FISHERY MANAGEMENT INVESTIGATIONS

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PANHANDLE REGION (Subprojects I-A, II-A, III-A, IV-A)

SUBPROJECT I. SURVEYS AND INVENTORIES
- Job a. Panhandle Region Mountain Lakes Investigations
- Job b. Panhandle Region Lowland Lakes Investigations
- Job c. Panhandle Region Rivers and Streams Investigations

SUBPROJECT II. TECHNICAL GUIDANCE
SUBPROJECT III. HABITAT MANAGEMENT
SUBPROJECT IV. LAKE RESTORATION

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2000 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management

Project: I-Surveys and Inventories

Subproject: I-A Panhandle Region

Job No.: a

Title: Mountain Lakes Investigations

Contract Period: July 1, 2000 to June 30, 2001

ABSTRACT

There were no mountain lake survey activities in the Panhandle Region during this contract period.

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2000 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management

Project: I-Surveys and Inventories | Subproject: I-A Panhandle Region

Job No.: b | Title: Lowland Lakes Investigations

Contract Period: July 1, 2000 to June 30, 2001

ABSTRACT

A midwater trawl was used to estimate the kokanee *Oncorhynchus nerka* population in Coeur d'Alene Lake in early August. Trawl results indicated continued low numbers of adult kokanee with the total population of age-3 fish estimated at 75,000, or 8 fish/ha. We estimated 784,000 age-1 and 169,000 age-2 kokanee. The estimated population of age-0 kokanee was 4.18 million fish. The standing stock of kokanee was 5.8 kg/ha. Kokanee fry collected in the trawl ranged from 30 mm to 80 mm TL, age-1 kokanee ranged from 100 mm to 170 mm, age-2 fish ranged from 180 mm to 250 mm, and age-3 kokanee ranged from 240 mm to 340 mm. Hydroacoustic surveys confirm that the trawler underestimates the older age classes of kokanee but is accurate for age-0.

We counted 45 chinook salmon *Oncorhynchus tshawytscha* redds in the Coeur d'Alene River drainage and five in the St. Joe River. All redds were left undisturbed to provide natural production. We stocked 28,200 age-0 chinook salmon at the Mineral Ridge boat ramp. Volunteer anglers implanted $10 spaghetti reward tags in chinook to monitor exploitation. Based on angler returns of reward tags and a correction factor for non-reporting, chinook exploitation in Coeur d'Alene Lake in 2000 was about 20%.

A midwater trawl was used to estimate the kokanee population in Spirit Lake in early August. We estimated a total kokanee population in Spirit Lake of 901,900 fish. Age-3 kokanee ranged from 250 mm to 280 mm at the time of trawling, and the population was estimated at 7,800 fish or 13 fish/ha. This is much lower than the average density in recent years of around 100 fish/ha. Age-2 kokanee were also very low in abundance. The age-2 population was estimated at only 6,800 fish or 12 fish/ha. Age-1 kokanee ranged from 150 mm to 190 mm. The age-1 population of 73,000 fish was much improved over the age-1 estimate from 1999.

An additional 365 lake trout *Salvelinus namaycush* were tagged by the Priest Lake volunteer angler. Fish ranged from 300 mm to 590 mm TL with a mean size of 474 mm. Twenty-nine tags from previous tagging efforts were returned in 2000. Annual growth of tagged fish ranged from 0 mm to 84 mm with an average of 40 mm. The return rate for tagged fish since 1983 for the first full year after tagging ranged from 0% to 16.8%, with a weighted mean of 6.8%. The mean annual decline in tag returns was 25%, which would likely be a close approximation of natural mortality (including tag loss).

We conducted a fish population survey of the northwest Smith Creek Slough, located on the Boundary Creek Wildlife Management Area (WMA), on June 21-22, 2000. The purpose of the survey was to determine fish species composition, assess size structure of game fish, and assess the potential for developing and/or enhancing sport fishing opportunities. We collected seven species of fish in the four

gill nets including yellow perch *Perca flavescens*, pumpkinseeds *Lepomis gibbosus*, and black bullheads *Ameiurus melas*. Game species collected were not of a size to attract significant angling effort. Although fish abundance in the surveyed areas was moderately high, the size structure, macrophyte cover and difficult shoreline access greatly limit the value of the Smith Creek Slough as a sport fishery.

We conducted a creel survey on Pend Oreille Lake from February 1, 2000 through January 30, 2001, with the primary objective of assessing rule changes designed to increase harvest of rainbow trout *O. mykiss* and lake trout. Anglers fished a total of nearly 364,000 rod hours during the survey period, or 232,200 angler hours during 33,140 angler days. Nearly 86% of the effort was for rainbow trout and around 8% was for lake trout. The remaining effort was by anglers targeting "any" fish (3%), warmwater fish (2%), or cutthroat trout (1%). Estimated harvest of rainbow trout was 8,827 fish. Approximately 40% of the rainbow trout landed were harvested. The mean rainbow trout catch rate for the entire season by anglers targeting rainbow trout was around 20 rod h/fish. Estimated harvest of lake trout was 4,707 fish. Anglers harvested around 78% of the lake trout landed. The mean catch rate of lake trout for the entire season by anglers targeting lake trout was 8 rod h/fish. The estimated harvest of cutthroat trout was 1,032, with anglers harvesting almost 70% of the fish landed.

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OBJECTIVES

1. Evaluate stock status of kokanee salmon *Oncorhynchus nerka kennerlyi* in Coeur d'Alene Lake.

2. Count redds and estimate production of wild chinook salmon *O. tshawytscha* in the Coeur d'Alene and St. Joe rivers.

3. Estimate exploitation of chinook salmon in Coeur d'Alene Lake.

4. Evaluate stock status of kokanee in Spirit Lake.

5. Use tag-return information from 1983 through 2000 to estimate exploitation and growth of lake trout *Salvelinus namaycush* in Priest Lake.

6. Assess the potential for establishing a fishery in the Smith Creek Slough on the Boundary Creek Wildlife Management Area.

7. Estimate effort, catch rates, and harvest parameters for the Pend Oreille Lake fishery.

METHODS

Fish Population Characteristics

Coeur d'Alene Lake

Kokanee Population Estimate-We used a midwater trawl as described by Bowler et al. (1979), Rieman and Meyers (1990), and Rieman (1992) to estimate the kokanee population in Coeur d'Alene Lake. Twenty-two transects were trawled during the dark phase of the moon on August 1-2, 2000. Trawl transects were selected using a stratified random sample design and were in identical locations (as near as possible) to those used in previous years (Figure 1). Kokanee were measured and weighed, and scales and otoliths were collected from representative length groups for age analysis.

We used an experimental sinking gill net to estimate mean length of male and female kokanee spawners. The net was set at depths of 3-5 m near Higgins Point for one-half hour on December 6, 2000. Potential egg deposition (PED) was estimated as the number of female kokanee spawners (half the mature population based on midwater trawling) multiplied by the average number of eggs produced per female. The average number of eggs produced per female kokanee was calculated using the following length to fecundity regression (Rieman 1992):

$$y = 3.98x - 544$$

Where: x = mean length of female kokanee spawners (mm)
y = mean number of eggs per female

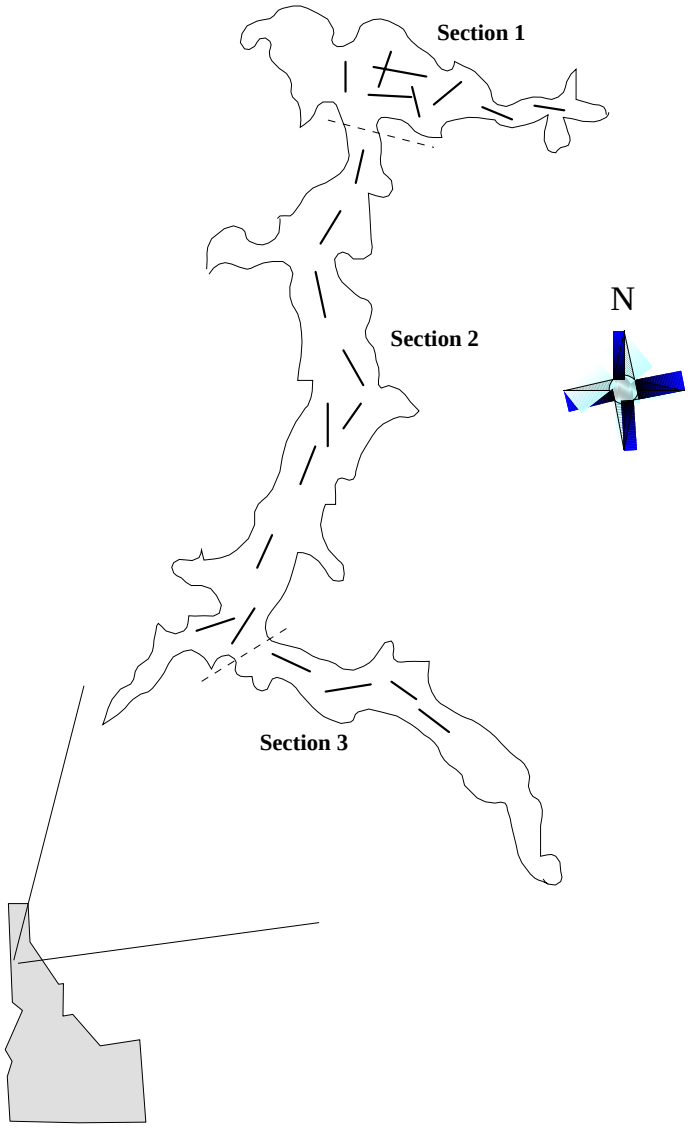

Figure 1. Location of the midwater trawling transects in three sections of Coeur d'Alene Lake, Idaho, used to estimate the kokanee population.

Chinook Salmon Abundance-As in previous years, we utilized a combination of hatchery reared and naturally produced juvenile chinook salmon to propagate the chinook population in Coeur d'Alene Lake. We estimated the natural production using redd counts, an estimate of 4,000 eggs per redd, and a mean egg-to-smolt survival of 10%. Idaho Department of Fish and Game (Department) personnel used a helicopter to conduct chinook redd surveys in the Coeur d'Alene River, North Fork Coeur d'Alene River, South Fork Coeur d'Alene River, Little North Fork Coeur d'Alene River and St. Joe River on October 7, 2000. We did not install a fish weir on Wolf Lodge Creek to collect eggs from migrating adult chinook salmon because of the low number of returning adult chinook. We conducted kelt and redd surveys to estimate natural reproduction in Wolf Lodge Creek.

Chinook Salmon Exploitation-We used volunteers to implant spaghetti reward tags in chinook salmon from December 1999 through March 2000. We then used angler returns corrected for compliance to estimate annual chinook exploitation in 2000. We also obtained growth information where angler records were sufficiently reliable.

Hydroacoustic Survey-An IDFG Fishery Research crew used hydroacoustic equipment on Coeur d'Alene Lake from July 31 through August 2 to estimate the chinook population and to compare kokanee density estimates obtained with the trawler with those from the hydroacoustic equipment. A detailed account of the methods and equipment is included in Appendix A.

Spirit Lake

We used a midwater trawl on the night of August 3, 2000 to estimate the kokanee population and relative year-class abundance in Spirit Lake. We trawled the same five transects as in previous years (Figure 2). Kokanee lengths and weights were recorded, and scale and otoliths were collected from representative length groups for age analysis.

Priest Lake

2000 Tagging and Tag Returns-Lake trout were tagged as part of an ongoing effort to quantify angler exploitation and help define the population dynamics of lake trout in Priest Lake. All fish were caught and tagged by Randy Phelps, a volunteer angler. Spaghetti tags were placed in the musculature beneath the dorsal fin. Catch location and date, fish length and weight, tag number, and any comments regarding the health or release of the fish were recorded at the time of tagging. Fish were released back to their original capture location.

In addition, we continued to collect information from tagged lake trout with tags from previous years reported by anglers in 2000. As in past years, we summarized total and annual growth and distance from original capture.

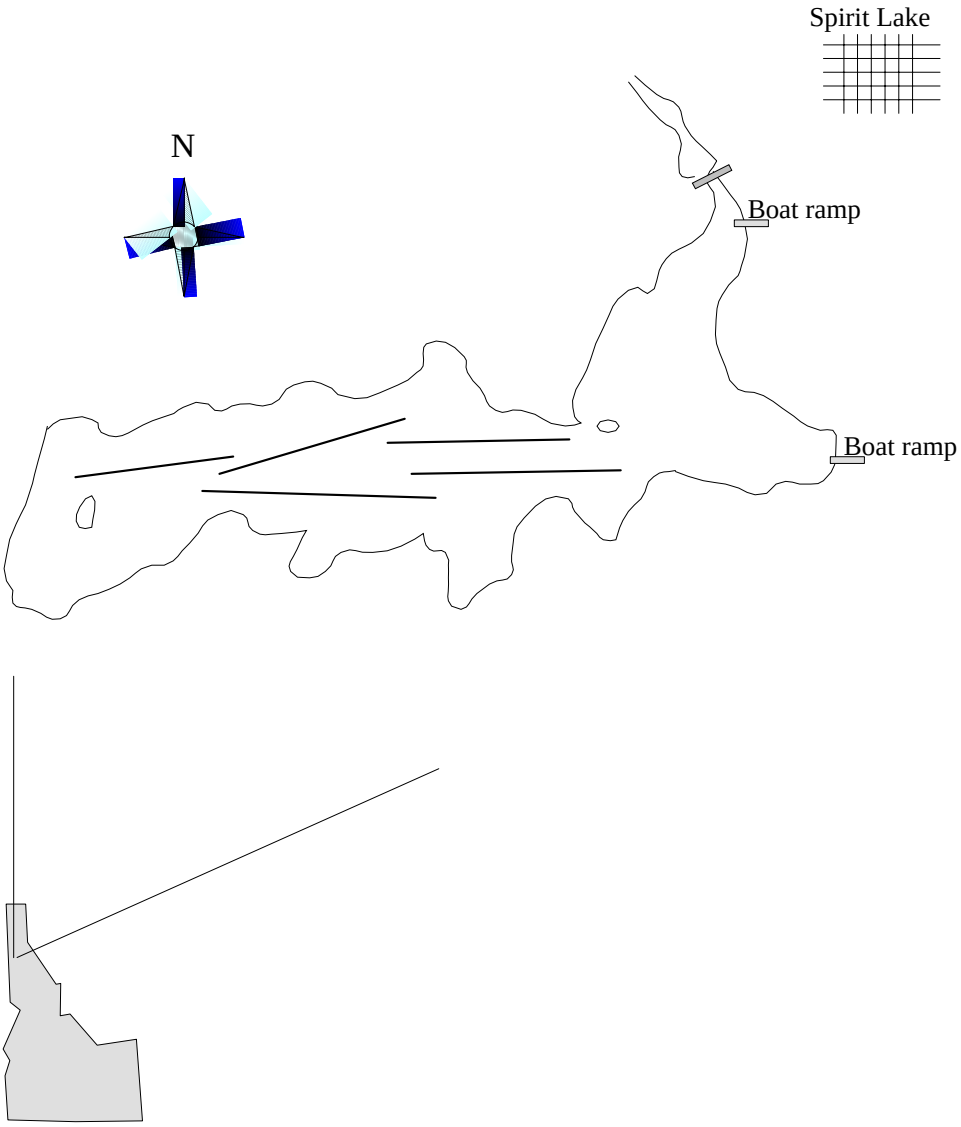

Figure 2. Location of the five midwater trawl transects used to estimate the kokanee population in Spirit Lake, Idaho.

Exploitation and Mortality Based on Historical Tagging Data-We reviewed historical tagging and tag return records from lake trout in Priest Lake to determine if accurate estimates of exploitation could be extrapolated from the data. Approximately 3,150 lake trout have been tagged since 1977. Unfortunately the records of the first three years of tagging are incomplete and there are no tag return records prior to 1983. Therefore the first six years of the tagging study are incomplete and unreliable with regard to exploitation estimates. For this reason, for the analysis we utilized tagging data only from 1983 through 1999 and tag return data only from 1984 through 2000. This included 1,787 tags and 281 tag returns.

Because these tagging numbers were based on returns of three types of tags (jaw, T-bar and spaghetti tags) and were both reward and non-reward, the percent return had to be corrected to account for tag retention and tag reporting rates. In 1986 and 1987, both non-reward jaw tags and non-reward T-bar anchor tags were used, which allowed for comparison of the two tag types. Jaw tags were assumed to have a near 100% retention rate as has been documented in rainbow trout *O. mykiss* within the first two years of marking (Stauffer and Hansen 1969). We therefore assumed the difference between the return rates of the two tag types over the six years following tagging could be attributed primarily to tag retention. In 1986 and 1995, both reward T-bar tags and non-reward T-bar tags were used. We assumed a nearly 100% return rate on the reward tags, and then assumed the difference between the return percentage for those two tag types could be attributed to variable reporting rates. After correction factors were calculated for tag retention and reporting rate for the various tag types, we adjusted the tag return percentage accordingly.

We were also able to estimate natural mortality with the tag return rates. To account for natural mortality, we assumed exploitation was constant from 1986 to present and used the decrease in tag returns to estimate annual mortality rates. We calculated the mean return rates for each year since tagging, from the first full year at large to 14 years since tagging. Because the number of tags implanted varied widely from year to year, we weighted the return rates accordingly. We then used the decline in annual tag return percentage for the six years post-tagging as a measure of natural mortality and tag loss.

Boundary Creek WMA Fishery Assessment

We conducted a fish population survey of the northwest Smith Creek Slough located on the Boundary Creek WMA, on June 21-22, 2000. The survey was intended to be more qualitative than quantitative in nature (i.e., our goal was to determine what species occur rather than how many). The purpose of the survey was to determine fish species composition, assess size structure of game fish collected, and assess the potential for developing and/or enhancing sport fishing opportunities.

We used two floating and two sinking gill nets on overnight sets in two separate areas of the slough. Gill nets were monofilament with mesh sizes ranging from 1.9 to 6.4 cm bar measure. The first site was typical of the shallow area of the slough, and the second site was at the deeper, more open water area along the hillside (Figure 3). Our initial intent was to use three gear types (gill nets, electrofishing, beach seine) for the survey; however, the steep banks, soft bottom, and dense aquatic vegetation prohibited the use of the backpack electrofisher and beach seine.

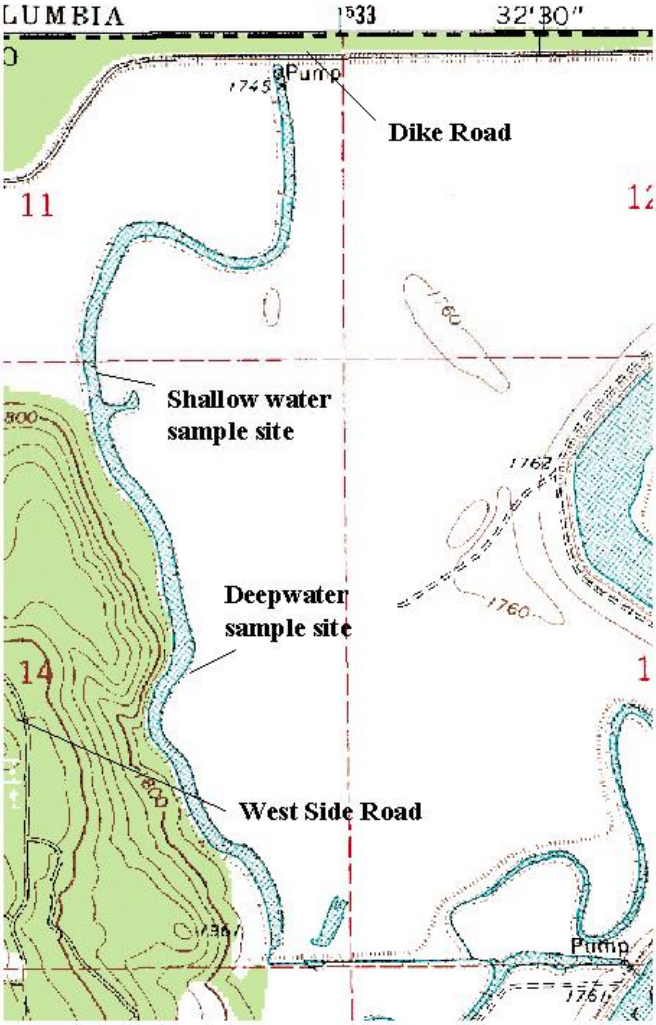

Figure 3. Location of the Smith Creek Slough sampling sites used to characterize the fisheries potential of the Boundary Creek Wildlife Management Area, Idaho.

Pend Oreille Lake Creel Survey

We conducted a creel survey on Pend Oreille Lake from February 1, 2000 through January 28, 2001. The intent was primarily to estimate harvest of Gerrard rainbow and lake trout in relation to liberalized seasons and bag limits, which were designed to minimize predation impacts to kokanee.

Effort Estimates

The 12-month study period was divided into 26 two-week intervals. During each interval, effort estimates were conducted by fixed-wing aerial counts. Two weekend days and two weekdays were randomly selected during each interval for counts. Boats were counted twice on selected count days, once at a randomly selected time in the morning and again at a randomly selected time in the evening. The aircraft observers did not make an effort to count the number of anglers or rods on each boat nor did they attempt to determine whether boats moving at high speed were fishing boats or not. Instead, the count was restricted to the number of boats that were actively fishing at the time of the count.

Angler Interviews

Two creel clerks were assigned full time to the creel survey from March through November. Volunteers and full-time staff interviewed anglers on a part-time basis from December through January. The clerks were stationed at the high-use boat launches and marinas for 10-hour shifts on two weekdays and two weekend days each week. During the spring and summer, when day length was 15-16 hours, the shifts were evenly split between morning (shift beginning about one hour after daylight) or evening (shift ending just after dusk). This ensured that clerks interviewed anglers who quit fishing at all hours of the day.

One clerk was assigned to the northern area access points (primarily the Boat Basin at Hope, Hope Marina, East Hope Marina, Holiday Shores, and Johnson Creek) and one to the southern area access points (Garfield Bay, Bayview, Farragut). Clerks were directed to station themselves at the various sites on a rotating basis, but were told to use their judgment as to where they were being most effective (i.e., if a clerk was stationed at a boat ramp where there were no empty boat trailers, [s)he would obviously not be successful interviewing anglers at that site). At high effort times of the year (Spring Derby and Thanksgiving Challenge) we added from one to six creel clerks to maximize the number of angler interviews.

Interviews consisted of asking anglers how many hours they had fished (based on time they began), how many anglers were in the party, how many rods were used, whether the trip was complete, the “preferred” or “target” species, and the number of each species caught and kept or released. Creeled fish were measured in total length.

Data Summary and Analysis

We used the Idaho Creel Census System program (CCS; McArthur 1992) for data analysis and summary. Total harvest for each interval was estimated as:

$$Y = P \times CR$$

Where: Y = total catch of a species
P = Pressure = fishing pressure in rod hours per day
CR = Mean Catch Rate = rod hours per species

Fishing effort or P (Pressure) was estimated as:

$$P = C \times H$$

Where: C = total number of rods (estimated by boat counts multiplied by the mean number of rods/boat)
H = total daylight hours in interval

More detailed methods of summary calculations including variance estimates are included in the CCS manual (McArthur 1992).

RESULTS

Fish Population Characteristics

Coeur d'Alene Lake

Kokanee Abundance-Trawl results indicated continued low numbers of adult kokanee with the total population of age-3 fish estimated at 75,300, or 8 fish/ha (Table 1). This represents a slight increase over the age-3 population estimated in 1999 but is still far below the long-term mean of nearly 1 million age-3 fish. We estimated 783,700 age-1 and 168,700 age-2 kokanee. Both of these year classes were below the 1979-1999 mean, and were down from the 1999 estimates. The estimated population of age-0 kokanee at 4.18 million fish was higher than the previous mean and higher than the 1999 estimate. The standing stock of kokanee in Coeur d'Alene Lake was 5.8 kg/ha, which is also slightly down from 1999 at 6.5 kg/ha. Both 1999 and 2000 are much improved over the 1998 estimate of 1.7 kg/ha, indicating that the kokanee population is recovering from the impacts of the 1996 and 1997 floods. Consistent with previous years, highest age-0 kokanee densities were in the northern section of the lake (Table 2). Based on the 1999 PED estimate and the 2000 age-0 estimate, egg to fry survival was 22%, which is much higher than previous years (Table 3).

Kokanee fry collected in the trawl ranged from 30 to 80 mm TL. Age-1 kokanee ranged from 100 to 170 mm with a modal length of around 140 mm, which is comparable to 1999. Age-2 fish ranged from 180 to 250 mm with a modal length of around 200 mm, also comparable to 1999. Size of the age-3 kokanee at the time of trawling ranged from 240 to 340 mm, with a modal length of 310 mm (Figure 4).

Table 1. Estimated abundance of kokanee made by midwater trawl in Coeur d'Alene Lake, Idaho, 1979-2000. To follow a particular year class of kokanee, read up one row and right one column.

Sampling year	Age class				Total	Age 3+/ha
	Age 0+	Age 1+	Age 2+	Age 3/4+		
2000	4,184,800	783,700	168,700	75,300	5,212,600	8
1999	4,091,500	973,700	269,800	55,100	5,390,100	6
1998	3,625,000	355,000	87,000	78,000	4,145,000	8
1997	3,001,100	342,500	97,000	242,300	3,682,000	25
1996	4,019,600	30,300	342,400	1,414,100	5,806,400	147
1995	2,000,000	620,000	2,900,000	2,850,000	8,370,000	296
1994	5,950,000	5,400,000	4,900,000	500,000	12,600,000	52
1993	5,570,000	5,230,000	1,420,000	480,000	12,700,000	50
1992	3,020,000	810,000	510,000	980,000	5,320,000	102
1991	4,860,000	540,000	1,820,000	1,280,000	8,500,000	133
1990	3,000,000	590,000	2,480,000	1,320,000	7,390,000	137
1989	3,040,000	750,000	3,950,000	940,000	8,680,000	98
1988	3,420,000	3,060,000	2,810,000	610,000	10,900,000	63
1987	6,880,000	2,380,000	2,920,000	890,000	13,070,000	93
1986	2,170,000	2,590,000	1,830,000	720,000	7,310,000	75
1985	4,130,000	860,000	1,860,000	2,530,000	9,370,000	263
1984	700,000	1,170,000	1,890,000	800,000	4,560,000	83
1983	1,510,000	1,910,000	2,250,000	810,000	6,480,000	84
1982	4,530,000	2,360,000	1,380,000	930,000	9,200,000	97
1981	2,430,000	1,750,000	1,710,000	1,060,000	6,940,000	110
1980	1,860,000	1,680,000	1,950,000	1,060,000	6,500,000	110
1979	1,500,000	2,290,000	1,790,000	450,000	6,040,000	46
Previous mean	3,241,200	1,622,300	1,780,300	909,100	7,407,000	94

Table 2. Kokanee density (fish/ha) estimates for each age class and standing crop in each section of Coeur d'Alene Lake, Idaho, August 1-2, 2000.

Section	Age 0	Age 1	Age 2	Age 3	Kg/ha
1	3,559,863	400,873	5,710	0	5.52
2	611,629	354,531	152,853	73,082	7.30
3	13,333	28,273	10,178	2,262	1.19
Whole lake	4,184,825	783,677	168,741	75,344	5.80
(±90% CI)	1,652,524	337,251	122,228	53,536	

Table 3. Estimates of female kokanee spawning escapement, potential egg deposition, fall abundance of kokanee fry, and their subsequent survival rates in Coeur d'Alene Lake, Idaho, 1979-2000.

Year	Estimated female escapement	Estimated potential number of eggs ($x10^6$)	Fry estimate the following year ($x10^6$)	Percent egg to fry survival
2000	37,700	32		
1999	28,000	19	4.18	22.62
1998	39,000	26	4.09	15.73
1997	90,900	54	3.60	6.67
1996	707,000	358	3.00	0.84
1995	1,425,000	446	4.02	0.90
1994	250,000	64	2.00	0.31
1993	240,000	92	5.95	6.46
1992	488,438	198	5.57	2.81
1991	631,500	167	3.03	1.81
1990	657,777	204	4.86	1.96
1989	516,845	155	3.00	1.94
1988	362,000	119	3.04	2.55
1987	377,746	126	3.42	2.71
1986	368,633	103	6.89	6.68
1985	530,631	167	2.17	1.29
1984	316,829	106	4.13	3.90
1983	441,376	99	0.70	0.71
1982	358,200	120	1.51	1.25
1981	550,000	184	4.54	2.46
1980	501,492	168	2.43	1.45
1979	256,716	86	1.86	2.20

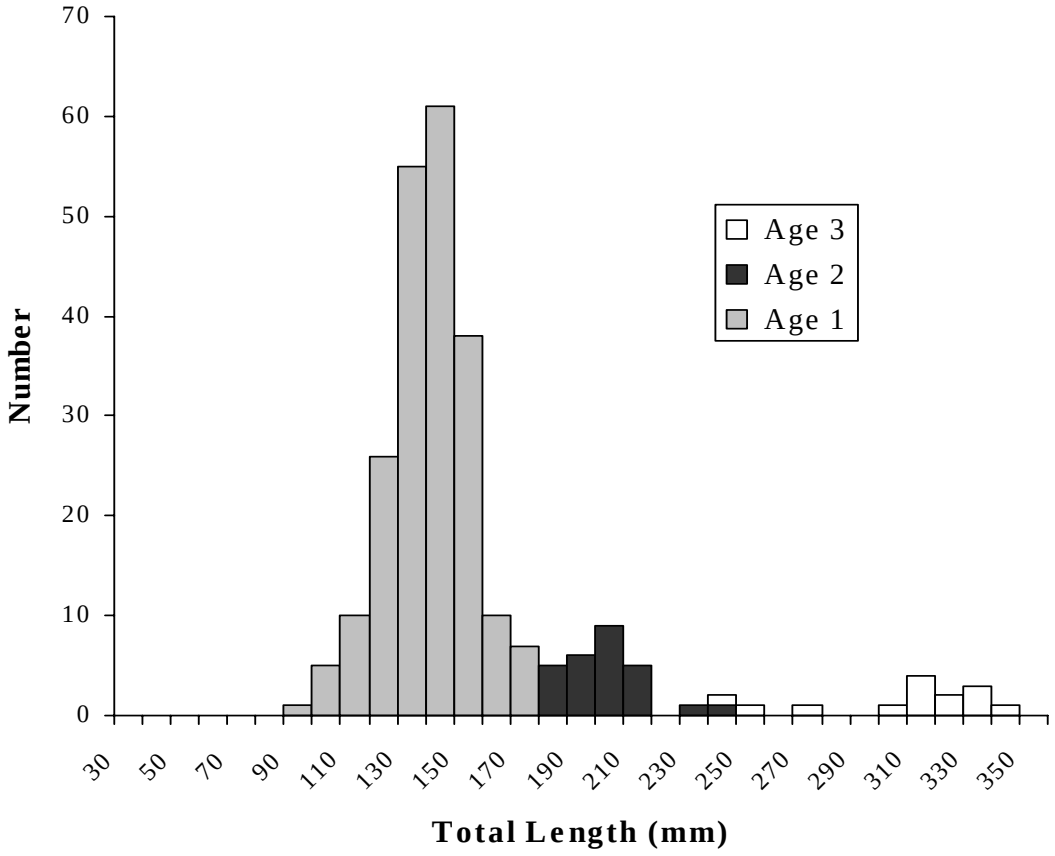

Figure 4. Length frequency and age of kokanee collected by midwater trawling in Coeur d'Alene Lake, Idaho, August, 2000.

This is 40 mm greater than the modal length of age-3 fish in 1999. Typical of kokanee in Coeur d'Alene Lake, maturity was primarily at age-3. None of the age-2 kokanee examined was mature, and all of the age-3 kokanee captured were mature.

In four half-hour gill net sets, we collected 37 kokanee spawners near Higgins Point in Wolf Lodge Bay. Males far outnumbered females with only around 16% of the sample being females. Female mean length was 353 mm (TL; n=6, SD=18). Male mean and modal lengths were both 380 mm (n=31, SD=1.2). Mean length of spawners was noticeably higher than 1998 and 1999. Males and females were both 50 mm larger than spawners in the past two years. Spawner length is the largest it has been since the 1950s (Figure 5). Mean fecundity was estimated at 860 eggs per female based on a mean female spawner length of 350 mm, and potential egg deposition was approximately 32.4 million eggs (Table 3). This is much higher than the 1999 PED estimate of better than 18 million eggs but is still well below the average for the past 19 years (135 million).

Chinook Salmon Abundance-We counted 45 chinook salmon redds in the North Fork of the Coeur d'Alene River and five in the St. Joe River. Interestingly, we also counted five redds in the South Fork of the Coeur d'Alene River between Interstate 90 and the confluence with the North Fork. This reach has not historically had significant reproduction, presumably because of the heavy metal levels associated with the streambed. We estimated an additional three chinook redds in Wolf Lodge Creek based on observed redds and kelts. We therefore estimated the total number of redds in the drainage at 53 (Table 4). All redds were left undisturbed to provide natural production. Conditions for counting were favorable (clear skies and clear water), and we were easily able to see most redds. We stocked 28,200 age-0 chinook salmon at the Mineral Ridge boat ramp in Wolf Lodge Bay on June 12, 2000 (Table 5). Chinook eggs were collected at Big Springs Hatchery in Oregon and were reared in the Nampa Hatchery. Mean length was 130 mm, and all fish were marked with an adipose fin clip.

Chinook Salmon Exploitation and Growth-Anglers implanted 83 $10 reward spaghetti tags in chinook salmon from December 1999 through April 2000. Eight of these tags were returned within one year of initial capture for an uncorrected annual exploitation rate of 10 percent. A non-reporting rate of around 50% is typical for $10 reward tags based on a model developed for duck bands (Nichols et al. 1991). Therefore, total exploitation was likely around 20%. We assumed tag loss was minimal, as it should be with spaghetti tags.

Annual growth ranged from 10 to 200 mm, with a mean annual growth of 126 mm (n=5; Table 6). Three of the fish were captured too soon after tagging to have grown significantly. Angler reported weights were not sufficiently accurate to estimate annual weight gain.

Hydroacoustic Survey-Hydroacoustic surveys indicated a lake-wide population of chinook (>500 mm) of 18,000 (±18%, α=0.1) fish. Mean chinook density was 2.7 fish/ha, with the highest densities per transect (5.4 to 5.7 fish/ha) found from East Point to Carlin Bay. Sample size was insufficient to partition the chinook into individual size classes. A complete summary of the chinook population estimate is in Appendix A.

Comparison of trawl and hydroacoustic data demonstrated the inefficiency of the trawl on older age classes of kokanee. A regression relationship between the two methods indicated that the trawl sampled nearly 100% of the kokanee fry but sampled less than 10% of the age-2 and age-3 kokanee.

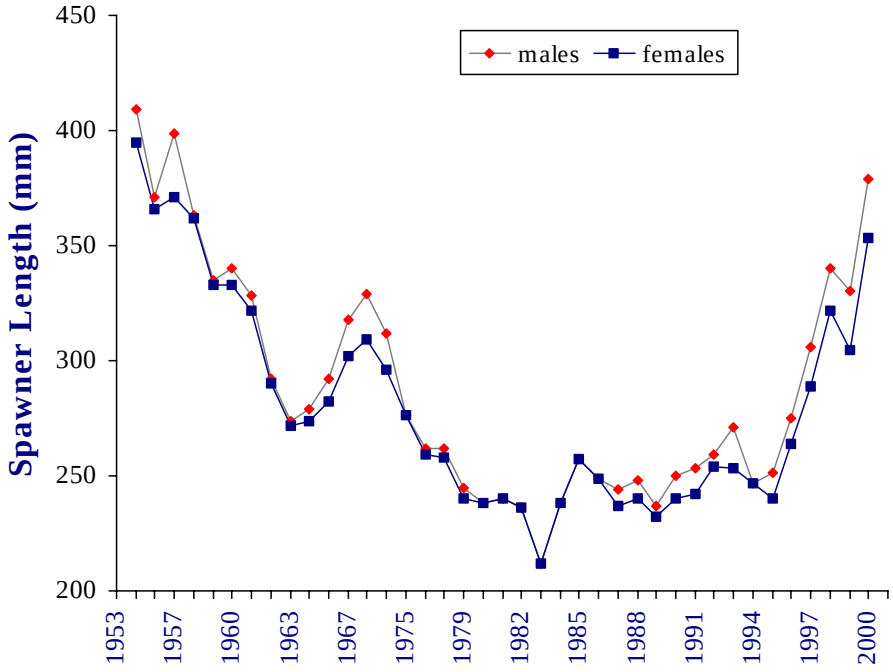

Figure 5. Mean total length of male and female kokanee spawners in Coeur d'Alene Lake, Idaho, from 1954 to 2000. Years where mean lengths were identical between sexes are a result of averaging male and female lengths.

Table 4. Chinook salmon redd counts in the Coeur d'Alene River drainage, St. Joe River, and Wolf Lodge Creek, 1990-2000.

Location	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coeur d'Alene River											
Cataldo Mission to S.F. Cd'A River	41	11	29	80	82	45	54	18	11	7	16
S.F. Cd'A River to L.N.F. Cd'A River	10	0	5	11	14	14	13	5	3	5	20
L.N.F. Coeur d'Alene River to Steamboat Creek	--	2	3	6	1	1	13	6	1	0	3
Steamboat Creek to steel bridge	--	--	1	0	0	2	0	3	0	0	0
Steel bridge to Beaver Creek	--	--	--	--	0	0	0	1	0	0	0
S. F. Coeur d'Alene River	--	--	--	--	13	--	4	0	0	0	5
L.N.F. Coeur d'Alene River	--	--	--	--	0	2	0	0	0	0	1
Coeur d'Alene River Subtotal	51	13	38	97	110	64	84	33	15	12	45
St. Joe River											
St. Joe City to Calder	4	0	18	20	6	1	59	20	3	0	5
Calder to Huckleberry C.G.	3	1	1	4	0	0	5	2	1	0	0
Huckleberry C.G. to Marble Creek	3	0	2	0	1	0	7	2	0	0	0
Marble Creek to Avery	0	0	0	0	1	0	0	0	2	0	0
St. Joe River Subtotal	10	1	21	24	8	1	71	24	6	0	5
Wolf Lodge Creek									4	5	3
TOTAL	66	14	63	121	118	65	155	57	25	17	53

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Table 5. Number of chinook salmon stocked and estimated number of naturally produced chinook salmon entering Coeur d'Alene Lake, Idaho, 1982-2000.

	Hatchery produced					Naturally produced		
Year	Number	Stock	Rearing hatchery	Mean length (mm)	Fin clip	Redds	Estimated smolts	Total
1982	34,400	Bonneville	Hagerman	137	--	--	--	34,400
1983	60,100	Bonneville	Mackay	124	--	--	--	60,100
1984	10,500	L. Michigan	Mackay	150	--	--	--	10,500
1985	18,500	L. Michigan	Mackay	140	L. ventral	--	--	18,500
1986	29,500	L. Michigan	Mackay	114	R. ventral	--	--	29,500
1987	59,400	L. Michigan	Mackay	119	Adipose	--	--	59,400
1988	44,600	Coeur d'Alene	Mackay	133	L. ventral	--	--	44,600
1989	35,400	Coeur d'Alene	Mackay	126	R. ventral	--	--	35,400
1990	36,350	Coeur d'Alene	Mackay	123	Adipose	52	23,400	59,100
1991	42,650	Coeur d'Alene	Mackay	129	L. ventral	70	31,500	73,100
1992	10,000	Coeur d'Alene	Mackay	132	R. ventral	14	6,300	16,300
1993	0				--	63	28,350	28,350
1994	17,269	Coeur d'Alene	Nampa	134	Adipose	100	40,000	57,269
1995	30,200	Coeur d'Alene	Nampa	124	L. ventral	100	40,000	70,200
1996	39,700	Coeur d'Alene	Nampa	122	R. ventral	65	26,000	65,700
1997	12,100	Coeur d'Alene	Nampa	120	Adipose	84	33,600	45,700
1998	55,200	Priest Rapids	Cabinet G.	100	L. ventral	37	14,800	70,000
1999	25,000	Big Springs	Cabinet G.	93	R. ventral	25	10,000	35,000
2000	28,200	Big Springs	Nampa	130	Adipose	17	6,800	35,000

Table 6. Tag returns, growth, and original release sites of chinook salmon tagged in Coeur d'Alene Lake, Idaho, from December 1999 through December 2000.

	Mark			Recapture			Growth (mm)		Distance (km)
Tag #	Date	TL (mm)	Location	Date	TL (mm)	Location	Total	Annual	
02362	4/13/00	400	Carlin Bay	10/8/00	500	Hudson Pt	100	200	14
R1-550	12/16/99	470	Windy Bay	10/6/00	480	Higgins Pt	10	10	24
R1-533	2/23/00	610	Driftwood	2/29/00	--	Black Rock	Not enough time at large		7
R1-541	12/99	490	Driftwood	3/20/00	490	Powderhorn	Not enough time at large		10
R1-527	2/21/00	686	Carlin Bay	8/9/00	760	East Pt	74	190	8
R1-551	12/16/99	674	Windy Bay	12/9/00	744	Loffs Bay	70	70	8
R1-523	2/17/00	570	Driftwood	4/27/00	--	Powderhorn	Not enough time at large		10
R1-601	1/16/00	400	Tubbs Hill	1/31/01	560	Tubbs Hill	160	160	0
MEAN		540						126	10

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A complete summary of the results of the comparison between trawl and hydroacoustic equipment is in Appendix A.

Spirit Lake

Kokanee Abundance-We estimated a total kokanee population in Spirit Lake of 901,900 fish (Table 7). Abundance of age-3 kokanee was estimated at 7,800 fish, or 13 fish/ha. This is the second lowest estimate of adult kokanee since trawling began in 1981. Similarly, age-2 kokanee (the 1998 year-class) were estimated at only 6,800 fish, which is the lowest estimate of age-2 fish on record. This year-class has been very weak since they were fry in 1998. The age-1 kokanee population was estimated at 73,100, which is much improved from the age-1 estimates in the past two years but is still only around half of the mean of all previous years. The age-0 kokanee population was far more encouraging than the older year-classes. We estimated there were over 800,000 fry, which far exceeds the mean of previous years. We estimated the total biomass of kokanee in Spirit Lake at 10.3 kg/ha.

Age-3 kokanee ranged from 250 to 280 mm with a mean size of 260 mm at the time of trawling. This was somewhat larger than the mean size of age-3 kokanee from 1999 of 245 mm. We only caught six age-2 kokanee and they ranged from 220 to 239 mm. Age-1 kokanee ranged from 150 to 180 mm (Figure 6), and age-0 kokanee ranged from 30-89 mm. All age-classes were slightly larger than the 1999 lengths. The increase in size is likely related to the lower densities in 2000.

Priest Lake

2000 Tagging and Tag Returns-An additional 365 lake trout were tagged by the Priest Lake volunteer angler. Fish ranged from 300 to 590 mm (TL), with a mean size of 474 mm. As in past years, most of these fish (82%) were tagged near the northeast tip of Bartoo Island.

A total of 29 tagged lake trout were reported in 2000. All had been tagged in Priest Lake between 1986 and 2000 (Table 8). Two of the tags had been found in the stomach of larger lake trout. One was an approximately 340 mm fish that was evidently consumed by a 725 mm fish, and the other was an approximately 320 mm fish that was consumed by a 660 mm fish. Growth of tagged fish ranged from zero to 130 mm/year, with an average annual growth of 40 mm/year. This is higher than the mean annual growth observed in 1999 (13 mm/year), and of 1998 (25 mm/year).

Exploitation Based on Historic Tagging Data-We summarized tag returns by year beginning with 1983. First, we tabulated the raw number of tags that have been reported annually for each year lake trout were marked (Table 9). These returns were then converted to percent return on an annual basis (Table 10). We then used the 1986, 1987, and 1995 marking years to address tag retention and reporting rates. In a pairwise comparison, we found no significant difference between the return rates of non-reward jaw tags and non-reward T-bar anchor tags. The mean annual return rates for jaw tags and T-bar tags implanted in 1986 were 2.3% and 1.9%, respectively (Table 11). The mean annual return rates for jaw and T-bar tags implanted in 1987 were 2.8% and 2.9%, respectively. We therefore concluded that tag

Table 7. Kokanee population estimates based on midwater trawling from 1981 through 2000 in Spirit Lake, Idaho.

Year	Age Class				Total	Age-3+/ha
	Age-0	Age-1	Age-2	Age-3		
2000	814,200	73,100	6,800	7,800	901,900	13
1999	286,900	9,700	50,400	34,800	381,800	61
1998	28,100	62,400	86,900	27,800	205,200	49
1997	187,300	132,200	65,600	6,500	391,600	11
1996	--	--	--	--	--	--
1995	39,800	129,400	30,500	81,400	281,100	142
1994	11,800	76,300	81,700	19,600	189,400	34
1993	52,400	244,100	114,400	11,500	422,400	20
1992	--	--	--	--	--	--
1991	458,400	215,600	90,000	26,000	790,000	45
1990	110,000	285,800	84,100	62,000	541,800	108
1989	111,900	116,400	196,000	86,000	510,400	150
1988	63,800	207,700	78,500	148,800	498,800	260
1987	42,800	164,800	332,800	71,700	612,100	125
1986	15,400	138,000	116,800	35,400	305,600	62
1985	149,600	184,900	101,000	66,600	502,100	116
1984	3,300	16,400	148,800	96,500	264,900	168
1983	111,200	224,000	111,200	39,200	485,700	68
1982	526,000	209,000	57,700	48,000	840,700	84
1981	281,300	73,400	82,100	92,600	529,400	162
Previous mean	145,900	146,500	107,600	56,100	456,100	98

Fry releases:
2000 - 200,208
1994 - 383,550
1988 - 75,000
1987 - 60,800
1986 - 57,142
1985 - 109,931
1984 - 100,000

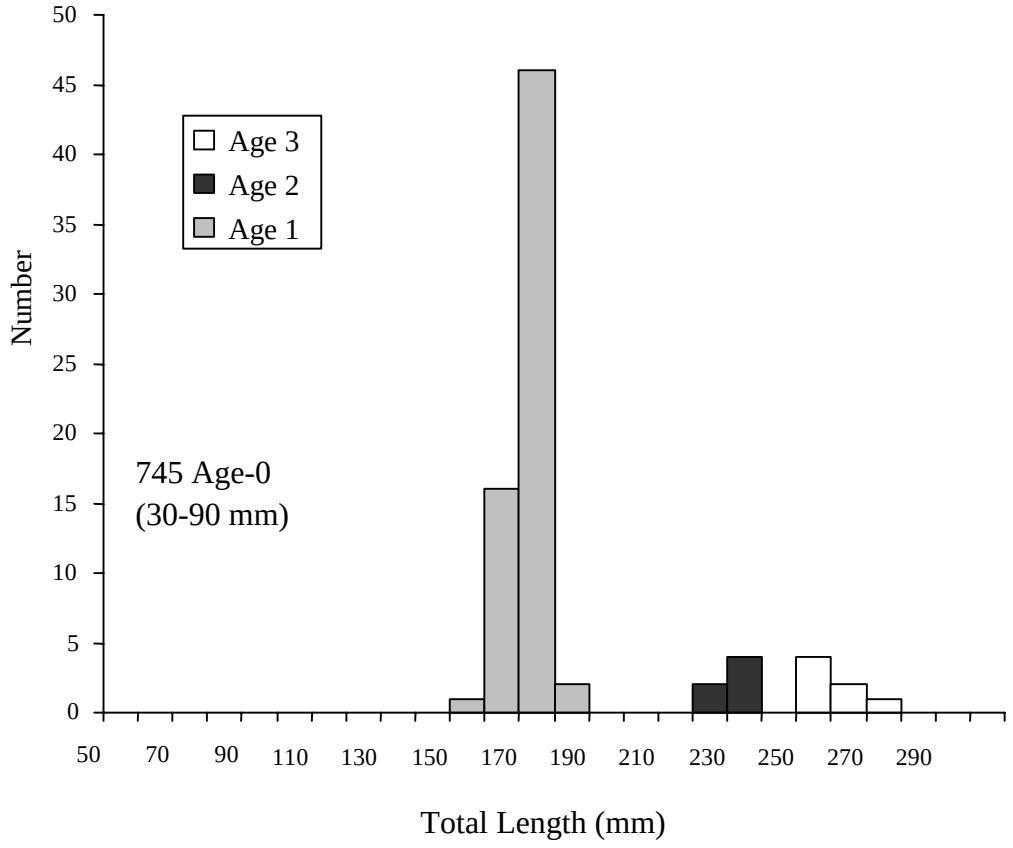

Figure 6. Length frequency and age distribution of kokanee collected by midwater trawling in Spirit Lake, Idaho, August 2000.

Table 8. Size, growth, and locations of tagged lake trout reported in 2000 from Priest Lake, Idaho.

		Recapture			Mark			Growth (mm)		
Tag # (color)		Date	Length (mm)	Location	Date	Length (mm)	Location	Total	Annual	Distance (km)
H-61	Jaw	2/1	1,020	North end	86	690	Cavanaugh	330	25	16+
R1-152	Green	4/29	710	Indian Cr.	Aug-99	340	NE Bartoo	Big fish ate tagged fish		
R1-1351	Yellow	5/1	460	Cape Horn	Jul-96	430	Eightmile	30	8	4
H-170	Jaw	5/13	720	Fourmile	Nov-86	650	Kalispell I.	75	5	3
R1-164	Blue	5/27	660	Twin I.	Oct-95	500	NE Bartoo	160	30	11
A00289	White	6/10	ND	Grandview	May-90	720	Pinto Pt.	ND	ND	4
R1-112	Green	7/8	600	NE Bartoo	Jul-99	560	NE Bartoo	40	40	0
R1-101	Green	7/17	≅ 600	Outlet B.	Jul-99	320	NE Bartoo	Big fish ate tagged fish		
R1-290	Green	7/20	430	Cavanaugh	Jul-00	430	NE Bartoo	Caught four days after tagging		
R1-320	Green	7/26	400	Cavanaugh	Jul-00	400	NE Bartoo	Caught one day after tagging		
R1-270	Blue	8/1	500	Cape Horn	Jun-97	400	NE Bartoo	100	30	8
249	Sonic	8/4	760	Twin I.	Aug-97	630	Up. Priest	130	43	13
R1-99	Green	8/8	480	NE Bartoo	Jul-99	400	NE Bartoo	80	80	0
R1-430	Green	8/12	500	NE Bartoo	Jul-00	500	NE Bartoo	Not enough time at large		
R1-324	Green	8/14	500	NE Bartoo	Jun-00	480	NE Bartoo	20	80	0
R1-36	Blue	8/14	600	Luby Bay	Sep-95	430	SE Bartoo	170	35	2
R1-126	Green	8/18	580	Pinto Pt.	Jul-99	500	NE Bartoo	80	80	3
R1-319	Blue	8/20	460	Cavanaugh	Aug-99	410	NE Bartoo	50	50	2
R1-642	Green	8/22	560	Kalispell B.	Jul-00	510	SE Bartoo	50? (not likely)		2
R1-291	Blue	8/27	670	Four mile	Aug-97	420	NE Bartoo	150	50	0
R1-42	Blue	9/1	660	Twin I.	Sep-95	510	NE Bartoo	150	30	10
R1-428	Green	9/4	560	Kalispell B.	Jul-00	560	NE Bartoo	0	--	3
R1-85	Green	9/9	580	NE Bartoo	Jul-99	440	NE Bartoo	140 ?	130	0
R1-500	Green	9/27	560	Rocky Pt.	Jul-00	550	NE Bartoo	10	30	2
2441	Red	9/27	910	Twin I.	May-00	890	Up. Priest	20	40	12
R1-492	Green	10/6	460	Cavanaugh	Jul-00	450	SE Bartoo	10	40	3
R1-82	Green	10/19	460	Luby Bay	Jul-99	410	NE Bartoo	50	40	3

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Table 9. Lake trout tag returns (by number) from 1983 through 2000 for each year since marking in Priest Lake, Idaho.

Tag year	# tags out	Type	Return year																	
			1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1980	154	J	2	5	4	8	2	1	1	3	1	1	2	0	0	0	0	0	1	0
1981	50	J	0	3	1	2	1	1	0	0	0	1	0	0	0	0	0	0	0	0
1983	7	T		0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0
1984	92	J, T			6	14	3	2	2	3	1	0	0	0	0	0	0	0	0	0
1985	6	J			2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	657	J, T				17	34	19	19	13	14	3	1	2	0	1	0	2	1	2
1987	129	J, T					2	4	8	4	4	3	0	0	0	0	0	0	2	0
1988	78	T						1	4	3	0	1	1	0	1	0	0	0	1	0
1990	84	T								1	7	1	2	0	1	0	0	0	0	1
1991	93	T									7	5	3	3	0	1	0	3	0	0
1995	229	T													1	7	5	3	9	3
1996	67	T															0	1	0	1
1997	47	Sp															2	2	1	3
1998	59	Sp																	1	0
1999	239	Sp																	1	6
2000	365	Sp																		9

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Table 10. Lake trout tag returns (by percent) since 1983 for each year since marking in Priest Lake, Idaho. Percentages were calculated by dividing tag return by the total number marked minus the number of tags previously reported.

Tag Year	# tags out	Type	Return Year																	
			1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1980	154	J*	1.2	3.3	2.7	5.6	1.5	0.7	0.7	2.3	0.8	0.8	1.6	0	0	0	0	0	0.8	0
1981	50	J	0	6.0	2.1	4.3	2.2	2.3	0	0	0	2.4	0	0	0	0	0	0	0	0
1983	7	T	0	0	0	1.2	0	0	2.4	0	0	0	0	0	0	0	0	0	0	0
1984	92	J, T		0	6.5	16.3	4.2	2.9	3.0	4.6	1.6	0	0	0	0	0	0	0	0	0
1985	6	J			33.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	657	J, T				2.6	5.3	3.1	3.2	2.3	2.5	0.6	0.2	0.4	0	0.2	0	0.4	0.2	0.4
1987	129	J, T					1.6	3.1	6.5	3.5	3.6	0.9	0	0	0	0	0	0	1.9	0
1988	78	T						1.3	5.2	4.1	0	0	1.4	0	1.4	0	0	0	1.5	0
1990	84	T								1.2	8.4	1.3	2.7	0	1.4	0	0	0	0	1.4
1991	93	T									7.5	5.8	3.7	3.8	0	1.3	0	4.2	0	0
1995	229	T													0.4	3.0	2.3	1.4	4.2	1.5
1996	67	T														0	0	1.5	0	1.5
1997	47	Sp															4.3	4.4	2.4	7.5
1998	59	Sp																0	1.7	0
1999	239	Sp																	0.4	2.5
2000	365	Sp																		2.5

* J=Jaw tag; T=T-bar Floy tag; Sp=Spaghetti Floy tag

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Table 11. Return rates of lake trout tags based on tag type from fish marked in 1986, 1987, and 1995 in Priest Lake, Idaho.

			Return Year								
1995 Returns by number		# out	1995	1996	1997	1998	1999	2000		Total	Mean
T-bar	reward	190	1	7	4	3	8	3		26	
	% return		0.5%	3.7%	2.2%	1.5%	4.0%	1.5%		13.5%	2.3
	non-reward	39	0	0	1	0	1	0		2	
	% return		0.0%	0.0%	2.6%	0.0%	2.5%	0.0%		5.1%	0.9
1987 Returns by number		# out	87	88	89	90	91	92			
Jaw	non-reward	90	2	3	5	2	2	1		15	
	% return		2.2%	3.4%	5.6%	2.2%	2.0%	1.0%		16.5%	2.8
T-bar	non-reward	41	0	0	3	2	2	0		7	
	% return		0.0%	0.0%	7.3%	5.3%	4.8%	0.0%		17.3%	2.9
1986 Returns by number		# out	86	87	88	89	90	91	92		
Jaw	non-reward	345	5	13	10	8	9	9	2	56	
	% return		1.4%	3.8%	3.0%	2.3%	2.5%	2.4%	0.5%	15.9%	2.3
T-bar	reward	126	5	16	7	6	2	1	1	38	
	% return		4.0%	13.2%	6.1%	4.3%	1.4%	0.6%	0.6%	30.2%	4.3
	non-reward	185	8	5	2	5	1	4	0	25	
	% return		4.3%	2.8%	1.1%	2.6%	0.5%	2.0%	0.0%	13.2%	1.9

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retention was high with both tag types, and a correction factor was unnecessary. The comparison of reward and non-reward T-bar tags, however, did indicate a higher return rate of reward tags in both 1986 and in 1995 (Table 11). Overall, there was an annual return rate of 1.7% for non-reward tags, and a 3.4% return rate for reward tags. This indicates that only around half of the non-reward tags are reported and that a correction factor is necessary.

We then corrected the return rates in Table 10 for reporting rate. Return rates for years when only non-reward tags were used were corrected by doubling the observed return rate. In years when both reward tags and non-reward tags were used, we corrected return rates proportionately. The adjusted return rate for tagged fish the first year at large since 1983 ranged from 0 to 16.8%, with a weighted mean of 6.8% (Table 12). As expected, the return rate decreased in subsequent years (5.7% in the second year, 3.5% in the third year, 2.5% in the fourth year). The mean annual decline in tag returns for the first seven years at large was 25%, which would likely be a close approximation of natural mortality (tag loss might account for a portion of this decline, but as discussed previously we have evidence that tag retention was very high). Conversely, survival was around 75%.

Boundary Creek WMA Fishery Assessment

The northwest Smith Creek Slough of the Boundary Creek WMA is nearly 2.8 km long and averages around 10 m wide. Average depth of the slough during the survey dates was probably 1.5 to 2 m. The shoreline is steep and not conducive to bank fishing. Because of the soft bottom, the slough is not conducive to wading. In most areas at least 50% of the surface area is covered with aquatic vegetation. The macrophyte community is dominated by milfoil (most likely a native variety). In the southern half of the slough, the old stream channel runs along the base of the hillside. The slough widens and is characterized by a maximum depth of 7 m and a mean depth of around 5 m. This appears to be the only area with depths sufficient to provide overwinter or mid-summer fish habitat.

We collected seven species of fish in the four gill nets. Three are classified as game species by IDFG, and four are classified as non-game fish (Table 13). Game species collected were not of a size to attract significant angling effort. None of the yellow perch *Perca flavescens*, pumpkinseeds *Lepomis gibbosus*, or black bullheads *Ameiurus melas* were over 205 mm. We observed numerous fish rising while setting and pulling nets. In general, fish abundance in the surveyed areas appeared to be moderately high based on the gill net catch and observed fish activity.

Pend Oreille Lake Creel Survey

We interviewed 6,443 anglers from February 2000 through January 2001, representing 5,500 completed trips. Sixty-eight percent of the anglers interviewed were residents and 32% were non-residents. We did not attempt to quantify shore anglers because of the difficulty of counting them with the aerial surveys. Based on occasional ground counts and interviews, however, shore angling was an insignificant component of the overall fishery.

Table 12. Estimated harvest rates for lake trout from Priest Lake, Idaho based on tag returns corrected for angler non-reporting and summarized by the number of years from initial time of tagging. Mean harvest rate for each year since capture was weighted based on the number of tags used for each year.

Tagging year	# tags out	Weighting factor	Years since capture														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1983	7	0.4%	0.0	0.0	2.4	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	92	5.1%	13.0	32.6	8.4	5.8	6.0	9.2	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	6	0.3%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1986	657	36.8%	8.1	4.9	4.7	3.2	3.8	0.6	0.2	0.4	0.0	0.2	0.0	0.4	0.2		
1987	129	7.2%	6.2	13.0	7.0	7.2	1.8	0.0	0.0	0.0	0.0	0.0	0.0	1.9			
1988	78	4.4%	10.4	8.2	0.0	0.0	2.8	0.0	2.8	0.0	0.0	0.0	3.0				
1990	84	4.7%	16.8	2.6	5.4	0.0	2.8	0.0	0.0	0.0	0.0						
1991	93	5.2%	11.6	7.4	7.6	0.0	2.6	0.0	8.4	0.0							
1995	229	12.8%	3.0	2.7	1.4	4.2	1.5										
1996	67	3.7%	0.0	1.5	0.0												
1997	47	2.6%	4.4	2.4													
1998	59	3.3%	1.7	0													
1999	239	13.4%	2.5														
Weighted mean			6.8	5.7	3.5	2.5	2.4	0.7	0.8	0.1	0.0	0.1	0.1	0.3	0.1	0.0	0.0

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Table 13. Species collected during the June 21-22, 2000 survey of the Smith Creek Slough, Boundary Creek Wildlife Management Area, Idaho.

Common Name	Scientific name	Number collected	Size range (mm)	Game species
Black bullhead	*Ameiurus melas*	20	120 - 205	✓
Peamouth	*Mylocheilus caurinus*	17	190 - 270	
Yellow perch	*Perca flavescens*	15	120 - 180	✓
Northern pikeminnow	*Ptychocheilus oregonensis*	13	200 - 420	
Largescale sucker	*Catostomus macrocheilus*	8	210 - 450	
Longnose sucker	*Catostomus catostomus*	2	230 - 240	
Pumpkinseed	*Lepomis gibbosus*	2	110 - 120	✓

Effort

We estimated a total of approximately 364,000 (±18%, α=0.05) rod hours of effort by boat anglers on Pend Oreille Lake from February 1, 2000 through January 30, 2001. This equates to around 9.5 rod h/ha. It is important to note that because of the implementation of the two-pole fishing permit, and the frequent use of additional rods by trollers on Pend Oreille Lake, this effort estimate is not directly comparable with past estimates of rod hours. During the survey period, the mean number of anglers per boat was 2.2, however the mean number of rods per boat was 3.4. Therefore, around 36% of the effort in terms of "rod hours" can be attributed to "extra" rods. The estimated effort for the same period in terms of "angler hours" would be around 232,000 h. Converting rod hours to angler days (there was an average of 10.2 rod h/angler) yields an estimate of 35,686 angler days during the survey period. Average trip length for the entire survey was 6.5 hours per day.

Anglers targeting rainbow trout contributed about 86% of the total effort during the survey period (Table 14). Lake trout anglers comprised the bulk of the remaining effort (about 8%). Warmwater species (primarily bass *Micropterus spp.*) comprised about two percent of the effort, and around three percent of anglers were targeting "any" fish. Cutthroat trout *O. clarki* anglers, most of which were angling from the shore, comprised only around one percent of the effort. We did not interview any anglers who indicated they were specifically targeting bull trout *S. confluentus* or kokanee for catch-and-release fishing.

The interval with the greatest amount of effort was from April 26 to May 9 when we estimated almost 90,000 rod hours of effort (Table 15). This effort was directly related to the Spring K&K Derby, which marks the traditional opening week of rainbow trout harvest season on Pend Oreille Lake. We estimated the effort of the derby alone was around 85,000 rod hours. The increase in effort during the derby is illustrated by mean daily boat counts of 132 boats during the derby in contrast to 11 boats in the two weeks immediately prior to the derby. The lowest effort was from December 6 through January 2 (Table 15). These were the two intervals following the fall fishing derby, which marks the traditional closure of the rainbow trout harvest season. The mean boat count during these two intervals was 2.8.

Table 14. Estimated angling effort and target species from February 2000 through January 2001 on Pend Oreille Lake, Idaho.

Parameter	Estimate
Residents	68%
Non-residents	32%
Rod hours	363,974
Angler hours	232,000
Mean rod hours/trip	10.2
Mean trip length	6.5
Angler days	35,686
Effort targeting:	
Rainbow trout	85.6%
Lake trout	7.8%
“Any fish”	3.2%
Warmwater fish	2.2%
Cutthroat trout	1.2%

Table 15. Effort and harvest of rainbow, cutthroat, and lake trout by creel survey interval from February 1, 2000 through January 30, 2001 on Pend Oreille Lake, Idaho.

Interval	Dates	Effort (rod hours)	Harvest		
			Rainbow trout	Lake trout	Cutthroat trout
1	Feb 1 – Feb 14	1,607	17	27	0
2	Feb 15 – Mar 1	2,261	0	31	0
3	Mar 2 – Mar 14	5,469	96	293	52
4	Mar 15 – Mar 28	4,944	42	75	0
5	Mar 29 – Apr 11	6,743	55	139	13
6	Apr 12 – Apr 25	4,208	137	94	26
7[a]	Apr 26 – May 9	89,687	1,883	586	49
8	May 10 – May 23	9,781	369	145	39
9	May 24 – Jun 6	15,679	671	286	40
10	Jun 7 – Jun 20	15,296	606	293	113
11	Jun 21 – Jul 4	27,139	526	159	193
12	Jul 5 – Jul 18	33,332	1,244	528	152
13	Jul 19 – Aug 1	23,948	292	321	19
14	Aug 2 – Aug 15	13,183	150	113	71
15	Aug 16 – Aug 29	7,672	80	211	7
16	Aug 30 – Sep 12	13,736	568	298	6
17	Sep 13 – Sep 26	9,264	153	204	22
18	Sep 27 – Oct 10	11,228	521	267	29
19	Oct 11 – Oct 24	14,553	503	111	59
20	Oct 25 – Nov 7	14,055	289	69	51
21[b]	Nov 8 – Nov 21	19,706	437	94	65
22[b]	Nov 22 – Dec 5	16,814	188	217	26
23	Dec 6 – Dec 19	353	0	0	0
24	Dec 20 – Jan 2	901	0	0	0
25	Jan 3 – Jan 16	1,170	0	46	0
26	Jan 17 – Jan 30	1,255	0	0	0
Total		363,974	8,827	4,707	1,032
(95% CI)		(± 65,804)	(± 2,192)	(± 1,245)	(± 207)

[a] Spring Derby ran from April 29 through May 7
[b] Fall Derby ran from November 18 through November 26

Harvest, Size, and Catch Rates

Rainbow trout-Anglers harvested an estimated 8,827 (±25%, α=0.05) rainbow trout during the survey period. An additional 13,240 rainbow trout were caught and released for a total rainbow catch of about 22,000 fish. Approximately 40% of the rainbow trout landed were harvested. This percentage varied throughout the season, with the highest percentage harvested from May through September (44-59% harvested) and the lowest percentage harvested during the fall derby (around 25% harvested).

Anglers harvested a wide range of sizes of rainbow trout. Creel clerks measured fish from 178 mm to 965 mm (TL; Figure 7). The mean length of creeled rainbow trout was 472 mm. Approximately 65% of the harvested fish (around 5,040) were less than 500 mm and would not have been legal size prior to removal of the 20" minimum size restriction. About 5,470 harvested fish were over 432 mm, which has been the minimum size used in previous rainbow trout population estimates. Approximately 15% (1,324 fish) and 11% (971 fish) of the harvested fish were over 610 mm and 660 mm, respectively. The largest fish harvested during the course of the season was approximately 13.8 kg.

Catch rates by those anglers targeting rainbow trout ranged widely throughout the season (Table 16). Greatest catch rates were generally in the fall when they were often less than 10 rod h/fish. The poorest catch rates were mainly in early spring and late summer when they were 50 to 100 h/fish. Weekday anglers tended to have slightly better catch rates. The mean catch rates over the entire season for rainbow trout by anglers targeting rainbow trout were 20 rod h/fish (weekday) and 25 rod h/fish (weekends). Eighty-nine percent of parties interviewed had an average of less than one rainbow trout per member of the angling party (Table 17). Only about two percent of the parties had at least two rainbow trout per member of the party.

Lake trout- Anglers harvested an estimated 4,700 (±26%, α=0.05) lake trout during the survey period. An additional 1,325 lake trout were caught and released for a total lake trout catch of about 6,025 fish. Approximately 78% of the lake trout landed were harvested. This percentage varied little throughout the season. Harvested lake trout ranged from 250 to 940 mm TL (Figure 8). The mean length of creeled lake trout was 571 mm.

As with rainbow trout, catch rates by those anglers targeting lake trout ranged widely throughout the season (Table 16). Catch rate estimates are somewhat limited by sample size and the small percentage of anglers that were specifically targeting lake trout. Greatest catch rates were from September through November, when they were often less than 5 rod h/fish. The poorest catch rates were in August. The mean catch rate over the entire season for lake trout by anglers targeting lake trout was 8 rod h/fish. Almost 95% of the parties interviewed had an average of less than one lake trout per member of the angling party (Table 17). Only about one percent of the parties had at least two lake trout per member of the party. We only contacted nine angling parties where each member had at least four lake trout.

Bull trout-There was a total catch of around 2,200 bull trout during the survey period. There is no legal harvest allowed on bull trout, and nearly all of the bull trout landed were released. However, we encountered four bull trout that had been retained by anglers (two of these were in live wells and were released at the time of the interview, and the other two were mortalities). We estimated the total number of wrongly harvested bull trout by extrapolating the four anglers contacted by the clerks to the total estimated number of angler days for the year. We interviewed nearly 18% of the total parties; therefore, assuming the anglers interviewed over the course of the survey were representative of all anglers with regard to bull trout identification skills, the total mistaken bull trout harvest for the year was around 22 fish. Obviously, this wouldn't include bull trout intentionally harvested and concealed from creel clerks.

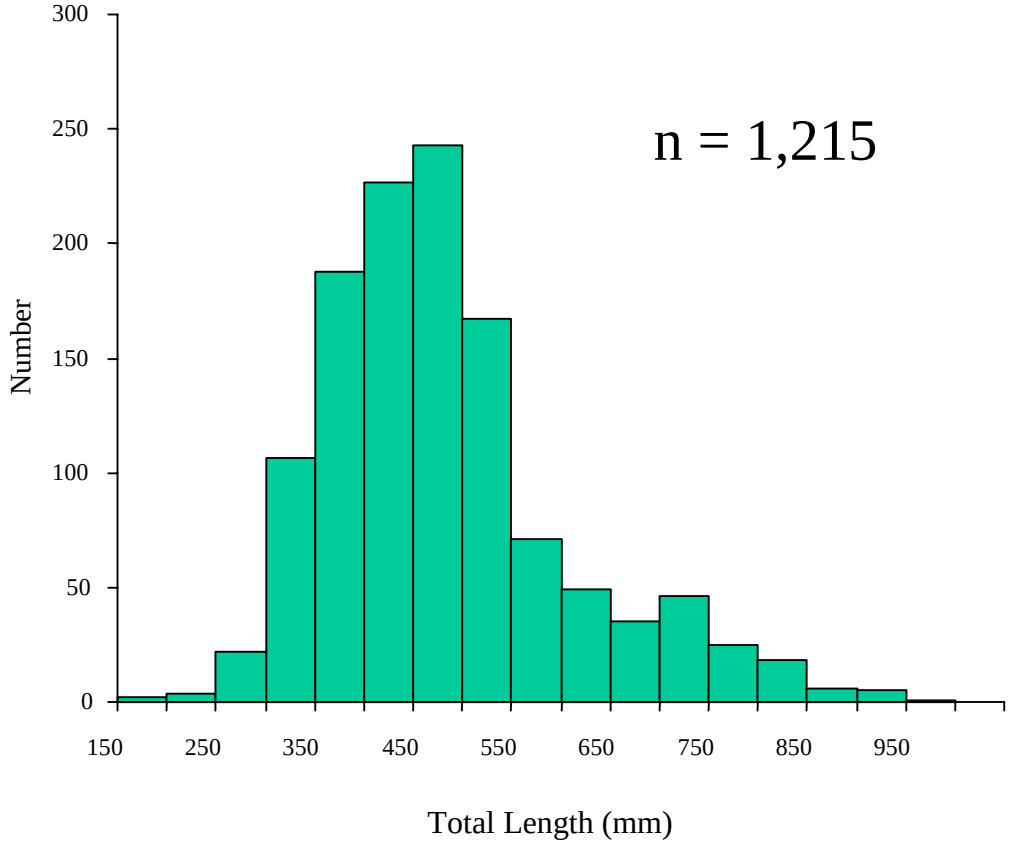

Figure 7. Length frequency distribution of rainbow trout checked in the creel survey on Pend Oreille Lake, Idaho, 2000.

Table 16. Catch rates for rainbow and lake trout February 2000 through January 2001 on Lake Pend Oreille, Idaho by anglers targeting those species.

Dates	Rainbow (h/fish)		Lake trout (h/fish)	
	Weekend	Weekday	Weekend	Weekday
Feb 1 – Feb 14	25	50	12	0
Feb 15 – Mar 1	0	0	17	50
Mar 2 – Mar 14	33	33	33	4
Mar 15 – Mar 28	100	50	25	3
Mar 29 – Apr 11	100	33	12	3
Apr 12 – Apr 25	12	25	17	10
Apr 26 – May 9	25	20	11	12
May 10 – May 23	17	25	7	0
May 24 – Jun 6	12	12	3	5
Jun 7 – Jun 20	17	11	9	8
Jun 21 – Jul 4	25	20	10	6
Jul 5 – Jul 18	25	9	11	6
Jul 19 – Aug 1	25	17	11	25
Aug 2 – Aug 15	50	33	11	20
Aug 16 – Aug 29	20	25	33	88
Aug 30 – Sep 12	20	11	8	3
Sep 13 – Sep 26	25	9	8	7
Sep 27 – Oct 10	10	11	0	3
Oct 11 – Oct 24	6	7	1	2
Oct 25 – Nov 7	10	10	8	4
Nov 8 – Nov 21	10	17	4	12
Nov 22 – Dec 5	33	33	0	3
Dec 6 – Dec 19	0	0	0	0
Dec 20 – Jan 2	0	0	0	0
Jan 3 – Jan 16	0	0	0	0
Jan 17 – Jan 30	0	0	0	0
Total	25	20	8	8

Table 17. The number of rainbow trout, lake trout, and cutthroat trout harvested per member of an angling party based on interviews with 2,650 parties fishing Pend Oreille Lake, Idaho in 2000.

	Number of fish harvested per party member				
Species	Less than 1	At least 1 but less than 2	At least 2 but less than 3	At least 3 but less than 4	4 or more
Rainbow trout					
Number	2,369	231	34	11	6
Percent	89.4	8.7	1.3	0.4	0.2
Lake trout					
Number	2,507	102	26	10	9
Percent	94.6	3.8	1.0	0.4	0.2
Cutthroat trout					
Number	2,639	9	2	0	0
Percent	99.6	0.3	0.1	0	0

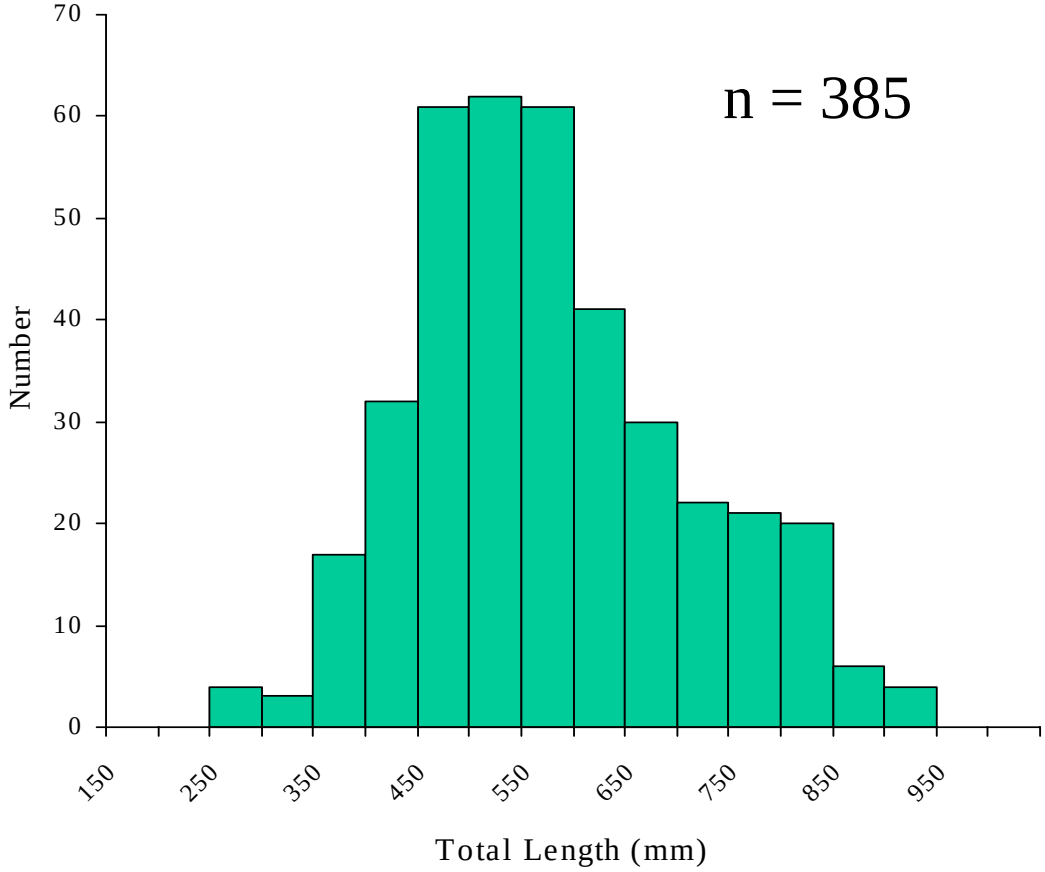

Figure 8. Length frequency distribution of lake trout checked in the creel survey on Pend Oreille Lake, Idaho, 2000.

Cutthroat trout-We estimated a total harvest of 1,032 (±20%, α=0.05) cutthroat trout (including cutthroat x rainbow trout hybrids). Around 443 additional cutthroat were caught and released, for a total cutthroat trout catch of 1,475 and a harvest rate of about 70%. The vast majority of cutthroat trout were caught by anglers targeting rainbow trout. Harvested cutthroat trout ranged from 200 to 475 mm, with a mean size of 370 mm (Figure 9). Approximately one third (32%) of the harvested cutthroat trout were less than 355 mm, and almost two-thirds (63%) were less than 406 mm. Less than one percent of the angling parties interviewed had at least one cutthroat trout per party member (Table 17).

Warmwater species-Bass anglers (smallmouth and largemouth) comprised the majority of the category of anglers targeting warmwater fish (82% of warmwater fish effort). Much of this effort was associated with a bass fishing tournament. There was a very small number of anglers (9 of 2,600 parties interviewed) fishing for black crappie *Pomoxis nigromaculatus* or yellow perch. One confirmed northern pike *Esox lucius* was caught incidentally near Denton Slough.

DISCUSSION AND RECOMMENDATIONS

Coeur d'Alene Lake Kokanee and Chinook Salmon

The kokanee population is still well below the long-term average and is rebuilding from the impacts of the floods in 1996 and 1997. As in 1998 and 1999, the low densities have resulted in much larger than average kokanee. The age-3 population appears to be similar to what it was in 1998 and 1999. Despite the low densities, the late summer fishery was been very popular because of the size of mature fish. We did not conduct any structured creel surveys on the kokanee fishery, but counts of 20-50 kokanee angling boats in the north end of the lake were common on weekends in August and September. Age-1 and age-2 kokanee are still well below average but are much improved from the 1997 and 1998 estimates. Age-0 kokanee were very abundant despite the low escapement in 1999. Interestingly, age-0 kokanee have been remarkably stable in the past four years. Following the 1999 trawl results and the apparent low escapement that year, we speculated that to produce an average year-class of fry, the PED to fry survival would have to be around 18%. Although this is much higher than the Coeur d'Alene Lake average of around 3%, the 1999 survival of almost 16% suggests that extremely high compensatory survival is possible. Furthermore, because of the size of mature kokanee (300-340 mm) in the 1999 trawl effort and the decreased capture efficiency with increasing size (Rieman 1992), we most likely underestimated the population of spawners. This suggests escapement of 1998 and 1999 spawners was greater than trawl-based estimates indicate and may partially account for the exceptionally high PED to fry survival rate in 1999 (Fredericks et al. in press).

The age-0 year class did prove to be above average despite the low 1999 escapement, and the PED to fry estimate was the highest ever. As we suspected, the hydroacoustic surveys confirmed the inefficiency of the trawl on the large, adult kokanee and partially explain the extremely high PED to fry survival observed in the past two years. Although the hydroacoustic surveys were not extensive enough to provide a size-based correction factor for the trawler, the available comparison data indicate that the trawl may have only sampled 5-20% of the larger kokanee. The same comparison data indicates that the trawler is very efficient for age-0 kokanee. If the comparison data are accurate, they suggest that the kokanee population is not as depressed as trawl data indicate.

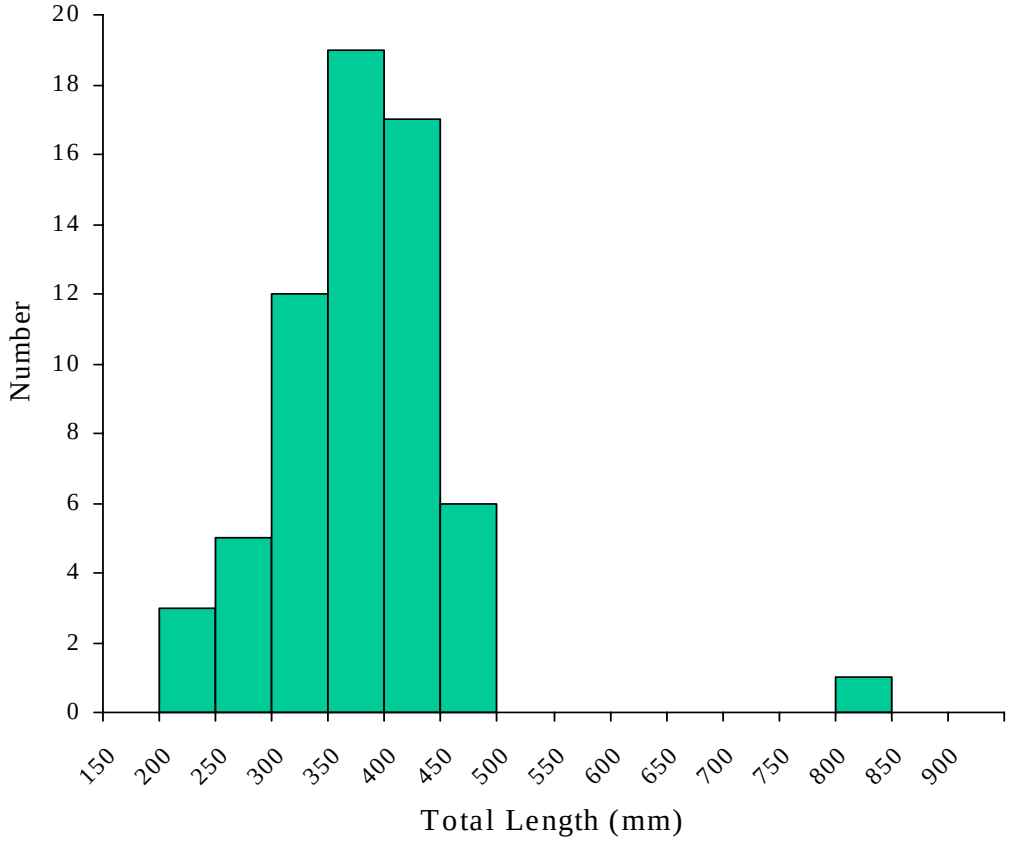

Figure 9. Length frequency distribution of cutthroat trout and cutthroat x rainbow trout hybrids checked in the creel survey on Pend Oreille Lake, Idaho, 2000.

The chinook salmon fishery in 2000 continued to be comprised primarily of naturally produced fish. This is not entirely surprising. The 1996 hatchery release (those that would have been age-4 in 2000) was subject to one of the largest spring floods on record and the majority were lost to outmigration. The 1997 release group (age-3 in 2000) consisted of only 12,000 fish because of a water line failure in the Sandpoint Hatchery. The 1998 release group (age-2 in 2000), which should have comprised the majority of the 2000 catch, has been inexplicably lacking in the fishery. These were Priest Rapids chinook that were reared in the Cabinet Gorge Hatchery. These fish were smaller than previously released chinook because of the late spawning date of this stock of fish combined with the cold water temperatures at the hatchery. The small size at release may have led to either much poorer survival or higher outmigration than anticipated.

We expect hatchery fish to comprise a much larger percentage of the catch in the next couple of years. We stocked 25,000 fish in 1999 and 28,000 fish in 2000. In those two years, we had a combined total of only 42 redds in the rivers. This means that hatchery fish should make up the majority of the one- and two-year-old fish in 2001 and the two- and three-year-old fish in 2002. If this does not occur, we can assume there is much more wild reproduction occurring than we are aware of, or our hatchery fish are not surviving at the rate we believe. The small size of chinook released in 1998 and 1999 may have influenced their survival or outmigration behavior. These two release groups were reared in Cabinet Gorge Hatchery as opposed to Nampa Hatchery, where they've been reared in 2000 and previous years. The colder water temperatures of Cabinet Gorge hindered growth and resulted in an average size of only 91 mm and 100 mm (1999 and 1998 release groups) compared to an average size of 160 mm of fish reared in the Nampa Hatchery (2000 release group). The fishery should be monitored closely to determine if Cabinet Gorge reared chinook are contributing to the fishery. If there is little evidence of survival and contribution to the fishery in 2001 and 2002, Cabinet Gorge should not be used as a rearing facility for Coeur d'Alene Lake fall chinook.

Recommendations:

1. Stock 15,000 age-0 chinook salmon in 2001 to supplement the estimated 20,000 naturally produced fish, for a combined total of 35,000.
2. Continue to monitor the recovery of the kokanee population and adjust age-0 chinook salmon supplementation accordingly.
3. Increase angler attention to fin-clips to assess contribution of hatchery fish stocked in 1999 and 2000.

Boundary Creek WMA Fisheries Potential

The only area likely to provide significant fishing opportunity is the deep section in the southern portion of the slough along the hillside. Non-motorized access to this area would require an approximately 1.5 km hike along the slough from the Boundary Creek dike road, or an approximately 0.5 km hike down the hillside from the West Side road. Because of the steep sides, soft bottom, and rock outcrops on the west bank, shoreline access is very limited. The macrophyte cover further limits bank-fishing opportunity. It is unlikely that many anglers would attempt to use boats in the area because of the poor access, although float tubes could be used. Shoreline fishing opportunity could be improved by creating earthen or wooden platforms for fishing; however, the cost of creating and maintaining platforms and the additional problem of the dense vegetative cover limit the potential of such improvements.

The current species composition and size structure are not sufficient to provide a popular fishery. The three game species that we did collect are not generally highly sought after fish. Because of the lack of large game species, development of a fishery would require some level of fish stocking. Largemouth bass, tiger muskies, or channel catfish could be stocked to utilize the abundant forage fish and provide a limited fishery for larger fish. Any coldwater fish, such as rainbow trout, would not likely survive past late spring and would have to be stocked as catchable fish on a seasonal basis. Based on the poor access and the short duration that trout could survive, it is extremely unlikely that an acceptable return to the creel of hatchery rainbow trout would be achieved.

Developing a fishery beyond what is currently available in the slough would present several conflicts with wildlife resources of the WMA. The most significant action to improve the fishery would be to greatly reduce the aquatic vegetation by large-scale herbicide treatment or to excavate the slough to increase depth. Obviously, both of these options are in direct conflict with management for waterfowl resources, which benefit from the current shallow, heavily vegetated condition of the slough.

Without extensive efforts to control aquatic vegetation, fishing would mostly be limited to the spring and early summer months. Significant angling activity would likely disturb nesting waterfowl. Also, the deep-water area of the slough is located within 0.5 km of an occupied bald eagle nest, creating the potential for breeding and nesting disturbance. Grizzly bears are known to utilize the foothill area between the slough and the West Side road, particularly in the spring. Anglers attempting to access the slough from the West Side road would be traveling through the center of this area and could therefore increase the likelihood for human/grizzly bear encounters.

Boundary County currently has an abundant and unique variety of lake, pond, and stream fishing waters. Because of the wealth of existing opportunities, development of an additional fishing site such as the Smith Creek Slough does not represent the same opportunity that it might in a region with very few fishable waters. Although the Smith Creek Slough has some limited potential for establishing a fishery, the benefits would not justify the cost, either financially or in terms of potential conflicts with wildlife. The slough should remain open to fishing to provide the opportunity to utilize the fishery that currently exists. The minimal interest that this generates should not be enough to conflict with waterfowl production or other wildlife uses.

Priest Lake

Based on tag return data from lake trout since 1983, average exploitation is only around seven percent, which is low when compared with estimates of exploitation in other systems (Healey 1978; Szarzi and Bernard 1997). The relatively low exploitation is remarkable considering that lake trout make up almost the entire fishery of the lake (Davis et al. 2000). Although there are errors and assumptions in any tagging study related to tag loss and reporting, the estimate was derived using an extensive data set from the past 17 years. The variety of tag types and the longevity of the tagging program increase the validity and reliability of the exploitation estimate, and we believe it is accurate. An annual exploitation of 7-8% equates to an instantaneous rate (F) of 0.04. Combined with a natural mortality estimate of 24% (instantaneous rate [M] of 0.12), total annual mortality was around 30% (instantaneous rate [Z] of 0.16). In Canadian lakes a total annual mortality in excess of 45-50% (Z=0.26-0.30) has been considered the level beyond which the lake trout fishery is not likely sustainable (Healey 1978, Olver et al. 1991). An exploitation rate of 30-40% (F=0.18-0.20) would likely be necessary to increase total annual mortality over 50%.

Intentional overexploitation of lake trout in Priest Lake has been discussed as an alternative management direction with the intent of benefiting native species. The slow growth and late age-at-maturity of the species make them vulnerable to overharvest (Healey 1978). The potential for a sport-fishery to achieve the level of mortality necessary to suppress the lake trout population has been obscured by conflicting data in recent years. Prior to this evaluation of tagging records, it was believed that lake trout were being exploited at an unsustainable rate. A 1994 creel survey estimated that yield exceeded 2 kg/ha, which far exceeds the 0.5 kg/ha maximum recommended by Healey (1978). This estimate, combined with a perceived decrease in size structure, led to the conclusion in 1994 that lake trout were being overharvested. However, the creel survey was of a fairly low intensity, with counts being made only four days/month and a total of only 310 angling parties interviewed. Given the apparent low exploitation based on tagging data, it now seems likely that harvest and yield were overestimated. In contrast to the creel survey, the tag-based exploitation estimates indicate that a four- to five-fold increase in exploitation would be necessary to achieve a level of unsustainability or overharvest.

Currently, there is a year-round season on Priest Lake with a two-fish daily limit and no size restrictions on lake trout. A more liberal daily limit would not likely achieve the several fold increase in harvest necessary to adversely affect the population. Based on completed trip interviews from the 1994 creel survey, when the daily limit was three fish, only 17% of anglers harvested more than two fish, and only 15% were capable of catching more than three fish. An increase in the daily limit to six fish (consistent with general trout regulations) would certainly have some impact on harvest; however, it would affect a relatively small portion of anglers that currently fish the lake. The impacts of liberalized regulations would more likely be related to any increased interest in lake trout fishing and recruitment of anglers who have been discouraged by the restrictive regulations in recent years. The actual increase in effort is highly speculative. Complaints regarding the two-fish limit are not uncommon and some anglers have purportedly quit fishing Priest Lake as a result. However, the liberal lake trout regulations in Pend Oreille Lake (no limit, year-round season) do not seem to have created a major fishery. Less than 15% of the angling effort on Pend Oreille Lake (around 4,000 angler days) was by anglers targeting lake trout. This seems particularly low considering the good catch rates (8 rod h/fish) and an average size of 570 mm (the average size of lake trout in Priest Lake during the 1994 survey was 530 mm). Regardless, liberalizing regulations would serve two important functions. First, an increased daily limit would provide additional opportunity to anglers and may increase angling interest in Priest Lake. Second, if

combined with a reliable creel survey, it would help assess the long-term potential of anglers to overexploit the lake trout population.

Recommendations:

1. Liberalize daily lake trout limit on Priest Lake beginning in 2002.
2. Conduct a creel survey in 2002 or 2003 to assess effort, harvest, and exploitation after implementation of liberalized regulations.
3. Continue tagging lake trout to maintain the long-term exploitation database.

Pend Oreille Lake Creel Survey

Predator Reduction

The creel survey showed an increased harvest of rainbow trout directly related to the liberalized regulations. Prior to the rule change, only two rainbow trout, with a minimum size of 510 mm (20 inches), could be harvested. Almost two-thirds of the rainbow harvested in 2000 would not have been legal prior to the change. The benefits of this harvest to kokanee are obviously related to the predation impact the smaller rainbow trout have on kokanee. Vidergar (2000) estimated a population of age-4 rainbow trout (384-394 mm) of around 4,800 fish. We estimated a harvest of just over 3,400 of this age-class for an exploitation rate of about 70% (Table 18). We estimated an additional harvest of 2,339 rainbow trout that were presumably age-3. It seems logical to conclude that the high exploitation of age-classes previously unexploited would result in some reduction in predation. Based on bioenergetics modeling, Vidergar (2000) estimated that age-4 rainbow trout consumed around 22.5 metric tonnes of kokanee, which was approximately 12 percent of the annual kokanee consumption. Age-3 rainbow trout consumed a negligible number of kokanee. Assuming some independence of fishing mortality and natural mortality, the regulation change likely resulted in some decrease in kokanee consumption by age-4 rainbow trout, but no effect on predation by age-3 rainbow trout. The relatively minor predation component of the smaller rainbows and the low exploitation of the older fish means that much of the benefit to kokanee will depend on the long-term effects of the increased fishing mortality on the younger ages (i.e., whether there is a compensatory decrease in natural mortality).

The liberalized daily limits for both rainbow (from two fish/day to six fish/day) and lake trout (from four fish/day to no daily limit) had little impact on the total harvest. Most anglers caught and kept fewer than two rainbow trout and fewer than four lake trout per day. Only around two percent of the parties interviewed kept two or more rainbow trout and less than one percent (0.2%) kept four or more lake trout. Extrapolated to the entire angling effort for the year, about 280 angling parties caught and kept more than two rainbow trout per person, and around 80 parties kept more than three rainbow trout per party member. Only around 28 parties kept more than four rainbow trout or four lake trout per party member. From the completed trip interviews, it seems evident that the increase in rainbow trout harvest was related primarily to the removal of the minimum size, rather than the increased daily limit. Exploitation declined with the older age-classes and was only 16% of the largest fish (Table 18). This indicates either an inability to catch the larger fish and/or continued resistance by anglers to kill those caught. In 1991, anglers harvested 2,157 fish over 610 mm, compared with only around 1,344 in 2000.

Additionally, the shift to a year-round season had little impact on total harvest of rainbow trout. Only around four percent of the total rainbow trout harvest occurred between December 1 and the traditional season opener in April. Much of the Pend Oreille Lake fishery is based on traditional seasons and derbies. There was minimal rainbow trout effort prior to the traditional opening weekend and virtually no rainbow trout effort in the months following the traditional closure of the season. The Spring Derby was in effect the "kick-off" to the season. Participation in this event was high, demonstrating the importance of derbies in generating angling interest on Pend Oreille Lake. The nine-day derby contributed almost one-fourth of the total effort and one-fifth of the rainbow trout harvest for the entire year. The fall derby, while not as big, contributed around 5-6% of the total rainbow trout harvest. Combined, about one fourth of the rainbow trout harvest for the year occurred during the 18 days of the two derbies. It seems evident that angler interest and ultimately harvest can be manipulated by encouraging derbies; however, there seems to be reluctance by organized anglers to promote additional derbies. This may be a reflection of an unwillingness to increase rainbow trout harvest or just adherence to the Pend Oreille Lake fishery traditions.

Table 18. Estimated kokanee consumption by age-class of rainbow trout from Vidergar (2000) and the estimated harvest and exploitation of corresponding age-classes based on the 2000 creel survey on Lake Pend Oreille, Idaho.

Age-class	Size (mm)	Number	Percent of population	Kokanee consumed (mt)	Percent of kokanee consumed	Number harvested	Percent of harvest	E
<4	< 384	ND	ND	Negligible	Negligible	2,339	26.5	ND
4	384-494	4,848	33.2	22.54	12.3	3,415	38.7	0.70
5	495-592	3,447	23.6	18.55	10.1	1,729	19.6	0.50
6	593-675	2,451	16.8	17.83	9.7	1,046	11.9	0.43
7	676-734	1,742	11.9	22.31	12.1	305	3.5	0.18
8	735-815	1,239	8.5	20.29	11.1	385	4.4	0.31
9	816-865	880	6.0	16.05	8.7	145	1.7	0.16
Total		14,607		183.63		8,827		

Changing Fisheries

The fishery on Pend Oreille Lake has shifted from one directed primarily at cutthroat trout, bull trout, and kokanee in the 1950s to one where these species are either closed to harvest or comprise a negligible portion of the fishery. Rainbow trout have steadily increased in importance from around 40% of the effort in 1978 and 55% in 1991, to 86% in 2000 (Table 19). In a 1953 creel survey, cutthroat and bull trout comprised about 80% of the "trout" harvest (Jeppson 1953). In the 2000 creel survey, with a harvest closure for bull trout and a growing lake trout fishery, cutthroat comprised less than eight percent of the "trout" harvest. Reflecting the poor condition of the native fish populations, there was little interest in the native species fisheries during this survey. Of over 6,400 anglers interviewed not one declared bull trout as their "preferred" or "target species". This is puzzling considering the prevalence of the catch-and-release ethic among Pend Oreille anglers, the high incidental catch of bull trout, and the large size of bull trout in Pend Oreille Lake. Similarly, there was little interest in cutthroat trout. During spring and early summer there was some shore angling, primarily around Sunnyside and Hope by anglers targeting

cutthroat trout; but their overall contribution to the total effort was very minimal. Anglers targeting rainbow trout harvested a large percentage of cutthroat trout landed. Although not methodically assessed, anecdotal evidence suggests the high harvest rate on cutthroat trout (70%) is related to anglers' efforts to cultivate a high quality, pure Gerrard rainbow trout population.

Table 19. Comparison of the 2000 creel survey results with past creel surveys on Pend Oreille Lake, Idaho.

Estimate	Creel survey year				
	1953	1978	1985	1991	2000
Residents	48%	48%	56%	--	68%
Rod hours	523,000	226,453	179,229	460,679	363,974
Angler hours	523,000	226,453	179,229	460,679	232,200
Angler days	100,000	48,470	36,446	90,000	33,140
Interviewed anglers	--	5,283	--	7,382	6,443
Total catch	1,431,000	178,135	81,546	237,570	15,015
Rainbow trout					
Caught	NA	NA	NA	17,165	22,000
Harvest	3,200	6,878	6,100	2,261	8,827
Mean size (mm)	--	400	430	735	472
Catch rate (h/fish)	--	20	12	15	20
Effort (rod h)	--	89,000	107,287	250,000	313,017
% of total effort	--	39%	60%	55%	86%
Lake trout					
Harvest	0	0	0	--	4,707
Checked by clerks	0	0	0	43	≅ 400
Mean size (mm)	--	--	--	594	574
Catch rate (h/fish)	--	--	--	12	8
% of total effort	--	--	--	< 5%	8%
Bull trout					
Harvest	5,000	1,469	915	1,723	--
Catch rate (h/fish)	--	8	12	7	NA
Mean size (mm)	--	485	496	492	NA
Cutthroat trout					
Harvest	8,200	813	664	766	1,032
Mean length (mm)	--	320	345	373	370
Kokanee					
Harvest	1,336,000	167,640	71,275	227,140	0

Lake trout, which were not documented in the 1985 creel survey, have gradually developed into a significant component of the fishery. In 1991, lake trout supported a minor target fishery with catch rates of around 12 rod h/fish and a mean size of 594 mm. In 2000, catch rates had improved to 8 rod h/fish, and mean size was only slightly smaller at 574 mm. Based on this most recent creel survey, lake trout now make up around 8% of the total effort and 31% of the total fish harvest in Pend Oreille Lake. This increasing trend in catch likely reflects an alarming expansion of the lake trout population. Evidence suggests that long-term sympatric populations with bull trout are unlikely (Donald and Alger 1993), and the impacts to an already depressed adfluvial cutthroat population could be severe. Unless the lake trout population can be effectively suppressed, it seems likely that the population will continue to expand at the expense of native species and kokanee. In Priest Lake, the availability of mysis shrimp *Mysis relicta* was thought to have increased juvenile lake trout survival and led to rapid population growth in the 1980s. It seems entirely possible that the lake trout population in Pend Oreille Lake has the potential for a similar expansion to the detriment of bull trout, cutthroat trout, and kokanee. Unfortunately, it does not appear that the sport fishery will be an effective tool in controlling the lake trout population.

The cutthroat trout harvest during the creel survey and the high creel percentage is cause for some alarm. The adfluvial cutthroat trout population in Pend Oreille Lake has likely been compromised in recent decades by the deteriorated quality of spawning and rearing streams. An annual harvest of 8,200 cutthroat was estimated in 1953 (Jeppson 1953), compared with only 500-1,000 in the past three decades. Pack River and Lightning Creek, which were once known for abundant populations of cutthroat trout, have lost most of their high quality cutthroat trout habitat due to erosion in headwater streams and excess gravel deposition lower in the drainage. Additionally, hybridization with rainbow trout may also be a factor. Predation by lake trout within the lake is likely an increasing factor given the apparent increase in the lake trout population in the past decade. Based on the creel survey, consideration of more restrictive cutthroat trout regulations should center on size limits as opposed to bag limits or seasonal restrictions. Only one tenth of one percent of all the angling parties interviewed (two parties) had two or more cutthroat trout per member. Additionally, management by seasonal restrictions would be cumbersome. Much of the harvest occurred in June and July, concurrent with the increased harvest of rainbow trout. Very few cutthroat trout were harvested from December through the last Saturday in April, indicating that the liberalized season had little impact on cutthroat trout. Therefore, a meaningful seasonal restriction would entail a summer-fall closure, which would likely be confusing, unpopular, and difficult to enforce.

Despite the changing nature of the fishery and the loss of historically important components, angler effort has not declined dramatically in the past three decades. In terms of angler hours, the effort expended in 2000 was comparable to that in 1978 and 1985 but was only around half of the effort in 1953 or 1991. Because of the two-pole permit, the 2000 estimate of rod hours is much higher than 1978 or 1985. Surprisingly, the percentage of residents fishing the lake has increased steadily since the 1950s from less than half to about two-thirds.

Recommendations:

1. Continue to encourage harvest of rainbow trout and lake trout in Pend Oreille Lake through club derbies, angler education, and liberal regulations.
2. Monitor survival of kokanee age-classes to assess effectiveness of predator reduction efforts.
3. Consider restrictive regulations for cutthroat trout to reduce the effects of harvest.

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APPENDIX

Appendix A. Hydroacoustic survey description of Coeur d'Alene Lake excerpted from IDFG research report (Teuscher 2001).

Coeur d'Alene Lake (CDA) was sampled on July 31 through August 2, 2000. The objective of the survey was to estimate chinook salmon abundance and to compare kokanee densities between the north Idaho trawl boat and HTI sonar gear. The sonar and trawl comparison was limited to the northern section of the lake. A total of six transects were completed for the comparison. A total of 13 transects (7 day and 6 night) were conducted to estimate chinook abundance. The day and night transects were necessary to ensure that diel movements of chinook salmon did not bias the population estimate. Because we assumed that chinook salmon densities would be low, long transects were used to maximize the probability of sampling at least one fish per transect. Transect lengths ranged from 2,212 to 6,028 m. Sampling time for transects ranged from 45 min to 120 min. We used a size cutoff criterion to differentiate chinook salmon from other fish species. We assumed that all of the tracked fish over 500 mm (–31.6 dB) were chinook salmon. There are other fish species in CDA Lake that reach or exceed 500 mm (i.e., northern pikeminnow). However, their use of the offshore habitat that we sampled with hydroacoustics is considered negligible compared to that of chinook salmon.

Densities of fish greater than 500 mm were similar for day and night transects. Because time of day was not statistically (P=0.74) significant, data from all 13 transects were pooled. A total of 52 (mean of four per transect) tracked fish met the chinook minimum size criteria, and densities ranged from 0.0 to 5.7 fish/ha with a mean of 2.7 chinook/ha. The greatest densities occurred between transect 20 and 30 (Table A-1). Expanded densities resulted in a total chinook estimate of 18,000 ±36%. Given that level of precision, our methods seemed reasonable for estimating the abundance of fish over 500 mm. However, due to the relatively small sample size, the estimate could not be refined to identify specific chinook age class strength.

The sonar estimate of kokanee abundance in the northern section of the lake was 2,580,000. Young of the year kokanee (fish <75 mm) made up the largest proportion of the population at 2,021,000 ±45%. Abundance of age-1 kokanee (75 mm-150 mm) was 472,000 ±38%. Fish larger than 150 mm contributed 92,000 ±43%. In the same area of the lake, the trawl boat estimated a total of 1,460,000. The mean density of YOY kokanee was 684 fish/ha for the trawl and 722 fish/ha using the sonar gear (Figure A-1). Due to trawl avoidance of larger kokanee, the comparison between gear types varied markedly for age-2 and older kokanee (Figure A-1). The differences observed between gear types, however, do not invalidate either technique. Trawl or acoustic sampling can be used to describe trends in kokanee abundance.

Figure A-2 shows length frequency and depth distributions of fish sampled in CDA Lake. Age-1 and older kokanee (fish between 75-375 mm) selected deeper water than YOY kokanee (<75 mm). Fish over 375 mm (-34 dB) in length were concentrated above the dominant kokanee cohorts.

Table A-1. Transect identification, lengths, and fish densities in Coeur d'Alene Lake, July 31–August 2, 2000.

Species	Time	Transect Identification	Length (m)	Density (# / ha)
Kokanee	Night	3-4	1,908	214
	Night	4-5	2,079	1,458
	Night	5-6	3,053	1,274
	Night	6-7	3,011	1,129
	Night	7-8	1,895	748
	Night	8-9	2,369	714
			Mean	923
			Abundance	2,580,000
			90% CI	40%
Chinook	Night	15-20	2,461	1.1
	Night	20-23	3,892	2.2
	Night	24-27	4,724	5.7
	Night	27-30	4,608	5.6
	Night	30-37	3,147	3.2
	Night	37-40	3,348	0.0
	Day	12-15	3,149	1.0
	Day	15-20	2,583	0.0
	Day	20-23	3,831	5.4
	Day	23-24	3,086	4.3
	Day	24-27	5,341	2.1
	Day	27-28	2,212	2.4
	Day	28-32	6,028	2.6
			Mean	2.7
			Abundance	18,000
			90% CI	36%

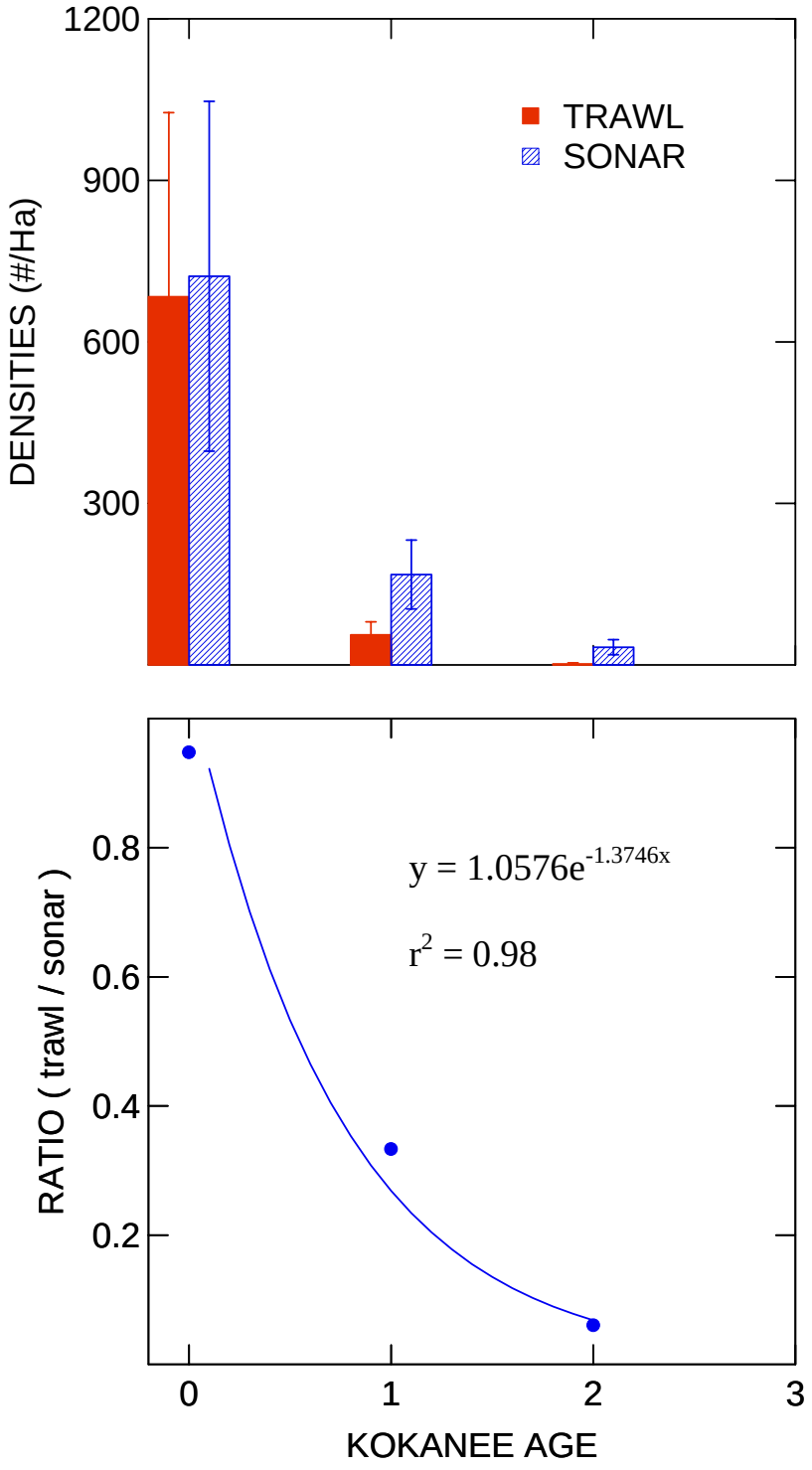

Figure A-1. Trawl and sonar estimates of kokanee densities (top) in the northern section of Coeur d'Alene Lake. The bottom figure shows the trawl:sonar ratio for three age-classes of kokanee.

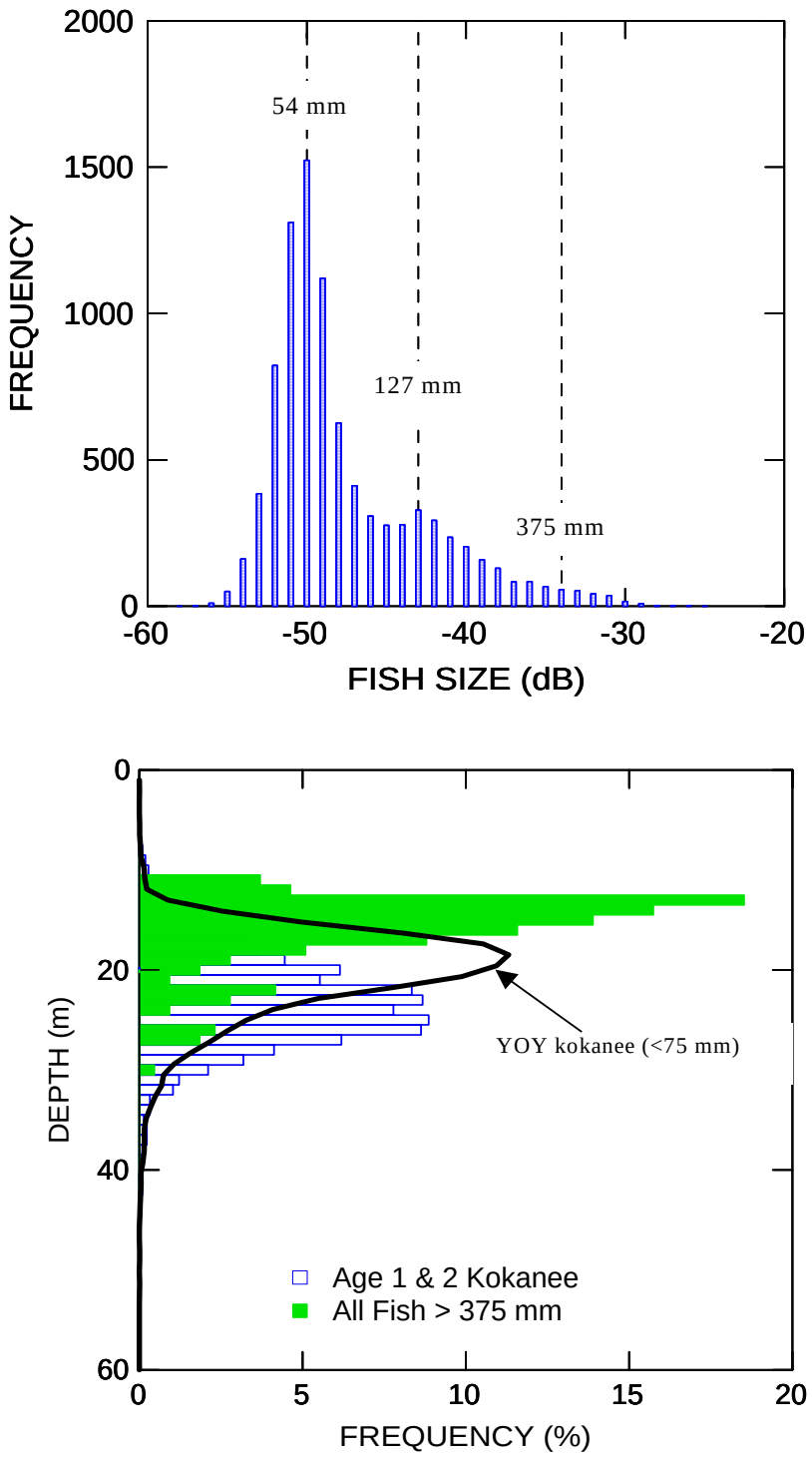

Figure A-2. Length frequency (top) and depth distributions (bottom) of fish sampled with hydroacoustics in Coeur d'Alene Lake. The bottom graph shows depth selection of different size classes of kokanee and all fish >375 mm.

2000 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management

Project: I-Surveys and Inventories | Subproject: I-A Panhandle Region

Job No.: c | Title: Rivers and Streams Investigations

Contract Period: July 1, 2000 to June 30, 2001

ABSTRACT

We used boat mounted electrofishing equipment to conduct a mark-recapture population estimate of cutthroat trout *Oncorhynchus clarki lewisi*, rainbow trout *O. mykiss* and mountain whitefish *Prosopium williamsoni* in the lower Coeur d'Alene River during May 2000. We estimated a population of 2,265 cutthroat trout >100 mm or 440 trout/km in the 5.1 km transect. Cutthroat trout ranged from 90 mm to 480 mm in total length, with a mean of 252 mm. Approximately 41% of cutthroat trout were protected by the 8"-16" slot limit. We estimated a total population of 9,615 mountain whitefish >100 mm or 1,867 whitefish/km. Mountain whitefish ranged from 37 mm to 425 mm and also had a mean length of 252 mm.

A total of 38 cutthroat trout, 28 rainbow trout, three cutthroat x rainbow trout hybrids, and eight brook trout *Salvelinus fontinalis* ranging from 175-480 mm were tagged with reward tags in 2000 in the lower Coeur d' Alene River. Anglers reported four tagged cutthroat and one tagged brook trout, for a combined return rate of 9.5%. After adjusting for noncompliance, estimated cutthroat exploitation in 2000 was around 16%.

In July 2000, we snorkeled a total of 59 index transects in the St. Joe, North Fork Coeur d'Alene and Little North Fork Coeur d'Alene rivers to estimate trout and whitefish abundance and approximate size distribution. Mean densities of age-1 and older westslope cutthroat trout and mountain whitefish in the St. Joe River transects was 1.25 and 1.90 fish/100 m^2, respectively. Densities in the North Fork Coeur d'Alene River were 0.67 westslope cutthroat, 0.37 rainbow trout, and 3.2 mountain whitefish/100 m^2. Densities in the Little North Fork Coeur d'Alene River were 0.68 westslope cutthroat and 0.24 rainbow trout/100 m^2. No mountain whitefish were observed in the Little North Fork Coeur d'Alene River.

We used a backpack electrofisher to sample the upper St. Joe River, Medicine Creek, and Wisdom Creek to determine fish species composition, size structure, and abundance. Bull trout *S. confluentus* were the only salmonid captured in Medicine Creek, while bull trout and cutthroat trout were captured in Wisdom Creek and the upper St. Joe River. Bull trout and cutthroat trout captured were juveniles and were 60-155 mm and 80-182 mm, respectively. Bull trout density estimates were highest in Medicine Creek, where they ranged from 6.2 to 10.9 fish/100 m^2.

We conducted bull trout redd counts in index streams of the Pend Oreille, Upper Priest, St. Joe, and Little North Fork of the Clearwater drainages in September and October to add to the long-term trend

data set. We counted 740 bull trout redds in the Pend Oreille drainage, 29 redds in the upper Priest Lake drainage, 48 redds in the St. Joe River drainage, and 18 redds in the Little North Fork of the Clearwater River drainage. There was no clear trend in bull trout redd abundance across the four drainages in 2000. The number of redds counted in the Pend Oreille, St. Joe, and Little North Fork of the Clearwater drainages were above the index stream mean, but counts in the Upper Priest drainage were below the mean.

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Regional Fishery Manager

OBJECTIVES

1. Estimate population, relative abundance and size structure of trout *Oncorhynchus spp*. and mountain whitefish *Prosopium williamsoni* on the lower Coeur d'Alene River and provide a basis for evaluation of regulation changes implemented in 2000.

2. Estimate exploitation of westslope cutthroat trout *O. clarki lewisi* on the lower Coeur d'Alene River.

3. Estimate salmonid density in selected index transects in the St. Joe, Little North Fork, and North Fork Coeur d'Alene rivers.

4. Assess game fish species composition, size structure, and abundance in the upper St. Joe River, Medicine Creek and Wisdom Creek.

5. Estimate bull trout *Salvelinus confluentus* redds and spawning escapement in Pend Oreille, Upper Priest Lake, St. Joe River and Little North Fork Clearwater River drainages.

METHODS

Lower Coeur d'Alene River Fishery Survey

We conducted an inventory of fish populations in the lower Coeur d'Alene River similar to our 1999 effort (Fredericks et al. In Press). Jet boat mounted electrofishers were used to capture trout and mountain whitefish in the 5.1 km section of the Coeur d'Alene River from the old railroad bridge above I-90 downstream to the Cataldo boat ramp (Figure 1). We assumed little movement into or out of the study reach and used a Peterson mark-and-recapture strategy to estimate the population (Ricker 1975). Marking runs were conducted after dark on two consecutive nights (May 24-25) and the recapture run was conducted on the night of May 30. We marked all trout and mountain whitefish with a caudal fin clip. We observed phenotypes suggesting rainbow trout *O. mykiss* introgression and concluded that accurate field identification of "hybrid fish" was difficult and maybe impossible (depending on the degree of hybridization/introgression). Therefore, fish that appeared to be cutthroat x rainbow trout hybrids were included in the cutthroat trout population estimate. Density was reported as fish/km.

A total of 38 cutthroat trout, 28 rainbow trout, three cutthroat x rainbow trout hybrids, and eight brook trout *S. fontinalis* ranging from 175-480 mm were tagged with reward tags in 2000. Exploitation estimates were calculated from tags returned in 2000. We assumed an approximately 60% reporting rate, which is typical of $10 reward tags (Nichols et al. 1991), and adjusted the return rate accordingly to provide an exploitation estimate.

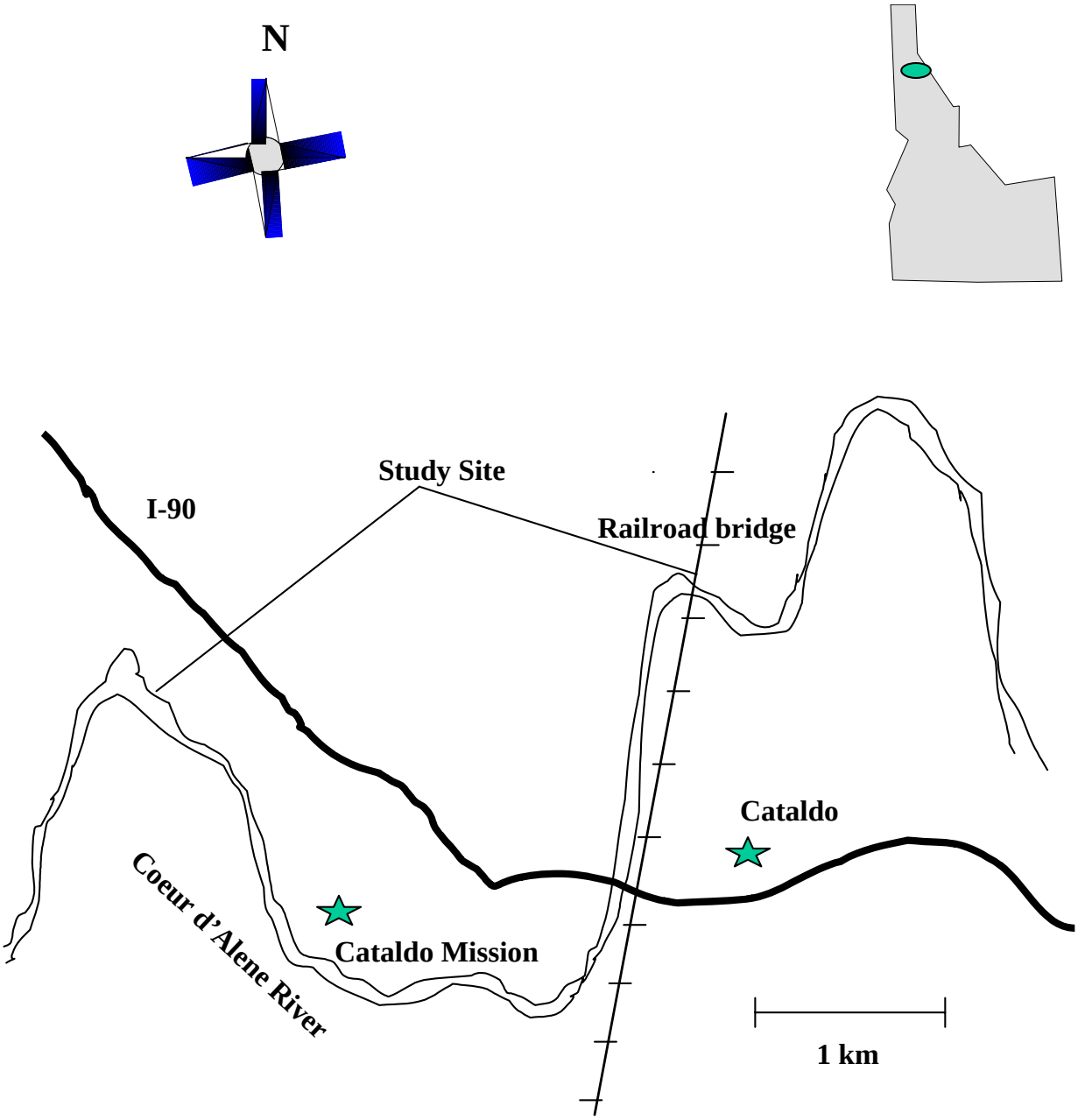

Figure 1. Location of electrofishing transects used to estimate cutthroat trout and mountain whitefish populations in Coeur d'Alene River, Idaho, 2000.

St. Joe and Coeur d'Alene River Snorkel Surveys

We used snorkel surveys to estimate fish in the St. Joe, North Fork of the Coeur d'Alene, and Little North Fork of the Coeur d'Alene rivers. The methodology used for each transect was based on sightability and transect width. Our intent was to be reasonably certain that all fish in the transect were visible to the divers and few or no fish were overlooked. In the wider transects, where one diver was not easily able to see fish throughout the river, two divers were used, one on each side of the river. In smaller transects only a single diver was used. We periodically duplicated counts using different divers to check accuracy of counts. Divers began at the upstream end of the transect and snorkeled downstream. Although upstream diver counts are preferable, the size of the rivers generally precluded upstream counts.

Estimates of salmonid abundance were limited to age-1+ fish for all species as summer counts for YOY cutthroat trout are typically unreliable. Most YOY cutthroat trout will be smaller than 80 mm during surveys in July and occupying the shallow stream margins where snorkeling is less effective (Thurow 1994). The numbers of trout and mountain whitefish were recorded for each transect by species and length group in 75 mm increments from 75 to 550 mm.

St. Joe River transects were snorkeled on August 17-19. A total of 24 transects were snorkeled in the St. Joe River (Figure 2). Most of these were originally established in 1969 (Rankel 1971); however, due to changes in stream habitat, four of the original transects were either eliminated or combined in 2000. Modified transect boundaries were selected based on fish holding capabilities, access, and permanence for future study. Transects in the Coeur d'Alene River system were initially established in 1973 (Bowler 1974; Figure 3). We snorkeled 24 transects in the North Fork of the Coeur d'Alene River and 10 transects in the Little North Fork of the Coeur d'Alene River between July 25 and August 3. Pools and runs were the predominant habitat types snorkeled.

After completing fish counts, we measured length and width of each transect with a Tasco 800 Lasersite Rangefinder to determine surface area (m^2) surveyed. Fish counts were converted to density to standardize the data and make it possible to compare counts to other watersheds. In an effort to accurately locate and duplicate snorkel surveys in the future, transect locations were saved and recorded as waypoints using a Magellan 315 Global Positioning System (GPS) (Appendices A-C). In addition, photographs of each site were taken with permanent landmarks in the photo including starting and ending points of each transect.

Upper St. Joe River and Tributaries Assessment

The upper St. Joe River and two tributaries, Medicine and Wisdom creeks, were surveyed on July 20 to determine species composition, density and size structure of salmonids. We sampled by multiple pass electrofishing using a Smith Root SR-15 backpack electrofishing unit. Crews worked upstream, with each consecutive pass made immediately after and with equal effort to the previous one until we achieved a 50% reduction in fish numbers. Captured fish were measured, placed in holding containers and monitored for recovery until all passes were complete. Once electrofishing was complete, we returned fish to the general area from which they were captured. Capture efficiency estimates were calculated for all sites using Microfish 3.0, a maximum likelihood estimator (Van Deventer & Platts 1985). Because of the difficulties in capturing smaller fish, we did not use fish smaller than 60 mm in

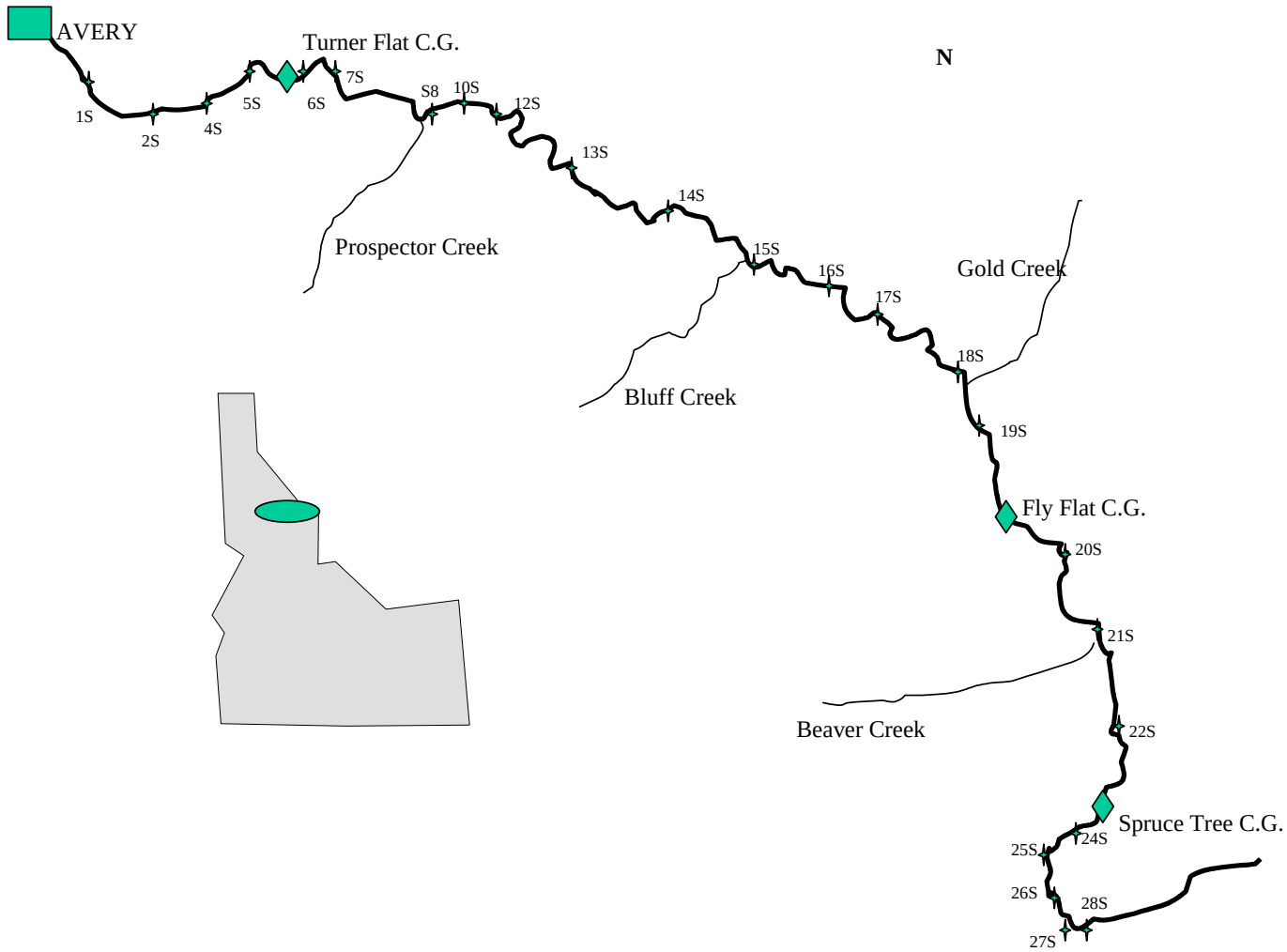

Figure 2. Locations of snorkel sites on St. Joe River, Idaho, 2000.

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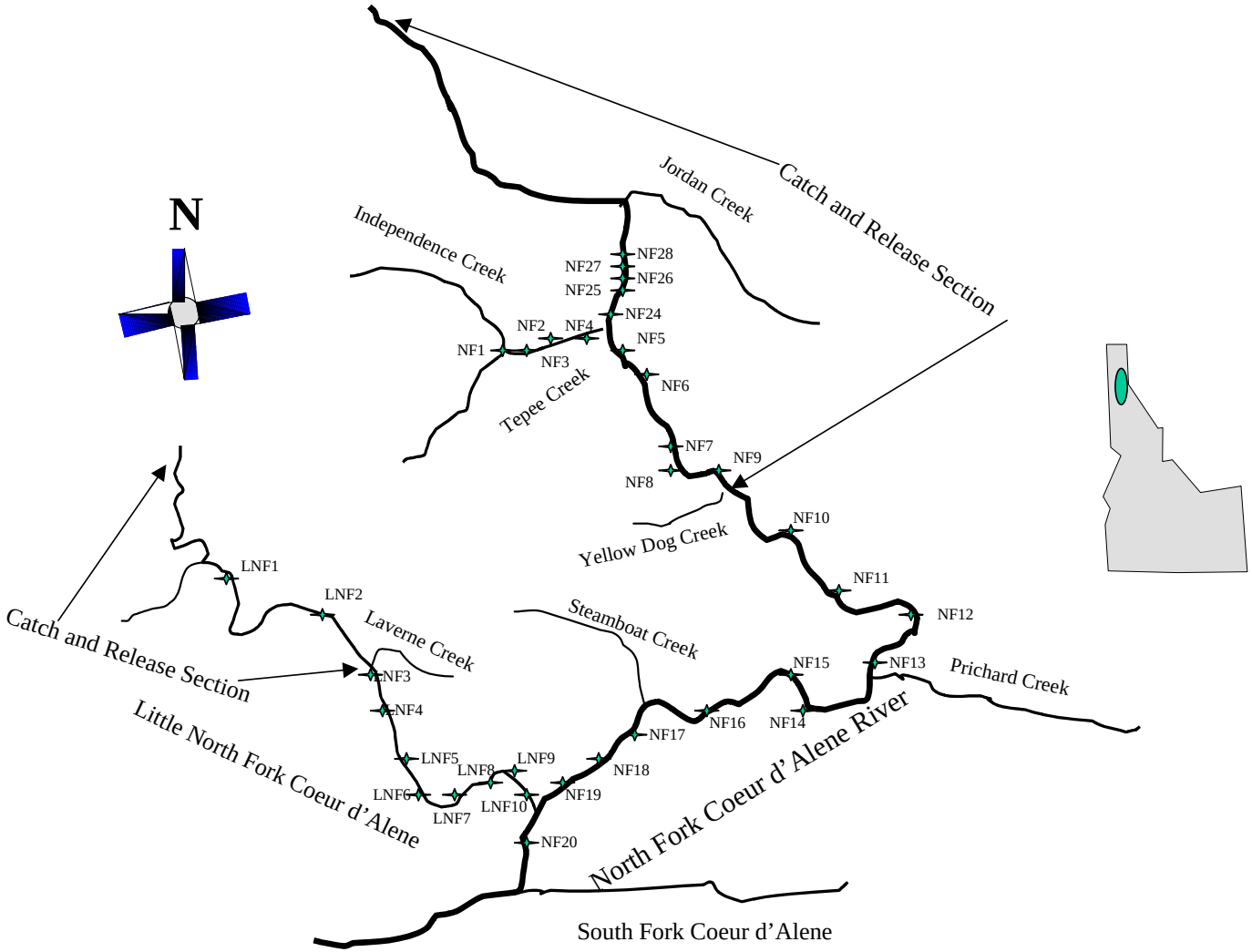

Figure 3. Locations of snorkel sites on North Fork and Little North Fork Coeur d'Alene rivers, Idaho, 2000.

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the population estimates. Transects were selected to include typical pool and riffle habitat representative of the stream. Transect lengths and widths were determined using a laser rangefinder and the estimated total number of fish per site was converted to fish/100 m^2. Population estimates were based on total surface area of site sampled. Electrofishing sites ranged from 14.8 mm to 34 m in length.

Bull Trout Spawning Surveys

Bull trout redds were counted in selected index tributaries of the Upper Priest, St. Joe, and Little North Fork of the Clearwater drainages based on previous surveys. We surveyed the Pend Oreille Lake tributaries October 12-23, the Upper Priest Lake drainage October 1, St. Joe River drainage September 22, and the Little North Fork of the Clearwater drainage September 19. Survey techniques and identification of bull trout redds followed methodology described by Pratt (1984). Because research has demonstrated the level of observer training and experience may influence the accuracy of redd counts (Bonneau and LaBar 1997), we utilized only experienced biologists for bull trout redd counts in the established index streams. We estimated the range of adult bull trout spawners entering each drainage by applying a low estimate of 2.2 fish/redd (Bonar et al. 1997) and an upper estimate of 3.2 fish/redd (Fraley and Shepherd 1998) to the total number of redds observed.

RESULTS

Lower Coeur d'Alene River Fishery Survey

We collected a total of 1,485 fish in three nights of electrofishing on the Coeur d'Alene River. Westslope cutthroat trout were the most numerous species captured in our electrofishing samples comprising 44% (n=657) of the catch (Table 1). Our mark-and-recapture efforts resulted in a population estimate of 2,265 cutthroat trout over 100 mm (including fish identified as cutthroat x rainbow trout hybrids) in our 5.1 km transect, or 440 fish/km. Lengths of cutthroat trout ranged from 90 to 480 mm with a mean length of 252 mm (Figure 4, Table 1). Thirty-six percent of the 657 cutthroat trout sampled were less than 200 mm, while 4.8% of the cutthroat captured were larger than 405 mm. Fish identified as cutthroat x rainbow trout hybrids were generally smaller with a mean length of 237 mm.

Mountain whitefish were the second most abundant of all species sampled, representing 43% of the three-night electrofishing catch (n=641). We estimated a population of 9,615 mountain whitefish in our survey transect, or 1,867 whitefish/km. Mountain whitefish ranged in length from 37 to 425 mm with a mean length of 252 mm (Figure 5, Table 1). Mountain whitefish >300 mm were estimated at 227 fish/km.

We did not collect enough marked rainbow trout on the recapture run to develop a population estimate, but rainbow trout comprised 5% of the overall three-night catch. Rainbow trout ranged from 110 to 480 mm, with a mean length of 255 mm (Figure 6, Table 1). We collected 30 brook trout which was 2% of the overall catch. Brook trout ranged from 150 to 340 mm (TL) with a mean length of 238 mm (Table 1). Additional salmonids collected were three kokanee salmon *O. nerka kennerlyi*, and one juvenile chinook salmon *O. tshawytscha.*

Table 1. Summary of game fish species, number captured, mean length, maximum length, minimum length, and species composition by percent for electrofishing survey in Coeur d'Alene River, Idaho, June 2000.

Species	Number captured	Mean length (mm)	Maximum length (mm)	Minimum length (mm)	Species composition by percent
Cutthroat trout	657	252	480	90	44
Rainbow trout	70	255	480	110	5
Cutthroat/Rainbow	77	237	396	100	5
Brook trout	30	217	340	150	2
Mountain whitefish	641	252	425	37	43
Kokanee	3	144	300	66	<1
TOTAL	1,480				

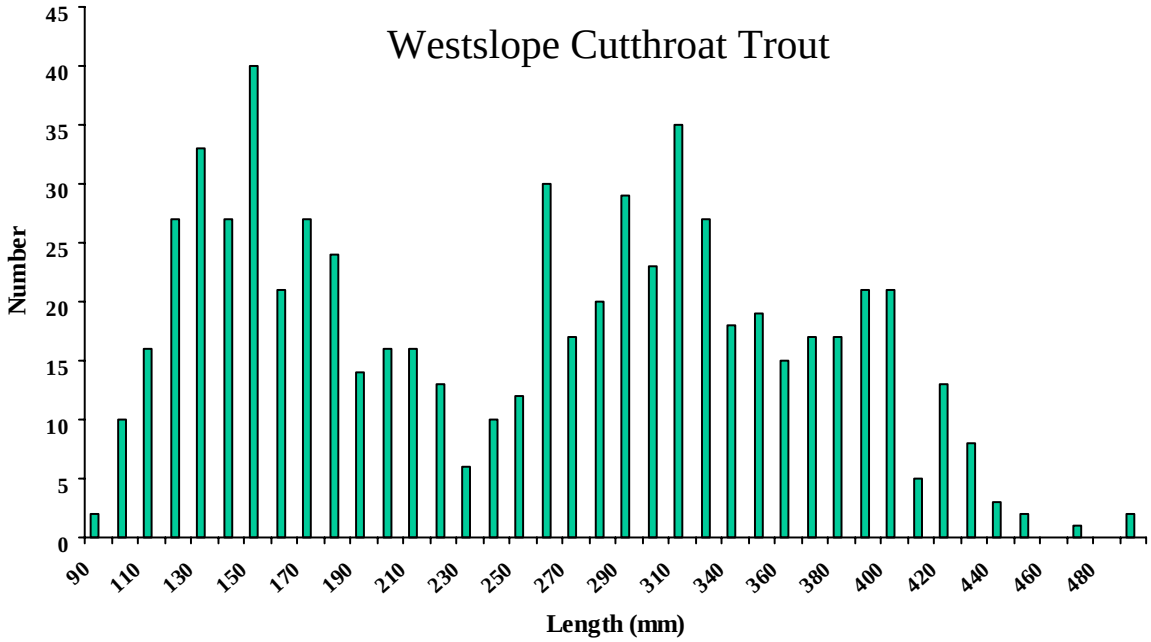

Figure 4. Length frequency of westslope cutthroat trout collected by electrofishing in the lower Coeur d'Alene River, Idaho, 2000.

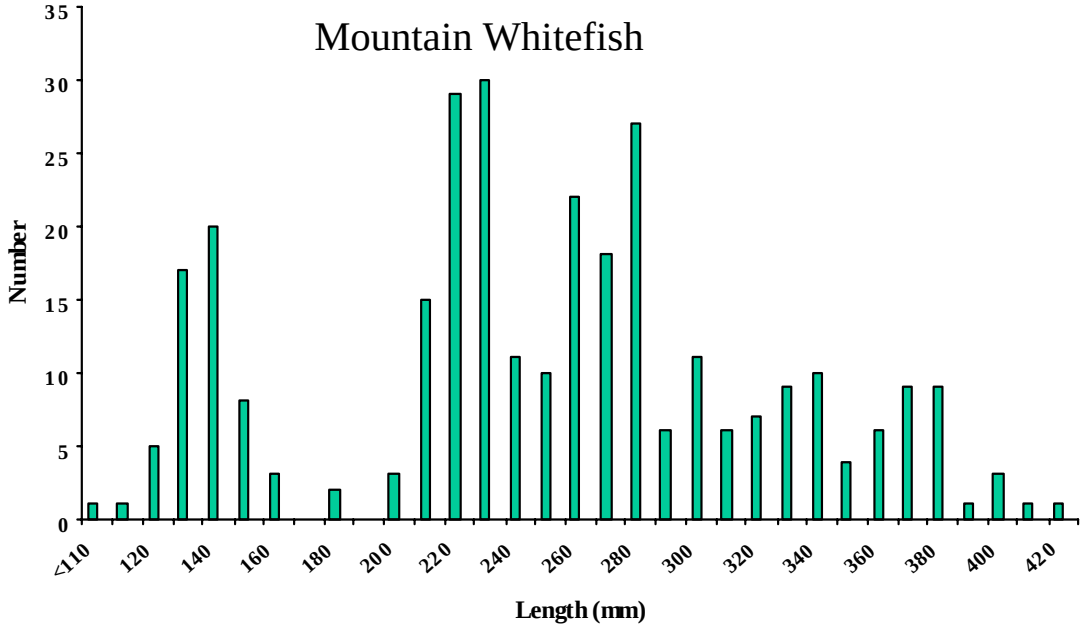

Figure 5. Length frequency of mountain whitefish collected by electrofishing in the lower Coeur d'Alene River, Idaho, May 2000.

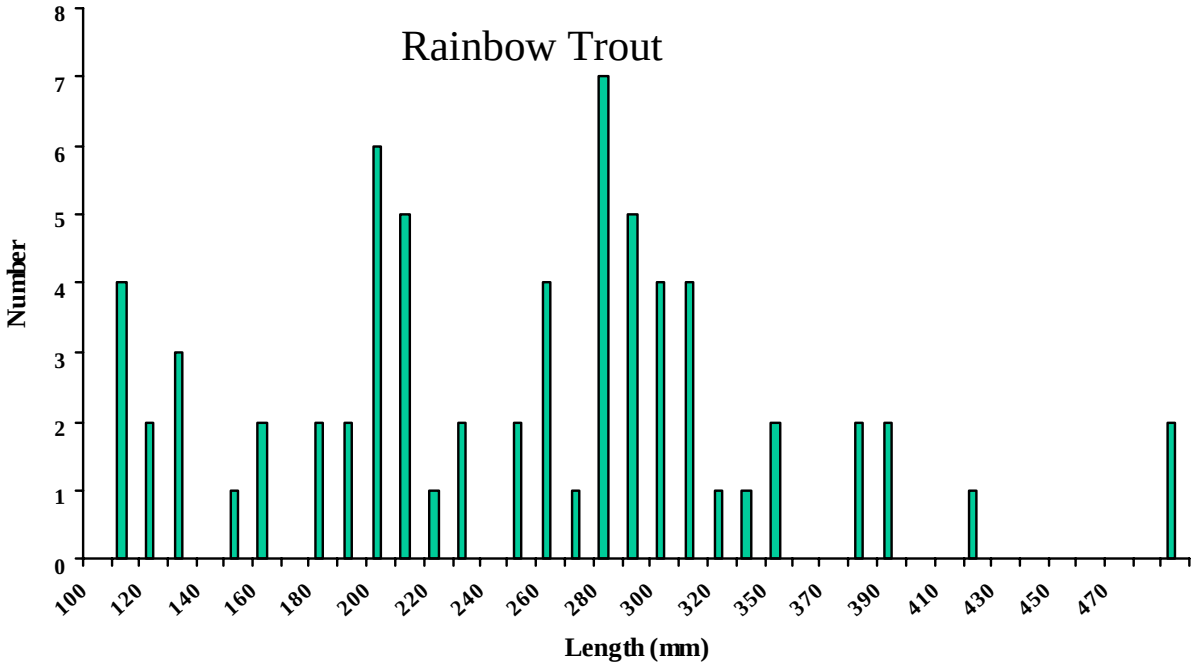

Figure 6. Length frequency of rainbow trout collected by electrofishing in the lower Coeur d'Alene River, Idaho, 2000.

Nongame species collected included northern pikeminnow *Ptychocheilus oregonensis;* largescale suckers *Catostomus macrocheilus* and tench *Tinca tinca*. We did not attempt to collect all non-game species, and their presence in the sample does not reflect relative abundance.

A total of 38 cutthroat trout, 28 rainbow trout, three cutthroat x rainbow trout hybrids, and eight brook trout ranging from 175 to 480 mm were marked with reward tags in 2000. Anglers reported tags from four cutthroat trout and one brook trout for a combined return rate of 9.5%. Only three of the four cutthroat trout were harvested. After adjusting for noncompliance, estimated cutthroat exploitation in 2000 was around 13% and brook trout exploitation was around 21% (note: brook trout exploitation estimate is compromised by small sample size). All five of the tag returns were recovered within 3 km of the sampling area within two months.

St. Joe and Coeur d'Alene Rivers Snorkel Surveys

St. Joe River

We counted 503 westslope cutthroat trout, one rainbow trout, and 308 mountain whitefish in St. Joe River snorkel transects in 2000 (Table 2). Westslope cutthroat trout were observed in all 24 St. Joe River snorkel sites. Twenty percent of the westslope cutthroat trout observed were estimated to be over 300 mm TL. Densities ranged from 0.07 to 4.73 cutthroat/100 m^2 (Table 2). Mean cutthroat trout density in the 24 St. Joe snorkel sites was 1.25 fish/100 m^2. Highest cutthroat densities were in the middle reach (from Prospector Creek to Red Ives). In the lowest section, from Avery to Prospector Creek (transects 1-8), an average of 16 cutthroat were counted per transect, or 0.66 fish/100 m^2. From Prospector Creek to Red Ives Ranger Station (transects 9-13) a mean of 27.5 cutthroat were counted per transect, or 1.7 fish/100 m^2, and from Red Ives to Ruby Creek (transects 24-28) the average count was 14 cutthroat trout per transect, or 1.1 fish/100 m^2.

Mountain whitefish were observed in nearly all transects in the section of river surveyed (Table 2). Mean density was slightly higher than cutthroat trout at 1.9 fish/100 m^2. Densities were comparable throughout the three river sections, with 0.67 fish/100 m^2, 0.48 fish/100 m^2, and 0.56 fish/100 m^2 found in the lower, middle, and uppermost sections of river, respectively (Table 2).

North Fork Coeur d'Alene River

A total of 3,996 salmonids were observed in 25 North Fork Coeur d'Alene River snorkel transects (Table 3). Species observed included westslope cutthroat trout, rainbow trout and mountain whitefish comprising 9.2, 9.9, and 80% of the fish observed, respectively. Westslope cutthroat trout were observed in all 25 North Fork Coeur d'Alene River transects. Of the 370 westslope cutthroat trout observed only 39 or 10.5% were estimated to be over 300 mm. Densities of westslope cutthroat trout observed in the North Fork ranged from 0.05 to 2.5 fish/100 m^2 (Table 3). The mean density of westslope cutthroat trout observed in 25 North Fork Coeur d'Alene River snorkel transects was 0.67 fish/100 m^2, but density was significantly higher in the catch-and-release transects (t-test, $P<0.05$). Mean density was 0.91 fish/100 m^2 above Yellow Dog Creek and 0.36 fish/100 m^2 in the transects below Yellow Dog Creek.

Table 2. Number and density of fish observed while snorkeling transects in the St. Joe River, Idaho in 2000. All transects are in the catch-and-release regulation zone as of 2000.

					Cutthroat trout			Rainbow trout		Whitefish	
					Number counted						
Reach	Transect Number	Length (m)	Width (m)	Area (m^2)	≤300mm	>300mm	Density (#/100 m^2)	Number counted	Density (#/100 m^2)	Number counted	Density (#/100 m^2)
Avery to Prospector Creek	S-1	64	43.3	2,773	1	1	0.07	1	0.04	9	0.32
	S-2	110	25.7	2,832	9	2	0.39	0	0	52	1.84
	S-3	55	15.3	843	10	9	2.25	0	0	4	0.47
	S-5	100	28.5	5,700	18	6	0.42	0	0	16	0.28
	S-6	215	29.5	6,342	26	5	0.49	0	0	18	0.28
	S-7	127	40.0	3,080	7	1	0.26	0	0	6	0.19
	S-8	122	19.5	2,379	14	4	0.76	0	0	31	1.30
Prospector Creek to Red Ives	S-10	250	22.0	5,500	16	7	0.42	0	0	20	0.36
	S-12	126	27.5	3,465	10	3	0.37	0	0	9	0.26
	S-13	152	28.2	4,294	22	11	0.77	0	0	27	0.63
	S-14	113	24.2	2,740	18	7	0.91	0	0	30	1.10
	S-15	102	17.7	1,810	15	0	0.83	0	0	6	0.33
	S-16	162	19.3	3,132	52	5	1.80	0	0	12	0.38
	S-17	158	15.3	2,422	40	4	1.82	0	0	0	0.0
	S-18	55	15.6	861	34	3	4.30	0	0	4	0.46
	S-19	46	18.7	862	11	1	1.40	0	0	3	0.35
	S-20	87	19.6	1,711	9	10	1.11	0	0	0	0.0
	S-21	30	18.3	550	18	8	4.73	0	0	0	0.0
	S-22	63	25.0	1,575	15	11	1.65	0	0	30	1.90
Red Ives to Ruby Cr.	S-24	73	21.6	1,581	11	2	0.82	0	0	0	0.0
	S-25	75	21.5	1,612	23	2	1.55	0	0	0	0.0
	S-26	57	21.0	1,197	6	1	0.58	0	0	8	0.66
	S-27	67	20.0	1,340	9	4	0.97	0	0	13	0.97
	S-28	60	14.3	860	9	3	1.40	0	0	10	1.16

Table 3. Number and density of fish observed while snorkeling transects in the Coeur d'Alene River, Idaho, 2000.

Reach	Transect Number	Length (m)	Ave. Width (m)	Area (m^2)	Cutthroat trout Number counted ≤300mm	Cutthroat trout Number counted >300mm	Cutthroat trout Density (#/100 m^2)	Rainbow trout Number counted	Rainbow trout Density (#/100 m^2)	Whitefish Number counted	Whitefish Density (#/100 m^2)
Catch-and-Release	NF-1	31	21.5	666.5	8	1	1.35	0	0	30	4.5
	NF-2	105	20	2,100	0	1	0.05	0	0	0	0
	NF-3	89	15.7	1,401	7	0	0.50	0	0	0	0
	NF-4	215	19	4,085	2	2	0.09	0	0	0	0
	NF-5	102	18.7	1,912	21	4	1.31	0	0	170	8.90
	NF-6	85	18.6	1,586	4	3	0.44	0	0	1	0.06
	NF-7	96	23	2,208	27	4	1.4	0	0	0	0
	NF-8	102	34	3,468	23	0	0.66	0	0	200	5.80
	NF-9	170	33	5,775	7	0	0.12	1	0.02	57	0.99
Lower River (Limited Harvest Allowed)	NF-10	146	45	6,570	2	0	0.03	1	0.02	0	0
	NF-11	440	43	18,920	26	4	0.16	7	0.04	30	0.16
	NF-12	230	51.6	11,868	16	1	0.14	5	0.04	55	0.46
	NF-13	100	39	3,900	5	0	0.13	4	0.10	200	5.10
	NF-14	139	29.7	4,135	14	0	0.34	128	3.10	385	9.30
	NF-15	104	31	3,224	58	4	1.9	96	3.00	275	8.50
	NF-16	212	27.7	5,883	20	0	0.34	25	0.42	45	0.76
	NF-17	140	43.7	6,118	23	0	0.37	42	0.69	1,000	16.30
	NF-18	134	32.5	4,355	5	0	0.11	27	0.62	175	4.00
	NF-19	100	42.3	4,230	2	0	0.05	7	0.12	350	8.30
	NF-20	160	28	4,480	18	0	0.40	55	1.20	250	5.60
Catch-and-Release	NF-24	26	16.3	425	1	2	0.70	0	0	0	0
	NF-25	33	13	429	3	2	1.2	0	0	0	0
	NF-26	77	14	1,078	17	7	2.22	0	0	0	0
	NF-27	51	19	969	20	4	2.5	0	0	5	0.52
	NF-28	67	15	1,005	2	0	0.20	0	0	0	0

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Rainbow trout were observed in 12 of the 25 transects with an increasing number in the lower portion of the river. Only one rainbow trout was observed above Yellow Dog Creek. Densities of rainbow trout observed ranged from 0.02 to 3.1 fish/100 m^2, with a mean density of 0.37 fish/100 m^2. Of the 398 rainbow trout observed only about five percent were estimated to be over 300 mm (Table 3).

Mountain whitefish were observed in 16 snorkel transects and densities ranged from 0.06 to16.3 fish/100 m^2 with a mean density of 3.2 fish/100 m^2. Highest densities of mountain whitefish were in the lower reach of the river, with few or no mountain whitefish observed in the walk-in reach or in the Teepee Creek transects (Table 3).

Little North Fork Coeur d'Alene River

We counted 117 salmonids in the Little North Fork Coeur d'Alene River snorkel surveys in 2000. A total of 71 westslope cutthroat trout were observed in eight of ten transects (Table 4). Ten percent of the westslope cutthroat trout observed were estimated to be over 300 mm TL. Densities of cutthroat trout ranged from 0 to 2.42 fish/100 m^2 with a mean density of 0.68 cutthroat trout/100 m^2 (Table 4). Mean density in the catch-and-release area (above Laverne Creek) was 1.26 cutthroat trout/100 m^2, compared with 0.53 cutthroat trout/100 m^2 in the harvest area.

A total of 44 rainbow trout were observed in six Little North Fork Coeur d'Alene River snorkel transects. Rainbow trout densities ranged from 0 to 0.7 fish/100 m^2 with a mean density of 0.24 rainbow trout/100 m^2. Two brook trout were observed and no mountain whitefish were observed in the Little North Fork of the Coeur d'Alene River.

Upper St. Joe River and Tributaries Assessment

Bull trout were the predominant species captured in the six electrofishing transects, comprising 66% of the catch. Cutthroat trout were the only other game species sampled. Bull trout were sampled in all three streams and in four of six sites, while cutthroat trout were sampled in only one site in Wisdom Creek and in both St. Joe River sites. Estimated bull trout density was highest on Medicine Creek, where we found 6.2 and 10.9 fish/100 m^2 in the lower and upper sites, respectively (Table 5). Densities in Wisdom Creek were about 4.5 fish/100 m^2, and density in the St. Joe River transects were 0 and 1.3 fish/100 m^2. Bull trout ranged in total length from 62 to 155 mm. Due to the small number of cutthroat trout captured, density estimates were made for bull trout only. Cutthroat trout ranged from 80-182 mm. Water temperatures taken at the time of electrofishing were 13°C in the St. Joe River, 7°C in Medicine Creek, and 10°C in Wisdom Creek.

Table 4. Number and density of fish observed while snorkeling transects in the Little North Fork of the Coeur d'Alene River, Idaho, 2000. Transects LNF-1 and LNF-2 are located in the Catch-and-Release section of river above Laverne Creek.

				Cutthroat trout			Rainbow trout		Whitefish	
				Number counted						
Transect number	Length (m)	Width (m)	Area (m^2)	≤300mm	>300mm	Density (#/100 m^2)	Number counted	Density (#/100 m^2)	Number counted	Density (#/100 m^2)
LNF-1	94	13	1,222	23	2	2.04	0	0	0	0
LNF-2	114	18.3	2,086	1	0	0.48	0	0	0	0
LNF-3	75	27.6	2,070	1	0	0.48	0	0	0	0
LNF-4	141	16	2,256	2	1	0.13	5	0.22	0	0
LNF-5	112	7	784	17	2	2.42	2	0.25	0	0
LNF-6	80	8	640	0	0	0	1	0.16	0	0
LNF-7	67	8.3	556	1	0	0.18	0	0	0	0
LNF-8	189	10.2	1,927	0	0	0	8	0.41	0	0
LNF-9	120	22.7	2,724	9	2	0.40	19	0.70	0	0
LNF-10	100	14.6	1,460	10	0	0.68	9	0.62	0	0

Table 5. Summary of trout captured by electrofishing in Upper St. Joe River, Medicine Creek, and Wisdom Creek, Idaho, during July 2000.

					Bull trout				Cutthroat trout		
Stream	Length (m)	Width (m)	Area (m^2)	Temp °C	Number captured	Density #/100 m^2	Length (mm) Range	Length (mm) Mean	Number captured	Length (mm) Range	Length (mm) Mean
Wisdom Creek	30	3.03	90.9	10	4	10.97	72-116	102.0	5	80-140	104.0
Wisdom Creek	15	3.00	45.0	10	2	6.22	105-110	107.5	0	--	--
Medicine Creek	21	2.17	45.6	7	5	4.4	65-126	101.0	0	--	--
Medicine Creek	34	2.84	96.5	7	6	4.5	62-112	83.5	0	--	--
St. Joe River	24	3.20	76.8	13	1	1.3	--	155.0	3	155-182	162.3
St. Joe River	22	3.00	66.0	13	0	0	--	--	1	--	133.0

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Bull Trout Spawning Surveys

Pend Oreille Drainage

A total of 740 redds were counted in the Pend Oreille Lake drainage, 631 of which were in the six index streams (Trestle, East Fork Lightning, Gold, North Gold, Johnson, and Grouse creeks). As is typical, around half of the total redds counted were in Trestle Creek, followed by Gold Creek, Grouse Creek, and the East Fork of Lightning Creek (Table 6). Expanding the number of redds observed by 2.2 and 3.2 fish/redd, an estimated range of 1,628-2,368 bull trout spawned in the Pend Oreille Lake tributaries in 2000.

Priest Lake Drainage

We counted 29 bull trout redds in the Upper Priest Lake drainage (Table 7). The 2000 counts were unusual in that we found far more redds in Gold Creek (nine) than are usually observed in that stream, and no redds in Trapper Creek, where counts have ranged from two to eight redds in recent years (Table 7). The greatest number of redds was counted in the Upper Priest River between Rock Creek and the Upper Priest Falls, where counts have only been conducted since 1996. Expanding the number of redds observed by 2.2 and 3.2 fish/redd, an estimated range of 64-93 bull trout entered the Priest Lake drainage index stream reaches to spawn in 2000.

St. Joe River Drainage

We counted 48 redds in the St. Joe River drainage. As is typical, the vast majority of the redds (43) were counted in Medicine Creek (Table 8). Three redds were counted in Wisdom Creek and two redds were observed in the upper St. Joe River between Heller Creek and St. Joe Lake. Expanding the number of redds observed by 2.2 and 3.2 fish/redd, an estimated range of 105-154 bull trout entered the St. Joe drainage index stream reaches to spawn in 2000.

Little North Fork Clearwater River

A total of 18 bull trout redds were identified in the upper Little North Fork Clearwater River drainage in 2000, which is the highest number observed in the six years that these tributaries have been surveyed (Table 9). One redd was observed in Lund Creek while Little Lost Lake Creek and the Little North Fork Clearwater River between Lund Creek and Lost Lake Creek had three and eight redds, respectively. Expanding the number of redds observed by 2.2 and 3.2 fish/redd, an estimated range of 40-58 bull trout entered the upper Little North Fork Clearwater River index stream reaches to spawn in 2000.

Table 6. Number of bull trout redds counted per stream in the Lake Pend Oreille drainage, Idaho, 1983-2000.

Stream	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CLARK FORK R.	--	--	--	--	--	--	--	--	--	2	8	17	18	3	7	8	5	5
Lightning Cr.	28	9	46	14	4	--	--	--	--	11	2	5	0	6	0	3	16	4
East Fork	110	24	132	8	59	79	100	29	--	32	27	28	3	49	22	64	44	54
Savage Cr.	36	12	29	--	0	--	--	--	--	1	6	6	0	0	0	0	4	2
Char Cr.	18	9	11	0	2	--	--	--	--	9	37	13	2	14	1	16	17	11
Porcupine Cr.	37	52	32	1	9	--	--	--	--	4	6	1	2	0	0	0	4	4
Wellington Cr.	21	18	15	7	2	--	--	--	--	9	4	9	1	5	2	1	22	8
Rattle Cr.	51	32	21	10	35	--	--	--	--	10	8	0	1	10	2	15	13	12
Johnson Cr.	13	33	23	36	10	4	17	33	25	16	23	3	4	5	27	17	31	4
Twin Cr.	7	25	5	28	0	--	--	--	--	3	4	0	5	16	6	10	19	10
Morris Cr.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1
NORTH SHORE																		
Trestle Cr.	298	272	298	147	230	236	217	274	220	134	304	276	140	243	221	330	260	309
Pack River	34	37	49	25	14	--	--	--	--	65	21	22	0	6	4	17	0	8
Grouse Cr.	2	108	55	13	56	24	50	48	33	17	23	18	0	50	8	44	50	77
EAST SHORE																		
Granite Cr.	3	81	37	37	30	--	--	--	--	0	7	11	9	47	90	49	41	25
Sullivan Springs	9	8	14	--	6	--	--	--	--	0	24	31	9	15	42	10	22	19
North Gold Cr.	16	37	52	8	36	24	37	35	41	41	32	27	31	39	19	22	16	19
Gold Cr.	131	124	11	78	62	111	122	84	104	93	120	164	95	100	76	120	147	168
6 index streams	570	598	571	290	453	478	543	503	423	333	529	516	273	486	373	597	548	631
Total of all streams	814	881	830	412	555	478	543	503	423[a]	447	656	631	320[b]	608	527	726	712	740

[a] Represents a partial count due to early snow fall.
[b] Observation conditions impaired by high runoff.

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Table 7. Description of bull trout survey locations and transects locations, distance surveyed, and number of redds observed in the Priest Lake drainage, Idaho, 1992-2000.

Stream	Transect description	Distance (km)	1992	1993	1994	1995	1996	1997	1998	1999	2000
Upper Priest River	Falls to Rock Cr.	4.5	--	--	--	--	15	4	15	33	7
	Rock Cr. to Lime Cr.	1.1	--	2	1	1	2	0	3	7	0
	Lime Cr. to Snow Cr.	2.4	--	3	4	2	8	1	10	9	9
	Snow Cr. to Hughes Cr.	4.4	--	0	0	--	0	3	7	4	2
	Hughes Cr. to Priest Lake	1.6	--	0	0	--	0	--	--	0	0
Rock Cr.	Mouth upstream to F.S. trail 308 crossing	0.5	0	0	--	--	2	1	0	--	0
Lime Cr.	Mouth upstream 0.8 km	0.8	0	0	--	--	0	2	0	1	0
Cedar Cr.	Mouth upstream 1.6 km	1.6	--	0	2	1	0	1	0	0	0
Ruby Cr.	Mouth to waterfall above F.S.Rd 655	2.0	0	0	--	--	--	0	0	--	--
Hughes Cr.	North end of Hughes Meadow to F.S. trail 312 crossing	2.0	7	3	2	0	1	4	0	1	0
	Foot bridge on F.S. trail 311 downstream to F.S. road 622 bridge	2.4	2	0	7	1	2	0	0	0	0
	F.S. road 622 downstream to mouth	8.0	--	1	--	--	2	3	1	0	2
Bench Cr.	Mouth upstream 0.8 km	0.8	0	2	2	0	1	0	0	0	0
Jackson Cr.	Mouth upstream to F.S. trail 311 crossing	1.6	4	0	0	0	0	0	0	--	--
Gold Cr.	Mouth upstream 2.0 km	2.0	5	2	6	5	3	0	1	1	9
Boulder Cr.	Mouth upstream of waterfall	1.6	0	0	0	--	0	0	0	--	0
Trapper Cr.	Mouth upstream 0.8 km from East Fork	3.2	--	4	4	2	5	3	8	2	0
Caribou Cr.	Mouth upstream to old road crossing	1.6	--	1	0	0	0	0	0	--	--
	Total of all streams		18	18	28	12	41	22	45	58	29
	Total of index streams						37	16	44	57	27

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Table 8. Number of bull trout redds counted in the upper St. Joe River, Idaho, and tributaries, 1992-2000.

	Number of redds[a] observed								
Stream	1992	1993	1994	1995	1996	1997	1998	1999	2000
St. Joe R. from Heller Cr. To St. Joe Lake[b]	10	14	3	20	14	6	0	10	2
Beaver Cr. and Bad Bear Cr.	2	2	0	0	0	0	1	--	--
Fly Cr.	--	--	--	0	0	--	2	--	--
Heller Cr.	0	0	--	0	--	1	0	--	0
Medicine Cr.[b]	11	33	48	26	23	13	11	48	43
Mosquito Cr.	--	--	--	0	4	--	2	--	--
Red Ives Cr.	--	0	--	1	0	1	0	--	0
Sherlock Cr.	0	3	--	2	1	1	0	--	0
Simmons Cr.	--	7	5	0	--	0	1	--	--
Wisdom Cr.[b]	1	1	4	5	1	0	4	11	3
Total of all streams	24	60	60	54	43	22	21	69	48
Total of index streams	22	48	55	51	38	19	15	69	48

[a]Only definite bull trout redd sightings are reported in this table. Bright/clean gravel areas reported as “possible” bull trout redds are not included.
[b]Bull trout index streams established in 1997.

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Table 9. Summary of bull trout redds counted in the upper Little North Fork Clearwater River drainage, Idaho, 1994-2000.

Stream	1994	1996	1997	1998	1999	2000
Lund Cr.	0	7	2	2	1	1
Little Lost Lake Cr.	0	1	1	1	7	3
Lost Lake Cr.	0	0	0	0	--	1
Little N.F. Clearwater						
Lund Cr. to Lost Lake Cr.	--	--	3	1	9	8
Lost Lake Cr. to headwaters	0	2	0	0	--	5
Total	0	10	6	4	17	18

DISCUSSION

Lower Coeur d'Alene River Fishery Survey

Prior to 2000, the fishery in the lower Coeur d'Alene River was closed until July 1, and only one cutthroat trout (not less than 355 mm) could be harvested. Other sections of the river opened during the general stream opener and tributaries were managed with a general stream opener and six fish limit. Beginning with the 2000 stream season opener (May 27), we implemented a cutthroat trout slot limit to protect native cutthroat trout and simplify regulations. This change, which was applied to the Spokane River drainage, restricts harvest to two cutthroat trout, none between 8 and 16 in (200-406 mm) and a general stream season (Saturday of Memorial Weekend through November). This regulation increases harvest opportunity on juvenile cutthroat trout in the mainstem rivers but decreases harvest opportunity on juvenile fish in tributary streams from a general daily limit of six fish to two. The regulation also provides additional protection for larger fish by prohibiting harvest of 355 to 406 mm fish. However, the general stream season allows over a month of additional fishing at a time when cutthroat trout may be vulnerable and concentrated in the lower river.

We believe the new regulations are very unlikely to adversely impact the cutthroat trout population. Based on electrofishing, only a small percentage of the population will be outside the protective slot. Furthermore, exploitation in the lower Coeur d'Alene River does not appear to be excessive, particularly since implementation of the new regulations. Initial indications are that corrected exploitation of cutthroat trout in the study reach of the Coeur d'Alene River was about 13% in 2000, compared with about 28% in 1999. Both of these estimates are lower than in the 1980s when Apperson et al. (1988) reported cutthroat exploitation was 29% in 1985 and 33% in 1986.

Nevertheless, the primary objective of the lower Coeur d'Alene River fishery survey was to develop good baseline population information so that we can effectively evaluate the recent regulation change. The 1999 and 2000 population and relative abundance estimates were very similar, indicating a reliable baseline data set (Table 10). In two to three years, a follow up survey to the 1999 and 2000 population estimates in the lower Coeur d'Alene River will be very useful in evaluating the effects of the regulation change on the cutthroat trout population.

Table 10. Comparison of summary of statistics of electrofishing survey in Coeur d'Alene River, Idaho, May 1999 and June 2000.

	Number captured		Mean length (mm)		Population estimate		Density (fish/rkm)		Catch composition	
Species	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000
Cutthroat trout	286	657	267	252	2,685	2,265	526	440	44%	44 %
Rainbow trout	8	70	263	255	--	--	--	--	1%	5 %
Cutthroat/Rainbow	44	77	207	237	--	--	--	--	7%	5 %
Brook trout	8	30	233	217	--	--	--	--	1%	2 %
Mountain whitefish	300	641	220	252	8,412	9,615	1,633	1,867	46%	43 %
Kokanee	4	3	260	144		--	--	--	<1%	<1 %

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Coeur d'Alene and St. Joe Snorkel Transects

An average of 1.25 westslope cutthroat trout/100 m^2 were observed in the St. Joe River in 2000 compared to 0.67 and 0.68 cuthroat/100 m^2 in the North Fork and Little North Fork Coeur d'Alene rivers, respectively. However, because of the regulations implemented in 2000, all snorkel transects on the St. Joe River are now in the catch-and-release area. Therefore, to insure a meaningful comparison between the two systems, we excluded the lower transects (harvest areas) on the North Fork and Little North Fork of the Coeur d'Alene rivers. The resulting density (0.95 cutthroat/100 m^2) is still lower than the mean St. Joe density, however the difference between the two systems is not statistically significant (T-test, df=38, P=0.19).

Given that cutthroat trout densities in the catch-and-release areas of the Coeur d'Alene system (0.95 cutthroat/100 m^2) were over two times greater than in the harvest areas (0.43 cutthroat/100 m^2), expansion of the catch-and-release area would likely improve overall densities in the Coeur d'Alene system, assuming reasonable angler compliance. Historically, however, residents of the Coeur d'Alene River valley have generally resisted expansion of catch-and-release areas, and such a regulation change will require increased public support.

Densities in the catch-and-release areas of both the St. Joe and the Coeur d'Alene rivers are remarkably high given the accessibility of the rivers and the vulnerability of cutthroat trout to illegal harvest and hooking mortality. The densities in both rivers were lower, but still similar to the Middle Fork Salmon River located in the Frank Church River of No Return Wilderness Area, where Curet et al. (1999) reported an average of 1.65 westslope cutthroat trout/100 m^2 in 1998.

Rainbow trout were far more abundant in the Coeur d'Alene River system than in the St. Joe River; however, nearly all rainbow trout were observed in the harvest sections of river, where rainbow trout are stocked. The corresponding reach of the St. Joe River is not snorkeled. In a more meaningful comparison, rainbow trout appear to be virtually absent from the catch-and-release areas of both systems.

Mountain whitefish were more abundant in the North Fork of the Coeur d'Alene River than in the St. Joe River. However, again, the comparison between the two systems may not be entirely valid because much of the lower St. Joe River was not snorkeled. Most mountain whitefish in the North Fork of the Coeur d'Alene River were in the large, deep pools and runs in the lower section of river. A liberal harvest of mountain whitefish is allowed throughout the entire river, so changes in density between the harvest and catch-and-release areas would not be expected. Mean density was 5.3 fish/100 m^2 below Yellow Dog Creek and only 1.5 fish/100 m^2 above Yellow Dog Creek. To more accurately compare mountain whitefish densities between the two systems and to develop baseline information on the mountain whitefish population in the St. Joe River, additional sites should be snorkeled below Avery in future years. Another benefit of additional transects would be the ability to once again compare cutthroat trout densities between harvest and catch-and-release sections of the St. Joe River.

Upper St. Joe River and Tributaries Assessment

The upper St. Joe River, Medicine Creek, and Wisdom Creek represent the vast majority of bull trout reproductive habitat in the St. Joe system. We have conducted redd counts in these streams since 1992, but prior to this electrofishing effort we had no quantitative data on juvenile bull trout abundance.

The intent of the 2000 assessment was largely to develop baseline information, as well as to compare bull trout abundance between the three streams.

Our survey was not sufficient to conclusively evaluate the relationship between density and temperature or redd counts, but we did see obvious trends. Densities in the three streams were what we would expect based on redd counts. Medicine Creek, which is one of the streams most heavily utilized by spawning bull trout in the Panhandle Region, had very high densities of juvenile bull trout and was comparable to other important rearing streams in the Panhandle. Densities in Medicine Creek ranged from 6.2 to 10.9 bull trout/100 m^2 compared with Malcom Creek, a tributary to the Upper Priest River where we found approximately 7 juvenile bull trout/100 m^2 in 1997 (unpublished data), and Trestle Creek, a tributary to Pend Oreille Lake, where we found 6.8 juvenile bull trout/100 m^2 in 1999 (unpublished data). Additionally, Medicine Creek had the coldest water temperature on the survey date, and the St. Joe River, which had the lowest density estimates, had the warmest water temperatures. Although limited, these data are consistent with research that has demonstrated the importance of cold-water temperatures for bull trout reproduction.

Bull Trout Spawning Escapement

Based on redd counts, there was no clear trend in bull trout escapement across drainages. Counts in the Pend Oreille and Little North Fork of the Clearwater drainages were the highest recorded since the surveys began, and counts in the St. Joe drainage were also above average. Conversely, the Upper Priest drainage counts were well below average.

The total estimate of 740 bull trout redds in the Pend Oreille drainage in 2000 was the highest since 1985. However, Dunham et al. (2001) indicated that inter-observer error caused wide variation in redd counts and that redd counts may only be useful for detecting relatively substantial changes in bull trout populations. Redd count accuracy may be improved with extensive training and the use of the same observer year after year (Dunham et al. 2001), but redd counts are best used to evaluate trends in population abundance, not absolute numbers.

Spawner escapement estimates determined by repeated snorkeling and weirs placed in East Fork Lightning Creek and Trestle Creek in 1998 indicated the spawner:redd ratios were 2.59 and 2.80, respectively ((Dunham et al. 2001). Applying these ratios to the total redd estimate of 740 would result in a total escapement estimate for all tributaries to Pend Oreille Lake ranging from 1,917 to 2,072 fish. This escapement estimate is likely somewhat conservative based on the findings of Dunham et al. (2001),

The Upper Priest drainage counts were 30% lower than the mean of index stream counts. Unfortunately, the index stream trend counts have only been conducted since 1996. Prior to then, the reach of the Upper Priest River from Rock Creek to the falls was not counted. Recent years have demonstrated the high importance of this reach; therefore, the total drainage redd counts prior to 1996 almost certainly underestimate escapement. The absence of any redds in Trapper Creek and the low number of redds in the Upper Priest River in the 2000 survey are alarming. It seems evident that the expanding population of lake trout in Upper Priest Lake poses an increasing threat to the adfluvial bull trout population (Fredericks et al. 2000; Donald and Alger 1993). The low counts in 2000 may be a reflection of a population decline or a dip in escapement related to low redd counts in 1995 or 1996 and the resulting poor recruitment. Redd counts in the next three to four years will be critical in assessing the status of the Upper Priest drainage bull trout population.

The St. Joe drainage redd counts were more encouraging. The total count of the three index streams (upper St. Joe River, Medicine Creek, Wisdom Creek) exceeded the eight-year mean by nearly 20%. The vast majority of the reproduction occurs in Medicine Creek. The extreme importance of Medicine Creek is further highlighted by evidence that the bull trout population in the St. Joe River system is the only population remaining in the Spokane River drainage. Therefore, Medicine Creek is likely critical to the persistence of bull trout in the Spokane River drainage. Ironically, Medicine Creek is not an unaltered habitat. Much of the stream was channelized in the early 1900s and is not suitable spawning or rearing habitat. The potential for habitat restoration in Medicine Creek should be investigated with the U.S. Forest Service. Additionally, the reproduction in Medicine Creek represents a concentrated risk to the population, and the potential to increase production in other tributaries, particularly Wisdom Creek, should also be evaluated.

Bull trout redd counts in the Little North Fork Clearwater drainage have been highly variable since counts began in 1994. The 18 redds counted in the upper Little North Fork Clearwater River drainage in 2000 is the highest number to date and well above the six year average of 9.1 redds. Unfortunately the trend data is somewhat complicated by inconsistency in streams counted and the difficulty of redd detection (because of the absence of periphyton on the substrate, cleaned gravel associated with redd is not always apparent). Nevertheless, the high count in 2000 is encouraging and potentially reflects much higher escapement than was estimated in 1994-1998.

RECOMMENDATIONS

1. Conduct a follow-up electrofishing survey of trout and mountain whitefish populations in the lower Coeur d'Alene River in 2002 or 2003.

2. Conduct a similar electrofishing survey of trout and mountain whitefish populations in the lower St. Joe River in 2001 or 2002.

3. Conduct biennial surveys in the Little North Fork Coeur d'Alene, North Fork Coeur d'Alene, and St. Joe rivers using snorkeling or electrofishing, expanding the snorkel survey to include transects in the harvest section of the St. Joe River below Avery.

4. Assess juvenile bull trout abundance in other tributaries of the St. Joe River where redds were historically observed (Simmons, Mosquito, Sherlock creeks).

5. Continue to monitor bull trout spawning escapement through redd counts in the Pend Oreille, St. Joe, Upper Priest, and Little North Fork Clearwater drainages.

6. Discuss with the U.S. Forest Service the feasibility of habitat restoration in Medicine Creek and/or Wisdom Creek.

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APPENDICES

Appendix A. Global Positioning System coordinates for St. Joe River, Idaho, snorkel sites.

Transect number	Latitude coordinate	Longitude coordinate
S-1	47° 14.74 N	115 ° 45.76 W
S-2	47° 13.68 N	115 ° 42.63 W
S-3	47° 13.83 N	115 ° 42.04 W
S-5	47° 14.35 N	115 ° 40.19 W
S-6	47° 14.35 N	115 ° 40.19 W
S-7	47° 14.16 N	115 ° 38.20 W
S-8	47° 13.49 N	115 ° 36.43 W
S-10	47° 13.72 N	115 ° 35.52 W
S-12	47° 13.51 N	115 ° 34.96 W
S-13	47° 12.18 N	115 ° 32.58 W
S-14	47° 12.10 N	115 ° 31.07 W
S-15	47° 11.14 N	115 ° 28.89 W
S-16	47° 10.57 N	115 ° 27.47 W
S-17	47° 10.26 N	115 ° 26.74 W
S-18	47° 09.08 N	115 ° 24.48 W
S-19	47° 07.99 N	115 ° 24.06 W
S-20	47° 05.71 N	115 ° 22.74 W
S-21	47° 04.69 N	115 ° 21.32 W
S-22	47° 03.53 N	115 ° 21.15 W
S-24	47° 01.83 N	115 ° 21.12 W
S-25	47° 01.87 N	115 ° 21.33 W
S-26	46° 59.46 N	115 ° 22.26 W
S-27	46° 59.35 N	115 ° 22.14 W
S-28	46° 59.00 N	115 ° 22.09 W

Appendix B. Global Positioning System coordinates for North Fork Coeur d'Alene River, Idaho, snorkel sites.

Transect number	Latitude coordinate	Longitude coordinate
NF-1	47° 52.66 N	116° 12.58 W
NF-2	47° 52.82 N	116° 11.56 W
NF-3	47° 52.64 N	116° 11.62 W
NF-4	47° 53.16 N	116° 10.06 W
NF-5	47° 52.32 N	116° 06.72 W
NF-6	47° 51.00 N	115° 06.63 W
NF-7	47° 48.42 N	116° 04.54 W
NF-8	47° 47.70 N	116° 04.02 W
NF-9	47° 47.41 N	116° 04.08 W
NF-10	47° 44.77 N	116° 01.21 W
NF-11	47° 41.80 N	115° 57.06 W
NF-12	47° 40.39 N	115° 56.86 W
NF-13	47° 38.87 N	115° 58.38 W
NF-14	47° 39.10 N	116° 01.81 W
NF-15	47° 40.13 N	116° 03.06 W
NF-16	47° 39.32 N	116° 07.54 W
NF-17	47° 39.62 N	116° 09.90 W
NF-18	47° 37.38 N	116° 11.83 W
NF-19	47° 35.89 N	116° 14.35 W
NF-20	47° 35.02 N	116° 15.83 W
NF-24	47° 53.10 N	116° 07.86 W
NF-25	47° 53.18 N	116° 07.51 W
NF-26	47° 53.74 N	116° 08.04 W
NF-27	47° 54.50 N	116° 07.33 W
NF-28	47° 54.65 N	116° 07.37 W

Appendix C. Global Positioning System coordinates for Little North Fork Coeur d'Alene River, Idaho, snorkel sites.

Transect number	Latitude coordinate	Longitude coordinate
LNF-1	47° 44.54 N	116 ° 25.48 W
LNF-2	47° 43.06 N	116 ° 23.11 W
LNF-3	47° 41.57 N	116 ° 22.63 W
LNF-4	47° 39.84 N	116 ° 22.18 W
LNF-5	47° 39.19 N	116 ° 21.92 W
LNF-6	47° 37.56 N	116 ° 19.72 W
LNF-7	47° 37.98 N	116 ° 18.77 W
LNF-8	47° 38.10 N	116 ° 17.59 W
LNF-9	47° 37.39 N	116 ° 16.21 W
LNF-10	47° 36.62 N	116 ° 14.43 W

2000 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management

Project: II - Technical Guidance | Subproject: I-A Panhandle Region

Contract Period: July 1, 2000 to June 30, 2001

ABSTRACT

Panhandle Region fisheries management personnel provided private individuals, organizations, public schools, and state and federal agencies with technical review and advice on various projects and activities that affect the fishery resources in northern Idaho. Technical guidance also included numerous angler informational meetings, presentations, and letters, continuation of the Panhandle Region portion of the 1-800-ASK-FISH program, and fishing clinics.

Author:

Ned Horner
Regional Fishery Manager

OBJECTIVES

1. To furnish technical assistance, advice and comments to other agencies, organizations, and individuals regarding projects that affect fishery resources in northern Idaho.

2. To promote the understanding of fish biology, fish habitat needs, and the ethical use of the fishery resource through individual contact, public school curricula, club meetings, public presentations, informational brochures and fishing clinics.

METHODS

Regional fisheries management personnel provided both written and oral technical guidance.

RESULTS AND DISCUSSION

The technical guidance provided by Panhandle Region fish management personnel focused on activities that directly affected fishery resources or resource users in north Idaho. Numerous presentations and programs were given to civic and sportsmens' groups throughout the year. Letters were sent to numerous individuals and organizations in response to specific questions about the fisheries in northern Idaho.

Fishing Clinics

Regional fishery management personnel coordinated six Free Fishing Day fishing clinics in the Panhandle Region. Department-sponsored clinics were held in Bonners Ferry at the Lions Club Snow Creek Pond, Coeur d'Alene at Ponderosa Golf Course (near St. Maries at Anderson Ranch Pond), at Round Lake State Park near Sandpoint, and at the Clark Fork and Mullan fish hatcheries. We also provided fish and guidance for a clinic at Priest Lake sponsored by the U.S. Forest Service. The clinics were geared toward teaching young anglers how to fish (casting, baiting hooks, etc.), fish identification, the reasons for regulations, fishing ethics and how to clean fish. The emphasis was on education and not competition. Regional personnel, people from other state and federal agencies and sportsmens' groups helped in making the clinics a big success.

1-800-ASK-FISH

Regional fishery management personnel provided information on northern Idaho fishing opportunities for the 1-800-ASK-FISH and Idaho Fish and Game Internet Web Page angler information program. Knowledge of regional fisheries programs combined with input from tackle shops, local fishing experts and Conservation Officers were used to provide information on fishing opportunities.

Endangered Fish Species Issues

The Regional Fishery Manager provided information on the abundance and status of bull trout *Salvelinus confluentus* and westslope cutthroat trout *Oncorhynchus clarki lewisi* populations in Panhandle Region waters. This information was given to numerous individuals, organizations and personnel from state and federal agencies working on issues related to bull trout listing and the petition to list westslope cutthroat trout. The Regional Fisheries Manager coordinated with the Kootenai River sturgeon/burbot/trout research team, Kootenai Tribe, U.S. Fish and Wildlife Service (USFWS), British Columbia Ministry on Environment and the Fisheries Bureau to review and comment on issues related to white sturgeon *Acipenser transmontanus* flow requests, conservation culture, ecosystem (nutrient) issues, and transboundary management programs. Additional discussions were held with the research staff, U.S. Army Corps of Engineers (USACE), Bonneville Power Administration (BPA), U.S. Fish and Wildlife Service, Kootenai Tribe of Idaho and British Columbia Ministry of Environment on the depressed status of Kootenai River burbot *Lota lota* and possible changes in water management in the Kootenai River system to hopefully avoid another ESA listing. The U.S. Fish and Wildlife Service received a petition from American Wildlands and the Idaho Conservation League on February 2, 2000 requesting burbot in Idaho to be listed as endangered under the Endangered Species Act. There was no action taken on the petition during this contract period.

Pend Oreille Lake Water Management

Fishery research personnel were responsible for completing all field activities, while the Fisheries Manager kept the public informed and involved in efforts to change lake level management on Lake Pend Oreille. Several sportsmen meetings were attended, articles were written and interviews were given to newspapers. The Fishery Manager briefed the Idaho Congressional staff on biological and social issues related to changes in lake level management. The Lake Pend Oreille Idaho Club (LPOIC) sued the U.S. Army Corps of Engineers again in 2000 to decide at what level the lake would be managed for the winter of 2000-2001. The National Marine Fisheries Service also requested water from Lake Pend Oreille to meet chum salmon *O. keta* spawning flows below Bonneville Dam. An out-of-court settlement was reached with the USACE that stipulated the lake be managed at elevation 2,053, two feet higher than maximum winter drawdown. In the same stipulation the USACE agreed to use storage space in Lake Pend Oreille to mitigate potential high flows in the Pend Oreille River at Cusick, WA, to maintain the summer pool level of 2062.5 until September 15, to draw down the lake not more than one foot from full pool during September, and to adhere to the United States Fish and Wildlife Service Biological Opinion for bull trout in Lake Pend Oreille. The USFWS BiOp called for a continuation of the winter lake elevation/kokanee egg-to-fry survival study for the next six years, a winter pool elevation of 2,051 during the winter of 2001-2002, a winter pool elevation of 2,055 during the winter of 2002-2003, and an independent scientific review and recommendation for holding the lake at elevation 2,055 for one to three consecutive years during the fall/winter operations of 2003 to 2006.

Summer pool management also became an issue in May of 2001. Downstream salmon managers requested that Lake Pend Oreille water be bypassed through August to help provide fall chinook salmon *O. tshawytscha* flushing flows in the Columbia River. The proposal, if adopted, would have resulted in the lake being managed at a summer pool elevation of 2,054 until the end of August. Adult bull trout in

Lake Pend Oreille would have been impacted by alluvial fans at mouths of important spawning streams preventing or slowing their spawning migrations. Fortunately, this issue was resolved in June when it became apparent that the salmon flow request could be met without utilizing water from Lake Pend Oreille.

Box Canyon Dam Relicensing

The Regional Fishery Manager reviewed and commented on fisheries related issues associated with the relicensing of the Box Canyon Dam operated by the Pend Oreille Utility District of Newport, Washington. The PUD was a major opponent of higher winter pool levels in Lake Pend Oreille, saying the shift in the timing of water coming down the Pend Oreille River caused a loss of revenue. The Regional Environmental Staff Biologist attended most relicensing meetings and coordinated comments.

Miscellaneous

Coordination meetings were held with hatchery, research, enforcement and Fisheries Bureau personnel to insure management goals were achieved. Private pond permits, transport permits, requests for grass carp importation and fish tournament applications were reviewed and forwarded. Requests for commercial guiding activities were reviewed and commented on. Anglers were kept informed of regional fishing opportunities and management programs at club meetings, monthly sportsmens' breakfasts, through informational articles written for Panhandle Region newspapers, and numerous interviews with television, newspaper and radio reporters. The Regional Fishery Management staff presented several programs to Panhandle Region schools on cutthroat trout and participated in other Water Awareness Week activities.

2000 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management

Project: III - Habitat Management | Subproject: I-A - Panhandle Region

Contract Period: July 1, 2000 to June 30, 2001

ABSTRACT

Fish passage was restored in Bruin Creek, tributary to the St. Joe River, by placing a detachable ladder in a smooth bottom, concrete box culvert to catch and hold bedload gravel. A kokanee *Oncorhynchus nerka kennerlyi* spawning channel in Spring Creek, tributary to Lightning Creek, Pend Oreille Lake, was reconstructed by removing accumulated vegetation, reconstructing seven drop log structures and adding 1,200 m^3 of new gravel.

Author:

Ned Horner
Regional Fishery Manager

OBJECTIVES

1. Reestablish fish passage into Bruin Creek, tributary to the St. Joe River.

2. Reconstruct the kokanee *Oncorhynchus nerka kennerlyi* spawning channel in Spring Creek, tributary to Lightning Creek, Pend Oreille Lake.

INTRODUCTION

Bruin Creek Fish Ladder

Access to Bruin Creek, tributary to the St. Joe River in Shoshone County, Idaho, for migratory westslope cutthroat trout *O. clarki lewisi* and bull trout *Salvelinus confluentus* has been blocked at its mouth for many years by a road culvert that was too steep for fish passage. The culvert was retrofitted with a fish ladder in a cooperative project between Idaho Department of Fish and Game, Shoshone County Public Works Department, Panhandle Chapter Trout Unlimited and volunteers.

Spring Creek Kokanee Spawning Channel

A spawning channel for kokanee was constructed in Spring Creek, tributary to Lightning Creek, near the town of Clark Fork, Idaho, in 1958 as mitigation for the construction of Cabinet Gorge Dam on the Clark Fork River. Gravel in the channel had become sedimented in, the log drop log structures had rotted out, and the channel had narrowed from vegetation encroaching along the banks. The channel was reconstructed during the summer of 2000 in a cooperative project between the Idaho Department of Fish and Game, Avista Corporation and the Lake Pend Oreille Idaho Club.

METHODS

Bruin Creek Fish Ladder

The Bruin Creek culvert was an 18.5 m long by 2.2 m wide, square concrete culvert. The smooth bottom and steep gradient created water velocities too high to allow fish passage. A “ladder” was constructed of 75 mm x 75 mm angle iron with cross bracing spaced every meter. Six 3-m sections were built so they could be bolted together inside the culvert. The sections were bolted together inside the culvert and rocks were placed against the upstream side of the braces to catch bedload gravel. The ladder was held in place with hooks that wrapped around the upstream edge of the culvert, allowing the ladder to be pulled out of the culvert if necessary.

Spring Creek Kokanee Spawning Channel

The Spring Creek spawning channel was mostly dewatered prior to channel work with a diesel powered water pump. A track hoe "raked" the old gravel with a custom-made rake constructed of short pieces of 2.5 cm cable to remove attached algae and aquatic macrophytes. Aquatic vegetation and bank material that had encroached on the channel were removed. Seven drop-log structures were reconstructed using two logs placed one on top of the other. Logs were keyed into the bank a minimum of 1 m and buried into the bottom so the top log was level with the upstream grade of the stream bottom. New gravel was hauled to the site and placed in the stream with the track hoe. Approximately 1,200 m^3 of new gravel were placed in the channel to a depth of approximately 30 cm. The majority of gravel ranged from 1.5 to 4 cm in diameter.

RESULTS AND DISSCUSSION

Bruin Creek Fish Ladder

The Shoshone County Public Works Department donated metal for the ladder and members from Panhandle Chapter Trout Unlimited welded the ladder sections. The ladder was physically placed in the culvert and bolted together with the assistance of Idaho Fish and Game Reservists (a group of volunteers). Rocks were hauled into the culvert and placed in front of each cross member of the ladder to hasten the deposition of bedload gravel. The total time to place the ladder and rocks in the culvert was less than two hours. A follow-up assessment is needed to determine if bedload gravel is depositing in the culvert and allowing fish passage.

Spring Creek Kokanee Spawning Channel

The channel reconstruction was completed during a three-week period in October. Total project cost was $49,219, with $11,000 from the fish resource monitoring, enhancement and management component of Appendix A in the Avista relicensing agreement for Cabinet Gorge and Noxon dams, and the remainder from Idaho Department of Fish and Game. The Lake Pend Oreille Idaho Club paid for the logs used in the seven drop-log structures.

The 1,200 m^3 of new gravel will provide about 3,580 m^2 of kokanee spawning habitat. Based on the Canadian estimate of 0.21 m^2 /spawning pair, the channel should accommodate approximately 17,000 spawners, producing about 5.1 million eggs (using 300 eggs/female), or about 2.6 million kokanee fry (using a 50% green egg to fry release survival rate). Unfortunately, in the fall of 2000, no late spawning kokanee entered Spring Creek or the spawning channel to spawn.

2000 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management

Project: IV – Lake Restoration

Subproject: I-A -Panhandle Region

Contract Period: July 1, 2000 to June 30, 2001

Title: Lake Restoration

ABSTRACT

There were no lake restoration related activities in the Panhandle Region during this contract period.

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