (Fig. 10). Larger chinook appear to key in on larger kokanee, as might be expected; however, chinook in the Great Lakes tend to forage differentially on smaller age and size classes of available forage.

Heavy predation primarily on smaller fish would theoretically limit chinook stocking to low levels. Since predation pressure appears to be more evenly distributed upon kokanee in Lake Coeur d'Alene, current or somewhat greater stocking densities should be maintained and evaluated.

Substantial public concern was raised early in 1986 when tissue samples in some species of fish in Lake Coeur d'Alene reportedly contained high levels of lead, zinc and cadmium. Samples of liver, kidney and muscle tissues were taken for subsequent heavy metals analysis by EPA (Table 4). Although the levels of some metals appeared to be high, EPA specialists reported that under the normal frequency of consumption, fillets of chinook and kokanee posed no health threat.

Kokanee

Population Estimates. Kokanee abundance was estimated at 7.31 million fish (757/hectare) during August 1986, a decline of over 2 million since 1985 (Fig. 11). Age-1+ kokanee (1984 year class) were much more abundant in 1986 corresponding to their high numbers at age-0+ (4.13 million) in 1985. Numbers of age-2+ fish were similar between 1985 and 1986, but estimates of other ages varied considerably (Table 5). Density of kokanee of all ages (757/hectare) was similar to the eight-year average .of 731/hectare.

Potential Egg Deposition and Fry Survival. Kokanee spawning escapement was estimated at 735,400 fish in 1986, down over 470,000 from 1985, but virtually the same as in 1984. The ratio of females to males was 50.5% and 49.5%, respectively, reflecting a lower proportion of males than in the previous two years (57% males). It. was estimated that 368,000 females deposited 103 million eggs in 1986, assuming a fecundity of 280 eggs/female (Bowler 1979). Potential egg deposition (PED) was lower in 1986 than in 1985 because of reduced female escapement (Table 6).

Survival rates from PED to fall fry have ranged from 0.71 to 3.90% and in conjunction with variable female escapement and fecundity have produced large variations in recruitment. Survival from PED to fall fry should be monitored annually to evaluate any apparent stock-recruitment relationship that would aid in modeling the chinook-kokanee populations.

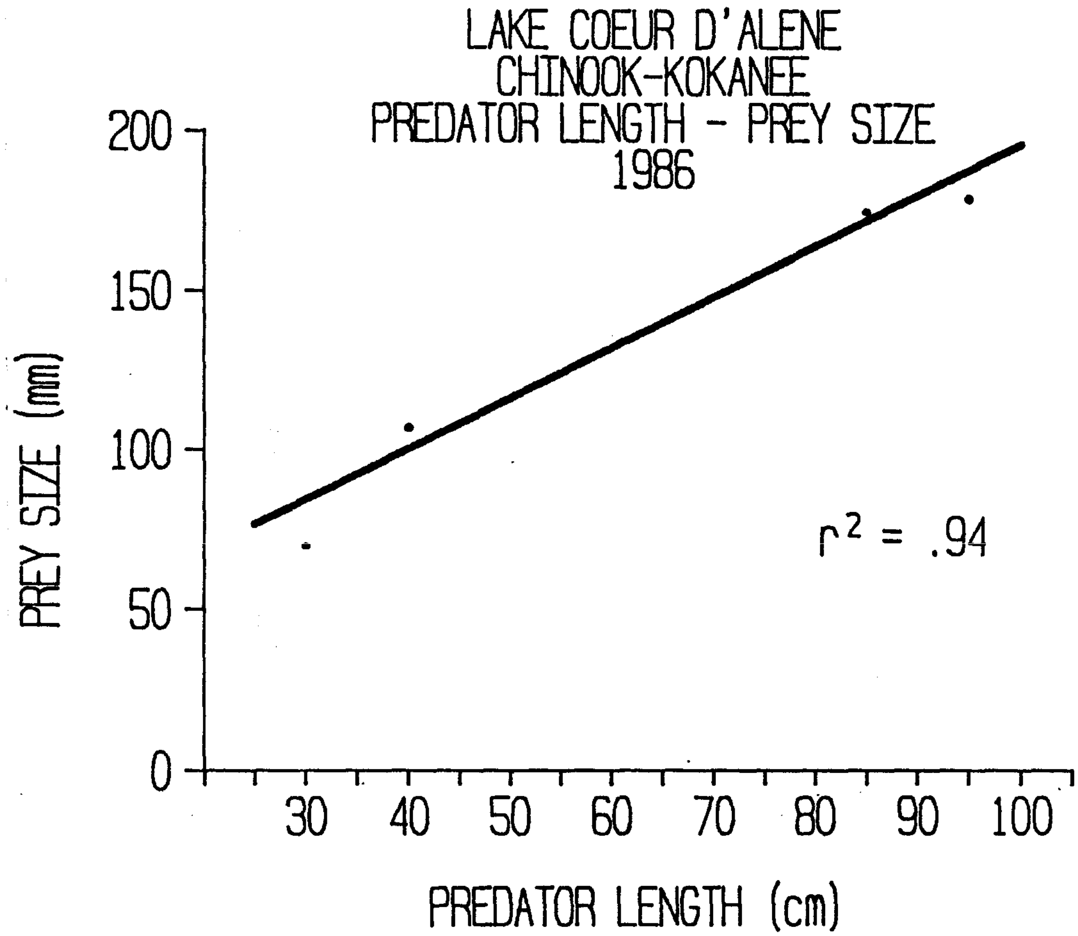


Figure 10. Relationship between size of fall chinook salmon (predator) and size of kokanee salmon (prey) in Lake Coeur d'Alene, Idaho, 1986.

Table 4. Concentrations of selected metals sampled in chinook and kokanee salmon collected in Lake Coeur d'Alene, Idaho, August 1986.

Sample	Metal concentration (ppm-wt) Cd	Pb	As	Hg	Cu	Zn
one large <u>chinook</u>						
filet	0.05	ND	0.04	0.13	0.38	4.9
kidney	5.27	0.50	0.10	0.07	5.27	36.5
liver	2.14	0.32	0.16	0.18	66.9	66.1
chinook <u>composites</u>						
5 kidneys						
1)	3.67	0.20	0.14	--	1.88	31.2
2)	5.91	ND	0.22	--	4.64	32.5
5 livers						
1)	1.73	0.08	0.28	--	33.4	66.5
2)	1.92	0.16	ND	--	24.9	51.7
kokanee <u>filets</u>						
1)	0.08	ND	0.06	--	1.12	8.7
2)	0.13	ND	0.06	--	0.54	8.4
3)	0.11	ND	0.14	--	0.58	6.7
4)	0.22	0.46	0.02	--	1.12	8.9
5)	0.17	ND	0.18	--	0.68	11.5
kokanee <u>whole</u>						
1)	0.72	0.58	ND	--	2.16	48.3
2)	0.79	0.20	ND	--	0.66	51.7

ND = not detected.

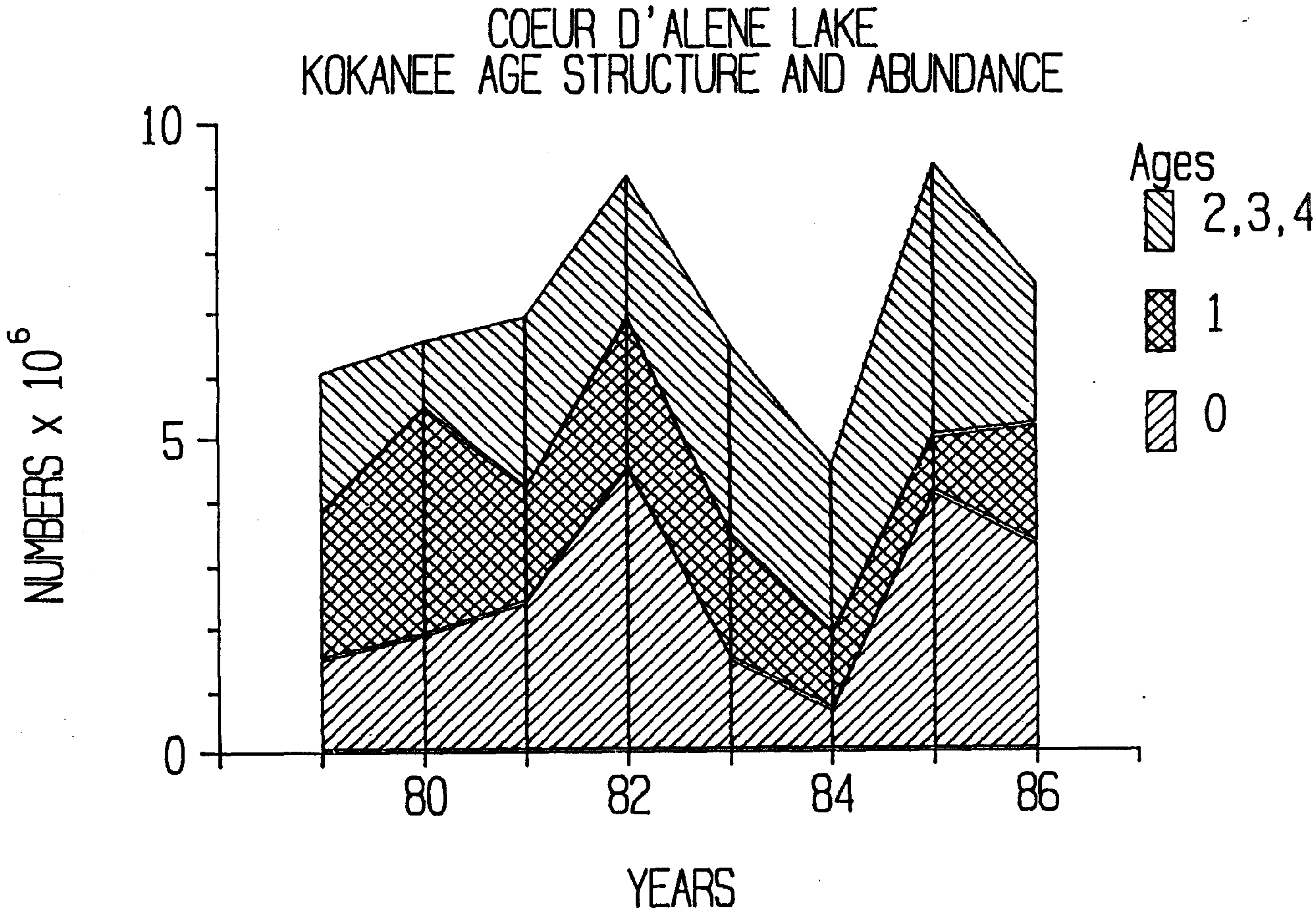


Figure 11. Estimates of kokanee abundance made by mid-water trawl in Lake Coeur d'Alene, Idaho, 1978 to 1986. Selected age groups are represented by differential shading.

Table 5. Estimates of kokanee year classes (1975 to 1985) made by mid-water trawl in Lake Coeur d'Alene, Idaho, 1978 to 1986. Estimates are in millions of kokanee.

Year class	Year estimated							
	1986	1985	1984	1983	1982	1981	1980	1979
1985	2.17							
1984	2.59	4.13						
1983	1.83	0.86	0.70					
1982	0.72	1.86	1.17	1.51				
1981		2.53	1.89	1.91	4.53			
1980			0.80	2.25	2.36	2.43		
1979				0.81	1.38	1.75	1.86	
1978					0.93	1.71	1.68	1.50
1977						1.06	1.95	2.29
1976							1.06	1.79
1975								0.45
Total	7.31	9.37	4.56	6.48	9.20	6.94	6.55	6.04
No./ha	757	970	472	671	953	719	678	625

Mean number per ha = 731

Table 6. Estimates of potential egg deposition, fall abundance of wild kokanee fry and their subsequent survival rates in Coeur d'Alene Lake, Idaho, 1979 to 1986.

		Estimates		
Year	Female spawn escapement	Potential no. eggs ($x10^6$)	Fall fry from prev. yr. escpt. ($x10^6$)	Wild survival (%)
1979	256,716	86	--	--
1980	501,492	168	1.86	2.2
1981	550,000	184	2.43	1.45
1982	358,200	120	4.54	2.46
1983	441,376	99	1.51	1.25
1984	316,829	106	0.70	0.71
1985	530,631	167	4.13	3.90
1986	368,633	103	2.17	1.29

Average survival of wild fry to fall estimate is 2.0%.

Length and Aqe at Maturity. Length and age at maturity were examined on spawning kokanee collected by gill nets in Wolf Lodge Bay in November 1986. Mean length of mature fish was 250 mm, a slight decline from that in 1985 (257 mm) (Fig. 12). The decline in size may have been in response to proportional declines in the abundance of males and in the number of age-4+ fish in the spawning stock (Fig. 13). The age composition of spawning kokanee has a dramatic influence on their mean size. Age at maturity should be monitored closely because it has such a strong influence on the size of fish available to anglers.

The collection of reliable data on kokanee population dynamics in Coeur d'Alene Lake is high in priority for Region 1 fishery management. Precision of the information will become increasingly important as the complexity of chinook and kokanee management increases.

Spirit Lake

Spirit Lake supports a diverse salmonid and spiny ray fishery, with kokanee and catchable rainbow supporting most of the effort. The kokanee fishery continues to be the best in the region and it should be closely

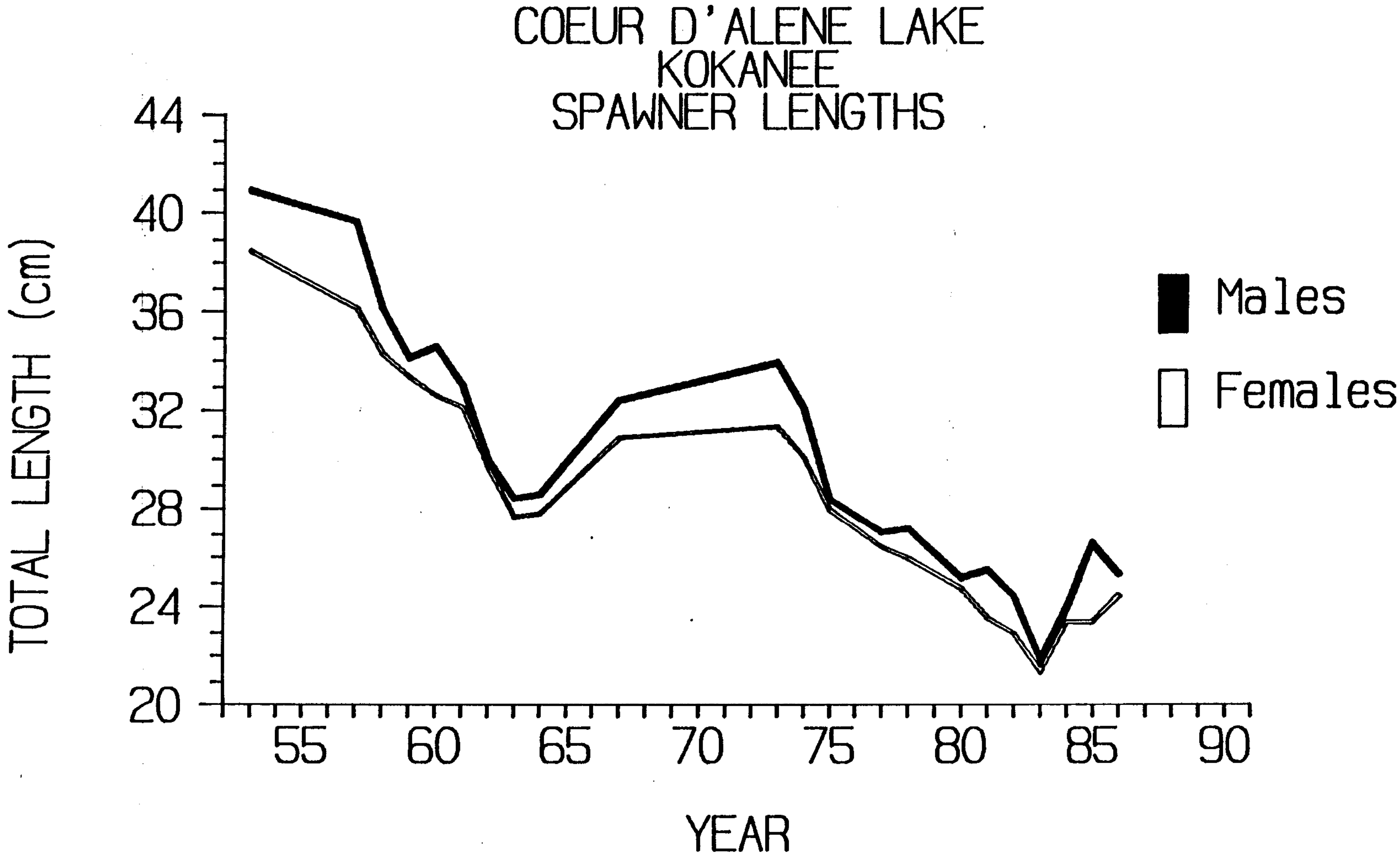


Figure 12. Mean total length of kokanee spawners measured in Lake Coeur d'Alene, Idaho, 1954 to 1986.

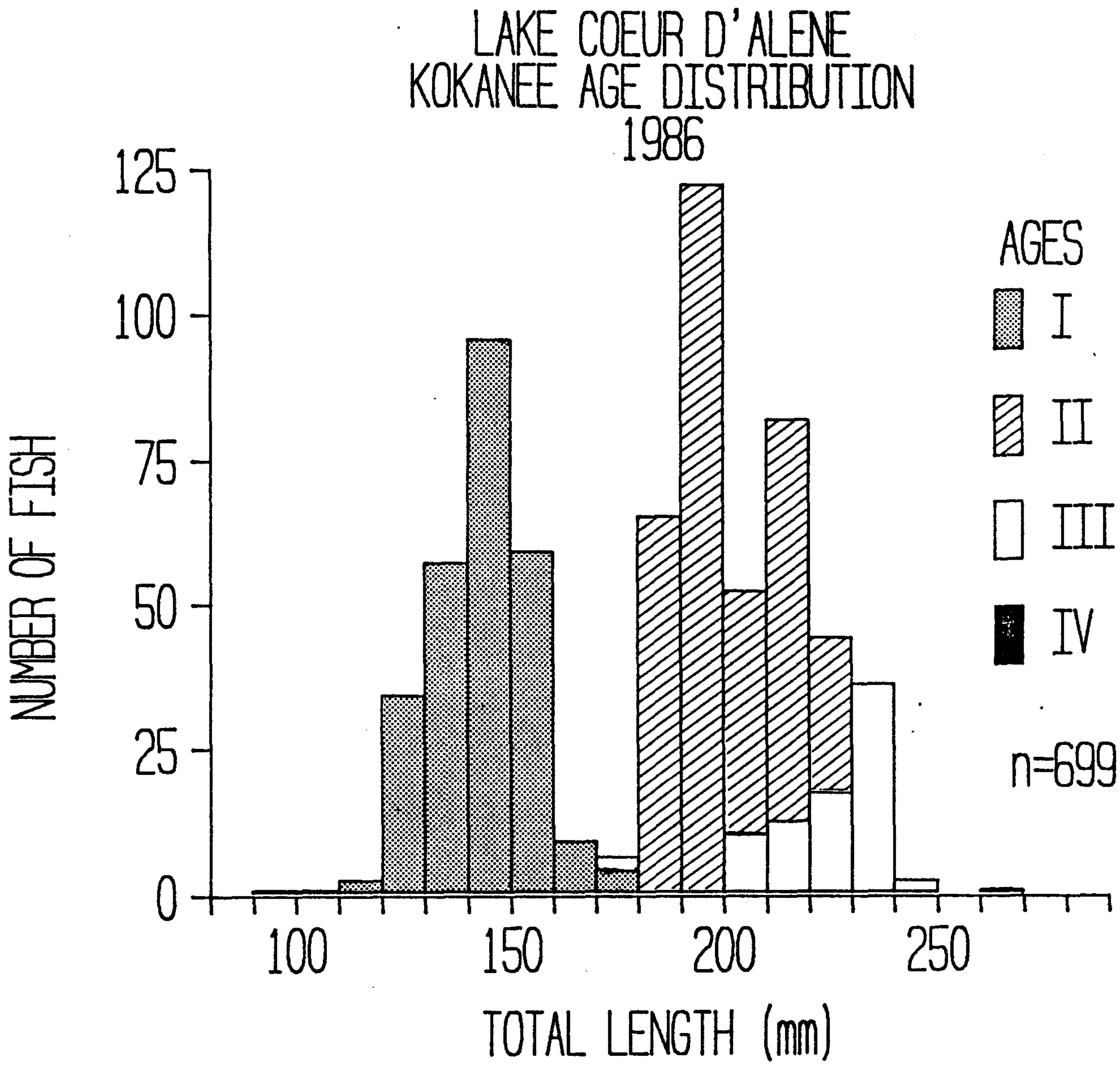


Figure 13. Age and length composition of kokanee collected in Lake Coeur d'Alene, Idaho, 1986.

monitored so that appropriate management can be taken to sustain the program. Recruitment is highly variable and failure can be detected during annual trawling, allowing augmentation of that cohort. The kokanee population is at a theoretical carrying capacity in Spirit Lake and heavy fishing pressure should be maintained to avoid the negative effects of overpopulation.

Kokanee Population Estimates

Kokanee abundance was estimated at 467,700 fish (816/hectare) in July 1986. Abundance decreased by 91,000 (16%) from that in 1985 (Fig. 14), apparently resulting from weak recruitment of the 1985 year class (Table 7). A total of 57,142 kokanee fry were stocked in Spirit Lake in August 1986 to offset this apparently weak recruitment. The supplemental release brought total kokanee abundance to an estimated 524,800 fish. Overall, the population is in good shape with abundance and densities similar to those in 1985, 1983 and 1981. Spirit Lake appears to support densities of kokanee in the range of 900 to 1,000/hectare without their growth being impacted. Precluding major changes in spawning areas, water quality and fishing pressure, these densities seem to be well within the carrying capacity of Spirit Lake.

Estimates of age-specific annual survival were low for age-O+ fish, reflecting the apparent weak recruitment. Survival for other ages were somewhat lower, but consistent with long-term averages for the lake (Table 8).

Potential Egg Deposition and Fry Survival

Estimates of abundance and survival of age-0+ kokanee in Spirit Lake have been highly variable, ranging from 0.02 to 2.56% (a one hundred and twenty-eightfold difference) (Table 9). This apparent high variability in recruitment has made hatchery supplementation necessary in several years. Kokanee survival was evaluated for PED to age-2+ over several years to determine if the apparent variable recruitment was reflected in abundance of older-aged fish. During the three years evaluated (1984, 1985 and 1986), survival ranged a consistent 0.60 to 0.78%. In 1984, however, recruitment was supplemented with a release of 100,000 hatchery fry, which contributed to the abundance of age-2+ fish in 1986. Including the hatchery supplement, survival to age-2+ was the lowest of the three years in 1986 (0.60%). Estimated survival would have been even lower without stocking, but still would not have produced the magnitude of variation seen in PED to age-0+ survival. Our conclusion is that both variable recruitment and inconsistent sampling success for age-O+ kokanee are responsible for wide variation in estimated PED to age-O+ survival in Spirit Lake.

Spawning escapement of female kokanee was estimated at 36,564 mature fish in 1986. Using an estimated fecundity of 317 eggs/female, PED was 11.6 million eggs.

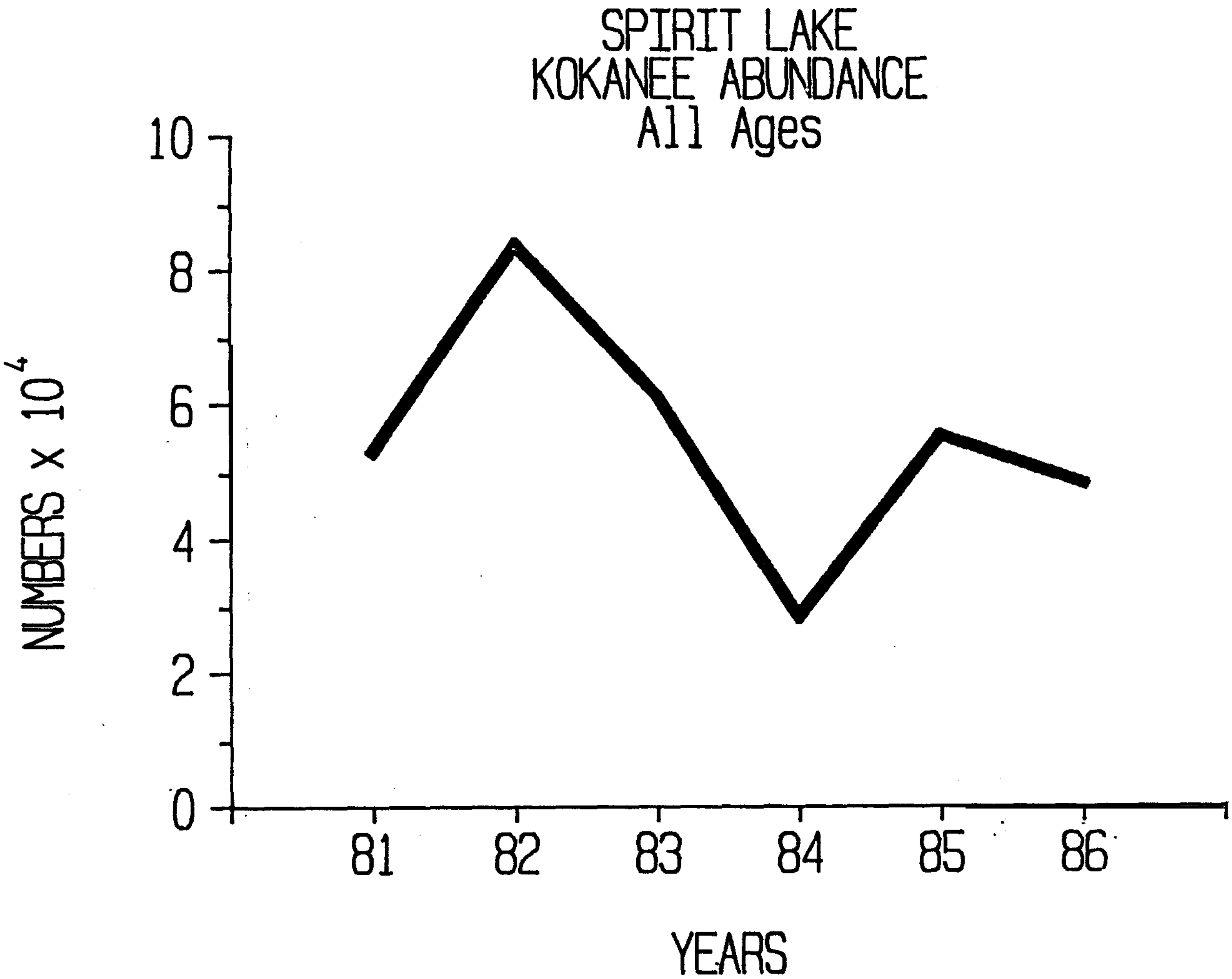


Figure 14. Estimates of kokanee abundance made by mid-water trawl in Spirit Lake, Idaho, 1981 to 1986.

Table 7. Estimates of kokanee year classes (1974 to 1985) made by mid-water trawl in Spirit Lake, Idaho, 1977 to 1986. Estimates are in thousands of kokanee.

Year class	Year estimated					
	1986	1985	1984	1983	1982	1981
1985	16.6					
1984	287.3	164.4				
1983	107.9	206.8	3.5[a]			
1982	56.5	113.2	17.4	143.3		
1981		74.3	160.8	272.6	526.0	
1980			103.1	146.8	209.0	281.3
1979				54.2	57.7	73.4
1978					48.0	82.1
1977						92.6
Totals	467.7	558.7'	284:8	616.8	840.7	529.4
No./ha	816	975	497	1,076	1,467	924

Mean number per ha = 959

[a]100,000 kokanee fry were released in 1984 to supplement this weak year class.

Table 8. Estimates of age-specific annual survival (%) for kokanee in Spirit Lake, Idaho.

Year class	Age span 0+ egg to fry	0+ to 1+	1+ to 2+	2+ to 3+
1978				58
1979			79	94
1980		74	70	70
1981	2.56	52	59	46
1982	0.93	12	651[a]	50
1983	0.02	199[a]	52	
1984	0.53	175[a]		
1985	0.07			
Mean annual survival (%)	0.82	46	65	64

[a]Overestimated survival resulting from problems with trawl gear.

Table 9. Estimates of potential egg deposition, fall abundance of wild kokanee fry and their subsequent survival rates in Spirit Lake, Idaho, 1981 to 1986.

	Estimates			
Year	Female spawn escapement no.	Potential eggs ($x10^3$)	Fall fry from previous yr. escapement	Wild survival(%)
1981	44,650	20,540	--	--
1982	26,400	15,400	526,000	2.56
1983	33,463	18,237	143,300	0.93
1984	57,457	26,430	3,494	0.02[a]
1985	55,326	25,726	164,400	0.62
1986	36,564	11,591	16,600	0.07[a]

[a]Average survival of wild fry is 0.84%.

Lowland Lakes Program

Routine Census

During 1986, we continued routine data collection to describe fishing effort and success on Region 1 lowland lakes. Most data were collected by conservation officers, but other regional personnel participated. The intent is to provide consistent, long-term data on waters other than those evaluated in research programs. Data are used to evaluate the success of management programs and detect areas in need of greater attention.

Complete census data were collected on five lakes in 1983 1984, six lakes in 1985 and 12 lakes in 1986 (Table 10). The north end of Lake Coeur d'Alene (including Wolf Lodge Bay) had the greatest effort of those lakes (or sections) surveyed, at 172,452 hours. Hayden, Pend Oreille (north shore), and Hauser lakes had between 65,000 and 90,000 hours and continued to be some of the most heavily used fisheries in the region. Estimated effort increased again on Hayden Lake to 82,000 hours, but effort on most systems was fairly consistent, or had declined somewhat (Table 11). Fishing pressure/unit area ranged from 8 to 491 hours/acre. Catch rates varied widely among lakes in each census year, but mean catch rates for salmonids were similar for all lakes between years (1984 = 0.44 fish/hour; 1985 = 0.50 fish/hour; 1986 = 0.40 fish/hour). Mean catch rates for spiny ray fishes were somewhat more variable between years (1984 = 0.78; 1985 = 0.93; 1986 = 0.44).

Opening day census data have been maintained specifically for several years on Hauser, Jewell, Kelso, Mirror, Spirit, Lower Twin and Round lakes (Table 12). -Opening-day catch rates are often variable, but fishing is typically good. Catch rate for brook trout in Mirror Lake has remained low since stocking was curtailed, resulting in a decrease of about 1 fish/hour in the combined catch rate. During this same time interval, catch rate for cutthroat in Jewell Lake increased fourfold, although high variability complicates the interpretation of these data.

Catchable Rainbow Trout Program Evaluation

The continual increase in demand for catchable trout highlights the need to better allocate this limited resource in order to achieve program goals. Standardization of stocking rates (number/area) continued for catchable rainbow trout to facilitate program evaluation in lakes of Region 1. Small lakes were stocked at 250 to 400 fish/hectare and very large lakes at 3 to 6 fish/hectare. Smaller lakes received higher densities of fish, but overall numbers stocked in each lake were relatively low. Stocking densities on intermediate lakes range from 10 to 60 fish/hectare. Although stocking rate is realistically a function of lake size, it can be adjusted where effort and rate of return make that appropriate.

Table 10. Routine census data collected on lakes in Region 1, Idaho, during 1986.

Lake	Anglers interviewed	Mean angler count	Estimated hours	Hours/ acre	Catch rates HRB	CT	KO	Total salmo	Spiny ray
Coeur d'Alene[e] Apr-Oct	584	56.1	172,452	-	-	-	1.22	1.22	-
Hauser Apr-Oct	217	25.2	66,710	121	.25	-	-	.25	.44
Hayden Apr-Oct	354	33.0	87,360	32	.04	.02	-	.06	.20
Pend Oreille[b] Apr-Nov	241	26.8	82,393	8	.01	.003	-	.02	-
Upper Twin Apr-Nov	26	5.2	13,760	-	-	-	-	-	-
Lower Twin Apr-Nov	86	14.3	37,900	-	.18	-	.08	.26	.05
Brush Apr-Nov	51	4.6	12,273	-	.71	-		.71	.11
Robinson Apr-Nov	96	9.6	25,303	-	.38	-	-	.39	.09
Spi ri t Jan-Apr	93	13.3	17,590	-	.09	-	5.9	6.0	.04
Priest Apr-Nov	206	15.8	50,930	-	-	-	-	.18	-
Cocolalla Mar	84	16.8	6,250	-	-	-	-	-	6.1
Medicine/Cave Jan-Sept	234	23.4	61,950	-	-	-	-	-	.67

[a]llorth end of Lake Coeur d'Alene, including Wolf Lodge Bay.

[b]North shore of Lake Pend Oreille near mouth of Clark Fork River.

Table 11. Comparative estimates of effort and catch rate on lakes in Region 1, Idaho, during April through September, 1983 to 1984, 1985 and 1988.

Lake	Anglers inter-viewed (n)	Effort (hours)			Hours/acre			Overall catch rate 1983-84		1985		1986	
		1983-4	1985	1986	1983-4	1985	1986	Sal-monids	Spiny ray	Sal-monids	Spiny ray	Sal-monids	Spiny ray
Coeur	746	-	192,168	172,452	-	-	-	0,92[1]	-	1,30[1]	-	1,22[1]	-
Hauser	385	49,500	75,210	66,710	89	135	121	0.26	0.16	0.24	0.11	0.25	0.44
Fernan	273	63,00	67,742	72,000	163	176	176	0.14	1.80	0.34	0.57	0.12	0.31
Hayden	275	40,50	80,776	87,360	11	30	32	0.03	0.96	0.05	0.38	0.06	0.20
Pend Oreille[b]	378	-	66,000	82,393	-	6	8	-	-	0,24[1]	-	0.02	-
Chatcolet	82	-	26,645	23,338	-	-	-	-	-	-	0.93	-	1.14
Upper Twin	40	-	17,401	16,000	-	35	32	-	-	0.19	-	-	-
Lower Twin	115	-	39,742	37,900	-	132	125	-	-	0.20	0.55	0.28	0.05
Brush	73	-	35,542	14,265	-	'1,225	481	-	-	0.45	-	0.71	0.11
Coeurd'Alene[c]	181	-	34,803	-	-	-	-	-	-	1,10[1]	0.03	-	-
Robinson	122	-	24,025	25,303	-	480	505	-	-	0.63	-	0.38	0.09
Smith	74	-	13,455	12,972	-	354	341		-	0.45	0.08	0.80	0.03
Round	21	13,100	-	-	252	-	-	0.83	0.40	0.75	-	-	-
Dawson	3	-	--	-	-	-	-	-	-	-	3.00	-	-
Mirror	38	-	-	-	-	-	-	-	-	0.24	-	0.33	-
Benewah	19	-	-	17,207	-	-	-	-	-	-	1.14	-	2.25
Perkins	12	-	-	-	-	--	-	-	-	-	2.51	0.27	0.20
Jewell	13	-	-	9,900	-	-	-	-	-	0.38	0.36	0.07	0.28
Cocolalla	33	-	-	-	-	-	-	-	-	0.22	-	-	-
Solomon	20	-	-	-	-	_	-	-	--	0.46			--
Bonner	2	-	-	-	-	-	-	-	-	1.00	-	-	-
Glidden	28	-	-	-	-	-	-	-	-	0.98	-	-	-
Kelso	52	-	-	19,060	-	-	-	-	-	0.45	0.17	0.70	0.19

Table 11. Continued.

Lake	Anglers interviewed (n)	Effort (hours)			Hours/acre			Overall catch rate					
								1983-84		1985		1986	
		1983-4	1985	1986	1983-4	1985	1986	Salmonids	Spiny ray	Salmonids	Spiny ray	Salmonids	Spiny ray
Porcupine	21	—	—	—	—	—	—	—	—	5.97[d]	—	0.98	—
Roman Nose #1	4	—	—	—	—	—	—	—	—	0.50	—	—	—
Freeman	15	—	—	—	—	—	—	—	—	0.07[e]	1.40	0.83	—
Rose	6	—	—	—	—	—	—	—	—	—	0.31	—	—
Ball	6	—	—	—	—	—	—	—	—	0.67	—	—	—
Sheperd	15	—	—	—	—	—	—	—	—	—	2.50	—	1.0

[a]North end of Lake Coeur d'Alene, including Wolf Lodge Bay.
[b]North shore of Lake Pend Oreille near mouth of Clark Fork River.
[c]South end of Lake Coeur d'Alene, but not including Lake Chatcolet.
[d]Small sample size and some confusion in data sheets.
[e]Opening day information only.
[1]Primarily kokanee.

Table 12. Opening day catch rates for salmonids on selected lowland lakes in Region 1, Idaho, 1982 to 1986.

Lake	Year	Anglers inter-viewed	Hours fished	Catch rate (fish/hour) RB	CT	BK	BN	KO	Combined catch rate
Hauser	1982	128	295	0.18	--	0.01	--	--	
	1983	86	126	0.64	--	0.01			0.65
	1984	75	194	0.46	--	--	--	--	0.47
	1985	42	120	0.32	0.02	--	--	--	0.33
	1986	116	343	0.33	--	--	--	--	0.33
Jewell	1982	28	98	--	0.17	--	--	0.04	0.21
	1983	28	26	--	0.19	--	--	--	0.19
	1984	11	9	--	0.44	--	--	--	0.44
	1985	3	6	--	0.67	--	--	--	0.67
	1986	--	--	--	--	--	--	--	
Kelso	1982	43	134	0.44	--	--	0.01	--	0.45
	1983	73	163	0.85	--	--	--	--	0.85
	1984	85	186	1.19	--	--	--	--	1.19
	1985	--	--	--	--	--	--	--	
	1986	21	56	0.75	--	--	--	--	0.75
Mirror	1982	133	458	--	0.03	1.31	0.04	--	1.38
	1983	143	498	--	--	1.30	0.03	0.02	1.35
	1984	138	353	--	0.16	0.24	0.01	--	0.42
	1985	35	175	--	--	0.11	0.10	--	0.21
	1986	20	43	--	--	0.21	0.09	0.02	0.32
Spirit	1982	124	348	0.05	0.01	--	--	0.28	0.34
	1983	121	258	0.12	--	0.01	--	0.69	0.82
	1984		--	--	--	--	--	--	--
	1985		--	--	--	--	--	--	--
	1986	30	27	0.15	--				0.15
Lower Twin	1983	99	365	0.19	0.01	0.01	--	--	0.21
	1984	40	40	0.52	--	--	--*	--	0.52
	1985	43	85	0.22	--		--	--	0.22
	1986	35	43	0.14	--	--	-	--	0.14
Round	1984	10	35	0.37	0.37	--	--	--	0.74
	1985	15	60	0.25	--	0.35	--	--	0.60
	1986								
Hayden	1986	76	183	0.04	0.02	--	--	--	0.06

We continued to use data from conservation officer census, historic census and tag returns to further evaluate the program in 1986. Catchable returns from tagging data were corrected for noncompliance bias by using reward tags as described by Rieman (1983). Rate of return was estimated on four lakes in 1984, five lakes in 1985 and on six in 1986 (Table 13). Return rates ranged from 6% to 25% in 1986 and the mean rate (16.4%) was greater than that in 1985 (9.6%), but still substantially lower than in 1984 (29.4%). Average catch rate for study lakes was similar between 1984 and 1985 (0.30 and 0.34 fish/hour, respectively), but the mean for lakes surveyed in 1986 was 0.56. Stocking rates for lakes in 1986 were consistent with models developed for evaluating stocking, catch and return rates. The relationship between total effort and return to creel was again evaluated, incorporating data collected in 1986. The regression of return to creel on total effort yielded an r^2 of 0.80, which was somewhat lower than that in 1985 ($r^2 = 0.88$), but still statistically significant ($p<0.03$). Return to creel was also regressed on total effort and morphoedaphic index (MEI) and on MEI alone. Values for r^2 were 0.16 and 0.23, respectively, and did not show any promise of predictive value.

Additional data are obviously needed in the evaluation of the catchable trout program, especially with respect to factors influencing return to creel. Not only would we like to better predict return to creel on a given system, but a definition of "acceptable" rates of return would provide a consistent basis for identifying viable programs. Refining the stocking model will help to efficiently provide catch rates consistent with goals of the five-year plan for lakes of Region 1. Catch rates for hatchery rainbow on lakes evaluated in 1986 exceeded the goal of 0.5 fish/hour on average (0.58), but a better understanding of factors influencing catch rates is still needed. Where fishing pressure or return to creel warrant special programs, stocking rates could be increased. In systems where fishing pressure and return to creel are consistently very low, efforts should be made to direct more pressure to the lake or stocking should be reduced or eliminated. In the future, stocking requests will be modified to be consistent with these goals.

Lake Surveys

New Species Evaluation

The status of new species introduced in several lakes in Region 1 was evaluated in 1986. Electrofishing was used to sample largemouth bass in McArthur and Kelso lakes and smallmouth bass in Hayden Lake. Domestic Kamloops rainbow and channel catfish were collected in Hayden and Cocolalla lakes, respectively, with gill nets. Kamloops rainbow in Hayden Lake were also sampled by hook and line.

Table 13. Lake area, catchable rainbow trout stocking level, catch rate, return to creel, and fishing pressure on lakes in Region 1, Idaho, 1984 to 1986.

Lake	Area		Current stocking rate		Estimated	Catch rate	Fishing pressure	Total
	Acre	Ha	#/acre	#/ha	% return	(fish/hour)	(hours/acre)	hours
Robinson	50	20	159	392	10[b]	0.57	480	24,025
Brush	29	12	136	329	12[b]	0.40	1,225	35,54
Lower Twin	300	121	18	45	20	0.18	132	39,742
Upper Twin	500	202	8	20	14[b]	0.18	35	17,401
Fernan	392	158	60 (75)	148	50[a]	0.14 (0.34)	160	56,000
Hauser	554	224	20 (25)	49 (63)	35[a]	0.26 (0.24)	90	50,000
Spirit	1,620	656	6 (7)	15(18)	50[a]	0.07	43	70,000
Pend Oreille R.	2,956	1,196	3	8	6[a]			
Cocolalla	770	312	20 (26)	49 (65)	6[a]	0.22 (0.22)	--	--
Round	52	21	100 (96)	247 (239)	80+[a]	0.83 (0.20)	252	13,000
Smith	38	15	55	137	20	0.80	344	13,096
Bonner	23	9	135	333	25	1.00	--	--
Kelso	61	25	165	403	--	0.70	312	19,060
Elsie	20	8	150	375	--	--	--	--
Glidden	25	10	121	302	--	0.46	--	--
Porcupine	13	5	77	200	--	0.35	--	--
Dismal	10	4	49 (49)	122 (122)	--	--	--	--
Stoneridge	30	12	100	250	--	0.29	--	--
Jewell	301	122	10	24	11	0.28	38	11,508
Freeman	40	16	100	250	6	0.83	--	--

[a]Return to creel data from 1984.
[b]Return to creel data from 1985..
()stocking rate in 1985 where 1984 data are used to estimate return to creel.

R9FS231 BIN

McArthur Lake. Electrofishing for largemouth bass and black crappie was attempted in September of 1986, but heavy macrophyte growth precluded effective sampling. Bass and crappie were stocked in 1983 and 1984, respectively, to provide more angling opportunity in the lake. Small perch and pumpkinseed were in great abundance throughout the areas sampled, but no crappie and only one largemouth was caught. A more effective evaluation of their performance could be done in May, prior to heavy weed growth, but the lake may be currently unsuited to bass and crappie angling during the general season. Fishing is closed on McArthur Lake until July 1 each year to enhance production of Canadian geese. Macrophytes have heavily congested the lake by the July opener, making boat angling difficult to impossible. The lake appears to be rapidly approaching dystrophy and may only provide marginal bass and crappie habitat now because of macrophyte densities, shallow depth and declining water quality. Northern pike might perform well in McArthur Lake and provide a winter ice fishery, but that option does not appear to be presently acceptable due to downstream concern for Canadian waters.

Kelso Lake. Largemouth bass and bluegill were sampled in Kelso Lake during September to evaluate the status of fish released in 1983 and 1982, respectively. Mean total length of largemouth was 205 mm and ranged from 125 to 435 mm (Fig. 15). Average length at age was 140 mm (age-2+), 204 mm (age-3+) and 266 mm (age-4+). These data correspond closely with those for growth of largemouth in other northern Idaho lakes (Rieman 1987). Mean total length of mature fish was 278 mm and given observed growth rates and age at maturity, the standard 305 mm (12 inch) minimum size limit should provide a trophy component in the fishery.

The sex ratio of mature fish captured were 83% females. Fish, zooplankton and odonatans made up the diets of bass sampled and 50% of the stomachs were empty.

Only four bluegill were collected in Kelso Lake, and they ranged in length from 55 to 85 mm (mean = 75 mm). These fish were not aged, but appear to be progeny of the initial release of 400 fish. The reason for the low catch of bluegill in Kelso Lake was unexplained. We do not know if their abundance is low due to poor reproductive performance, heavy predation by bass overharvest due to this "unique" fish in Region 1, or if they were simply undersampled.

Cocolalla Lake. Channel catfish were collected in Cocolalla Lake during the latter part of October 1986. Mean total length of all fish collected was 217 mm and ranged from 135 to 315 mm (Fig. 16). Mean length at age was 186 mm (age-1+), 240 mm (age-2+) and 289 mm (age-3+). These growth rates are much better than average for most western waters (Carlander 1970). Stomach contents were composed mostly of chironomids and fish were generally in good condition. No mature fish were sampled, so they appear to have at least four seasons of growth prior to maturing. Given their current growth rates, channel cats may reach 350 mm in total length before any mature at age-4+. Growth rates and condition of catfish sampled appear to demonstrate the potential of Lake Cocolalla to provide an unique quality fishery in northern Idaho.

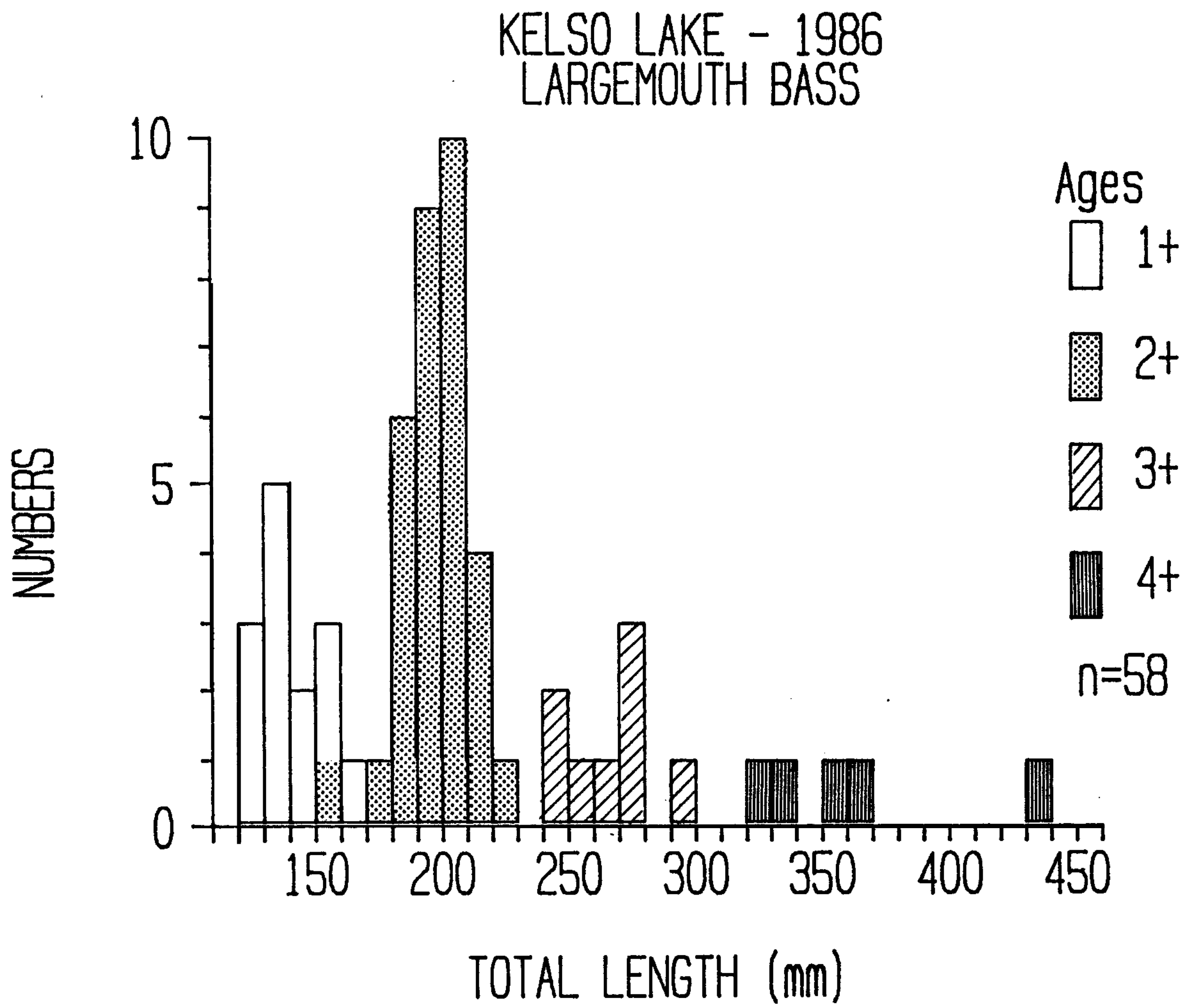


Figure 15. Length and age composition of largemouth bass collected at Kelso Lake, Bonner County, Idaho, 1986.

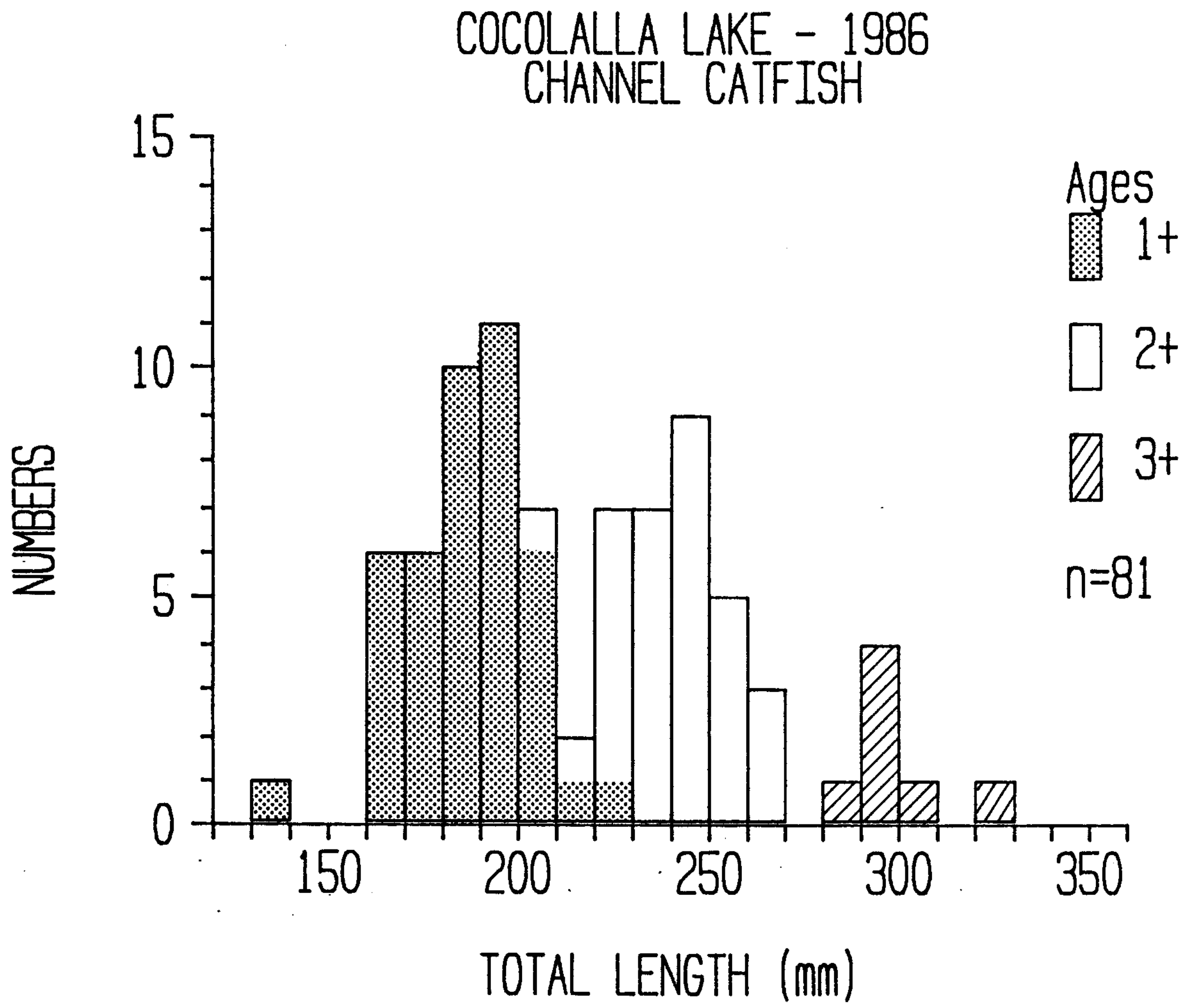


Figure 16. Length and age composition of channel catfish collected at Cocolalla Lake, Bonner County, Idaho, 1986.

Hayden Lake. Trout management on Hayden Lake continued in 1986 to emphasize the use of domestic Kamloops rainbow trout fingerlings and somewhat restrictive regulations (3 fish; none <14") to provide better than average angling for large trout. Releases of rainbow fingerlings in 1986 included 158,625 domestic Kamloops and 24,335 wild Gerrard stock fish (Table 14). Kamloops have the potential to grow about 20 mm/month in Hayden Lake, but their early age at maturity caused concern about their availability to anglers after reaching legal size. Post-spawning mortality is typically high on hatchery fish and their performance was evaluated in Hayden Lake in 1986. Mean size of rainbow caught during June and August was 48.0 cm with lengths ranging from 20 to 74 cm (Fig. 17). Average total length of domestic Kamloops caught in December (spawning fish) was 56.4 cm and mean weight was 2.0 kg. Age composition favored males (64%) in the mature fish, but mean length of males and females was virtually identical (56 cm).

Domestic Kamloops ate primarily Mysis during the spring through fall, providing excellent growth rates in Hayden Lake. Mean size of the Kamloops approached 2 kg after Just two seasons in the lake, and 3 kg at three seasons. Even fish maturing at age-2+ are available to anglers (legal size) throughout their second season in the lake. This stock has demonstrated excellent potential for providing a consistent trophy fishery in an urban lake that receives heavy angling pressure. Young age at maturity of the Kamloops does not appear to reduce their availability to anglers and their rapid growth and fairly large size in the catch have made them a very popular component of Hayden Lake's trophy fisheries.

Wild Gerrard stock rainbow fingerlings were again released into Hayden Lake in 1986.. These fish were Duncan River (British Columbia) stock obtained as eggs from the Ennis National Fish Hatchery in Montana and reared at the Hagerman State Fish Hatchery. The first return of Gerrard stock rainbow to Yellowbanks Creek should have occurred in 1986 (from fingerlings released in 1984), with larger runs expected from 1987 to 1989. The use of this strain and Yellowbanks Creek as a brood source is now contingent upon disease certification. Since all fish must be tested during egg-taking operations, an interim facility must be available to hold all eggs until this fish strain is cleared.

Smallmouth bass are doing very well in Hayden Lake, with the establishment of several strong year classes. The final release of 4,000 smallmouth was made in September 1986, and an attempt was made in late September to evaluate the status of the population by electrofishing. Many bass were caught in smaller size classes (<200 mm), but water temperatures had cooled and larger fish were too deep to effectively sample. Sampling will be conducted again in May 1987 to evaluate growth, diet, length and age at maturity and natural mortality so regulations can be developed before the opener in 1988. There appears to be strong public support for restrictive regulations and Hayden Lake has the potential to offer a unique trophy experience in an urban fishery.

Surveys. The lowland lakes survey program was continued in 1986, and fishery and limnological surveys were conducted on six and three lakes, respectively. To date, physical data have been collected on 27 lakes (Table 15). Fishery surveys should be completed for all 27 lakes by 1988.

Table 14. Number and average length of domestic Kamloops and wild Gerrard stock rainbow trout released into Hayden Lake, Idaho, 1983 to 1986. Length measurements were derived from a table that converts the number of fish/pound to average length.

Date	Number released	Average length (mm)	
1983			
6 2 2 / 8 3	115,000	96	Trout Lodge Inc., WA -- egg take
8/5/83	17,490	89	both lots infected with IHN
	132,490		
10/4/83	51,450	157	Trout Lodge Inc., WA -- egg take
10/18/83	44,100	157	Trout Lodge Inc., WA -- egg take
	95,550		
TOTAL	228,040		
1984			
4/23 to 5/18/84	88,445	76	Gerrard stock from Pend Oreille Lake fish, stocked in Yellowbanks Creek for egg bank purposes
7/23/84	260,400	87	Trout Lodge. Inc., WA -- egg take
TOTAL	348,845		
1985			
3 / 1 6 / 8 5	3,531	107	Gerrard stock from Pend Oreille Lake fish, stocked in Yellowbanks Creek for egg bank purposes
7/3/85	7,470	93	Trout Lodge Inc., WA -- egg take
7/8/85	4,565		Trout Lodge Inc., WA -- egg take
9/16/85	156,100		Trout Lodge Inc., WA -- egg take
TOTAL	171,166		
1986			
5/28/86	81,000	96	Trout Lodge Inc., WA -- egg take
5/29/86	77,625	96	Trout Lodge Inc., WA -- egg take
8/7/86	24,335	134	Duncan R. Strain from Ennis NFH, Montana, hatched and reared at Hagerman SFH, Idaho
TOTAL	182,960		
GRAND TOTAL TO DATE	1,063,561		

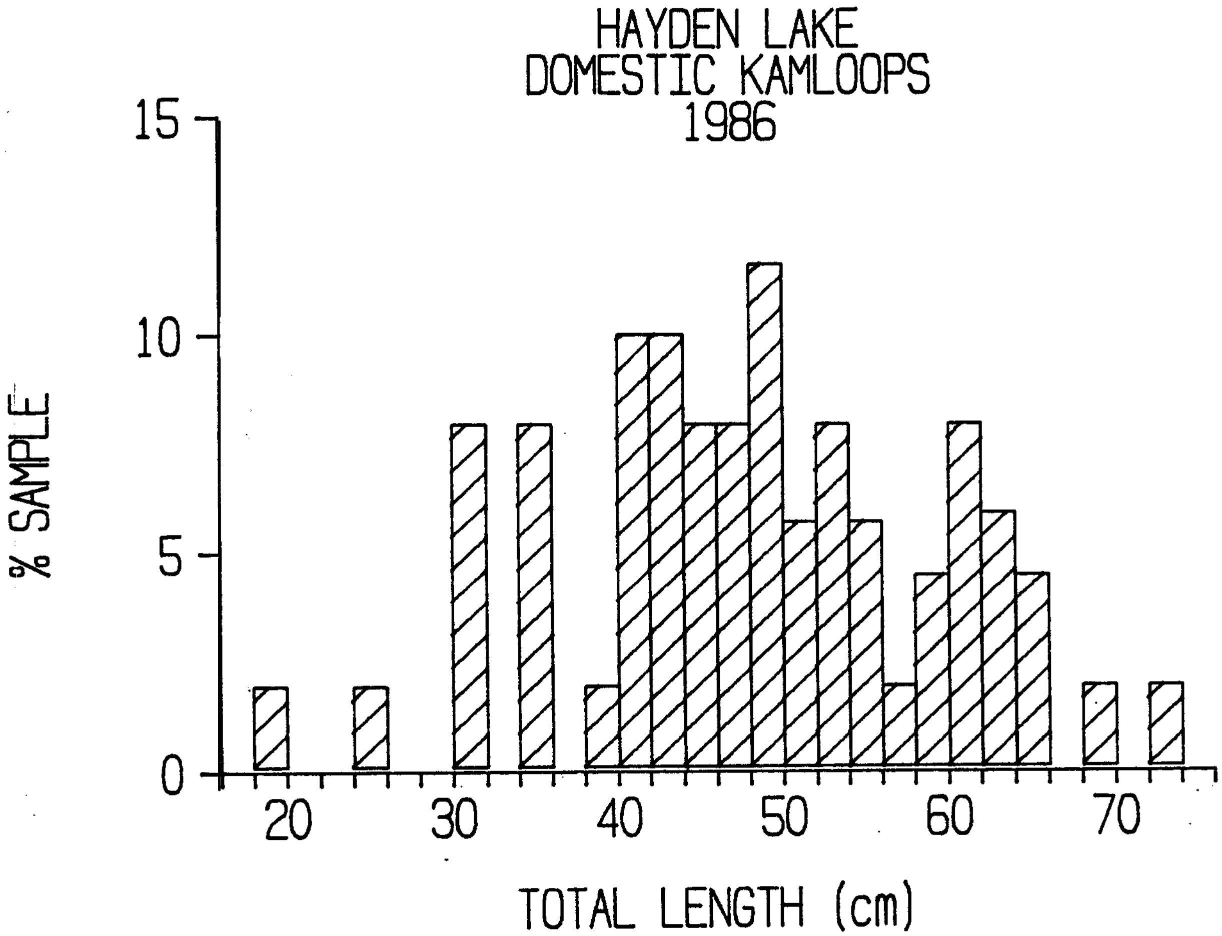


Figure 17. Length frequency of rainbow trout caught by gill net and hook and line in Hayden Lake, Idaho, 1986.

Table 15. Physical, chemical and potential Limiting factors for salmonids in northern Idaho Lowland Lakes.

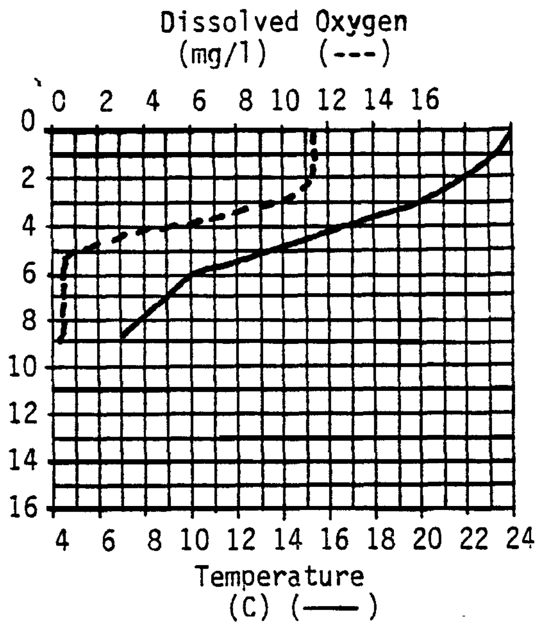
Lake	Depth (m)		Conductivity	MEI	Secchi	Summer Limitation factors for salmonids	
	$\bar{x}$	(max)	UMHO/L		(m)	Low O^2	Hi h temperature
Anderson	3.7	(5.2)	79	3.62	2.4	moderate	moderate
Black	4.6	(6.0)	18	4.24	3.8	high	extreme
Blue	4.5	(6.4)	63	2.35	2.7	moderate	moderate
Blue (Priest R.)	3.4	(3.7)	54	2.68	2.5	Low	extreme
Brush	3.8	(5.5)	58	2.55	3.0	moderate	high
But Irun	1.3	(2.5)	--	--	--	extreme	extreme
Chatcolet	3.4	(10.7)	51	2.50	3.8	moderate	high
Chase	2.4	(3.7)	35	2.48	2.5	low	extreme
Cocollala	8.0	[13.7)	64	1.35	3.0	moderate	moderate
Coeur d'Alene	24.3	(61.0)	50	0.35	4.0	Low	Low
Fernan	3.0	(7.6)	39	2.19	3.6	Low	extreme
Freeman	1.8	(5.5)	81	7.73	2.5	moderate	high
Gamble	4.1	(11.4)	110	4.51	4.5	high	extreme
Granite	20.8	(40.0)	235	1.91	4.5	high	extreme
Hauser	6.1	(12.2)	45	1.24	5.7	moderate	extreme
Hayden	46.2	(64.6)	60	0.22	8.1	Low	Low
Jewel	5.9	(10.5)	53	1.53	1.6	moderate	high
Kelso	7.7	(14.8)	97	2.14	5.8	moderate	moderate
McArthur	1.0	(3.0)	161	29.42	2.0	Low	extreme
Mirror	15.9	(18.5)	69	0.73	7.0	moderate	Low
Rose	2.7	(5.2)	40	2.48	3.2	high	extreme
Round	5.7	(10.4)	69	2.06	2.5	moderate	Low
Smith	7.0	(12.0)	104	2.53	3.8	moderate	Low
Spirit	10.5	(28.0)	28	0.46	3.6	moderate	Low
Thompson	4.0	(7.0)	92	3.85	3.5	moderate	moderate
Lower Twin	4.6	(10.4)	23	0.84	5.3	moderate	moderate
Upper Twin	2.4	(5.0)	24	1.71	5.0	low	extreme

Jewel Lake. Jewell Lake is currently in need of a major management effort. Extremely abundant yellow perch have limited the success of the cutthroat trout program. Fish populations were again sampled on Jewel Lake in July 1986. Mean size of cutthroat trout was somewhat greater in 1986 (309) than in 1983 and average size of perch had declined (Fig. 18). Perch ranged from 139 to 288 mm, with at least four age classes present (Fig. 19). A more complete evaluation of growth of perch and cutthroat will be made in 1987. Consideration should be given to a rotenone treatment and re-establishment of a "salmonid only" lake, or an effort could be made to establish a diversified spiny ray fishery. Jewell Lake has the potential to produce salmonid fishing similar to Mirror Lake and has been treated in the past. The presence of perch, however, indicates that illegal introductions of spiny ray fish would most certainly occur again, limiting success of the trout program to a few years. Current effort data indicate anglers prefer trout, however, so a spring stocking of catchable rainbow trout, combined with enhancement of the spiny ray fishery, may provide the best overall management solution. If approved in the new five-year plan, potential spiny ray fish could include largemouth bass, northern pike, black crappie and bluegill sunfish.

Fernan Lake. Fish populations were sampled by gillnetting in July 1986. Yellow perch, hatchery rainbow and crappie were the three most abundant species sampled, respectively. Mean size of yellow perch sampled was small (174 mm) and their length ranged from 142 to 209 mm (Fig. 20). Crappie averaged 208 mm and ranged in length from 172 to 222 mm. Length distribution of the crappie catch was weighted toward the larger size classes and smaller fish may have been undersampled (Fig. 21). Evaluation of age and growth of yellow perch and crappie will be conducted in 1987 to further assess the status of their populations.

A more complete description of all lowland lakes in Region 1, with management recommendations, will be prepared when both aspects of the survey procedure have been completed. Limnological and biological parameters of lakes surveyed in 1986-are reported here (Figs. 20 to 32).

Jewell Lake
7-11-86



Parameter	Value	Comments
Secchi (m)	1.6	
Conductivity (um/cm2)	53	
Mean depth (m)	5.9	
MEI	1.53	

Net Collections

Species	n	Length (mm) $\bar{x}$	Length (mm) range
	Surveyed 8-83		
Cutthroat	28	279	181-375
Perch	49	209	151-280
	Surveyed 7-86		
Cutthroat	4	309	193-385
Perch	59	185	139-288
Kokanee	4	209	184-229

Stocking History

Year	Species	Size	Number
1979	C1	1	28,426
1981	C1	2	4,350
	C1	1	20,000
	KL	1	1,572
1982	C2	2	3,500
	KL	1	1,672
1983	C2	3	480
	KL	1	2,264
1984	C2	3	175
	C2	2	5,066
	KL	1	1,660
1985	KL	1	2,998
1986	R1	3	2,007
	R4	3	1,000

Figure 18. Limnological and biological parameters, and stocking history of Jewel Lake, Bonner County, Idaho.

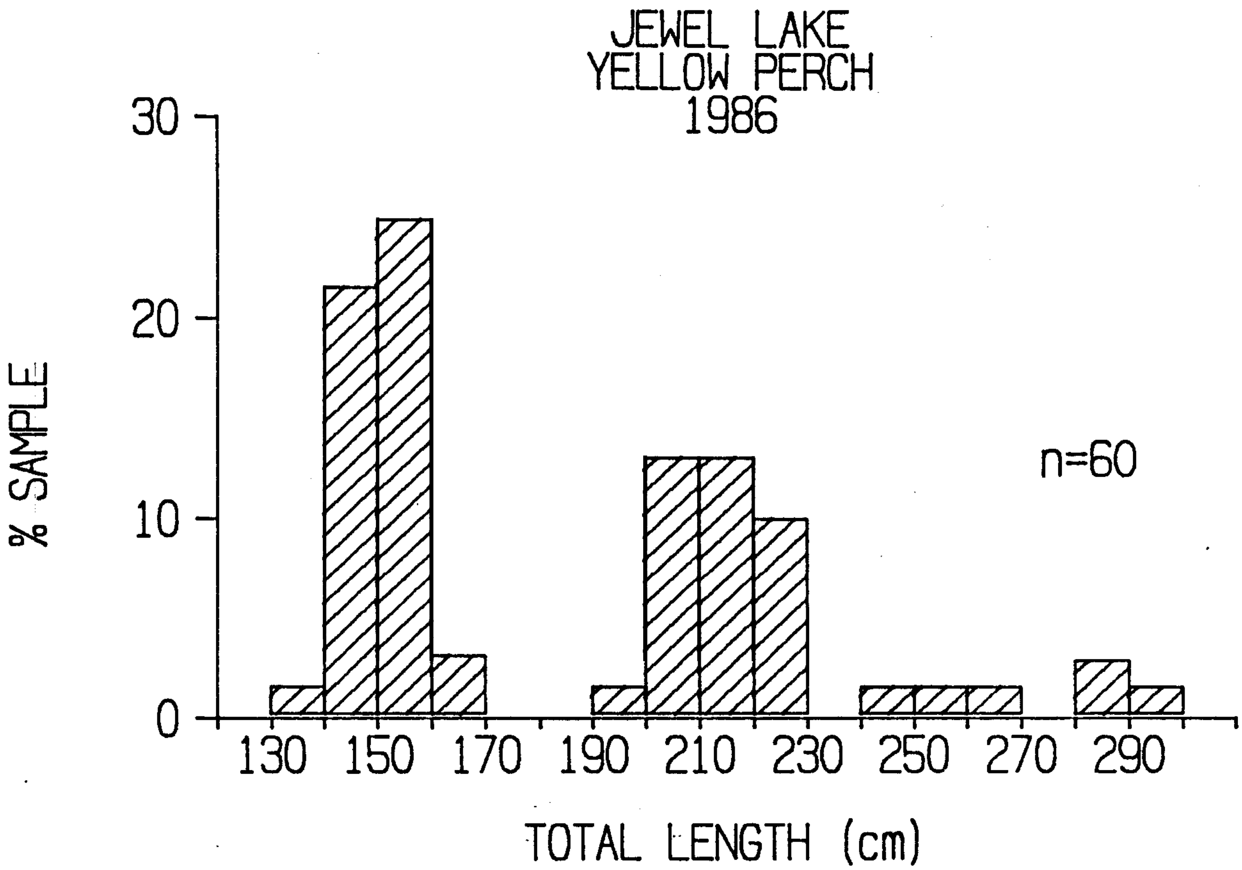
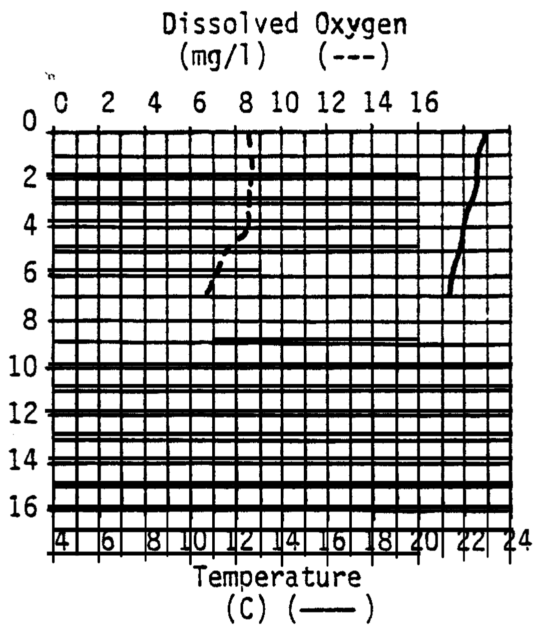


Figure 19. Length frequency of yellow perch collected in Jewel Lake, Bonner County, Idaho, 1986.

Fernan Lake
7-8-86



Parameter	Value	Comments
Secchi (m)	3.6	
Conductivity (um/cm^2)	39	
Mean depth (m)	3.0	
MEI	2.19	

Net Collections

Species	n	Length (mm) $\bar{x}$	Length (mm) range
Hatchery R1	72	250	212-355
Largemouth Bass	5	224	161-306
Channel Catfish	3	178	166-190
Cutthroat Trout	5	193	187-203
Yellow Perch	304	174	142-209
Crappie	39	208	172-222

Stocking History

Year	Species	Size	Number
1979	R1	3	17,530
	R1	1	27,144
1980	R1	3	29,160
1981	R1	3	10,460
	KL	1	3,150
1982	R1	3	25,460
	FC	2	1,020
1983	R1	3	36,120
1984	R1	3	25,000
1985	R1	3	29,240
1986	R1	3	16,460
	R4	3	12,575

Figure 20. Limnological and biological parameters, and stocking history of Fernan Lake, Kootenai County, Idaho.

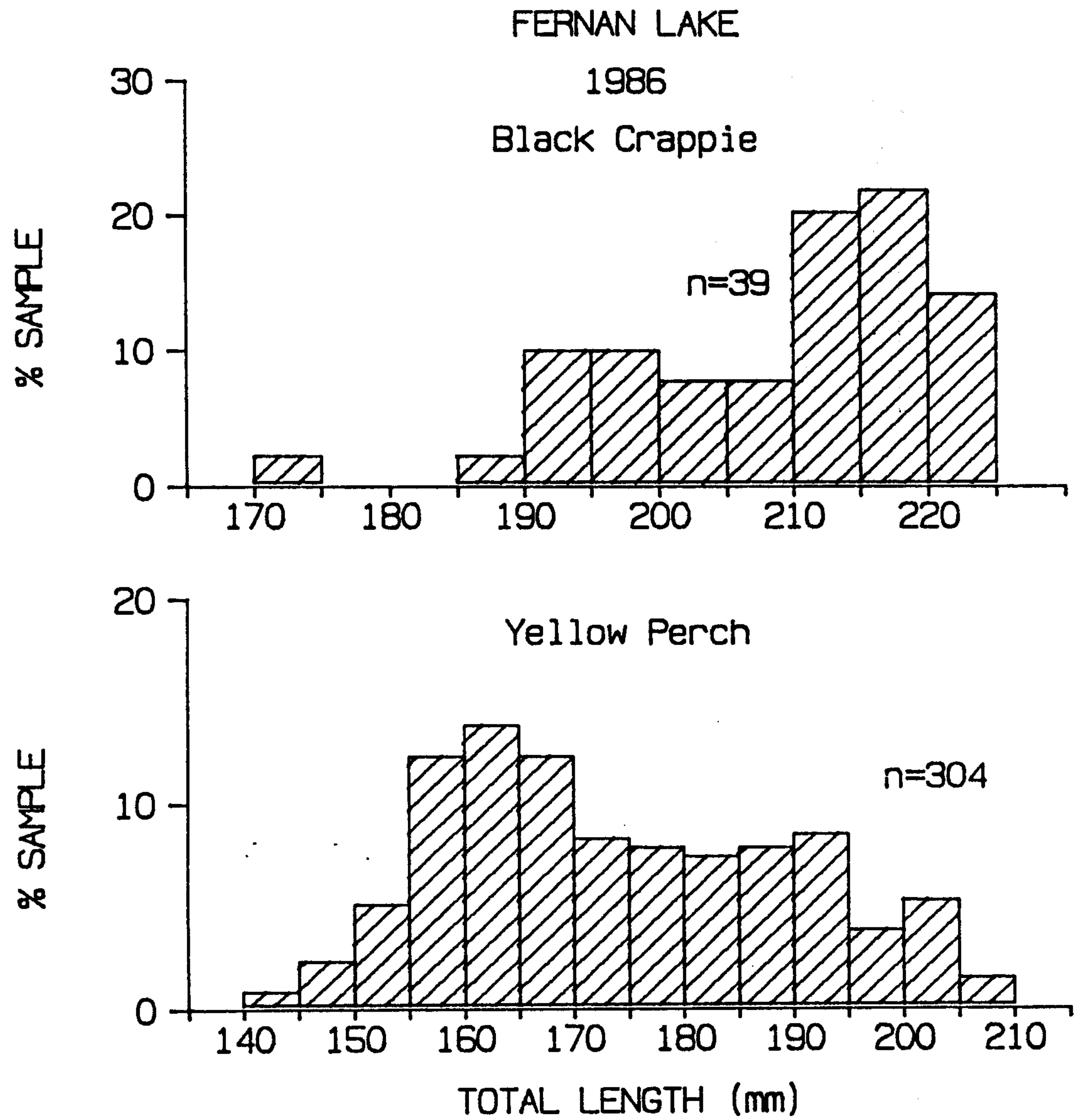
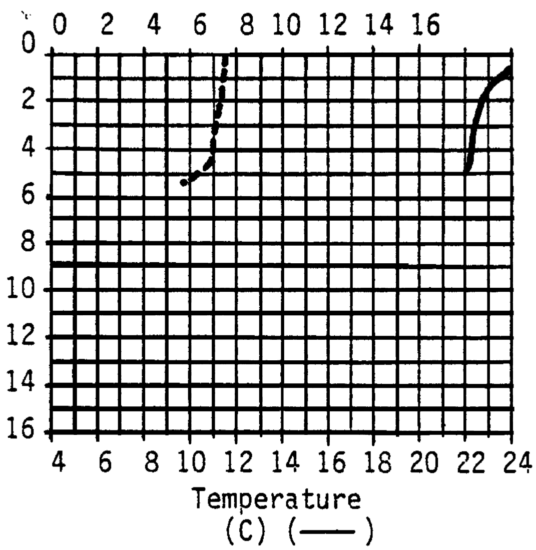


Figure 21. Length distribution of yellow perch and crappie collected by gill net in Fernan Lake, Kootenai County, Idaho, 1986.

Anderson Lake



Parameter	Value	Comments
Secchi (m)	2.4	
Conductivity (um/cm2)	79	
Mean depth (m)	3.7	
MEI	3.62 8-25-86	

Net Collections

		Length (mm)	
Species	n	$\bar{x}$	range

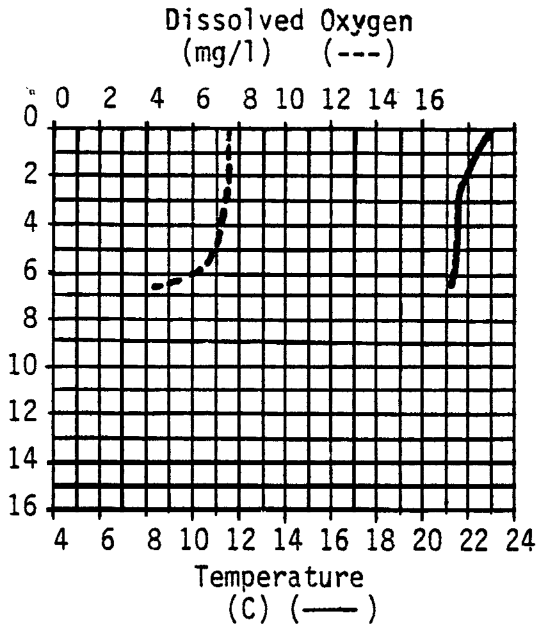
Not Netted

Stocking History

Year	Species	Size	Number
1979	No Stocking		
1980	" "		
1981	" "		
1982	" "		
1983	" "		
1984	" "		
1985	" "		
1986	" "		

Figure 22. Limnological and biological parameters, and stocking history of Anderson Lake, Kootenai County, Idaho.

Blue Lake
8-25-86



Parameter	Value	Comments
Secchi (m)	2.7	
Conductivity (um/cm2)	63.3	
Mean depth (m)	4.5	
MEI	2.35 8-25-86	

Net Collections

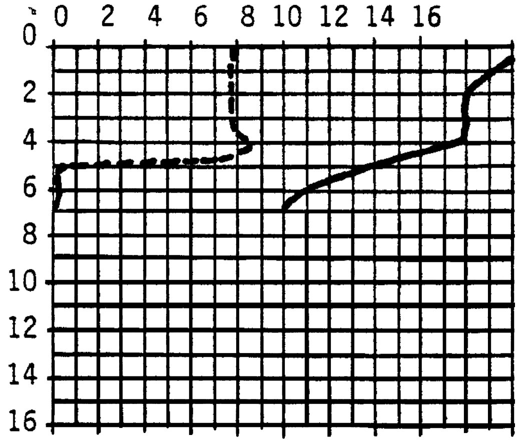
		Length (mm)	
Species	n	$\bar{x}$	range

Stocking History

Year	Species	Size	Number
1979	--	--	--
1980	--	--	--
1981	--	--	--
1982	--	--	--
1983	--	--	--
1984	--	--	--
1985	--	--	--
1986	--	--	--

Figure 23. Limnological and biological parameters, and stocking history of Blue Lake, Kootenai County, Idaho.

Thompson Lake
8-23-86



Parameter	Value	Comments
Secchi (m)	3.5	
Conductivity (um/cm2)	92	
Mean depth (m)	4.0	
MEI	3.85	
	8-23-86	

Net Collections

Species	n	Length (mm) $\bar{x}$	range

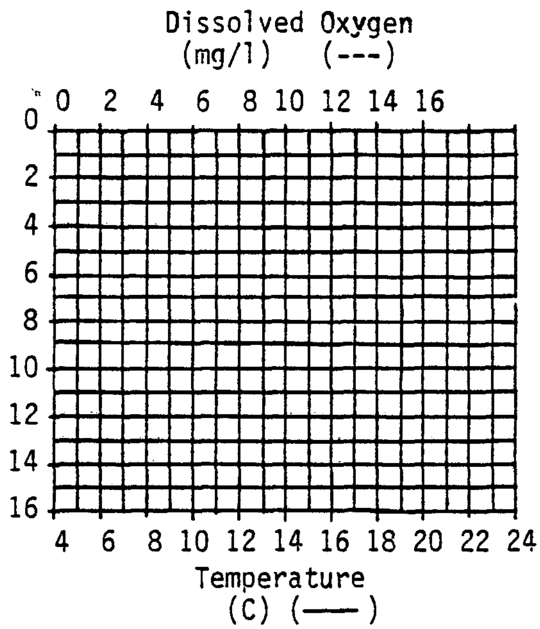
Not Netted

Stocking History

Year	Species	Size	Number
1979	--	--	--
1980	--	--	--
1981	--	--	--
1982	--	--	--
1983	--	--	--
1984	--	--	--
1985	--	--	--
1986	--	--	--

Figure 24. Limnological and biological parameters, and stocking history of Thompson lake, Kootenai County, Idaho.

Sinclair Lake
6-20-86



Parameter	Value	Comments
Secchi (m)		
Conductivity (um/cm2)		
Mean depth (m)		
MEI		
	Not Surveyed	

Net Collections 6-2-86

Species	n	Length (mm) $\bar{x}$	Length (mm) range
Yellow Perch	101	166	140-211

Stocking History

Year	Species	Size	Number
1979	RB	3	3,014
1980	RB	3	2,800
1981	RB	3	1,025
1982	No Stocking		
1983	BK	2	58,000
1984	No Stocking		
1985	No Stocking		
1986	No Stocking		

Figure 25. Limnological and biological parameters, and stocking history of Sinclair Lake, Boundary County, Idaho.

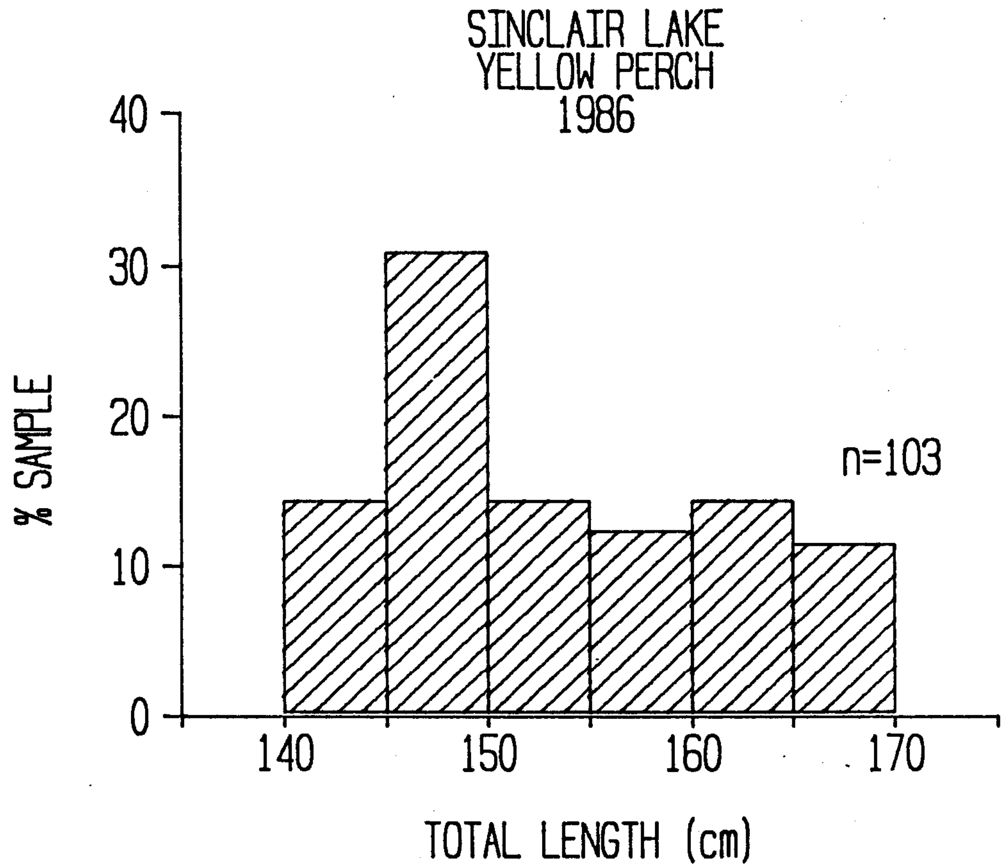
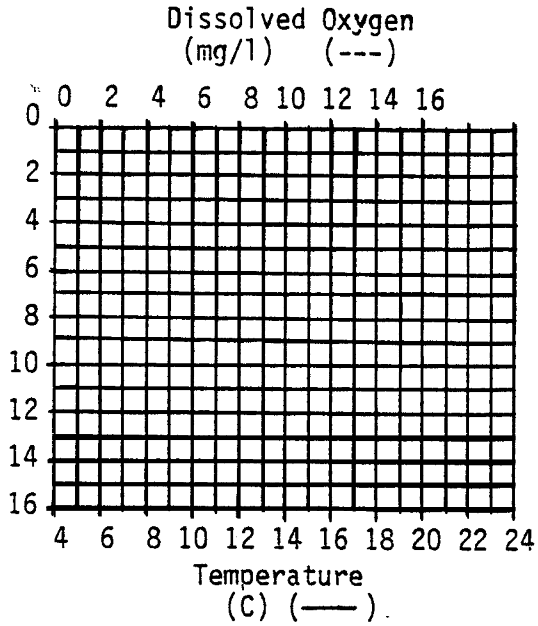


Figure 26. Length composition of yellow perch collected in Sinclair Lake, Boundary County, Idaho, 1986.

Bonner Lake



Parameter	Value	Comments
Secchi (m)		
Conductivity (um/cm2)		
Mean depth (m)		
MEI		

Not Surveyed

Net Collections 6-21-86

Species	n	Length (mm) $\bar{x}$	Length (mm) range
Pumpkinseed	46	114	102-131
Hatchery R1	32	--	---

Stocking History

Year	Species	Size	Number
1979	RB	3	3,807
	KM	1	5,080
1980	RB	3	4,130
1981	RB	3	4,755
1982	R1	3	3,180
1983	R1	3	1,505
1984	R1	3	3,020
1985	R1	3	2,962
1986	R1	3	2,015
	R4	3	1,000

Figure 27. Limnological and biological parameters, and stocking history of Bonner Lake, Bonner County, Idaho.

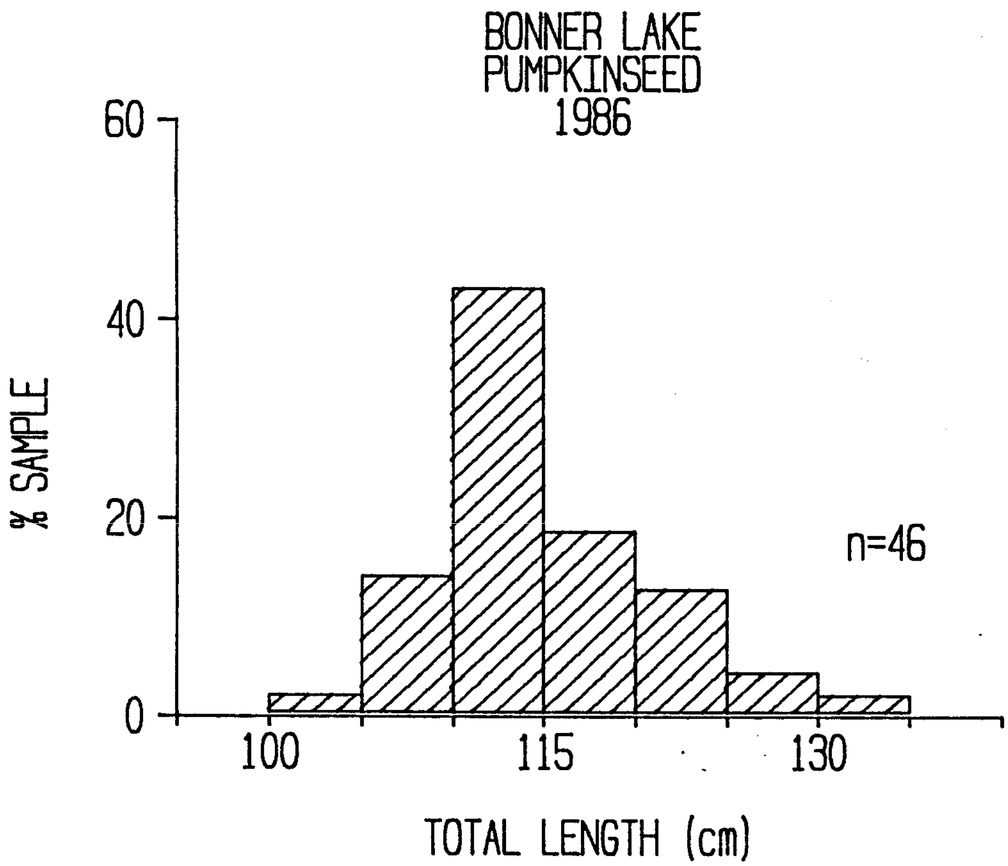
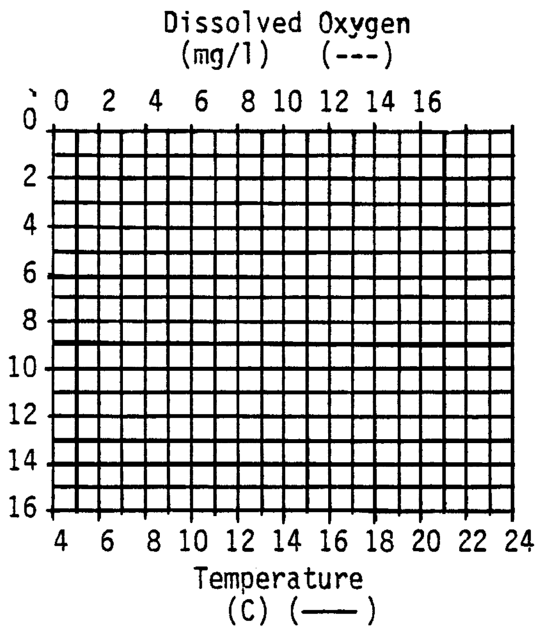


Figure 28. Length composition of pumpkinseed sunfish collected in Bonner Lake, Bonner County, Idaho, 1986.



Parameter	Value	Comments
Secchi (m)		
Conductivity (um/cm2)		
Mean depth (m)		
MEI	Not Surveyed	

Net Collections 7-24-86

Species	n	Length (mm) $\bar{x}$	Length (mm) range
Cutthroat	15	230	156-385

Stocking History

Year	Species	Size	Number
1979	KM	1	5,062
1980	No Stocking		
1981	No Stocking		
1982	KM	1	3,040
1983	C3	1	2,162
1984	K1	1	2,268
1985	No Stocking		
1986	C2	1	2,500

Figure 29. Limnological and biological parameters, and stocking history of Solomon Lake, Bonner County, Idaho.

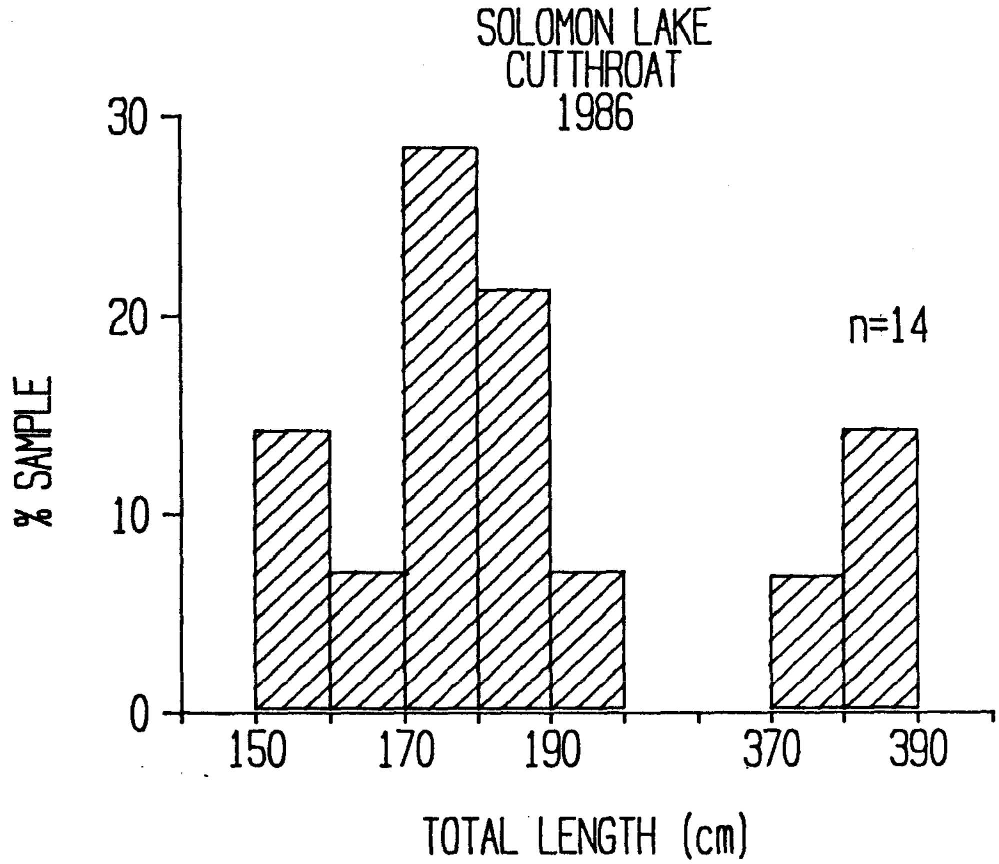
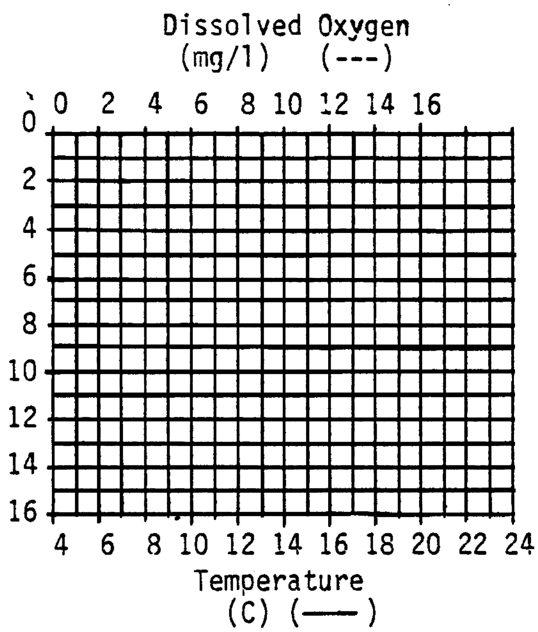


Figure 30. Length composition of cutthroat trout collected by gill net in Solomon Lake, Bonner County, Idaho, 1986.

Dawson Lake



Parameter	Value	Comments
Secchi (m)		
Conductivity (um/cm2)		
Mean depth (m)		
MEI		

Not Surveyed

Net Collections 7-23-86

Species	n	Length (mm) $\bar{x}$	Length (mm) range
Bullhead	34	253	199-277
Perch	14	190	173-208
Bluegill	1	71	71
Crappie	11	204	155-260
Largemouth	5	272	182-355

Stocking History

Year	Species	Size	Number
1979	no stocking		
1980	"	"	
1981	"	"	
1982	"	"	
1983	"	"	
1984	"	"	
1985	"	"	
1986	"	"	

Figure 31. Limnological and biological parameters, and stocking history of Dawson Lake, Bonner County, Idaho.

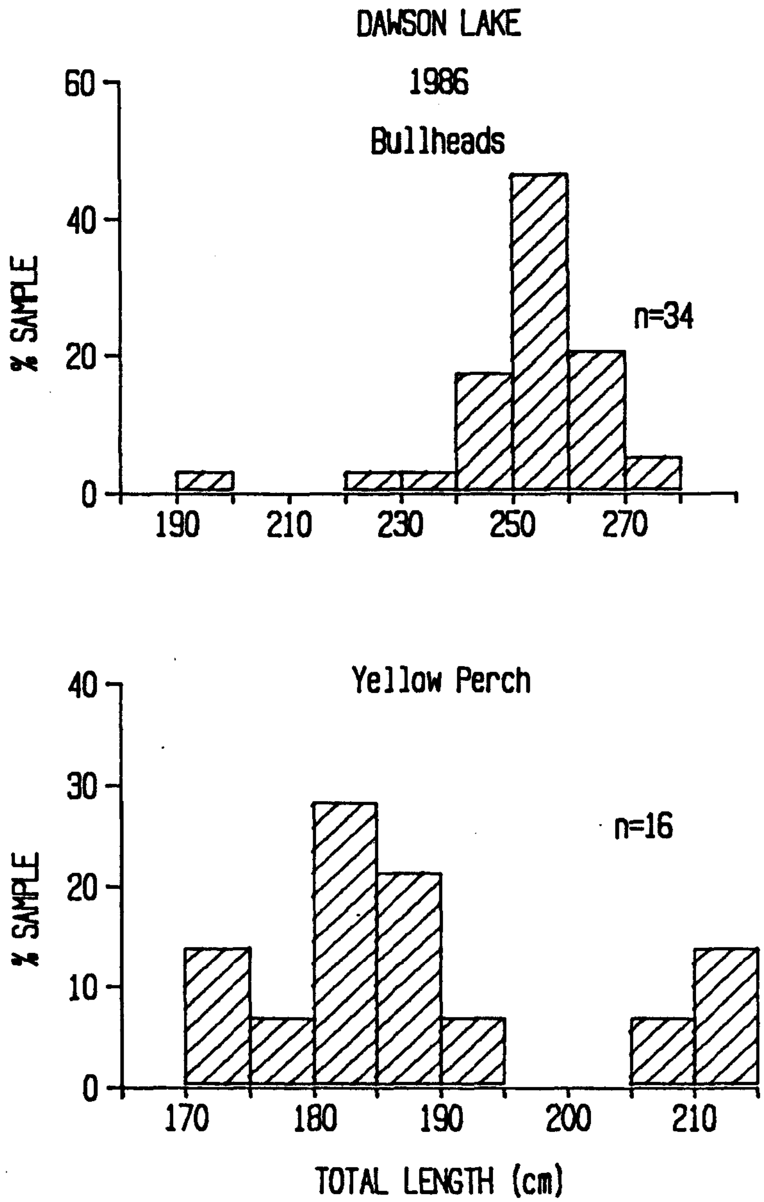


Figure 32. Length composition of bullheads and yellow perch collected by gill net in Dawson Lake, Bonner County, Idaho, 1986.

LITERATURE CITED

Bowles, E.C. 1986. Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho. ProJ. 85-339, Idaho Dept. Fish and Game. 41 p.

Carlander, K.D. 1969 Handbook of freshwater fishery biology Vol. I. Iowa State Univ. Press, Ames. 752 p.

LaBolle, L.D. 1981. Constraints of the laboratory environment on predator-prey systems in fishes pp. 24-32 in C.A. Simenstad and G.M. Cailliet eds. Fish Food Habits Studies, proceedings of the Third Pacific Workshop. Washington Sea Grant Publication, Seattle. 312 p.

Rieman, B.E. 1987. Fishing and population dynamics of largemouth bass (Micropterus salmoides) in select northern Idaho lakes. Ph.D. Dissertation, Univ. of Idaho. 133 p.

JOB PERFORMANCE REPORT

State of: Idaho

Project No.: F-71-R-11

Job No.: 1-c

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Title: Region 1 Rivers and Streams Investigations

Period Covered: July 1, 1986 to June 30, 1987

ABSTRACT

The routine officer creel census was continued in 1986 to provide information on fishing effort and harvest throughout the region. The hatchery catchable rainbow trout program was also evaluated, using the officer creel census and tag returns. The relationship between catch rate and stocking rate described in 1984 and 1985 was not consistent in 1986 and it appears factors other than stocking density affect catch rates of hatchery rainbow trout in streams.

An evaluation of the lower Spokane River trout population was continued in 1986. A summary of the results are as follows: (1) abundance of salmonids was high, but variable; (2) growth was good; (3) fishing mortality was low; (4) natural mortality was high; and (5) recruitment was highly variable. A detailed analysis of age structure, growth, mortality, seasonal distribution and movement will be reported by Underwood (in preparation).

Numbers of kokanee spawners in selected tributaries of the Kootenai River declined from the 1985 estimate, resembling estimates made in 1983 and 1984. An estimated 820 kokanee spawned in four tributaries (Boundary, Long Canyon, Parker and Smith creeks). Counts were conducted in early September in 1986 and may have missed the peak of the spawning activity.

Data to establish a staff gauge-discharge relationship for Grouse Creek were collected in 1986 and will continue to be collected until 1988. A staff gauge will be installed in Lightning Creek. Staff gauge-discharge data will be collected in 1987. Two additional streams (North Fork Grouse and Trestle creeks) are proposed for minimum instream flow requests for 1987.

In 1985, a sample of 326 westslope cutthroat trout was collected from the upper St. Joe River by anglers and length measurements were made. The average length of fish collected was 165 mm and 99% were 305 mm or shorter in length. Since most cutthroat in the St. Joe River appear to first mature at 305 to 330 mm, the potential to overharvest fish before they have the opportunity to spawn at least once seems high if restrictive regulations are not applied.

A project to evaluate the status of adfluvial trout and char populations in the Lake Pend Oreille drainage was continued in 1986. The project will attempt to quantify annual production of Gerrard rainbow trout smolts and also rainbow and bull trout spawning escapements from selected tributaries to Lake Pend Oreille. A detailed report of the first year's data collection will be presented in a separate document (Hoelscher, in preparation). A small-scale creel census was conducted on tributaries of Grouse and Lightning creeks to determine if angler harvest has a significant detrimental impact on smolt escapement to the lake. Absolute numbers of rainbow harvested were low, (40 from Lightning Creek and 23 from Grouse Creek), but taken in conjunction with limited habitat availability and apparent low spawning escapement, any harvest may be detrimental.

A project to evaluate quality and quantity of habitat and status of fish populations in selected tributaries of the lower Priest River was initiated in 1986. Data on species composition, relative abundance, age and growth characteristics and quality and quantity of habitat were collected and analyzed. Overwintering habitat in the lower portions of the study tributaries is limited, but the streams appear to support moderate populations of brook and cutthroat trout. Fishing pressure was relatively low.

Juvenile cutthroat trout abundance in Wolf Lodge Creek was again assessed in 1986 as a follow-up to the 1983 gas spill. Overall, cutthroat densities were higher than in 1985 but much lower than in 1984. Densities of brook trout of all ages have increased two to fivefold since 1984. Habitat surveys of lower Wolf Lodge Creek and lower Marie Creek were conducted to determine the quality and quantity of available rearing habitat for age-1+ and 2+ westslope cutthroat. Habitat in the undeveloped section of Wolf Lodge Creek downstream from the Schoolhouse Bridge is in better condition than habitat in the developed section upstream of the Schoolhouse Bridge.

Fish species composition, relative abundance and limnological characteristics of the Pend Oreille River above Albeni Falls Dam were evaluated in August 1986. Gill nets were fished and 12 species of fish (7 game and 5 nongame species) were collected. Nongame fish were more abundant than game fish.

Limnologically, the river is fairly homogeneous from the lake outlet to the dam and has adequate oxygen levels, but habitat is limited for salmonids by high isothermal water temperatures.

Authors:

Cynthia A. Robertson
Regional Fishery Biologist

Ned J. Horner
Regional Fishery Manager

OBJECTIVES

1. To determine relative abundance, density, and age and growth data for wild and hatchery stocks of trout in streams.

2. To determine availability of spawning, rearing and overwintering habitat and existing and potential use of stream habitat by trout.

3. To determine instream flow requirements for trout.

4. To determine impacts of land use activities on fish populations and stream habitat.

RECOMMENDATIONS

1. Use catchable trout stocking rates of 150 to 300 total fish/km on stream systems where wild recruitment is extremely limited or nonexistent.

2. Eliminate stocking of brown trout in the Spokane and Priest river systems until evaluations of their population status can be made.

3. Enforcement of catch-and-release regulations on the upper Coeur d'Alene River system and on the upper St. Joe River should be a Region 1 priority to ensure maximum compliance and best possible biological responses.

4. Educate the local angling public to the fishing opportunities that exist for brook trout and cutthroat trout in many of the lower Priest River tributaries. These populations seem largely underutilized.

5. Habitat in the lower portions of the East River and tributaries has been impacted by cattle grazing. Encourage landowners to fence the streams or otherwise restrict cattle access to the stream. Riparian vegetation could be restored and fish habitat improvement structures (drop logs, boulder clusters, etc.) should be used to increase pool habitat.

6. Brook trout in lower Wolf Lodge Creek may be a significant predator-competitor with juvenile cutthroat. Remove brook trout to enhance cutthroat production.

TECHNIQUES AND FINDINGS

Routine Census

The routine creel census data collection program implemented in 1984 was continued in 1986, with conservation officers collecting information from the main stem, North Fork and South Fork Coeur d'Alene rivers; main stem and North Fork St. Joe rivers; Priest and Kootenai rivers; and Teepee Creek. Estimated fishing effort ranged from 83 hours/km on Priest River to 656 hours/km on Teepee Creek (Table 1). Effort appeared to decline on several of the following waters from 1985 estimates: special regulation zones on the main stem and North Fork Coeur d'Alene rivers, South Fork Coeur d'Alene and Priest rivers and the general regulation zone of the St. Joe River. However, it should be noted that 1985 estimates were for the entire fishing season (Memorial Day to October 31), while 1986 estimates are from Memorial Day to August 31. In general, officers only collected data until the end of August in 1986; however in 1985, they were able to check anglers until after Labor Day. Effort in 1986 was nearly the same as estimated in 1985 for the main stem and North Fork Coeur d'Alene rivers and the St. Joe and Priest rivers during the Memorial Day to August 31 period. Apparently, effort did decline on the South Fork Coeur d'Alene River, which may be due to concern over heavy metal contamination or anglers' perceptions that the river simply did not provide a good fishery. This is corroborated by the reduced catch rates for hatchery rainbow trout (0.8 fish/hour in 1985; 0.35 fish/hour in 1986). Hatchery rainbow may have migrated out of the area following release and thus were not available to anglers fishing the South Fork.

Catch rates generally met or exceeded goals outlined in the current fisheries management plan. Exceptions included: the main stem Coeur d'Alene River--both general and special regulation areas and the special regulation area of the North Fork Coeur d'Alene River. Other exceptions were Teepee Creek and the North Fork St. Joe River. Low catch rates in the Coeur d'Alene River system are likely related to low fish densities resulting from lack of good quality rearing habitat and poor embryo survival in the gravels (Gamblin 1986). Creel information from the North Fork St. Joe River was collected sporadically and may not accurately reflect effort and catch rates.

Catchable Rainbow Trout Program Evaluation

We continued to use conservation officer census and tag return data to evaluate the catchable trout program in Region 1 rivers and streams. Returns from tagging data were corrected for the noncompliance bias, using reward tags as described by Rieman (1984). Estimates of noncompliance ranged from 40% to 77% for waters evaluated from 1984 to 1986. The estimated return of catchable rainbow trout to the creel ranged from 2% to 47% (Table 2).

Table 1. Routine census data collected on Region 1 rivers and streams during 1986.

River	No. anglers interviewed	Km in section	X anglers	X anglers / Km	Est. total hours	Est. hours / KM	Catch rate fish/hour HRB	WRB	CT	Total	Estimated catch no. fish HRB	WRB	CT	Total
Coeur d'Alene														
General Regulation	153	64	27	0.42	29,660	463	0.8	0.03	0.03	0.14[1]	2,373	890	890	4,450[1]
Special Regulation	59	32	9	0.28	12,960	405		- -	0.17	0.17	-	-	2,203	2,203
North Fork Coeur d'Alene														
General Regulation	68	19	8	0.42	9,640	507	1.16	-	0.15	1.31	11,177	-	1,445	12,622
Special Regulation	73	24	6	0.25	3,010	125	-	0.01	0.12	0.13	-	30	361	391
South Fork Coeur d'Alene	21	19	1	0.05	1,310	69	0.35	-	0.15	0.67[1]	459	-	197	879[1]
Teepee Creek	87	8	5	0.62	5,250	656		-	0.80	0.80		-	4,198	4,198
St. Joe														
St. Mertes to Calder	91	30	4	0.13	4,390	146	-	0.10	0.43	0.58[1]		487	1,886	2,544
Avery to Prospector Creek	48	27	7	0.26	6,430[2]	238	0.12	-	0.09	0.21	772	-	579	1,351
Special Regulation	75	33	11	0.33	13,960[2]	423								
North Fork St. Joe	40	35	7	0.20	9,630[2]	275	0.10	-	-	0.10	963	-		963

Table 1. Continued.

River	No. anglers interviewed	Km in section	$\bar{X}$ anglers	$\bar{X}$ anglers/Km	Est. total hours	Est. hours/KM	Catch rate fish/hour				Estimated catch no. fish			
							HRB	WRB	CT	Total	HRB	WRB	CT	Total
Priest	42	48	4	0.08	3,980	83	0.70	0.05	0.05	1.10[1]	2,785	199	199	3,183
Kootenai	50	—	10	—	9,060[2]	—	—	0.17	0.04	0.29[1]	—	1,540	362	2,626

[1]Includes species other than rainbow and cutthroat trout.

[2]Limited data.

R9FS228BM

Table 2. Catchable trout stocking rates, catch rates and percent return to the creel for Region 1 rivers and streams in northern Idaho, 1984 to 1986.

River	Year	km	Stocking density (fish/km)	Estimated percent return	Catch rate	Fishing pressure (hrs/km)	Total hours
Coeur d'Alene	1986	64	192	--	0.08	463	29,660
	1985	54	287	14	0.29	265	14,310
	1984	54	256	--	0.35	530	36,000
South Fork Coeur d'Alene	1986	19	220	--	0.35	69	1,310
	1985	19	215	--	0.79	377	7,150
	1984	19	375	8	0.73	--	--
North Fork Coeur d'Alene	1986	19	316	--	1.16	507	9,640
	1985	19	316	10	--	--	--
	1984	19	313		--	--	--
St. Joe	1986	57	159	--	0.12	190	10,820
	1985	60	159	28	0.51	209	12,525
	1984	64	144	--	0.21	282	14,000
North Fork St. Joe	1986	35	275	46	0.10	275	9,630
	1985	35	161	--	0.43	256	8,950
	1984	35	263	--	--	--	--
Priest	1986	48 •	251	--	0.70	83	3,980
	1985	48	249	--	--	149	7,160
	1984	48	413	3	--	--	--
Marble Creek	1986	19	110	47	--	--	--
	1984	19	50	--	0.21	1,462	23,400
St. Maries	1985	42	168	--	0.88	256	10,740
	1984	42	206	22	0.50	--	--
Pend Oreille	1985	42	238	2	--	--	--

Catch rates supported by hatchery-reared rainbow trout ranged from 0.08 to 1.16 fish/hour (Table 2). In general, catch rates declined in 1986 when compared to 1984 and 1985. In 1984, catch rates appeared to be a function of stocking density (Fig. 1). In subsequent years, however, this relationship has not held up (Fig. 2). It appears that unquantified factors other than stocking density may be affecting catch rates; census bias or missing data may have affected the results. Another method to measure the success of the catchable stocking program is the percent of stocked fish returning to the creel. Percent return to the creel may be related to the strain of fish stocked. In 1984 and 1985, rainbow trout stocked in Region 1 rivers and streams were R1 (unspecified) rainbow and maximum return to the creel was 28% in the St. Joe River (Table 2). In 1986, percent return to the creel from tagged rainbow trout was 46% and 47% in the North Fork St. Joe River and Marble Creek, respectively. These fish were Hayspur stock and at least upon first examination, they appeared to perform better than the R1 rainbow. Other researchers have reported similar results of good return to the creel for Hayspur fish (Ellis et al. 1982; Partridge 1985).

Further evaluation of the performance of Hayspur fish and other strains of rainbow trout in northern Idaho rivers and streams is needed to effectively utilize this limited resource. Until additional data are collected, it appears that we can provide catch rates of about 0.3 to 0.5 fish/hour, with stocking densities of approximately 150 to 300 fish/km on most northern Idaho streams where hatchery trout supplement or support native populations. Low catch rates reported for the St. Joe, North Fork St. Joe and Coeur d'Alene rivers may be due to census bias. These areas were not targeted for officer census and data were collected less often than on other waters. However, low catch rates on the main stem Coeur d'Alene River were corroborated by additional harvest data collected by research personnel during the first four weeks of the general fishing season. Catch rates ranged from 0.01 to 0.14 fish/hour on the river from Enaville to Dudley (Bill Horton, Fishery Research Biologist, IDFG, personal communication). Reasons for low catch rates may be twofold: 1) the strain of rainbow stocked may exhibit low catchability, and 2) the fish may be emigrating shortly after release and are not available to anglers. High catch rates in the North Fork Coeur d'Alene River (1.16 fish/hour) reflect excellent angler success experienced during the first few days of the fishing season.

Additional harvest, catch rate and return to the creel data will be collected to evaluate releases of catchable rainbow trout in the Moyie River during 1987.

Spokane River

A graduate student research study, funded by Washington Water Power Company (WWP), was initiated in 1985 and data collection was completed in 1986. The objectives of the study were to:

1. To determine relative abundance and species composition of fishes;

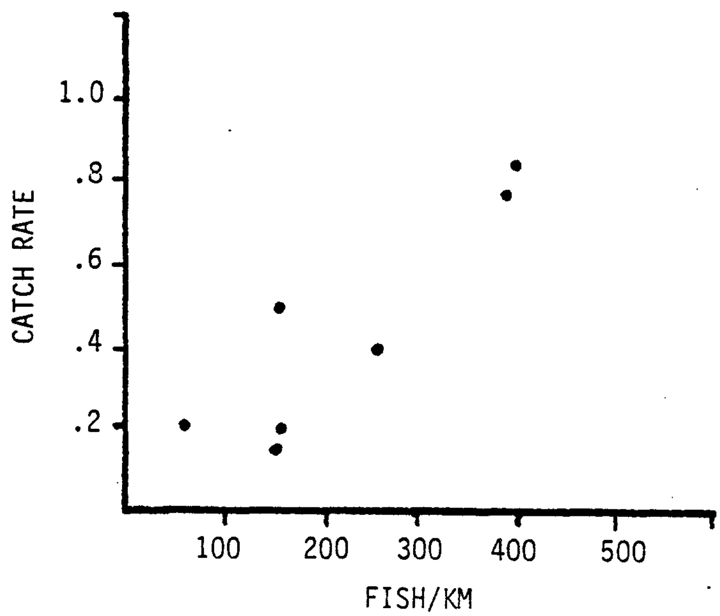


Figure 1. Relationship of catchable rainbow trout stocking density to catch rate for Region 1 rivers and streams in northern Idaho, 1984.

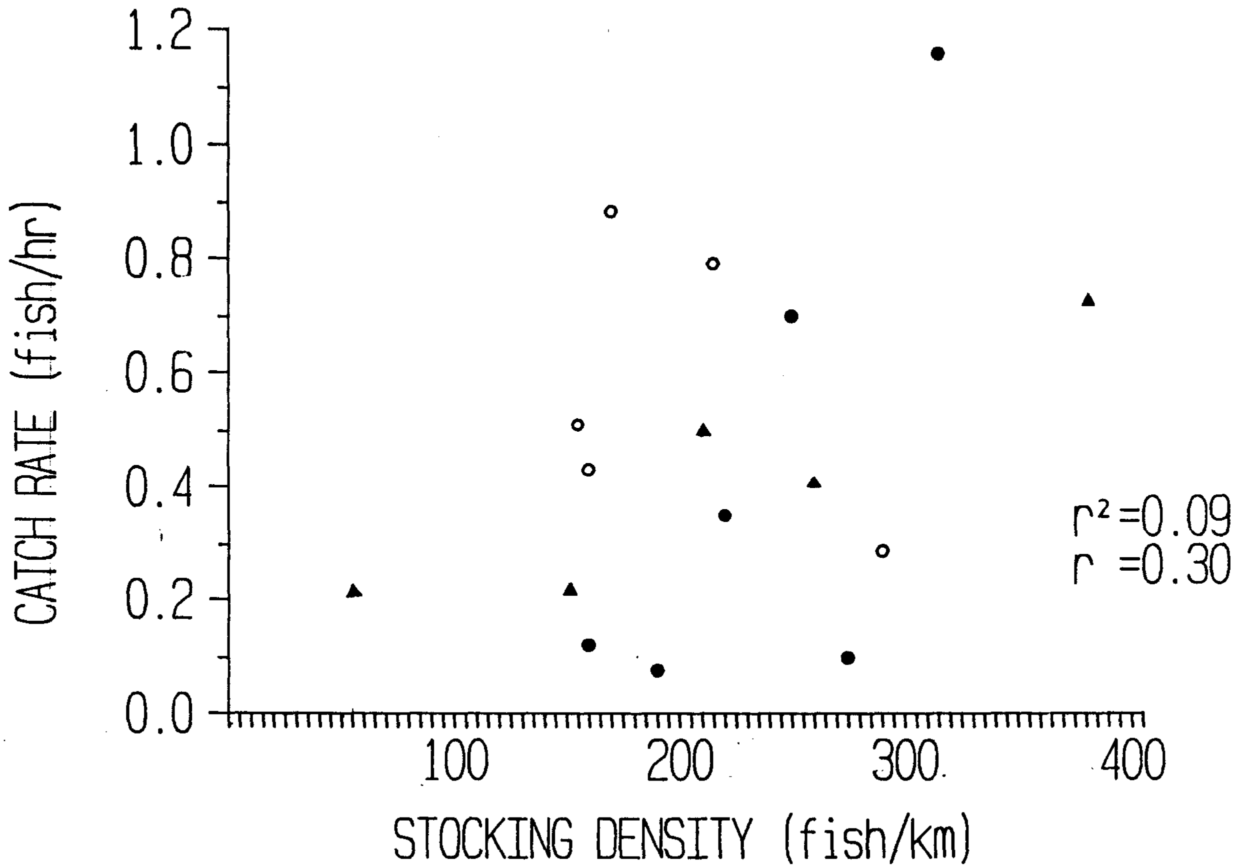


Figure 2. Relationship of catchable rainbow stocking density to catch rate for Region 1 rivers and streams in northern Idaho, 1984 to 1986.

Legend: ● = 1986 data
o = 1985 data
▲ = 1984 data

2. To assess seasonal distribution, movement, and habitat utilization of salmonid fishes;

3. To assess population dynamics of salmonid fishes; and

4. To assess recruitment as a factor limiting the salmonid population.

Fish sampling in 1986 was conducted in summer and fall using a boat-mounted electrofishing unit in the main river and a backpack electroshocker in shallow and backwater areas. A population estimate of approximately 19,000 salmonids was made using a modified Peterson estimate. Approximately 95% of the salmonids sampled were rainbow trout.

Analysis of movement was determined by angler returns of tagged fish and radio telemetry. Six adult rainbow trout had transmitters surgically implanted in them prior to the spawning season and their movements were monitored twice weekly for about six weeks. In general, the fish remained in the areas where they had been originally captured and released. The following is a brief summary of the results of the study:

1. Abundance of salmonids was high, but variable.

2. Growth was good.

3. Fishing mortality was low.

4. Natural mortality was high.

5. Recruitment was highly variable. -

It was suspected that high natural mortality was due to post-spawning stress caused by low summer flows and high water temperatures. More detailed results of the study will be reported in a separate document (Underwood, in preparation).

Approximately 202,000 brown trout fry were stocked in the Spokane River in May and June 1986. Fish ranged from 45 to 85 mm in length and had a mean length of 64 mm at the time of release (Fig. 3). Nearly 784,000 brown trout have been stocked in the river since 1983 to diversify the fishery and take advantage of the abundant forage (speckled dace) (Table 3). To date, tagging data indicate a low return to the creel (about 5%). Research indicates that the available habitat may be saturated, as fish less than 300 mm in length are in relatively poor condition. Stocking of brown trout in the Spokane River will be curtailed until further evaluation of the population's status can be made.

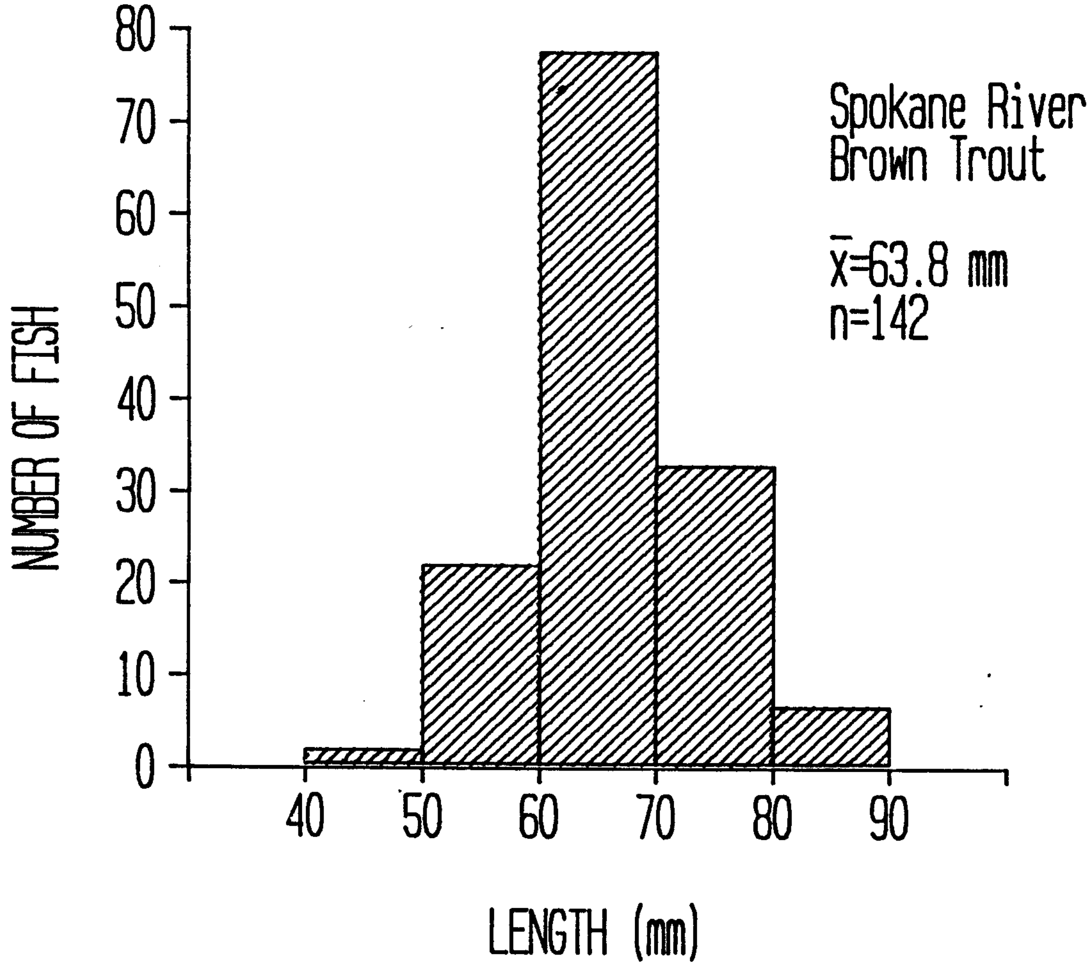


Figure 3. Length frequency distribution of brown trout fry released in the Spokane River, Idaho, in May and June, 1986.

Table 3. Summary of releases of brown trout in the Spokane River, Idaho, 1983 to 1986.

Year	Number of fish released	Mean length (mm)
1983	106,250	62
1984	100,625	62
1985	370,460	73
1986	202,030	64
TOTAL	783,940	

Kootenai River

Kokanee

Counts of kokanee spawners in selected tributaries of the Kootenai River were down from 1985 estimates and more closely resembled estimates made in 1983 and 1984 (Table 4). Counts in 1986 were made approximately one week later in the year than in 1985. It appears that the peak number of spawners are in the tributaries during the latter pat-t of August.

The closure of Ball, Boundary, Long Canyon, Mission, Myrtle, Park, Smith and Trout creeks in 1982 eliminated a then popular fishery and generated considerable public concern. In an effort to maintain a local kokanee fishery, we have requested kokanee eggs from Canada to initiate a small-scale enhancement program. To date, surplus eggs have not been available, nor does it seem likely that they will become available in the near future. Following a recent decline, the kokanee population in Kootenay Lake has not yet recovered and all hatchery production will be needed to prevent the collapse of Kootenay Lake stocks.

Prespawning adult kokanee have been fairly abundant in the main stem Kootenai River in recent years. Anglers are learning where and how to fish for these kokanee and concern over the tributary closures appears to have died down. The reopening of Boundary Creek in 1985 further increased fishing opportunity for kokanee. Neither the response of the fishery or the fish population were monitored in 1986.

Table 4. Estimates of spawning kokanee salmon in tributaries of the Kootenai River, Idaho, in August to September, 1983 to 1986.

	Number Observed				
Stream	1983[a]	1984[a]	1985[b]	1986[c]	Comments
Boundary	10	55	200	10	About 250 m around county road access
Long Canyon	300	17	650	400	From below West Side road to flat gradient section (about 500 m)
Parker	100	70	75	10	From Morter's gate downstream 650 m
Smith	150	130	1500+	400	West Side road bridge upstream to falls

[a]Counts made on August 15.
[b]Counts made on August 31.
[c]Counts made on September 6.

Instream Flows

Grouse and Lightning Creeks

The Department applied for instream maintenance flows on Grouse and Lightning creeks in 1981 and those applications have been recommended for approval by the Director of the Idaho Water Resources Board. They will be submitted for legislative review and approval during the next legislative session (1988).

A staff gauge was installed on Grouse Creek in 1986 and we began collecting data to establish a staff gauge-discharge relationship. We will continue to collect data during 1987. A staff gauge will be installed in Lightning Creek during 1987 and discharge data will be collected during the 1987 field season.

Two additional streams have been proposed for minimum instream flow requests for 1987. Regional personnel will use IFIM (Instream Flow Incremental Methodology) techniques to determine minimum instream flow needs on the North Fork Grouse and Trestle creeks to protect spawning and rearing habitat for Gerrard rainbow trout and bull trout.

St. Joe River

Westslope Cutthroat Trout

In July 1985, seven members of the North Idaho Flycasters Club of Coeur d'Alene fished the upper St. Joe River from Conrad Crossing to Spruce Tree campground. This section of river is managed as a wild trout water (3 fish, 330 mm minimum size; artificial flies and lures only, single barbless hooks required). In three days of fishing, they collected and measured lengths of 326 cutthroat trout. Fish ranged in length from 76 to 330 mm, with a mean length of 165 mm. Ninety-nine percent of the fish collected were 305 mm or shorter in length (Fig. 4). Only two of the 326 fish caught were greater than 305 mm long. These data were not reported in our 1985 annual report.

The lack of larger fish (longer than 330 mm) in the catch would indicate that as soon as a cutthroat attains a length at or even close to the minimum size limit, it is harvested. It seems likely that anglers are catching and keeping a significant number of illegal fish (those less than 330 mm long), as shown by the lack of fish between 305 and 330 mm. The stretch of river from Conrad Crossing to Spruce Tree campground is within the roaded section. Thus, this section receives moderately high fishing pressure (approximately 14,000 hours of effort annually) and the potential to overharvest near legal-sized fish is high. Since cutthroat in the St. Joe River typically are 305 to 330 mm long at first spawning, the potential to overharvest fish before they have the opportunity to spawn seems high. Increased enforcement of the 330 mm minimum size requirement, and/or implementation of a more restrictive regulation, will be necessary to protect and enhance westslope cutthroat trout populations in the St. Joe River.

Lake Pend Oreille Tributaries

Grouse and Lightning Creeks

A project to evaluate the status of adfluvial trout and char populations in the Pend Oreille drainage was continued in 1986 with Joint funding from the Lake Pend Oreille Idaho Club and the Department. This phase of the project is being conducted as a graduate student research project. The study will attempt to quantify annual production of Gerrard rainbow smolts and Gerrard rainbow and bull trout spawning escapements from selected tributaries to Lake Pend Oreille. Results of the first year's data collection will be reported in a separate document (Hoelscher, in preparation).

In addition to the graduate student research project, in 1986 we conducted a small-scale creel census on tributaries of Grouse and Lightning creeks to supplement the creel census conducted in 1985 by Irving (1987) on the main stems of those two streams. We censused anglers on weekends and holidays from the opening weekend (Memorial Day) to early July and found limited fishing activity occurring on the tributaries. The

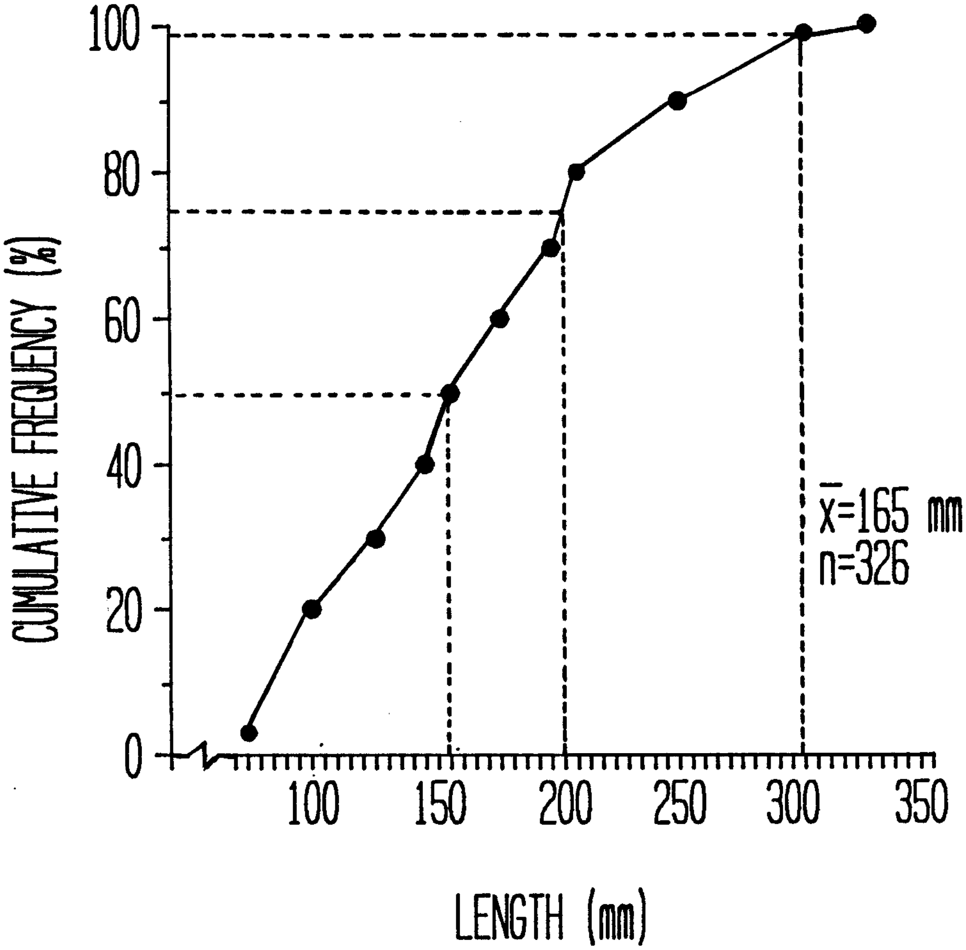


Figure 4. Cumulative length frequency of westslope cutthroat trout taken by angling from the St. Joe River (Conrad Crossing to Spruce Tree campground), Idaho, July 19 to 21, 1985.

bulk of effort was expended on main stem streams. During the interval from Memorial Day to July 4, an estimated 30 people fished 63 hours and harvested 40 Gerrard rainbow trout in tributaries of Lightning Creek. During the same period on Grouse Creek tributaries, 11 people fished 16 hours and harvested 23 rainbow trout. In and of itself, this does not appear to be a significant harvest, but combined with limited habitat availability and apparent low numbers of spawners returning to the tributaries, any harvest of juvenile Gerrard rainbow trout could have detrimental effects on their populations.

Lower Priest River Tributaries

Public concern has been voiced over the lack of good stream fishing opportunities in the lower Priest River drainage. The fishery in the lower river and its tributaries have largely been unquantified. Information on habitat quantity and quality and status of fish populations was lacking. During July 1986, we initiated a project to gather sufficient information on the lower river tributaries to determine appropriate management alternatives. The objectives of the project were:

1. To determine the quality and quantity of spawning and rearing habitat in selected lower Priest River tributaries.

2. To determine species composition and relative abundance for fish in lower Priest River tributaries.

3. To assess age and growth characteristics for fish species in lower Priest River tributaries.

4. To propose management recommendations to improve the fisheries in the lower Priest River tributaries.

Methods

We collected baseline information on habitat quality and quantity using a methodology developed by fishery biologists from the Idaho Panhandle National Forest. This methodology subdivides a drainage into reaches on the basis of channel gradient, stream order, valley bottom type and stream channel type. It provides information on habitat type, cover, spawning areas, sediment, temperatures and stream gradient. Lengths and average widths of eight habitat types are measured. Cover components (e.g., large woody debris, boulders, undercut banks and overhanging vegetation) are measured and percent of cover is recorded. Gradient is measured with a clinometer. Information was recorded on field forms (Fig. 5) designed for easy data entry into the Panhandle National Forest computer system.

We collected fish in portions of the tributaries with a Coffelt BP-1C backpack electroshocker or by angling. Fish were anesthetized and total length (mm) and scale samples taken. Scales were collected from the caudal peduncle area--where they first form below the adipose fin--and above the lateral line. Scales were impressed onto plastic laminate slides using approximately 20,000 pounds of pressure and read at 43x magnification on a Micro Design 920 microfiche reader. The distance from the focus to each annulus and the edge of the scale was measured at a 20^0 angle from the longest axis of the scale.

We snorkeled the East River from the mouth to the confluence with the Middle Fork East River and the lower 2.4 km of the Middle Fork East River to determine species composition, relative abundance and distribution of fish (Fig. 6). More snorkeling would have been done, but snorkeling gear was not available until mid-July. Generally, the weather was overcast or rainy during July and conditions were not conducive to making snorkel counts. Electrofishing was used extensively to collect abundance, species composition and distribution information (Fig. 6).

Habitat

We collected habitat information on eight of 20 streams in the lower Priest River drainage. All eight streams are accessible to the river and thus are potentially useful to fluvial trout. In general, the lower reaches of streams were dominated by riffles (Table 5) and spawning sites were either absent or of marginal quality (Table 6). Gradients ranged from 1 to 2%. However, the upper reaches generally contained more and better quality pool habitat (Table 5). Also, the quantity and quality of instream cover was improved in the upper reaches (Table 6). Gradients ranged from 2 to 5%.

The main stem East River and the lower portion of the Middle Fork East River generally lacked good quality riparian vegetation and have been moderately impacted by cattle grazing. Nearly all of the land is held in private ownership and is unfenced. Bank sloughing and erosion are common and contribute significant amounts of fine sediment to the streams, subsequently reducing the quality of considerable spawning gravels in the East River (Table 6). In the Middle Fork East River, the predominant particle size observed was small cobble and spawning gravels were interspersed in small pockets.

The Upper West Branch was the largest tributary surveyed and overall it appeared to have the least productive habitat. The Upper West Branch flows through a highly erosive, granitic land type and consequently, the predominant substrates are coarse and fine sands (Table 6). The limited spawning gravels present are of marginal quality and instream cover is generally absent. Most pools observed were either class 2 or 3 (Table 5).

Binarch Creek, North Fork East River and Big Creek generally had the best quality habitat of all surveyed tributaries. Pools were more abundant and of better quality than other streams (Table 5). Instream cover was fair to excellent and spawning sites were fairly numerous and of good quality (Table 6).

FISHERIES HABITAT EVALUATION JULY 2, 1985 070285

District # _ _ Reach # _ _ Stream Name _ Date _ _ _ _ _ _

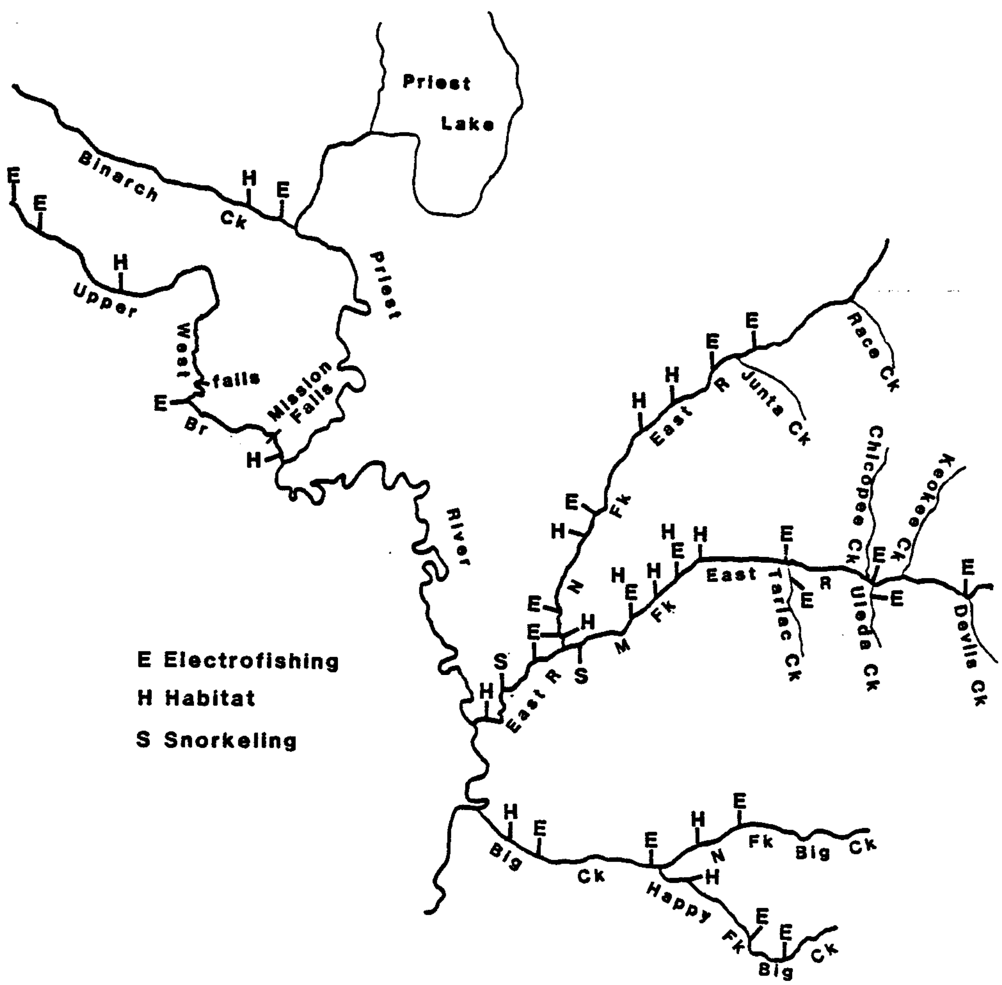
Forest # _ _ Elevation Start _ _ _ _ _ Elevation End _ _ _ _ _ Total Reach Distance _ _ _ _ _

Valley Bottom _ Channel Type _ _ Stream Order _ Stream Temp _ _ Air Temp _ _

HAB TYPE	LENGTH FT	WIDTH FT	GRADIENT %	POOL CREATOR	COVER COMPONENTS (PERCENTAGE): LOD	BOULDER	UNDERCUT	BANKS	OVERHANG	VEG	OTHER (* NOTE TYPE)	SPAWNING AREA: # SITES	CREATOR	% FINES	FINES METHOD	REMARKS PROJECTS ELEVATIONS PASSAGE PROBLEMS ETC.

Investigator: ____________________

Figure 5. Fisheries habitat evaluation field data form developed by USFS personnel, Idaho Panhandle National Forests.



PRIEST RIVER TRIBUTARIES
STREAM SURVEY 1986

Figure 6. Locations of habitat, electrofishing and snorkeling survey transects in tributaries of the lower Priest River, Idaho, July 1986.

Table 5. Percent habitat types for eight tributaries of the lower Priest River, Idaho, surveyed in July 1986.

Stream	Reach	Pool classes 1	2	3	4	Riffles	Runs	Pocket water
Binarch Creek	1	1	1	2	--	70	12	15
	2	--	--	6	3	54	21	17
	3	--	--	--	56	--	41	3
Upper West Branch	1	--	21	9	--	43	27	--
	2	6	9	21	--	1	63	--
Big Creek	1	1	15	5	3	40	35	--
Happy Fork Big Creek	1	--	--	--	4	55	41	--
	2	--	--	--	--	71	29	--
North Fork Big Creek	1	--	--	1	--	85	14	--
East River	1	--	2	3	10	27	58	--
Middle Fork East River	1	1	4	1	2	81	7	4
North Fork East River	1	6	--	7	2	45	40	--
	2	--	--	10	5	75	10	--
	3	6	33	11	22	21	7	--
	4	3	3	--	13	38	5	38

Table 6. General stream habitat characteristics of eight tributaries of the lower Priest River, Idaho, surveyed in July 1986. (LOM = large organic matter, OV = overhanging vegetation, BK = brook trout and CT = cutthroat trout.)

Stream name	Reach length (miles)	Gradient (%)	Pool-riffle	Spawning sites	Comments
Binarch	0.7	2	1:17.5	14	MaJority of cover provided by LOM and boulders; good cover.
	0.4	3	1:6	7	MaJority of cover provided by LOM and OV.
	0.25	1	56:1	3	56% of habitat in pools; all Class 4 pools. Mostly pools created by beavers.
Upper West Branch	0.6	1	1:1.4	12	Cover lacking; spawning sites marginal quality 30% fines.
	0.4	1	18:1	--	Substrate predominantly sand; no spawning sites observed; lacks instream cover. Class 3 pools.
Big Creek	0.5	1	1:1.7	29	Numerous BK fry and adults obs. channel braids in several places. Cover good.
Happy Fork Big Creek	0.5	1	1:13.7	16	All Class 4 pools. Instream cover adequate. Channel braids in places.
	1.4	3	1:71	1	Instream cover very good; provided by boulders and OV. Pools lacking.

Table 6. Continued.

Stream name	Reach length (miles)	Gradient (%)	Pool-riffle	Spawning sites	Comments
North Fork Big Creek	1.25	2	1:85	14	Small, shallow stream. Spawning sites of marginal quality due to fines. Cover adequate; pools lacking.
East River	1.4	1	1:1.8	375	Spawning gravel marginal quality; instream cover minimal; few fish obs., mostly cyprinids. Grazing.
Middle Fork East River	1.0	2	1:10	12	Most pools Class 1 or 2. Substrate mostly cobble; spawning gravel in pockets. Cover minimal.
North Fork East River	0.25	2	1:3	21	Cover adequate; 1/2 pools Class 1 channel braids near upper end of reach. Spawning gravels good.
	0.3	2	1:5	33	Channel braids occasionally. All pools Class 3 or 4. Instream cover minimal. Spawning sites good.
	0.9	2	3.6:1	20	Most pools created by beaver activity. Spawning sites few. Lots of BK obs.; 50% of pools Class 2; 50% of pools Class 3 and 4. Channel braids extensively.

Table 6. Continued.

Stream name	Reach length (miles)	Gradient (%)	Pool-riffle	Spawning sites	Comments
North Fork East River (cont.)	1.0	5	1:6.1	3	Habitat primarily pocket water; several large debris jams--partial barriers. Mostly CT. Excellent cover.

The third reaches of both North Fork East River and Binarch Creek were dominated by pools created by beaver dams. In general, spawning sites were limited and instream cover, primarily large tree stumps and logs, was abundant. Habitat in the uppermost reach of the North Fork East River was primarily pocket water, with small riffle-pool sequences (Table 5). Spawning habitat was restricted to small pockets behind boulders. Large, log-debris jams were observed, but none were believed to be total migration barriers. Instream cover was considered excellent (Table 6).

The North Fork and Happy Fork of Big Creek were riffle-dominated streams, with few pools (Table 5). Instream cover was adequate, but spawning gravels were marginal quality (Table 6).

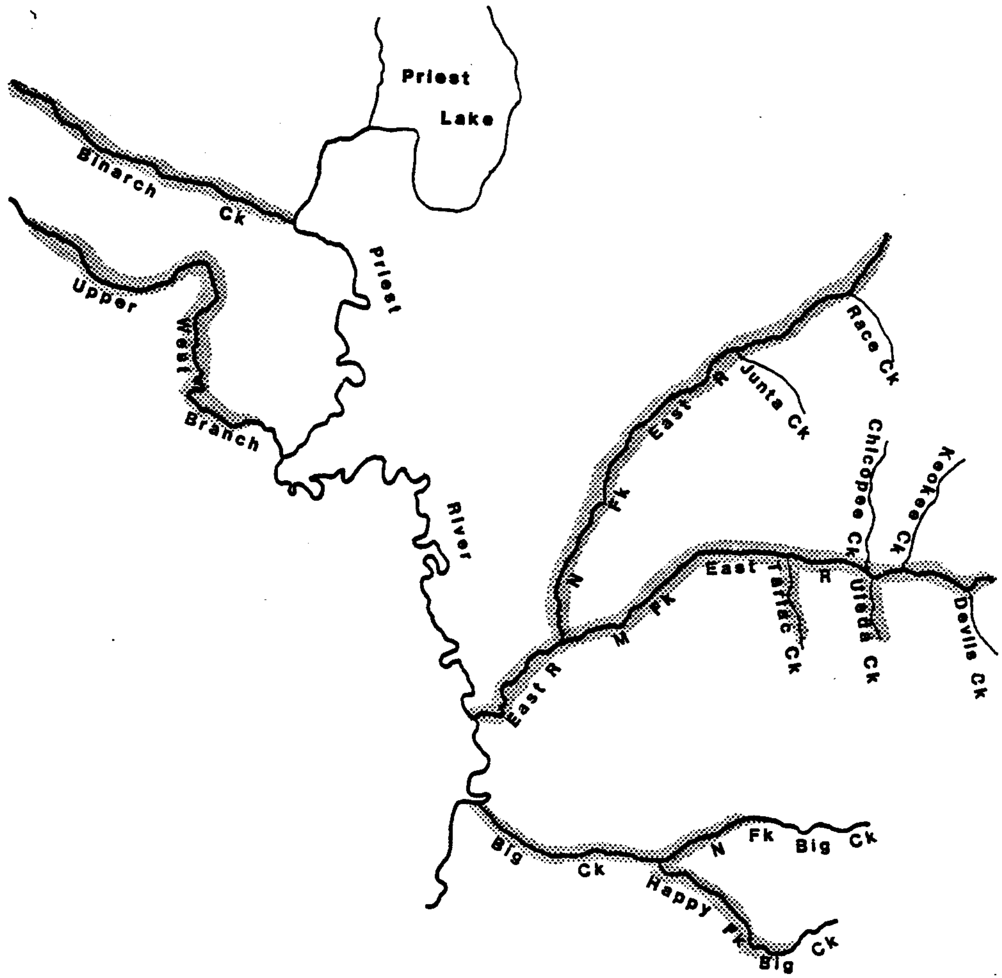
Fish Populations

Species Composition, Relative Abundance and Distribution

Species observed in lower Priest River tributaries included brook trout (*Salvelinus fontinalis*), westslope cutthroat trout (*Salmo clarki lewisi*), bull trout (*Salvelinus confluentus*), brown trout (*Salmo trutta*), mountain whitefish (*Prosopium williamsoni*), rainbow trout (*Salmo gairdneri*), largescale sucker (*Catostomus macrocheilus*), northern squawfish (*Ptychocheilus oregonensis*), slimy sculpin (*Cottus cognatus*), redside shiner (*Richardsonius balteatus*) and longnose dace (*Rhinichthys cataractae*).

Longnose dace and largescale suckers were rarely collected and were generally taken in the lower reaches of the streams. Redside shiners were collected in the Upper West Branch only. Squawfish were observed only in the lower East River. Sculpins were collected in all stream reaches.

Brook trout were the most abundant and most widely distributed species of game fish (Fig. 7). Although they were observed in every tributary we surveyed, their densities were greatest in the Big Creek drainage (Table 7). Cutthroat trout were the second most abundant species (Table 7) and were collected throughout the Big Creek drainage, Binarch Creek and the upper reaches of the North and Middle forks of East River (Fig. 8). They were also collected at the mouth of Uleda Creek. The highest densities of cutthroat were observed in the uppermost reach of the Middle Fork East River and throughout the Big Creek drainage (Table 7). Bull trout and brown trout were considerably more restricted in their distribution (Figs. 9 and 10) and generally found in very low densities (Table 7). Bull trout were observed only in the Middle Fork East River and in the middle and upper reaches, while brown trout were observed in the East River and lower reaches of the North and Middle forks. Only three brown trout were collected from Big Creek.



PRIEST RIVER TRIBUTARIES
STREAM SURVEY 1986

Figure 7. Distribution of brook trout sampled by snorkeling, angling and electroshocking in tributaries of the lower Priest River, Idaho, during July 1986.

Table 7. The number and density (fish/100 m^2) of fish collected by electrofishing, snorkeling and angling in tributaries of the lower Priest River, Idaho, July 1986.

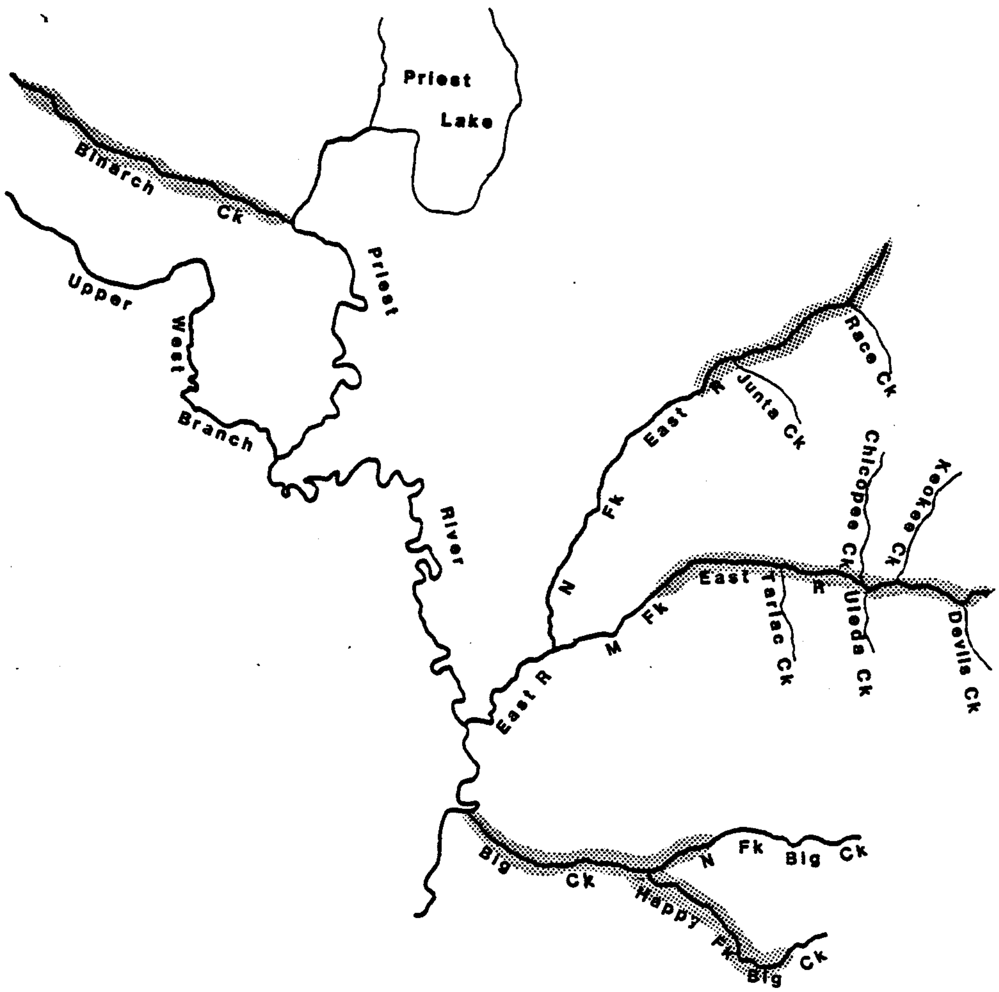
Stream	Section	Species[a]	N	Density (fish/100 m)
Binarch Creek	1	BKT	17	3.2
		CTT	3	0.2
Upper West Branch	1	BKT	10	2.1
	2	BKT	28	3.3
	3	BKT	1	0.7
		RBT	1	0.7
East River	1	BRN	7	0.5
		BKT	1	0.2
North Fork East River	1	BKT	21	6.0
		BRN	10	2.9
	2	BKT	5	1.4
		BRN	3	0.9
	3	BKT	9	1.4
		BRN	25	3.9
	4	BKT	43	12.4
	5	BKT	15	2.6
		CTT	14	2.2
	6	BKT	7	2.0
		CTT	20	4.4
Middle Fork East River	1	BKT	22	3.3
		BRN	5	0.8
		BLT	2	0.3
	2	CTT	1	0.3
		BRN	7	1.8
		BLT	7	1.8
	3	CTT	44	24.0
Tarlac Creek	1	BKT	3	2.1
		BLT	7	4.4
Uleda Creek	1	CTT	4	4.4
		BLT	6	6.6
Big Creek	1	BKT	10	3.1
		BRN	3	0.9
		MWF	1	0.3
	2	BKT	38	13.9
		CTT	21	7.7
	3	BKT	21	17.2
		CTT	8	6.6

R9FS228BM

Table 7. Continued.

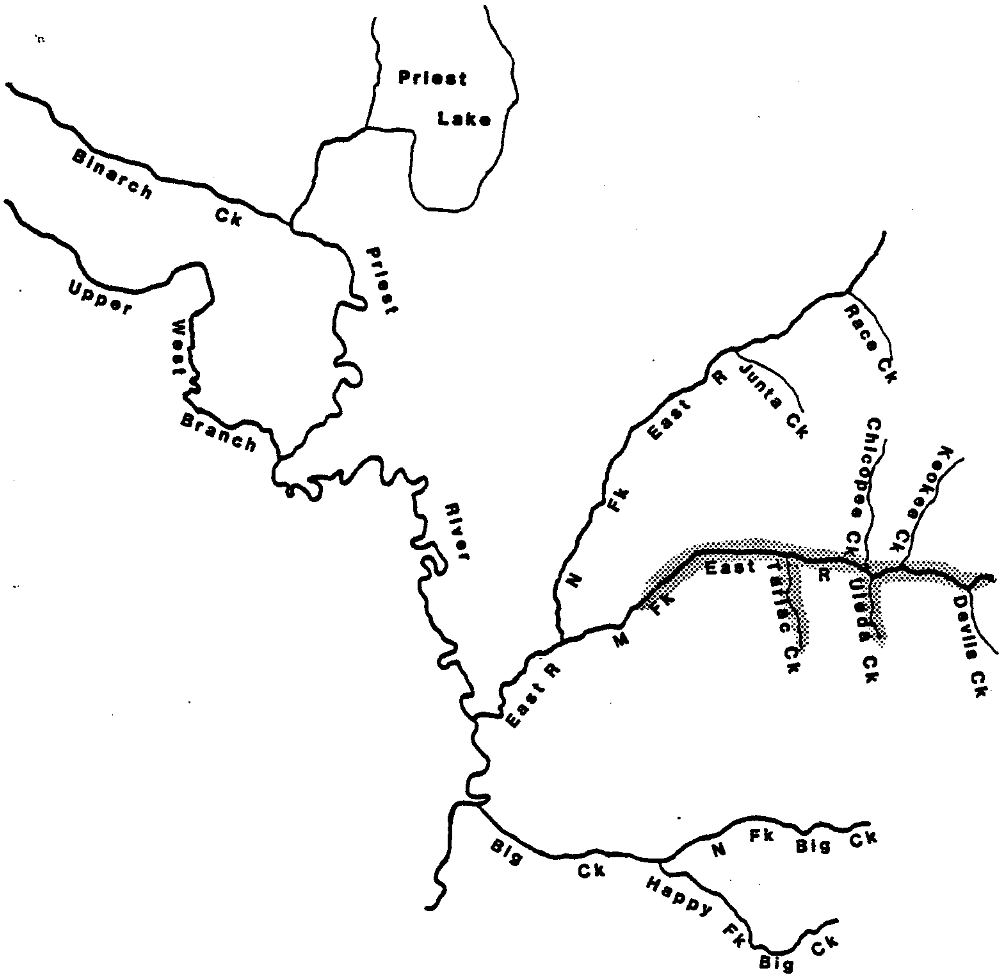
Stream	Section	Species[a]	N	Density (fish/100m²)
Happy Fork Big Creek	1	BKT	11	13.4
		CTT	5	7.3
	2	BKT	26	106.6
		CTT	5	20.5
North Fork Big Creek	1	BKT	15	8.2
		CTT	14	7.6

[a]BKT = Brook trout.
CTT = Cutthroat trout.
RBT = Rainbow trout.
BRN = Brown trout.
BLT = Bull trout.
MWF = Mountain whitefish.



PRIEST RIVER TRIBUTARIES
STREAM SURVEY 1986

Figure 8. Distribution of cutthroat trout sampled by angling and electroshocking in tributaries of the lower Priest River, Idaho, during July 1986.



PRIEST RIVER TRIBUTARIES
STREAM SURVEY 1986

Figure 9. Distribution of bull trout sampled by electroshocking in tributaries of the lower Priest River, Idaho, during July 1986.

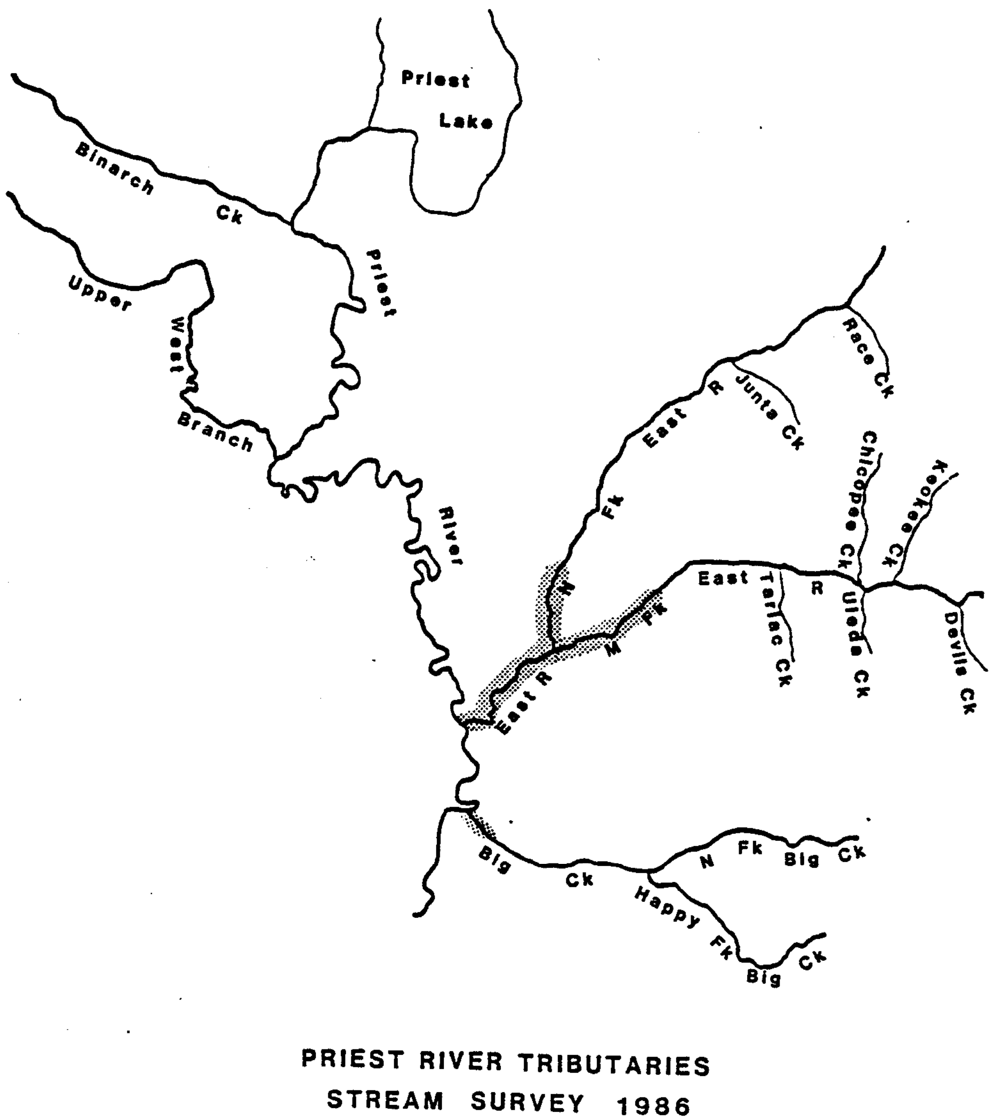


Figure 10. Distribution of brown trout sampled by snorkeling and electroshocking in tributaries of the lower Priest River, Idaho, during July 1986.

Age and Growth

Brook Trout

A total of 131 brook trout were collected from the East River drainage. Scales were examined for age determination on 58 of these fish. Fish ranged in age from 0 to 3 and were 33 to 221 mm in total length (Fig. 11). Back-calculated length at annulus formation was 84 mm at age-1, 124 mm at age-2 and 158 mm at age-3 (Table 8).

Brook trout collected from Big Creek and its tributaries (N = 121) ranged in age from 0 to 3 and from 37 to 228 mm in total length (Fig. 12). Of the 63 fish aged, back-calculated length at age-1 was 83 mm, 122 mm at age-2 and 171 at age-3 (Table 9).

Brook trout collected from Upper West Branch River ranged in age from 0 to 3 and from 46 to 182 mm in total length (Fig. 13A). Back-calculated length at age-1 was 88 mm, 124 mm at age-2 and 148 mm at age-3 (Table 10).

Seventeen brook trout were collected from Binarch Creek, ranging in age from 0 to 3 and from 34 to 178 mm in total length (Fig. 13B). Back-calculated length at age-1 was 84 mm, 121 mm at age-2 and 152 mm at age-3 (Table 11).

Cutthroat Trout

Cutthroat trout collected from the East River drainage (N = 86) ranged in age from 0 to 3 and 39 to 217 mm in total length (Fig. 14A). Back-calculated length was 95 mm at age-1, 136 mm at age-2 and 171 at age-3 (Table 12).

Fifty-four cutthroat trout were collected from the Big Creek drainage, ranging in age from 0 to 4 and from 34 to 197 mm in total length (Fig. 14B). Back-calculated length was 81 mm at age-1, 121 mm at age-2, 154 mm at age-3 and 177 mm at age-4 (Table 13).

Only two cutthroat were collected from Binarch Creek. Both were age-2 and were 161 and 171 mm in total length.

Bull Trout and Brown Trout

Few (N = 20) bull trout were collected, ranging in age from 0 to 6 and from 32 to 541 mm in total length (Fig 15A). The largest fish we collected was six-years-old, taken near the mouth of Uleda Creek. It is likely to have migrated upstream from Priest River and was holding in the tributaries until it spawned in the fall. Back-calculated length at annulus formation was 92 mm at age-1, 133 mm at age-2 and 180 mm at age-3 (Table 15).

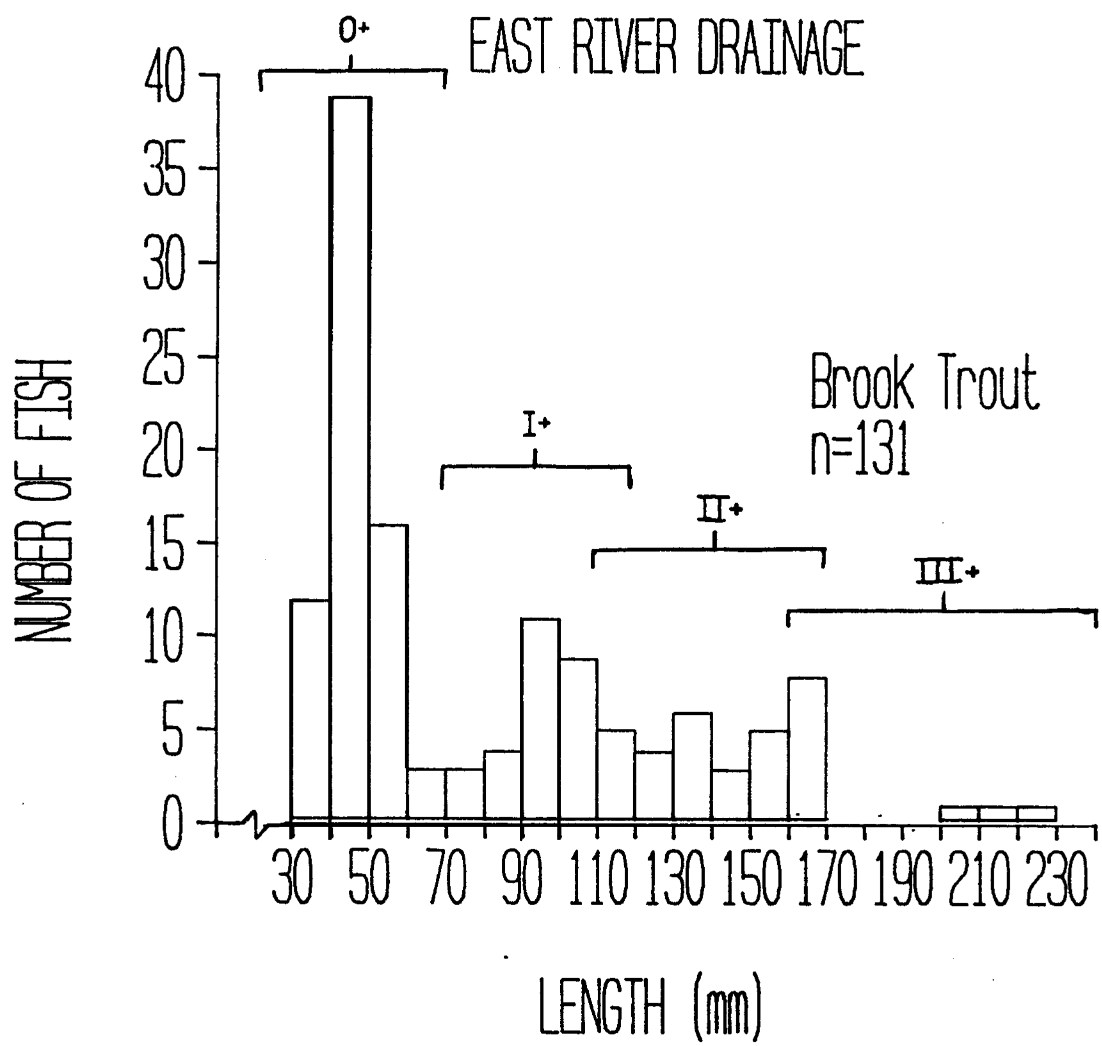


Figure 11. Length frequency and age distribution of brook trout collected from East River, Priest River drainage, Idaho, July 1986.

Table 8. Back-calculated lengths at age and increment of growth for brook trout in East River, Priest River drainage, Idaho, July 1986.

Age class	N	1	2	3
I	13	76	--	--
II	23	86	122	--
I11	8	91	127	158
Average length		84	124	158
N		44	31	8
Increment of growth		84	40	34

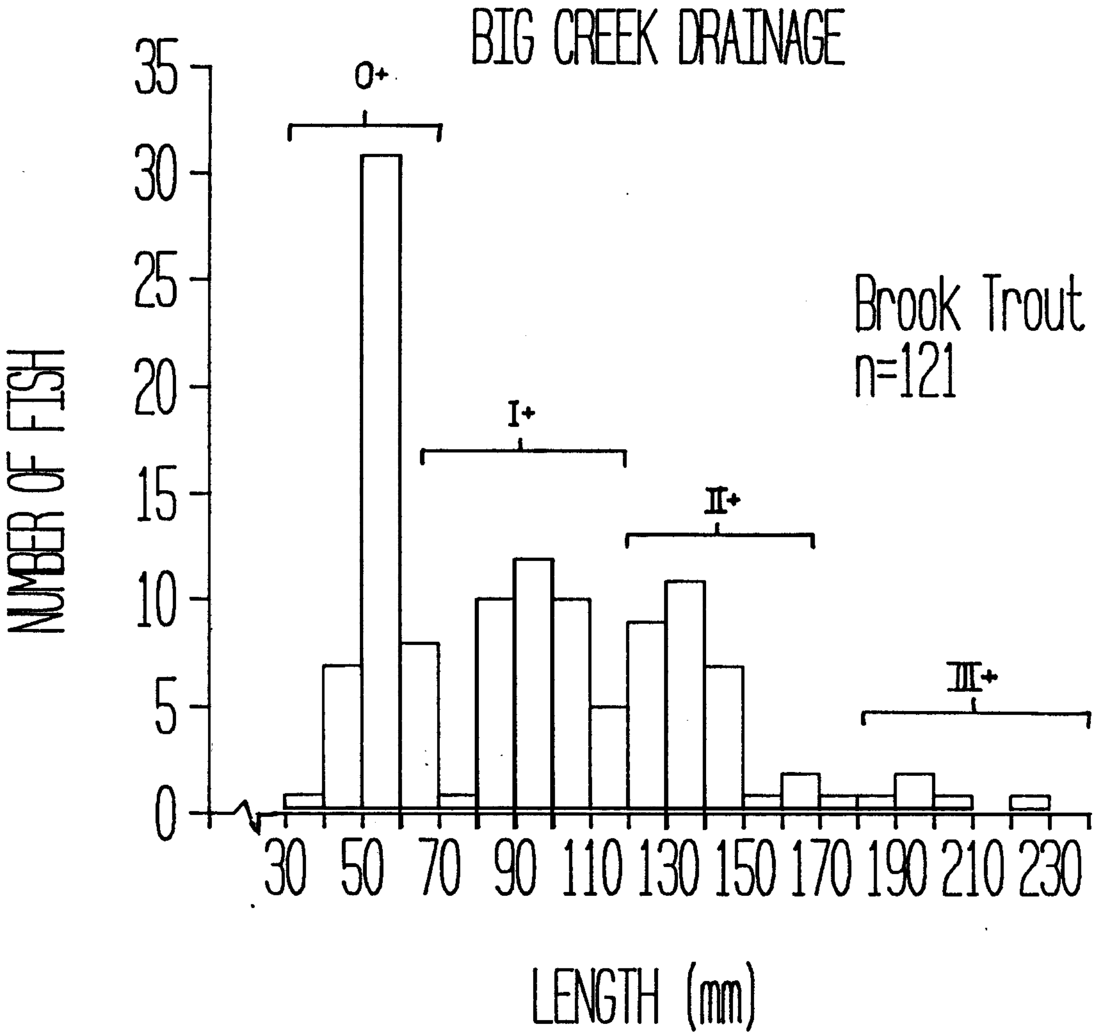


Figure 12. Length frequency and age distribution of brook trout collected from Big Creek, Priest River drainage, Idaho, July 1986.

Table 9. Back-calculated lengths at age and increment of growth for brook trout in Big Creek, Pend Oreille drainage, Idaho, July 1986.

Age class	N	1	2	3
	28	78	--	--
II	21	84	118	--
III	3	86	127	171
Average length		83	122	171
N		52	24	3
Increment of growth		83	39	49

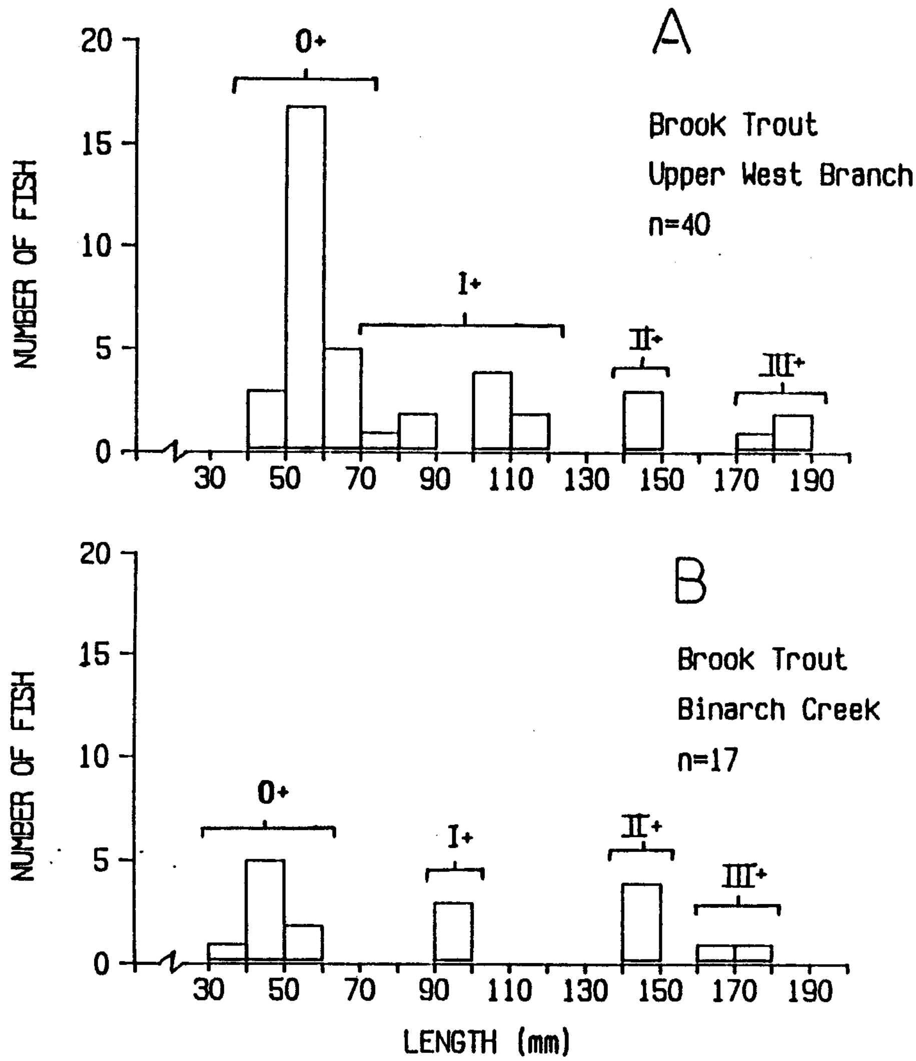


Figure 13A. Length frequency and age distribution of brook trout collected from Upper West Branch River, Priest River drainage, Idaho, July 1986.

Figure 13B. Length frequency and age distribution of brook trout collected from Binarch Creek, Priest River drainage, Idaho, July 1986.

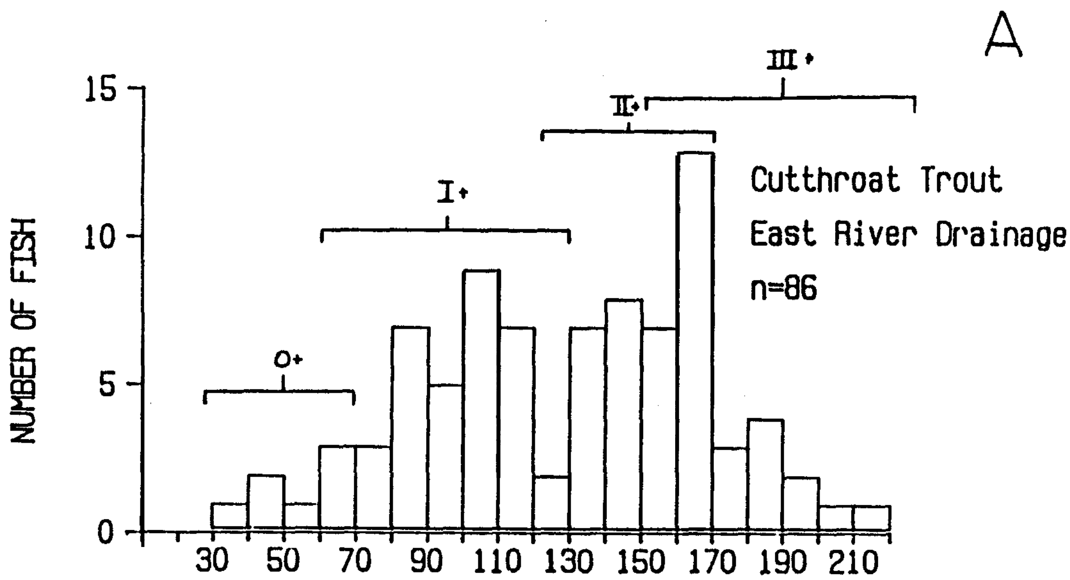
Table 10. Back-calculated lengths at age and increment of growth for brook trout from Upper West Branch River, Priest River drainage, Idaho, July 1986.

Age class	N	1	2	3
I	8	81	--	--
II	2	96	126	--
III	2	86	121	148
Average length		88	124	148
N		12	4	2
Increment of growth		88	36	24

Table 11. Back-calculated lengths at age and increment of growth for brook trout from Binarch Creek, Priest River drainage, Idaho, July 1986.

123

Age class	N	1	2	3
I	2	78	--	--
II	4	92	125	--
III	1	82	117	152
Average length		84	121	152
N		7	5	1
Increment of growth		84	37	31



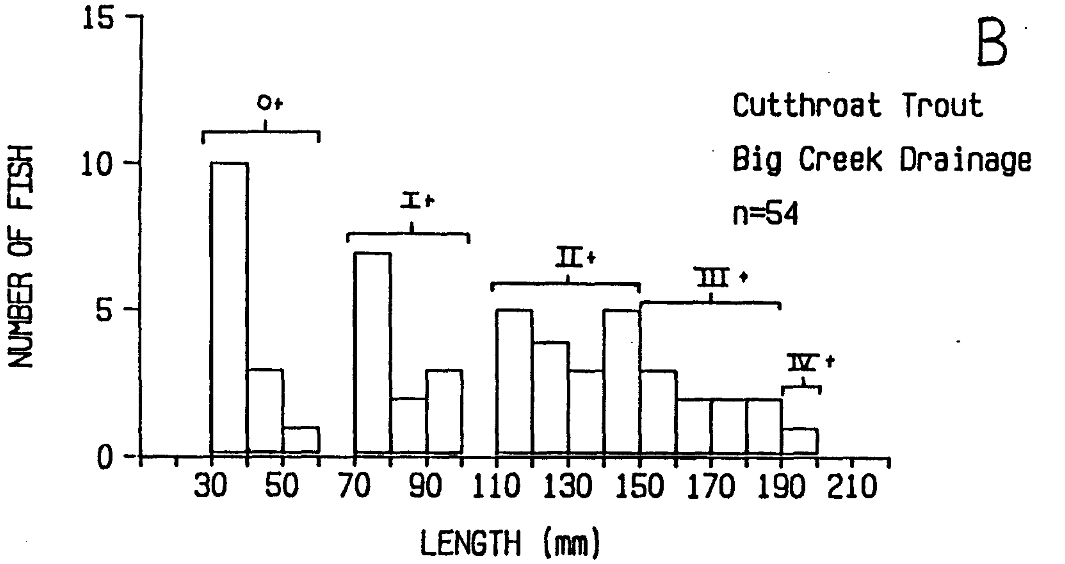


Figure 14A. Length frequency and age distribution for westslope cutthroat collected from East River, Priest River drainage, Idaho, July 1986.

Figure 14B. Length frequency and age distribution for westslope cutthroat collected from Big Creek, Priest River drainage, Idaho, July 1986.

Table 12. Back-calculated lengths at age and increment of growth for cutthroat trout in East River, Priest River drainage, Idaho, July 1986.

Age class	N	1	2	3
I	23	82	--	--
II	20	99	134	--
III	7	103	139	171
Average length		95	136	171
N		50	27	7
Increment of growth		95	41	35

Table 13. Back-calculated lengths at age and increment of growth for cutthroat trout in Big Creek, Priest River drainage, Idaho, July 1986.

125

Age class	N	1	2	3	4
I	10	70	--	--	--
II	15	82	--	--	--
III	6	83	120	154	--
IV	2	90	122	154	177
Average length		81	121	154	177
N		33	23	8	2
Increment of growth		81	40	33	23

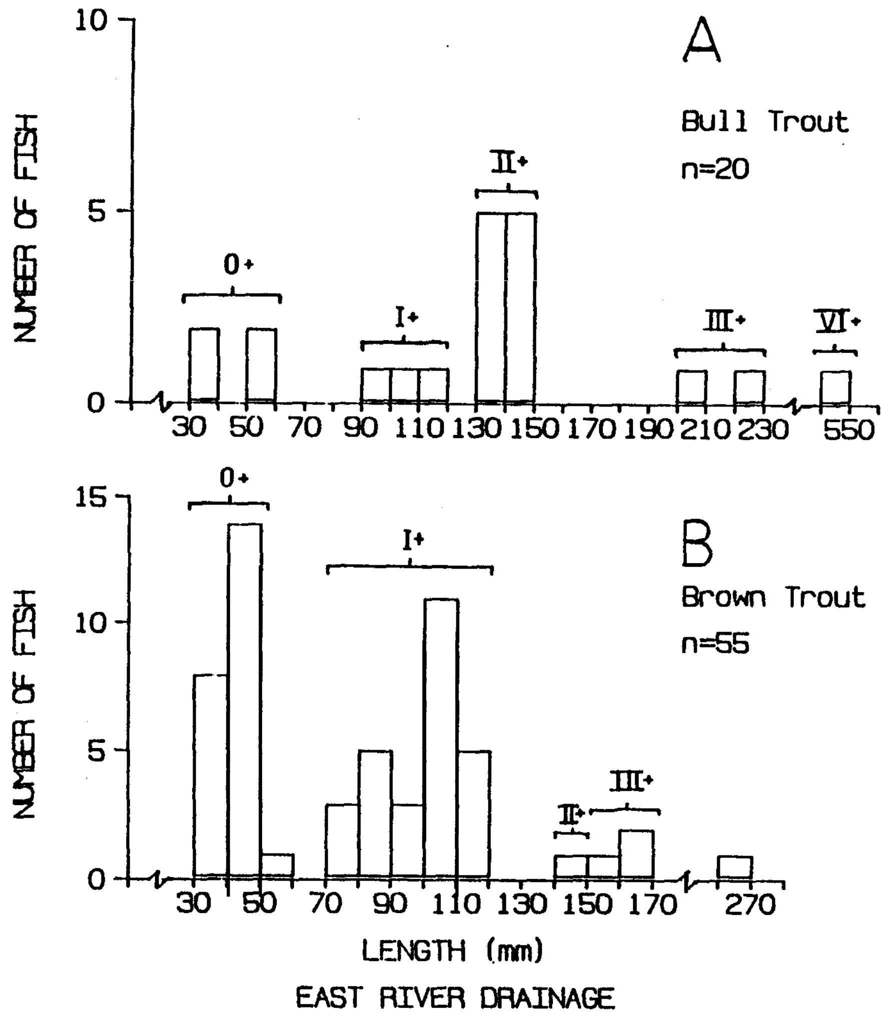


Figure 15A. Length frequency and age distribution of bull trout collected from East River, Priest River drainage, Idaho, July 1986.

Figure 15B. Length frequency and age distribution of brown trout collected from East River, Priest River drainage, Idaho, July 1986.

Table 14. Back-calculated lengths at age and increment of growth for brown trout in East River, Priest River drainage, Idaho, July 1986.

Age class	N	1	2	3
	20	74	--	--
II	1	87	123	
III	2	78	112	138
Average length		80	118	138
N		23	3	2
Increment of growth		80	38	20

127

Brown trout collected from the East River drainage ranged in age from 0 to 3 and from 35 to 168 mm in total length (Fig. 15B). Back-calculated length at annulus formation were 80 mm at age-1, 118 mm at age-2 and 138 mm at age-3 (Table 14). One larger (265 mm) fish was collected, but not aged.

Discussion

The lower Priest River tributaries appear to support fair populations of resident brook trout and cutthroat trout. Densities of fish are comparable to other northern Idaho streams. Densities of bull trout are very low, indicating they are probably maintaining only remnant status. Bull trout are currently protected from harvest in the Pend Oreille drainage in an effort to restore their population.

Brown trout densities were also relatively low. Brown trout were first stocked in the Priest River drainage in 1976, primarily in the main stem Priest River below Priest Lake and in the East River drainage. Nearly 960,000 brown trout fry and fingerlings have been released in the Priest River drainage since 1976 (Table 16). To date, limited evaluation of the success of those stockings has been undertaken. It appears from the limited number of brown trout observed during our surveys that they have not been extremely successful. In conversations with local anglers who fish the tributaries and the main river, it became apparent that few brown trout are caught. Whether this low success rate is due to poor survival of the stocked fish or the low catchability of the brown trout is unclear. Brown trout should no longer be stocked in the Priest River drainage until a complete evaluation of the success of the stocking program can be done.

During our surveys, we observed that fishing pressure was quite low during the week. In a four-week interval, we met four anglers who had fished a total of six hours and caught eight fish. In talking with local anglers and the local conservation officer, it seems the drainage received the bulk of fishing pressure during the first three to four weeks of the general fishing season and then effort declined quickly.

From our surveys, it appears the fishery is underutilized and could withstand greater angler exploitation. It also appears that many people are either unaware of the fishery's potential, or are not interested in the type of fishery the streams provide--a yield type fishery for small (6 to 9 inch) trout. Access is not a problem, as nearly every tributary is either paralleled by a road or has access at several points along its length.

Table 15. Back-calculated lengths at age and increment of growth for bull trout in East River, Priest River drainage, Idaho, July 1986.

Age class	N	1	2	3
	2	84	--	--
II	9	84	119	--
III	2	107	147	180
Average length		92	133	180
N		13	11	2
Increment of growth		92	41	47

Table 16. Releases of brown trout into Priest River drainage, Idaho, 1976 to 1986.

Location	Year	Number		
		Fry	Fingerling	Catchable
Priest River	1978	--	3,100	--
	1983	--	62,500	28,000
	1985	--	212,200	--
	1986	145,900	--	--
East River	1978		3,100	--
North Fork East River	1978	26,568	3,600	--
	1979	66,638	--	--
	1980	41,440		--
Middle Fork East River	1976	--	21,500	--
	1977	65,484	--	--
	1978	26,568	33,000	--
	1979	141,600	15,700	--
	1980	62,180	--	--

In general, habitat in lower portions of the East River drainage appeared to be impacted by land use activities (primarily cattle grazing). Several areas of bank sloughing and erosion were observed during our surveys. Most areas of poorer habitat are held in private ownership. Riffles were the dominant habitat type, with pools either absent, or generally of poorer quality. Opportunities exist for habitat improvement if private landowners would be willing to fence the streambanks or otherwise restrict cattle access.

Drop log structures or boulder placement in proper locations could be used to create scour pools to improve fish habitat in the stream. Upper portions of the East River drainage had better quality habitat and higher fish densities.

The main stem Big Creek had the best quality habitat of all we surveyed and supported the highest fish densities. Happy Fork and North Fork Big creeks were small tributaries that generally supported mostly age-0 and age-1 trout.

Binarch Creek is a relatively small tributary that maintains low densities of brook trout and cutthroat trout and has been known to become intermittent late in the summer (Joe Esteves, Hydrologist, Priest Lake Ranger District, USFS, personal communication). The Upper West Branch River appears to have the least productive habitat of all the tributaries surveyed. It was also the most difficult tributary to access and probably receives little fishing pressure as a result. It appeared that large amounts of sand in the stream are the natural substrate and little opportunity exists for habitat improvement in the lower stream sections. The upper section is a low gradient (1%), meandering stream and seems adequately suited for the small- population of brook trout that inhabits this section.

Wolf Lodge Creek

On July 29, 1986, six transects were snorkeled within Section 1 of the area impacted by the gasoline spill of June 3, 1984. Because the day was sunny with Just a few high clouds, underwater visibility was 3 m. Water temperature was 15.5^{0}C at 1200 hours. Snorkel transects were completed by 1630.

Size classes of juvenile fish were easily distinguishable. Cutthroat fry were about 40 to 65 mm in length, while brook trout fry were approximately 60 to 75 mm. Age-1+ cutthroat ranged from 90 to 110 mm and age-2+ were about 120 to 135 mm.

Cutthroat fry were found in high densities in suitable backwater areas, while older age cutthroat were located mostly in pools. More age-2+ cutthroat were observed than age-1+ in most pools. Overall, cutthroat densities were higher than in 1985, but much lower than densities reported in 1984 (Table 17). Densities of all ages of brook trout increased two to fivefold since 1985 (Table 17). Large brook trout were often observed in the deeper holes and could be significant predators. We recommend the selective removal the brook trout to reduce the risk of predation and competition.

Using the Idaho Panhandle National Forest fisheries habitat survey methodology, habitat surveys were conducted on Wolf Lodge Creek from Cedar Creek upstream to the confluence with Marie Creek and on Marie Creek from the mouth up to Burton Creek. Tributaries in the upper portion of the Wolf Lodge Creek drainage have previously been surveyed by Forest Service personnel. The majority of cutthroat spawning occurs in these upper tributaries (Lukens 1978), but habitat in the lower section, where the majority of the older age classes of cutthroat rear before going to Lake Coeur d'Alene, has not been quantified. The lower section is divided into two reaches, developed and undeveloped, and there are noticeable differences in habitat between them. The undeveloped section from Cedar Creek upstream to the Schoolhouse Bridge has many large, deep pools and relatively few riffles and runs (Table 18). Riparian bank cover is generally good and banks are stable. In the developed area above the Schoolhouse Bridge, riffles and pools are nearly equally represented, but the majority of the pools (28%) are class 3 or 4 (Table 18). Above the Gateway subdivision, the old channel has filled with gravel, causing major bank cutting and split channels in places. There are few deep holes. and much of the available habitat is now shallow riffles or runs, with little riparian bank cover.

Habitat in lower Marie Creek is in relatively poor condition. Riffles are the predominant habitat types and pools are either entirely lacking or in low abundance (Table 18). In August 1986, Marie Creek largely dried up and fish were trapped in a few isolated pools. The lower portion of Marie Creek has been channelized, resulting in a lack of adequate holding water for fish. Fishery management personnel electroshocked several hundred cutthroat fry out of several pools and released them in Wolf Lodge Creek below the confluence with Marie Creek.

Pend Oreille River

Species Composition and Relative Abundance

Fish species composition and relative abundance in the Pend Oreille River were determined by gillnetting on August 27 to 28, 1986. Seven experimental gill nets (4 sinking sets and 3 floating sets) were fished once each in two general areas of the river. Section 1 included the river from Laclede downstream to the confluence with Priest River; Section 2 included the river from Riley Creek campground upstream to Muskrat Lake (Fig. 16).

Table 17. Observed fish densities (fish/100 m²) in transects in Wolf Lodge Creek, Idaho, 1984 to 1986, affected by the gasoline spill of June 4, 1983.

		Observed fish densities (fish/100 m²)						
	Transect	Cutthroat trout			Brook trout			
Transect location	area m²	0	1+	2+	0	1+	2+	+
1. Hole at upstream side Schoolhouse Bridge	81.5	24.5	6.1	11.0	7.4	8.6	11.0	7.4
2. 200 m upstream of Schoolhouse Bridge	212.0	32.1	0.9	2.4	5.7	2.4	2.4	0.5
3. Large deep hole Just below Funk's pond	198.2	23.2	6.0	2.0	1.5	4.0	4.0	2.0
4. 200 m above Gateway Bridge	186.0	8.6	1.1	0.5	1.1	0	0	0
5. Long riffle-run with shallow water adjacent to Mr. Burnstynes' residence	123.1	6.5	0.8	2.4	0	0	0	0
6. About 500 m below gas spill location	63.6	3.1	6.3	7.9	0	3.1	4.7	0
Total area snorkeled	864.4 m²							
Average of all transects	1986	16.3	3.4	4.4	2.6	3.0	3.7	1.6
	1985	15.9	3.8	1.5	1.9	.25	.96	.96
	1984[a]	61.3		6.6		3.0	.93	

[a]Data in 1984 for 0 to 1+ and 2+ and older were combined.

Table 18. Stream habitat characteristics of Wolf Lodge Creek and Marie Creek, Kootenai County, Idaho, August 1986.

Stream	Reach description	Length (ft)	Average width [ft)	Average gradient (%)	Pool class (%) 1	2	3	4	Total	Runs (%)	Riffles (%)	Pocket water (%)
Wolf Lodge Creek	Cedar Creek to below Schoolhouse Bridge	5,760[1]	13	1	13	24	23	7	67	4	28	--
	Schoolhouse Bridge to Lonesome Creek	13,441	17	1	3	7	11	17	38	24	37	--
Marie Creek	Mouth to Searchlight Creek	5,684	16	2	0	0	0	0	0	0	92	8
	Searchlight Creek to Burton Creek	6,127	14	2	3	0	0	0	3	5	91	1

"Includes the stream to the Interstate 90 bridge.

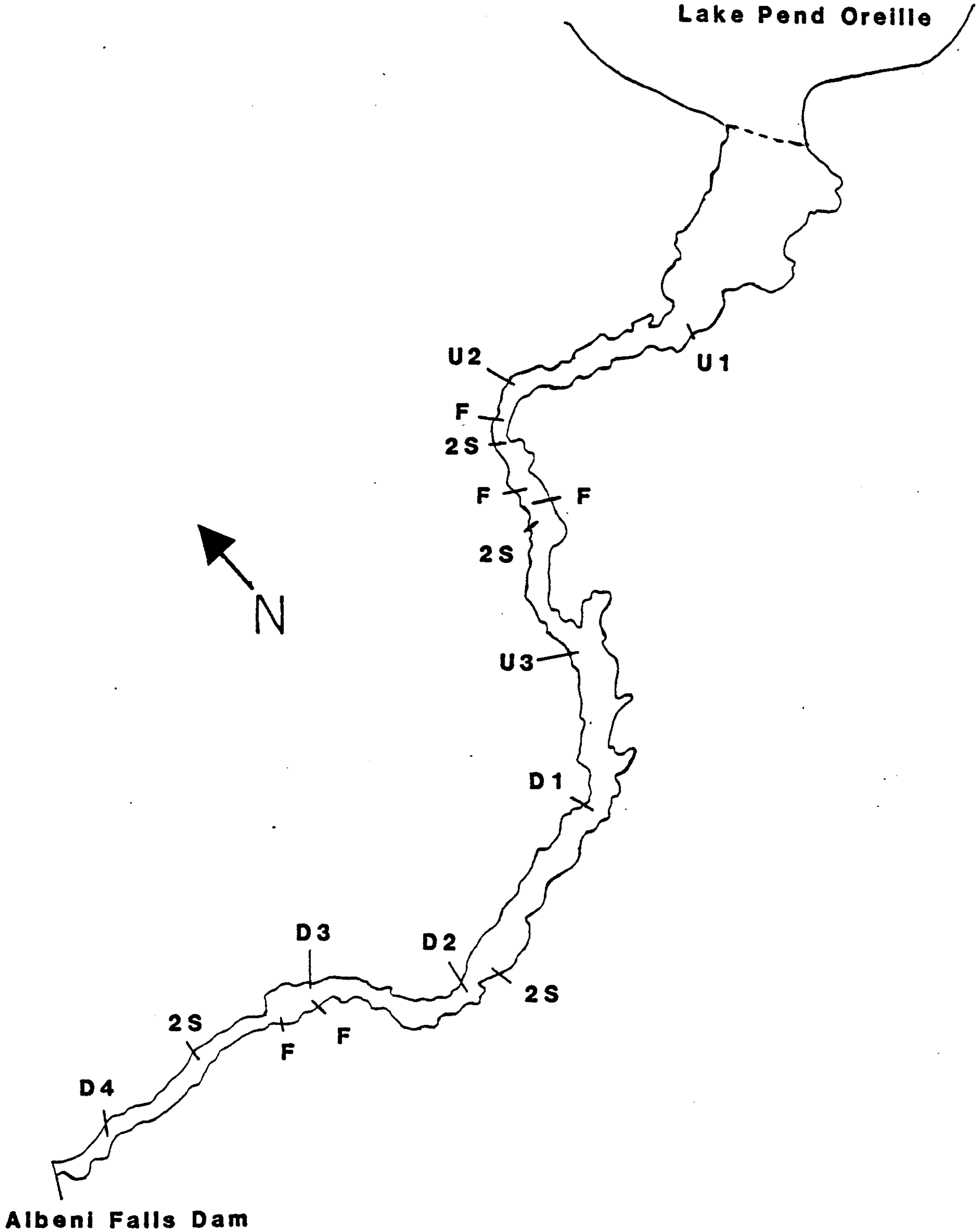


Figure 16. Locations of gill nets sets and limnological sampling stations in the Pend Oreille River Idaho, August 1986. (U1 = upriver station 1; D1 = downriver station 1, etc.; F = floating gill net; and S = sinking gill net.)

Twelve species of fish (7 game and 5 nongame species) were collected from the river (Table 19). Nongame fish were more abundant, representing nearly 52% and 75% of the total number of fish collected in sections one and two, respectively (Fig. 17). Although few weights were recorded, nongame fish comprised the bulk of the biomass of fish collected. Yellow perch were the most abundant game fish collected, while northern squawfish were the dominant nongame species observed (Table 19). Overall, northern squawfish were the most abundant species collected, accounting for over 41% of the total number for both sections combined.

Few rainbow trout (<2%) were collected. Temperature-depth profiles measured at the four downstream and three upstream Iimnological sampling stations indicated the river is generally isothermal and generally exceeds 21°C (70°F) from the surface down to a depth of 25 m (Figs. 18 to 21) during late summer. It appears the Pend Oreille River seasonally has limited suitable habitat for salmonids and would likely be better suited for a spiny ray predator that could take advantage of the abundant forage and the warmer water temperatures.

Age, Growth and Maturity

Scale samples were collected from black crappie, yellow perch and rainbow trout and analyzed for age, growth and maturity characteristics (Table 20). Sample sizes were quite small and only older age classes (2 to 5) were represented in the sample. It appears that black crappie from the Pend Oreille River are relatively slow-growing and late-maturing when compared to fish from other western waters (Carlander 1977). No data were available to compare growth and maturity for yellow perch, but they are expected to be comparable to perch from other northern Idaho waters. Growth of the wild rainbow trout collected is comparable to that reported for rainbow in Montana waters (Carlander 1969), but growth is not optimum because of summer high water temperatures. These fish could be progeny of hatchery rainbow trout stocked in the river as catchables or wild Gerrard strain fish. It is unclear whether these fish had matured and spawned once prior to being collected, or whether unfavorable environmental conditions delayed maturity. Wallace and Simpson (1978) reported that rainbow trout typically mature at age-2 or 3.

Obviously, additional information is needed to better quantify the fishery potential of the Pend Oreille River. In 1986, the Department proposed an amendment to the Northwest Power Planning Council's Fish and Wildlife Program. We proposed that Bonneville Power Administration (BPA) or the Army Corps of Engineers fund research to evaluate the existing fish populations and habitat and provide data to maximize existing and potential fisheries in the river. The proposal has been accepted by the Power Planning Council and funding for the project is being pursued.

Table 19. Species, numbers and range of total lengths (mm) of fish collected by gillnetting the Pend Oreille River, Idaho, August 27 to 28, 1986.

Section	Species	Number	(%)	Total length (mm)
1	Rainbow trout	5	(1.5)	170-230
1	Whitefish	5	(1.5)	190-250
1	Yellow perch	125	(36.7)	130-220
1	Largemouth bass	12	(3.5)	140-270
1	Pumpkinseed	12	(3.5)	90-120
1	Black crappie	5	(1.5)	110-140
1	Brown bullhead	1	(0.3)	220
1	Tench	18	(5.3)	160-380
1	Largescale sucker	17	(5.0)	240-450
1	Redside shiner	2	(0.6)	140
1	Peamouth	16	(4.7)	190-270
1	Northern squawfish	122	(35.9)	180-510
	TOTAL	340	(100.0)	
2	Rainbow trout	3	(1.6)	180-220
2	Yellow perch	25	(13.2)	140-170
2	Largemouth bass	6	(3.2)	140-240
2	Pumpkinseed	4	(2.1)	90-120
2	Black crappie	7	(3.7)	110-220
2	Brown bullhead	3	(1.6)	230-250
2	Tench	2	(1.0)	330-370
2	Largescale sucker	17	(9.0)	220-460
2	Redside shiner	7	(3.7)	150-160
2	Peamouth	20	(10.6)	230-290
2	Northern squawfish	95	(50.3)	190-520
	TOTAL	189	(100.0)	

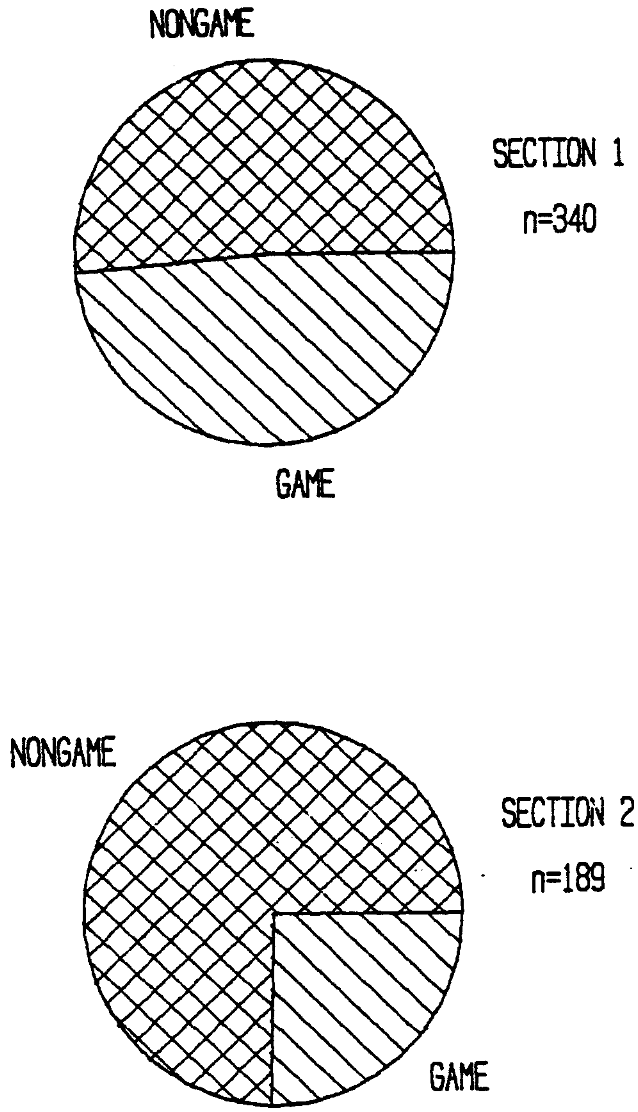


Figure 17. Relative abundance of game and nongame fish collected by gillnetting two sections of the Pend Oreille River, Idaho, August 27 to 28, 1986.

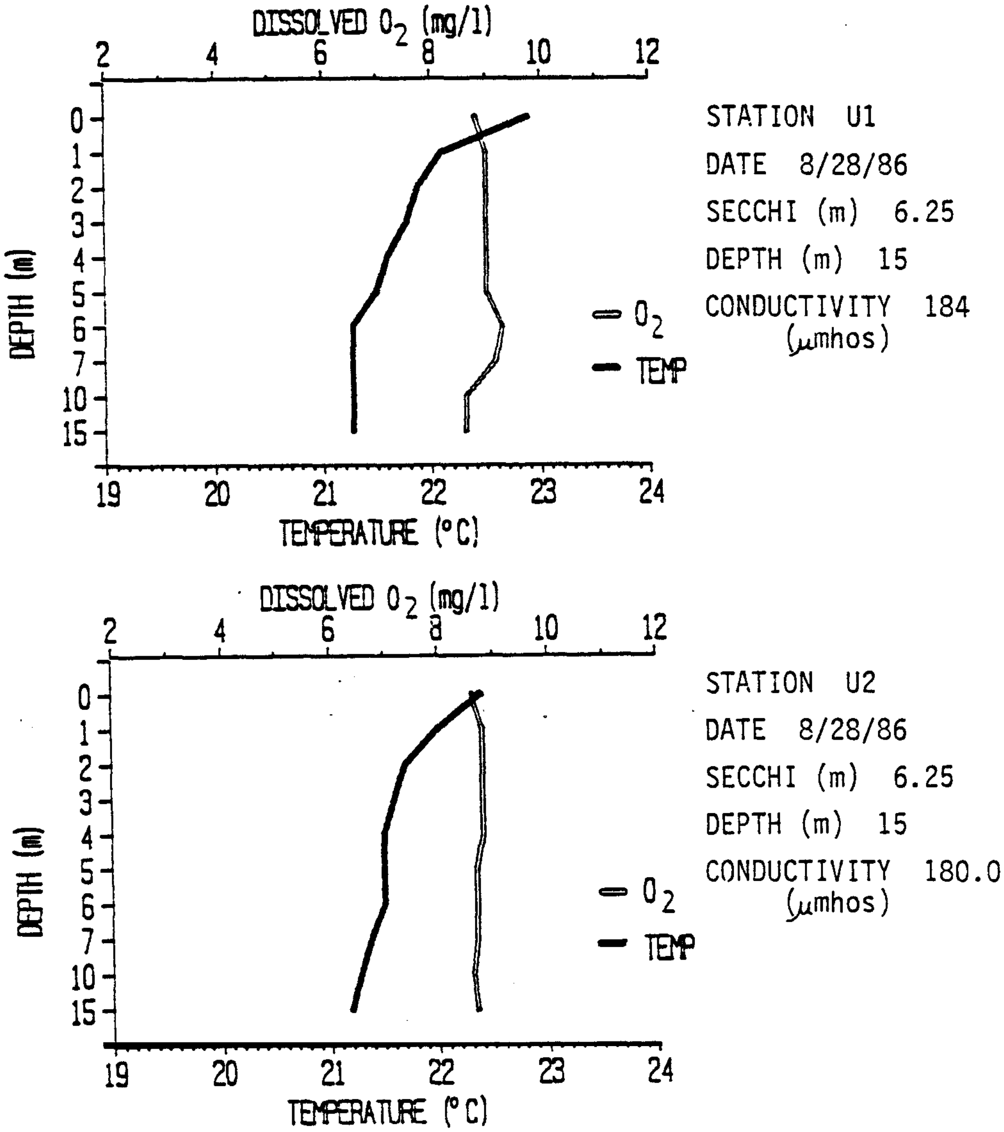


Figure 18. Limnological characteristics of the Pend Oreille River at two sampling stations (U1 and U2) in Bonner County, Idaho, 1986.

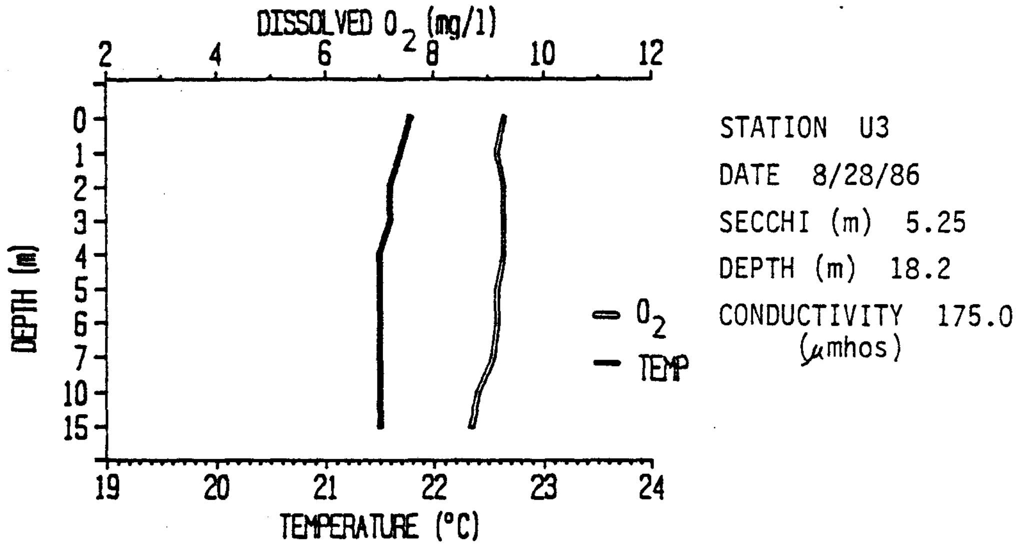


Figure 19. Limnological characteristics of the Pend Oreille River at one sampling station (U3) in Bonner County, Idaho, 1986.

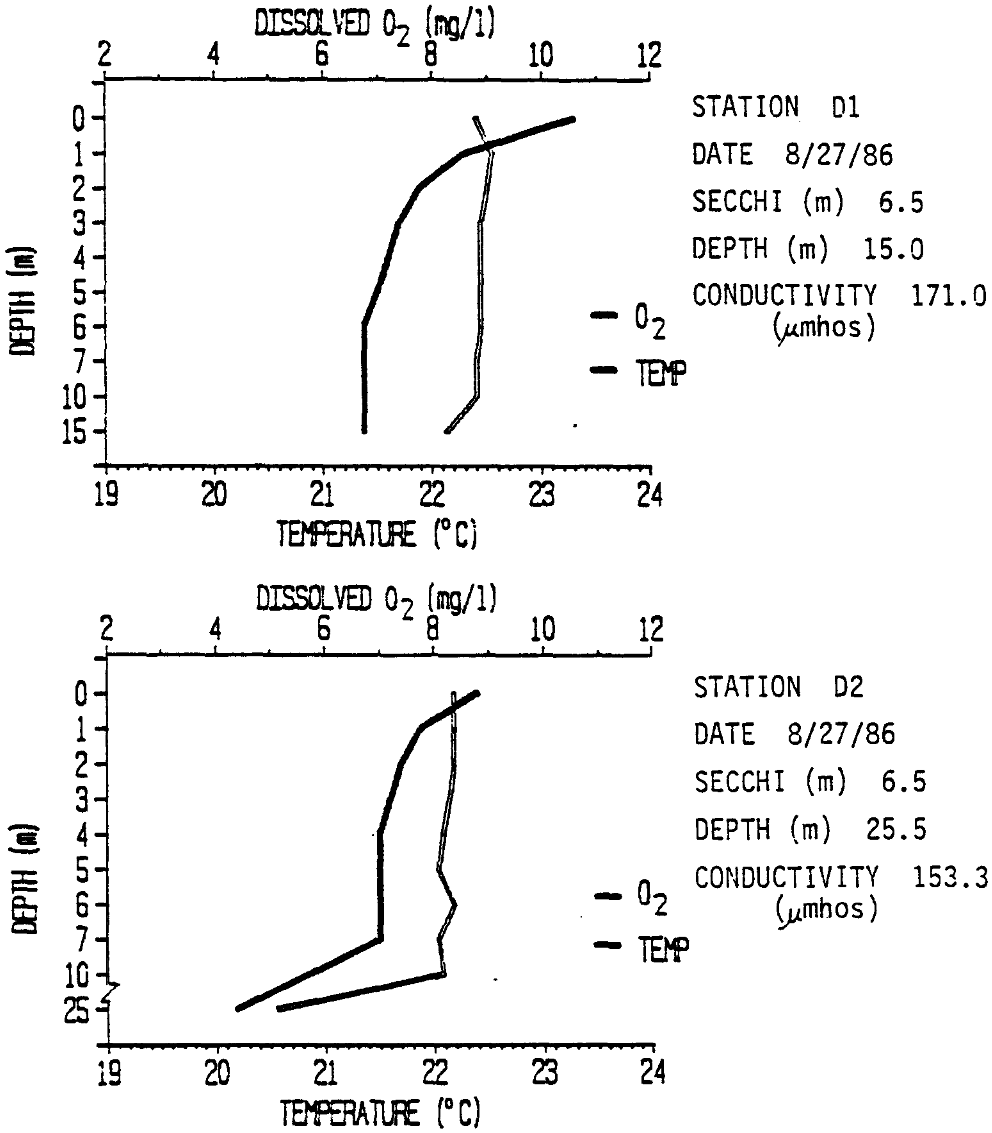


Figure 20. Limnological characteristics of the Pend Oreille River at two sampling stations (D1 and D2) in Bonner County, Idaho, 1986.

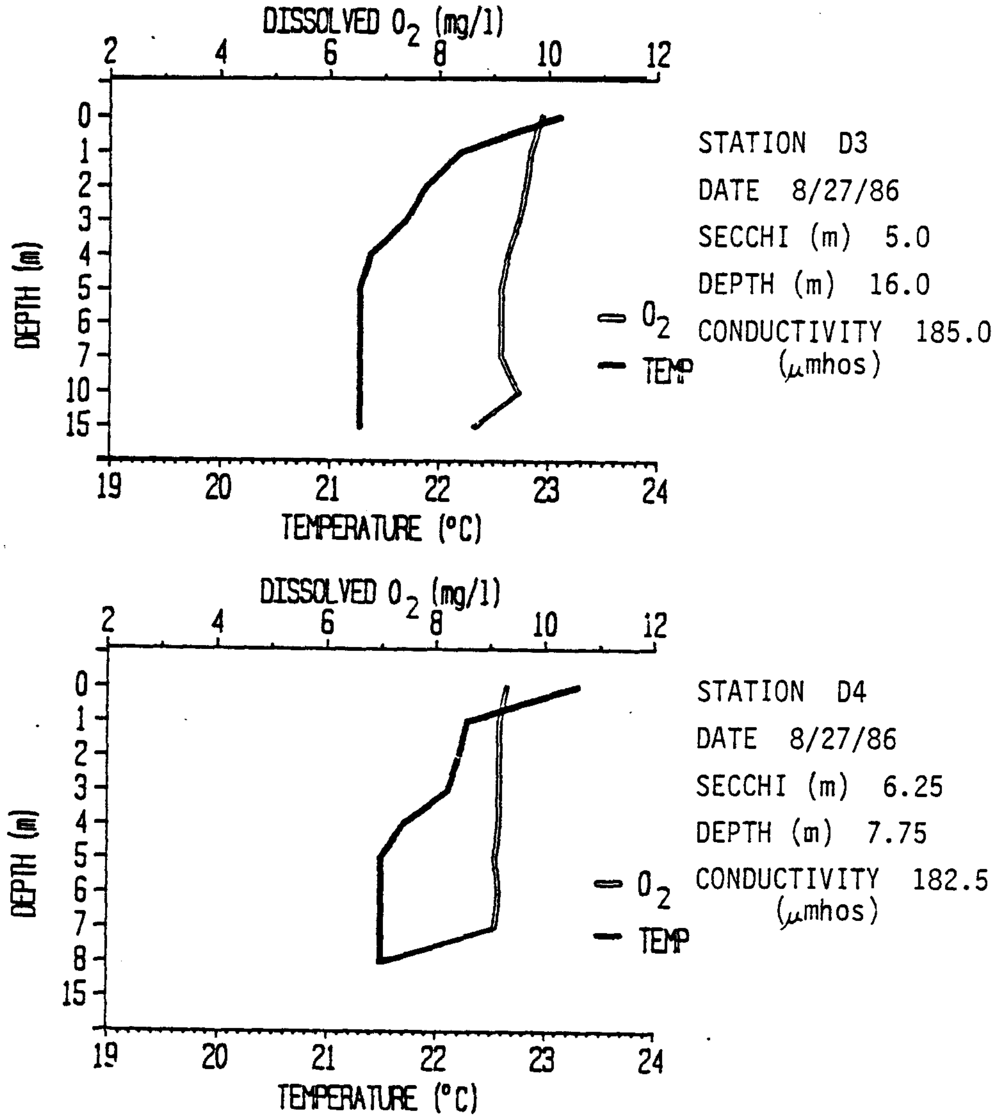


Figure 21. Limnological characteristics of the Pend Oreille River at two sampling stations (D3 and D4) in Bonner County, Idaho, 1986.

Table 20. Age, growth and maturity characteristics of game fish sampled by gillnetting in Pend Oreille River, Idaho, August 27 to 28, 1986.

Species	Length (mm)	Weight (g)	Sex	Mature	Age
Black crappie	119	16	M	No	2+
	129	25	M	No	2+
	130	23	-	No	2+
	212	128	F	Yes ('87)	5+
	220	163	M	Yes ('87)	5+
Yellow perch	145	29	M	No	3+
	157	38	F	Yes ('87)	4+
	161	40	F	Yes ('87)	4+
	178	54	F	Yes ('87)	4+
	223	--	F	Yes ('87)	5+
Rainbow trout (wild)	180	59	M	No	3+
	182	50	M	No	3+
	182	53	M	No	3+
	203	66	M	No	3+
	209	85	M	No	4+
	211	82	F	No -	3+
	222	100	M	No	4+

Habitat Survey

Limnological characteristics of Pend Oreille River were measured at seven stations in 1986 to quantify the current fishery habitat potential of the system. Samples were taken at four stations downstream from Riley Creek campground (stations D1 to D4) and three stations (U1 to U3) were located upstream (Fig. 16). Water temperature, dissolved oxygen concentration, conductivity, depth and Secchi transparency were measured at each station.

Stations U1, U2 and U3 were characterized by nearly vertical dissolved oxygen profiles (Figs. 18 and 19). Saturation was 100%+ at the surface and declined with increasing depth to produce the consistent concentrations with depth. Temperature profiles were slightly orthograde, but the water column was not strongly stratified. Mixing to the bottom probably occurs quite readily and frequently in the upper reaches of the Pend Oreille River. As a result, adequate oxygen concentrations and high temperatures are found at all depths. Other characteristics measured were similar among the upriver stations.

At the downstream sampling stations, conditions were most similar at D1 and D3 and at D2 and D4, respectively (Figs. 20 and 21). Stations D1 and D3 were more similar to those of the upper river, while stations D2 and D4 showed a more pronounced oxygen deficit near the river bottom. Depth at station D2 was about 10 m greater than at other locations and relatively less mixing may occur in these deeper pockets of cooler and more stable water. Greater biological activity along the bottom of the river at D4 may have caused the oxygen decline observed there.

Limnologically, the river was fairly homogeneous from the mouth to the dam and had adequate oxygen levels, but habitat was limited for salmonids by high isothermal water temperatures.

Shoreline Survey

A total of 54.3 and 53.1 km of shoreline habitat was characterized along the north and south banks, respectively, of the Pend Oreille River from the long bridge at Sandpoint to Albeni Falls Dam. The two dominant shoreline features delineated were grass banks and developments and they comprised an average of 53% of the total shoreline (Fig. 22). Riprap and brush-grass components comprised 40% of the north shoreline, while trees and brush-trees were of secondary ranking along the south shore.

Major reaches of the Pend Oreille River do not appear to provide quality habitat for resident or potentially introduced game fish populations. With over half the shoreline being developed, or in relatively unproductive grass banks, the abundance and distribution of more suitable habitats becomes important. Riprap banks provide important fishery habitat in many large river systems (HJort et al. 1984). Riprap banks comprise 20% of the north shore of the Pend Oreille River, but the material does not appear to extend below the low pool level in most areas. This habitat type may be important to resident fishes, but only seasonally available. Evaluation of current habitat conditions will be especially important when reviewing the temporal and spatial habitat needs for potential new species. This habitat survey does provide a solid descriptive foundation for more in-depth research and review.

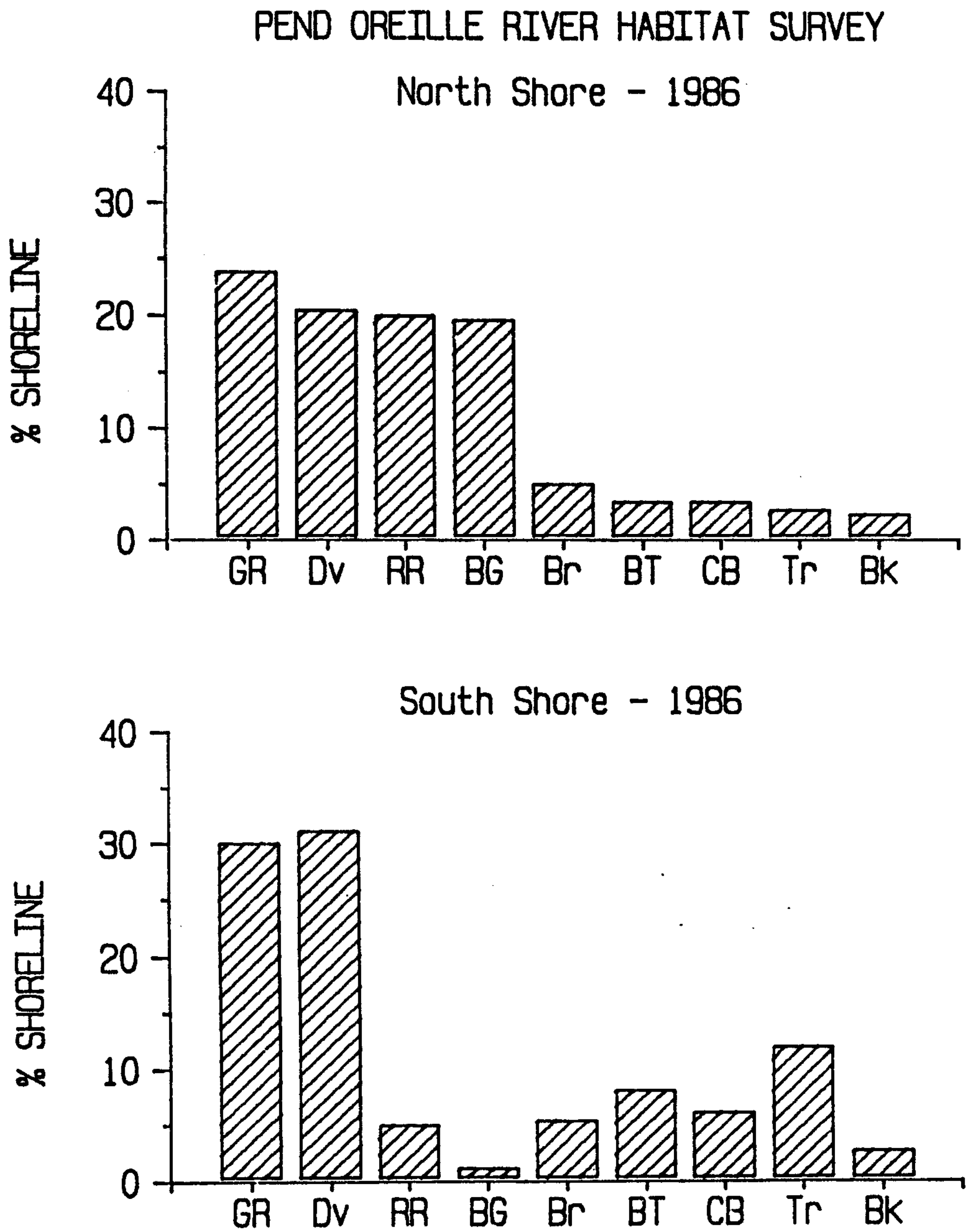


Figure 22. Percent of shoreline in various habitat types along the north and south shores of the Pend Oreille River, Idaho, from Sandpoint to Albeni Falls Dam.

Legend:

GR = grass	DV = developed
RR = riprap	BG = brush-grass
Br = brush	BT = brush-tree
CB = clay banks	Tr = tree
Bk = bedrock	

LITERATURE CITED

Carlander, Kenneth D. 1969. Handbook of Freshwater Fishery Biology, Volume 1. The University of Iowa Press, Ames, Iowa.

Carlander, Kenneth D. 1977. Handbook of Freshwater Fishery Biology, Volume 2. The University of Iowa Press, Ames, Iowa.

Ellis, Vern, B. Rieman, and T. Cochnauer. 1982. Lake and Reservoir Investigations. Job Performance Report, F-73-R-4, Job II. Idaho Department of Fish and Game.

Gamblin, Mark S. 1986. Taft-Bell Sediment and Fishery Monitoring Project. Progress Report, DE-A179-85 BP 23203. Idaho Department of Fish and Game.

Hoelscher, Brian. In preparation. Pend Oreille trout and char life history study. Idaho Department of Fish and Game.

HJort, Randy C., P. Hulett, L. LaBolle, and H. Li. 1984. Fish and invertebrates of revetments and other habitats in the. Willamette River, Oregon. Technical Report E-84-9, prepared by Oregon State University for the US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Irving, David B. 1987. Pend Oreille trout and char life history study. Idaho Department of Fish and Game.

Lukens, James R. 1978. Abundance, movements and age structure of adfluvial westslope cutthroat trout in the Wolf Lodge Creek drainage, Idaho. M.S. thesis, University of Idaho.

Partridge, Fred E. 1985. Lake and Reservoir Investigations. Job Performance Report, F-73-R-7, Job 2. Idaho Department of Fish and Game.

Rieman, Bruce E. 1984. Lake and Reservoir Investigations. Job Performance Report, F-73-R-6, Study I. Idaho Department of Fish and Game.

Simpson, James and R. Wallace. 1978. Fishes of Idaho. University Press of Idaho, Moscow, Idaho.

Underwood, Tevis. In preparation. Dynamics and ecology of salmonid fishes in the upper Spokane River, Idaho. Job Completion Report. Washington Water Power Company.

JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-11

Title: Region 1 Technical Assistance

Job No.: 1-d

Period Covered: July 1, 1986 to June 31, 1987

ABSTRACT

Region 1 management personnel provided private individuals, organizations and state and federal agencies with technical guidance, review and advice on projects associated with or having impacts on the fishery resource or aquatic habitat in Region 1. The guidance included written comments on 176 documents.

Author:

Ned J. Horner
Regional Fishery Manager

R9FS228BM

OBJECTIVES

1. To direct land use decisions in Region 1.

2. To provide other agencies and individuals with technical guidance and assistance pertaining to the fishery resources of Region 1.

3. To furnish technical assistance, advice and comments to other agencies, organizations, or individuals regarding any items, projects, or activities that are associated with or may have an impact on the fishery resource or aquatic habitat of the region.

4. To comment on environmental impact statements, provide input regarding timber sales, small scale hydropower projects, highway construction, stream alterations, EPA discharge permits, dock and boat basin development, gas and electrical transmission lines, land use planning, and other environmental impacts.

RECOMMENDATIONS

1. The loss of aquatic habitat due to land use development, stream and lake encroachment and pollution is a continuing and expanding problem. Current demands for technical guidance and the level of involvement necessary to suitably influence these proceedings exceed the amount of time that management personnel are able to contribute. This type of activity is critical to slow the continual loss of aquatic habitat, but does not directly benefit the angling public by providing any enhancement through management of existing fisheries. To accomplish both the habitat protection and the more intensive fishery management necessary under increasing demand, additional manpower is necessary. A person dealing strictly with habitat protection issues would allow the Regional Fishery Manager and biologists more time to devote to aggressive, "proactive" fishery management.

2. Appropriate technical guidance to protect lands associated with streams, while minimizing damage to aquatic habitat, has been unavailable. Development of a booklet detailing alternatives for stream stabilization should be considered. A cooperative effort between the Department of Water Resources and the Soil Conservation Service may be useful. In the meantime, the Department of Water Resources should be encouraged to take a more active role in technical guidance or referral.

3. Additional impacts to Region 1 streams from roading and timber harvest have severely degraded trout and char spawning and rearing habitat. Research to date has focused on the impact of fine sediment on early life stages of salmonids. Many Region 1 streams are further impacted by excessive bedload sediment and the loss of large woody debris,

resulting in major losses of summer and winter rearing habitat for all salmonid life stages. The need to better quantify the relationships between land use activities, stream channel dynamics, sediment transport and storage and fish habitat should be a high priority of fishery research.

TECHNIQUES USED

Through personal contact, project and document review and field inspections, we made comments and provided advice on projects or activities associated with or impacting the fishery resource or aquatic habitat of the region.

FINDINGS

During 1986, Region 1 responded to 176 written requests for comment from various agencies (Table 1). Over 90% of the Region's total were strictly fisheries related. Region 1 responded to 29% of the state's total of written technical guidance with Region 1 fisheries, representing about 25% of the state's total comments on both fish and wildlife issues. The apparent disproportionate number of written comments handled by Region 1 fisheries management appears to be primarily associated with US Forest Service timber sales, as well as US Army Corps of Engineers, Water Resources and Department of Lands stream alteration and shoreline encroachment permits. The majority of requests were handled by the Regional Fishery Manager in an attempt to free up the regional fishery biologists' time for data collection and analysis. The current technical guidance workload will require a more equitable distribution between existing fish management staff personnel at the sacrifice of more active fisheries management.

Numerous presentations and programs were made to civic and sportsmen groups throughout the year.

In addition to routine comment and technical guidance, a number of issues required considerably more effort and involvement by regional personnel.

Forest Service

Several issues related to logging impacts on fishery habitat in northern Idaho were dealt with in greater detail. Newly proposed water quality standards for nonpoint source activities were reviewed and commented on numerous occasions. Adequacy of the Forest Practices Act in protecting fishery habitat was discussed. Timber industry representatives were made aware of critical life history stages and habitat needs of fish in technical workshops and field tours. Numerous newspaper interviews were given on the above—referenced subjects.

Table 1. Written technical guidance comments by agency and Idaho Department of Fish and Game Region during 1986.

Region or Bureau	Bureau Land Management	Corps of Engineers	U.S. Forest Service	U.S. Bureau of Reclamation	Environ. Protection Agency	Idaho Dept. Lands	Health & Welfare	State Clearing-house	Dept. Transportation	Dept. Water Resources	Misc.	Total	Per cent
Region 1	3	26	32	--	4	54			4	26	27	176	29
Region 2	1	11	18	--	7	12	1		10	32	13	105	17
Region 3	11	8	24	--	12	.13			10	25	10	113	19
Region 4	1	5	2	--	5	1			2	2	9	27	4
Region 5	9	3	11	1	1	2			7	7	19	60	10
Region 6	15	11	30	1	6	10			3	21	15	112	19
Program Coordination	3	--	5	--	1	--	--		--	--	6	15	2
Fisheries	--	--	--	--	--	--		--	--	--	1	1	>1
Wildlife	--	--	--	--	--	--		--	--	--	--	--	--
Total	43	84	122	2	36	92	1		36	113	100	609	--
Percent	7	11	20	>1	6	15	>1		6	19	16		

R9FS231GM

Wolf Lodge Creek

Regional personnel continued to be involved in data collection, analysis and discussions related to mitigation for fish losses from the June 4, 1983 gasoline spill in Wolf Lodge Creek. The north end of Lake Coeur d'Alene, Wolf Lodge Creek and the upper Spokane River remained closed to the harvest of trout in 1985 and will remain closed through 1987 to protect critically low populations of cutthroat from the Wolf Lodge Creek drainage.

The gas spill lawsuit was finally resolved and $80,000 was made available for mitigation purposes. A detailed mitigation plan was not developed in 1986 although three areas of potential mitigation were identified. A trapping facility for both cutthroat and chinook near the 1-90 crossing, reproduction of two-year-old cutthroat smolts and match money for habitat restoration were identified as potential mitigation options.

Discussions continued in 1986 with numerous agencies and Wolf Lodge Creek landowners to identify and hopefully resolve fish habitat loss-private property damage problems in the lower end of Wolf Lodge Creek. Regional personnel continued discussions with the Forest Service, Soil Conservation Service, Idaho-Washington Rural Conservation Districts, Water Resources, US Army Corps of Engineers, County Planning and Zoning, Division of Environment, and private landowners. Identification and resolution of the problem will be a priority project in 1987.

Excessive bedload sediment in the lower portion of the creek has created a situation where existing channel capacity cannot handle-normal bank full discharges. Bank destabilization, property damage, and loss of critical spawning and rearing habitat for westslope cutthroat has resulted. The causes of the problem are not well understood. Landowners' attempts to protect their property have -often been ineffective and have aggravated the existing problem. Landowners have become frustrated with agency involvement to date. We felt that something had to be done to attempt to resolve these problems or the rapid loss of the adfluvial cutthroat fishery in Coeur d'Alene Lake would result.

Fish Habitat Improvement

The fishery management staff actively pursued habitat improvement projects on both streams and lakes in 1986. Drop log structures were built on Hayden Creek with the assistance of US Forest Service and the North Idaho Flycasters. The region assisted the North Idaho Flycasters apply for a $5,000 grant from Fish America Foundation to match with US Forest Service money for habitat improvement projects on Teepee Creek in the Coeur d'Alene River drainage. The region coordinated with the US Forest Service and local sportsmen to initiate a spiny ray habitat improvement project in Hayden lake. Materials were collected in 1986 to be placed in the lake in 1987.

Submitted by:

Ned J. Horner
Regional Fishery Manager

Larry D. LaBolle
Regional Fishery Biologist

Cynthia A. Robertson
Regional Fishery Biologist

Approved by:

IDAHO DEPARTMENT OF FISH & GAME

Kenneth D. Norrie

for, Jerry M. Conley, Director

David L. Hanson

David L. Hanson, Chief
Bureau of Fisheries

Virgil Moore

Virgil K. Moore
Fishery Research Manager