LAKE PEND OREILLE/CLARK FORK RIVER FISHERY RESEARCH AND MONITORING

2007/2008 Lake Pend Oreille Creel Survey

Idaho Tributary Habitat Acquisition and Enhancement Program

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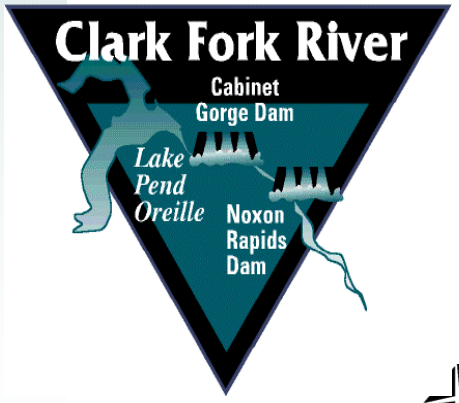

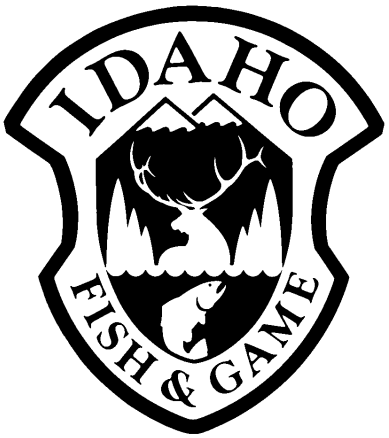

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2007/2008 Lake Pend Oreille Creel Survey

ABSTRACT

Lake Pend Oreille is Idaho's largest water body and hosts a variety of popular and economically important fisheries. Kokanee, once the primary species sought by anglers, are rapidly declining. Predator removal through netting and angling has been the primary tool used in an attempt to recover the Lake Pend Oreille kokanee population. An angler creel survey was used to estimate angler effort, catch rates, and associated harvest. Survey results were used to describe trends in angler data and evaluate the ongoing angler incentive program associated with Lake Pend Oreille predator removal. The Lake Pend Oreille creel survey was conducted from 4 March, 2007 to 1 March, 2008. Estimated angler effort (rod hours) was 368,846 h. Rainbow trout and lake trout collectively were the primary target of 85% of all anglers interviewed. The remaining angler effort was directed at warmwater fishes and other salmonids. Total angler effort was consistent with previous survey years since 1991. However, targeted angler effort reflected increases in focused effort on lake trout and warmwater fishes. LPO creel survey results provided evidence that ongoing angler incentives are generating additional harvest and angler exploitation generates fishing mortality sufficient to suppress both lake trout and rainbow trout at varying levels. However, current exploitation on rainbow trout is not likely to significantly reduce rainbow trout in the near future.

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INTRODUCTION

Lake Pend Oreille (LPO) is Idaho's largest and deepest natural lake, with a maximum depth greater than 360 m, and a surface area of about 36,000 ha. The native salmonid species assemblage consists of bull trout *Salvelinus confluentus*, westslope cutthroat trout *Oncorhynchus clarkii lewisi*, mountain whitefish *Prosopium williamsoni*, and pygmy whitefish *Prosopium coulteri*. LPO supports one of the strongest remaining adfluvial bull trout populations in the United States. LPO also has a significant non-native sport fish component including rainbow trout *Oncorhynchus mykiss*, lake trout *Salvelinus namaycush*, kokanee *O. nerka*, smallmouth bass *Micropterus dolomieui*, largemouth bass *Micropterus salmoides*, yellow perch *Perca flavescens*, black crappie *Pomoxis nigromaculatus*, walleye *Sander vitreus* , and *Lepomis spp*. LPO is known for its premier sport fishery for trophy rainbow trout, but has also had notable fisheries for kokanee, bull trout and westslope cutthroat trout. The LPO fishery has significant economic value to the state of Idaho estimated at around $17.7 million in 2003 (IDFG 2003 Sport Fishing Economic Survey Report).

Kokanee have historically provided an important fishery on LPO, once generating over half the angler effort. However, kokanee have been declining since the mid 1960's, primarily as a result of declines in shoreline spawning habitat due to winter lake level management changes, but more recently, increased predation from rainbow, lake and bull trout has resulted in a kokanee population on the verge of collapse. Major fishing regulation changes were implemented in 2000 in an attempt to balance predators with the kokanee prey base. The kokanee fishery was closed, rainbow trout limits were liberalized to 6 fish any size and the limit on lake trout was removed. Angler incentive programs were tested to encourage harvest of lake trout. Despite these efforts, anglers continued to release most of the rainbow they caught, the lake trout population continued to expand and the kokanee fishery remains closed (Fredericks et al. 2003).

Kokanee recovery remains an important component of LPO fisheries management. Kokanee provide a key forage base not only for non-native sport fish, but also native bull trout. The current level of predation on kokanee by predator species is not sustainable and a collapse of the kokanee population is highly likely. It is necessary to reduce the predation pressure on kokanee quickly to allow the population to rebuild. Predator reduction efforts will need to focus on rainbow and lake trout because they are consuming most of the kokanee, and bull trout cannot be harvested at this point in time.

Predator management has been the primary tool utilized in kokanee recovery on LPO. Predator management to date has largely focused on addressing the threat that lake trout pose to the LPO fishery. Although lake trout were introduced into Lake Pend Oreille in 1925, they were relatively scarce until just the last decade. During a 1991 creel census, 43 lake trout were observed in the angler catch, but they were infrequent enough that no estimate of total catch and harvest was made that year. During the 2000 creel census, creel clerks handled over 400 lake trout and the estimated catch and harvest of lake trout was 6,025 and 4,707, respectively (Fredericks et al 2003). Lake trout introductions in other waters within the native range of bull trout have provided evidence that lake trout likely pose a significant threat to native and other non-native sport and non-game species in LPO (Donald and Alger 1993, Fredenberg 2002). Commercial trap and gill netting has been employed as one method for managing lake trout numbers. Monetary angler incentives have also been implemented as a method for encouraging anglers to harvest lake trout and rainbow trout.

Rainbow trout suppression has also been a key component to predator management. Vidergar (2000) estimated that rainbow trout comprised 82% of the pelagic predator biomass in LPO and consumed 50% of the annual kokanee production in the late 1990's. Bull and lake trout were estimated to consume 8% and 10% of the annual kokanee production, respectively. Based on these values, it has been readily apparent that successful suppression of lake trout will not lead to kokanee recovery alone, without significant reductions in rainbow trout predation as well. Monetary angler incentives have been the only method available for rainbow trout suppression. Prior to monetary angler incentives rainbow trout harvest was estimated to be approximately 40% (Fredericks et al. 2003). Harvest rate following the implementation of the angler incentive program has not been evaluated.

Beginning In 2007, a creel survey was completed on Lake Pend Oreille in order to estimate angler effort, estimate catch and harvest of key species in LPO, and evaluate changes in angling catch statistics from previous surveys. Survey results provided an evaluation of the effectiveness of the angler incentive program at encouraging angler harvest and the resulting role of angler harvest as a component of the LPO predator management program.

OBJECTIVES

- Evaluate current status of, and changes over time to, the Lake Pend Oreille (LPO) fishery.
- Evaluate the effectiveness of the angler incentive program at encouraging angler harvest
- Evaluate angler harvest as a component of the LPO predator management program

METHODS

An angler survey was conducted on LPO from 4 March, 2007 through 1 March, 2008. The angler survey was used to estimate angler effort, catch rates, and associated harvest. Survey results were used to describe trends in angler data and evaluate the ongoing angler incentive program associated with LPO predator removal.

Effort Estimates

The angler survey was completed using an aerial-access design. Angler counts were completed using randomly scheduled flights. A 12-month sampling year was divided into 26 two-week intervals. Using the Idaho Fish and Game Creel Census System Version 1.7, two weekend/holidays and two weekdays were randomly selected for aerial surveys within each two-week interval. On each selected day two randomly selected times were chosen for flights using the random number generator tool in the Creel Application Software (CAS, Version 2.0). One time was chosen in the morning and one in the afternoon. In the event bad weather prohibited a flight on a particular day or time, a second "makeup" flight was attempted on the next available

weekend or weekday during the current interval at the same time as the original flight was scheduled. In addition, a statistical relationship was developed between the aerial counts of boats and boat trailer counts at the boat launches to provide an estimate of effort on the days the plane could not fly. Angler data collected were analyzed using Creel Application Software (CAS, Version 2.0).

Flights started at the same location on each day and flight (Long Bridge at Sandpoint). Direction of travel was randomly determined in advance for each flight. The flight route took one of two directions including progression along the North and East shoreline of the lake or along the South and West shoreline. The flight route was a complete circle of the lake. Although the assumption was these were "instantaneous" counts, we made an attempt to avoid any potential counting bias by having the pilot fly in one of two randomly determined directions.

Flight counts included both angling and non-angling boats. Based on discussions with the pilot as well as two other IDFG biologists with experience in determining activity type from aerial surveys over LPO, it was not difficult to separate angling from non-angling boats from the air. We did not attempt to quantify shore or ice based angling activity as these activities represented minor components of the LPO fishery. These fisheries also do not have a significant impact on the key issues facing LPO, namely the predation issue impacting kokanee. Pursuing such estimates would have taken resources away from the primary tasks associated with the creel survey as proposed.

Catch and Harvest Estimates

Two full-time creel clerks were employed during the survey period to collect the catch and harvest information. Clerks conducted angler interviews on the same randomly scheduled days as the flights. In addition, the clerks sampled both remaining weekend days during the interval, as well as two other randomly selected weekdays during each interval. A total of 4 weekend/holidays and 4 weekdays were sampled by clerks during each two week interval.

The clerks worked one of two randomly selected 10-hour shifts on each day. Daylight hours (1/2 hour before sunrise to 1/2 hour after sunset) were split into two even time-periods, and one was selected for sampling on each randomly selected day (morning or afternoon). Due to changing day-length, sampling days were longer in the summer months and shorter in winter months. Shorter sampling periods during winter months resulted in fewer interviews, but by using non-overlapping time-periods, we avoided over-sampling the mid-day hours and potentially biasing our catch and harvest data.

Creel clerks divided efforts across the lake. One clerk surveyed the West and South end of the lake (Garfield, Farragut, Bayview) and the other surveyed the northern part of the lake (Sandpoint, Hope marinas, Boat Basin, Pringle Park, Johnson Creek, and the Trestle Creek area (COE launch and trailer park marinas). Effort on the North end of the lake was apportioned to sample both the marinas and the public boat launches to avoid bias. We attempted to spend approximately 50% of the sampling time at the public boat launches and 50% at the marinas. On the North end of the lake it was possible to be stationed as to observe boats coming into multiple ramps/marinas at one time, and move to those places with current angler use in order to maximize the number of interviews.

On the South end of the lake, the clerk was directed to spend time sampling Garfield (35%), Farragut (35%), and the Bayview marinas and boat ramps (30%). The starting point (of the three locations) for each day and direction was randomly determined (similar to the Bus Route Method). If there were no boat trailers at a particular location, the clerk would move to the next location. The Bus Route Method (random, pre-determined timed travel route) was used to ensure that we didn't bias our creel sample by only sampling at the high-use public ramps, but there was a trade-off with decreased sample size. When lake levels dropped in the fall, we were limited to conducting interviews at the private marinas and boat ramps that remained useable at the lower lake level. We attempted to sample these locations in proportion to angler use.

Creel questions included was the trip complete, how many hours were fished on the trip, party size (as the number residents and non-residents), Idaho county of residence, number of rods fished, target species for the current trip, and the number and species caught and harvested. Creel clerks measured (TL;mm) and weighed (g) harvested fish as they encounter them.

Catch, harvest, and angler use data was entered and analyzed in the computer software program CAS Version 2.0.

Fishery Trend Evaluation

Creel statistics were compared across previous survey years to evaluate changes and trends. Compared statistics primarily included angler effort, catch, and harvest.

Angler Incentive Evaluation

Estimated harvest of lake trout and rainbow trout were compared to angler reported catches both from survey results and the angler incentive program to relate the relative impact the program has on harvest rates. Angler harvest rates were compared with previous years to relate the impacts of the incentive program to pre-program rates.

To define the relative success of angler harvest in suppressing LPO lake trout and rainbow trout populations, estimated angler exploitation on lake trout and rainbow trout was compared to modeled values of fishing mortality (F) provided in Hansen 2007 (lake trout, 0.6 to 0.7; rainbow trout 0.3). Modeled values were used to predict angling impact on population suppression and should provide a relative gauge of the impacts anglers had on the lake trout and rainbow trout populations. Estimates of F were converted to exploitation rates (u) using the formula:

$$F = u\,(Z/A)$$

where Z represents instantaneous rate of total mortality and A represents total annual mortality (Van Den Avyle 1993). Values for Z and A for LPO lake trout and rainbow trout in 2007 were adapted from Hansen 2007. Exploitation estimates for the creel survey period were calculated using the ratio of estimated angler harvest to estimated abundance in the same time period. Abundance of rainbow trout in LPO vulnerable to angler harvest in 2006/2007(36,000) was taken from Maiolie et al. 2008. Abundance of lake trout (41,470) vulnerable to gillnetting in the spring

of 2007 was taken from ongoing netting removal efforts on LPO (Mike Hansen, University of Wisconsin Stevens Point, unpublished data).

RESULTS

A total of 1,748 parties were interviewed from 4 March, 2007 to 1 March, 2008. Completed trips represented 1,670 of the total interviewed parties. Mean angler party size was 2.03 (± .17, α=0.05) anglers and mean completed trip length was 5.61(± .06 hr, α=0.05) hours. Angling parties used an average of 3.58 (± .03 hr, α=0.05) rods per boat. Resident and non-resident anglers comprised 74% and 26% of 3,644 individual anglers interviewed.

Effort

Total estimated angler hours during the surveyed period was 217,347 (± 10.4%, α=0.05). Estimated angler effort (rod hours) was 368,846 h (±10.6%, α=0.05) or approximately 9.6 h/ha (Table 1). Based on rod hours (estimated 9.5 rod h/angler day) there were approximately 38,743 angler days during the survey period.

Observed angler effort was seasonally variable (Table 1). Estimated angler effort (rod hours) were greatest for the period from April 28th to May 6th (49,749 h), which corresponded directly with the spring K and K Derby. Angler effort remained high (> 10,000 h/interval) from May 13th to November 10th. Estimated angler effort was low, ranging between 278 and 2,374 hours, following this time period with the exception of estimated effort between November 17th and November 25th (23,065 h) corresponding to the Thanksgiving Derby.

Table 1. Estimated angler effort (rod hours) and associated harvest of rainbow trout and lake trout by creel survey interval period.

				Harvest	
Interval	Start	End	Effort (rod h)	Rainbow Trout	Lake Trout
1	3/4/2007	3/17/2007	7,711	35	389
2	3/18/2007	3/31/2007	5,928	41	207
3	4/1/2007	4/14/2007	10,770	90	276
4	4/15/2007	4/27/2007	11,195	232	379
5[a]	4/28/2007	5/6/2007	49,749	1,156	1,429
6	5/7/2007	5/12/2007	4,513	113	138
7	5/13/2007	5/26/2007	20,894	404	756
8	5/27/2007	6/9/2007	26,147	608	1,714
9	6/10/2007	6/23/2007	23,437	319	1,566
10	6/24/2007	7/7/2007	23,449	147	2,200
11	7/8/2007	7/21/2007	21,621	305	1,694
12	7/22/2007	8/4/2007	18,654	202	1,391
13	8/5/2007	8/18/2007	20,335	442	1,020
14	8/19/2007	9/1/2007	15,849	324	692
15	9/2/2007	9/15/2007	20,060	469	1,654
16	9/16/2007	9/29/2007	10,519	252	616
17	9/30/2007	10/13/2007	13,504	293	808
18	10/14/2007	10/27/2007	14,132	638	794
19	10/28/2007	11/10/2007	16,226	570	440
20	11/11/2007	11/16/2007	1,456	68	49
21[b]	11/17/2007	11/25/2007	23,065	970	329
22	11/26/2007	12/8/2007	2,374	42	46
23	12/9/2007	12/22/2007	1,921	23	35
24	12/23/2007	1/5/2008	1,120	27	126
25	1/6/2008	1/19/2008	827	17	42
26	1/20/2008	2/2/2008	278	0	0
27	2/3/2008	2/16/2008	780	5	69
28	2/17/2008	3/1/2008	2,332	7	151
Total (95%			368,846 (± 38,936)	7,798 (± 1,495)	19,008 (± 2,800)

[a] Spring K and K derby

[b] Fall Derby

Angler effort was largely targeted at coldwater species (Table 2). Rainbow trout and lake trout collectively were the primary target of 85% of all anglers interviewed. Anglers specifically targeting only rainbow trout or only lake trout made up 19% and 29% of interviewed anglers, respectively. Anglers indicating they targeted both rainbow trout and lake trout made up approximately 37% of the anglers interviewed. Only 7.76% of anglers contacted indicated they were targeting warmwater fish species (primarily bass *Micropterus spp.).* Two anglers (0.05%) indicated they were targeting bull trout despite no open catch season was currently open. Only

six interviewed anglers (0.16%) indicated they targeted walleye and seven anglers (0.19%) indicated they targeted westslope cutthroat.

Harvest, Catch Rates, Size

Rainbow trout

Anglers harvested an estimated 7,798 (±19%, α=0.05) rainbow trout during the survey period (Table 2). An additional 881 rainbow trout were caught and released for a total estimated rainbow trout catch of about 8,679. Approximately 90% of rainbow trout caught were harvested. Anglers targeting rainbow trout caught 0.18 (±0.09, α=0.05) fish per rod hour. The majority of all angling parties interviewed (98%) harvested less than one rainbow trout (Table 3). Rainbow trout caught ranged from 260 mm to 830 mm and averaged 471 mm across the survey period.

Lake trout

Lake trout made up the largest portion of angler catch and harvest (Table 2). Anglers harvested an estimated 19,008 (±15%, α=0.05) lake trout during the survey period. An additional 353 lake trout were caught and released for a total lake trout catch of about 19,361 fish. Approximately 98% of the lake trout landed were harvested. Anglers targeting lake trout caught 0.35 (±0.18%, α=0.05) fish per rod hour. The majority of all angling parties interviewed (88%) harvested less than one lake trout (Table 3). Measured lake trout caught ranged from approximately 320 mm to 980 mm and averaged 536 mm across the survey period

Cutthroat trout

Estimated total harvest of westslope cutthroat trout and westslope cutthroat x rainbow trout hybrids were 357 (± 23%, α=0.05) and 40 (± 100%, α=0.05), respectively (Table 2). An estimated 479 additional cutthroat were caught and released, for a total catch of 854 and a harvest rate of about 42%. An estimated 19 additional westslope cutthroat x rainbow trout hybrids were caught and released, for a total catch of 59 and a harvest rate of about 68%. A regulation change effective January of 2008 eliminated harvest opportunity for westslope cutthroat trout in LPO. Legal harvest of hybrids was still allowed.

Table 2. Estimated total catch (N), harvest (N), percent of catch harvested, and catch rates (catch/ rod h) for species for fish caught in Lake Pend Oreille, Idaho from March 4th, 2007 to March 1st 2008. Catch and harvest estimates included 95% confidence bounds (95% CI). Minimum total length (Min TL), maximum total length (Max TL) and average total length including sample size ((n) Avg TL) were provided for each species of fish with measured samples taken.

	Catch		Harvest						
Species	N	95% CI	N	95% CI	% Harvest	Catch/rod h	Min TL	Max TL	(n)Avg TL
Black crappie	521	236	163	43	31%	< 0.01*	---	---	---
Bluegill	25	39	25	39	100%	< 0.01	---	---	---
Brown trout	135	57	83	55	61%	< 0.01*	412	630	(21)476
Bull trout	2247	570	17	18	1%	0.08	---	---	---
Kokanee	918	263	0	0	0%	< 0.01	---	---	---
Lake trout	19361	2828	19008	2800	98%	0.35*	310	980	(1744)536
Lake whitefish	206	174	13	22	6%	< 0.01*	---	---	---
Largemouth bass	1000	411	131	157	13%	1.19*	385	520	(6)436
Mountain whitefish	8	---	8	---	100%	< 0.01	---	---	---
Northern pikeminnow	2532	1779	156	203	6%	0.01	303	625	(12)498
Peamouth	26	---	0	---	0%	< 0.01	---	---	---
Pumpkinseed	53	66	0	0	0%	< 0.01	---	---	---
Rainbow trout	8679	1675	7798	1495	90%	0.18*	260	835	(896)471
Smallmouth bass	17193	6236	1564	967	9%	2.31*	263	430	(120)346
Sucker spp.	52	55	4	9	8%	< 0.01	---	---	---
Unidentified fish	168	124	0	0	0%	< 0.01	---	---	---
Walleye	5	8	0	0	0%	< 0.01*	---	---	---
Westslope cutthroat trout	854	272	357	83	42%	< 0.01*	400	441	(11)426
Westslope cutthroat x rainbow trout hybrid	59	40	40	40	67%	< 0.01	381	553	(10)444
Yellow perch	6136	5130	3400	3544	55%	18.70*	230	265	(5)244

*Catch rate for anglers targeting the specified species

Bull trout

During the survey period, estimated total bull trout catch was approximately 2,247 fish (Table 2). There was no legal harvest allowed on bull trout, and nearly all bull trout landed were released.

Brown trout

Brown trout made up an insignificant portion of the catch (Table 2). An estimated catch of only 135 (±42%, α=0.05) brown trout was generated from the creel survey. Brown trout in the creel ranged from 410 mm 630 mm.

Warmwater species

Warmwater and temperate fish anglers made up a relatively small portion of the surveyed population (Table 2). However, anglers caught a sizable portion of the total catch with an estimated 17,193 and 1,000 smallmouth and largemouth bass, respectively. The majority of smallmouth bass (91%) and largemouth bass (87%) caught were released. Bass anglers (smallmouth and largemouth) comprised the majority of the category of anglers targeting warmwater fish, but only a small portion of all anglers surveyed (7%). An insignificant number (< 1%) of anglers fished for other warmwater and temperate fishes including black crappie, yellow perch, walleye, northern pike, bluegill, and pumpkinseed. Harvest estimates were minimal for these species and generally exhibited low confidence due to small sample sizes.

Table 3. Number and percent of angling parties interviewed and corresponding harvest per party of rainbow trout and lake trout from Lake Pend Oreille, Idaho from March 4th, 2007 to March 1st 2008.

	Number Harvested Per Party				
Species	> 1	1 - 1.99	2 -2.99	3 - 3.99	4 +
Rainbow					
Number	1706	35	7	0	0
Percent	98%	2%	0%	0%	0%
Lake Trout					
Number	1530	125	43	23	27
Percent	88%	7%	2%	1%	2%

Angler Incentive Evaluation

A total harvest of 16,234 and 7,364 lake trout and rainbow trout, respectively were reported in the angler incentive program by anglers during the same period as the creel survey. Reported harvest represents 85% and 94% of estimated harvest for lake trout and rainbow trout associated with the creel survey during the same time period and were within the 95% confidence bounds of the harvest estimates.

Angler exploitation rates in 2007 on LPO lake trout and rainbow trout were estimated at 46% and 22%, respectively. Exploitation rates associated with F at levels of 0.3, 0.6 and 0.7 were

22%, 40%, and 47%, respectively. Fishing mortality on lake trout and rainbow trout therefore was likely near 0.7 and 0.3 respectively, assuming the instantaneous rate of total mortality and total annual mortality as related to angling stayed constant.

DISCUSSION

Changing Fisheries

Effort documented on LPO in 2007 indicated that the fishery continued to evolve from what has been observed over the last 55 years. Dramatic changes in species targeted angler effort from previous survey years were clearly present (Table 4). Lake trout, once absent from the fishery, was the most targeted fish and attributed to over 29% of the total observed effort. Rainbow trout was once the dominant sport fishery in the lake as recent as 2000 (Fredericks et al. 2003). In 2007, rainbow trout made up a smaller portion of the fishery with targeted effort accounting for only 19% of the total targeted effort. As noted in the results, a portion (37%) of the effort documented was attributed to both lake trout and rainbow trout. The transition from a rainbow trout fishery to a lake trout and rainbow trout fishery is reflected in the combined effort (85%) targeted at both species in 2007. Rainbow trout alone accounted for 86% of the angler effort in 2000.

Changes in angler effort and associated catch due to regulation changes observed in 2000 remained consistent with 2007 results. Harvest closures for kokanee and bull trout were in effect in 2007 and were reflected in the absence of targeted effort and harvest on those species. A westslope cutthroat trout harvest closure was initiated in January of 2008. The impact of the regulation change on cutthroat trout harvest during the survey period was likely minimal. Fredericks et al. 2003 noted that very few cutthroat trout were harvested in LPO between the months of December and April. Angler effort targeted at westslope cutthroat trout remained low and catches primarily reflected by-catch by anglers targeting other species. Westslope cutthroat trout harvest was comparable to previous survey years since 1978.

Angler effort targeted at warmwater and or temperate fishes increased as a component of the LPO fishery. In 2007, approximately eight percent of angling effort observed targeted these fishes. Only slightly more than two percent of anglers were noted as targeting warmwater fish in 2000 (Fredericks et al. 2003). Bass angling made up the majority of this effort in both survey years. Statewide warmwater fisheries, particularly largemouth and smallmouth bass, have demonstrated increased angler interest (IDFG 2007). Regionally, increased popularity in warmwater fisheries likely reflects changes in angler preferences as well as changes in relative species abundance in LPO. Anecdotally, observations have indicated smallmouth bass specifically have increased in abundance during the last decade. As noted this survey was not designed to target shoreline or ice angling and likely didn't accurately capture all effort by warmwater/temperate water species anglers because of this design.

Although targeted angling effort demonstrated shifts between years by species, no significant change in overall angling effort (rod hours) was observed from 2000. The estimated number of angler hours during the 2007 survey period was a potential reduction of approximately 15,000 hours from 2000 (Fredericks et al. 2003). However, during the survey period anglers

were allowed to fish up to four rods each. Rod hours were comparable to the 2000 survey year, but remained less than peaks in angling effort observed in 1953 and 1991.

Table 4. Comparison of creel survey results from Lake Pend Oreille, Idaho by survey year.

	Creel Survey Year					
Estimate	1953	1978	1985	1991	2000	2007
Residents	48%	48%	56%	--	68%	78%
Rod hours	523,000	226,453	179,229	460,679	363,974	368,846
Angler hours	523,000	226,453	179,229	460,679	232,200	217,347
Angler days	100,000	48,470	36,446	90,000	33,140	38,743
Interviewed anglers	--	5,283	--	7,382	6,443	3,644
Total Catch	1,431,000	178,135	81,546	237,570	15,015	60,167
Rainbow trout						
Caught	NA	NA	NA	17,165	22,000	8,678
Harvest	3,200	6,878	6,100	2,261	8,827	7,797
Mean size (mm)	--	400	430	735	472	471
Catch rate (h/fish)	--	20	12	15	20	≤24
Effort (rod h)	--	89,000	107287	250,000	313,017	--
of Total effort	--	39%	60%	55%	86%	≥ 19%
Lake Trout						
Caught	0	0	0	≥ 43	6,025	19,361
Harvest	0	0	0	--	4,707	19,008
Mean length (mm)	--	--	--	594	574	536
Catch Rate (h/fish)	0	0	0	12	8	≤13
Effort (rod h)	--	--	--	--	--	--
% of Total effort	--	--	--	< 5%	8%	≥ 29%
Bull Trout						
Harvest	5,000	1,469	915	1,723	--	17
Catch Rate (h/fish)	--	8	12	7	NA	NA
Mean length (mm)	--	485	496	492	NA	NA
Cutthroat trout						
Harvest	8,200	813	664	766	1,032	42
Mean length (mm)	--	320	345	373	370	426
Kokanee						
Harvest	1,336,000	167,640	71,275	227,140	0	0

Catch of lake trout and rainbow trout reflected observed shifts in effort from 2000 to 2007. Lake trout catch increased approximately 320% from estimated catches in 2000 (Fredericks et al. 2003). In contrast, rainbow trout catch declined approximately 250% in the same time period. Shifts in targeted angler effort were likely influenced by increases in both relative abundance of lake trout and increases in monetary incentive offered through the LPO angler incentive program during the same period. Large increases in lake trout abundance were demonstrated between 2000 and 2007 (Mike Hansen, University of Wisconsin Stevens Point, unpublished data). In addition, Lake trout were demonstrated by higher catch rates in 2007 to be more vulnerable to angling than rainbow trout. Anglers likely focused heavily on lake trout because the potential for monetary reward was greater given their relative vulnerability.

Angler Incentive Evaluation

LPO creel survey results provided evidence that ongoing angler incentives are generating additional harvest. Anglers harvested almost as many lake trout and rainbow trout as caught during the survey period given the realized catch rates. Approximately 90% of rainbow trout and 98% of lake trout caught in the 2007/2008 survey period were harvested. Fredericks et al. 2003, estimated harvest of lake trout and rainbow trout in 2000 were approximately 78% and 40%, respectively despite efforts to liberalize limits during that period. Some resistance likely still remains by anglers to harvest large rainbow trout and likely accounts for the 10% released portion of rainbow trout caught. As previously noted angler effort has not changed in recent years suggesting that although incentives may encourage harvest by anglers they don't necessarily encourage more angling.

Estimated exploitation rates from creel survey results provided evidence that levels of fishing mortality observed during the creel were likely sufficient to suppress both lake trout and rainbow trout at varying levels. Hansen 2007, estimated that a fully selected fishing mortality (F) of at least 0.6 to 0.7 was necessary to rapidly suppress the lake trout population in LPO. Lake trout exploitation on LPO in 2007 approached F of 0.7 with an estimated exploitation of 46% and provided some evidence angler harvest is beneficial in eliminating lake trout. Hansen 2007, also estimated that F approaching 0.3 was sufficient to reduce rainbow trout populations to levels observed in 1999, but not significantly suppress populations. Estimated angler exploitation on rainbow trout in 2007 of 22% was consistent with F of 0.3 and comparable to estimated exploitation on rainbow trout in 2006/2007 (Maiolie et al. 2008). Current exploitation on rainbow trout is therefore not likely to significantly reduce rainbow trout in the near future. However, harvest remains the only method for rainbow trout suppression.

Angler harvest appeared to be an integral component of the LPO predator management program. Estimated harvest rates provided a good indication that the angler incentive program is beneficial in promoting harvest of predator species. However, the effectiveness of current harvest levels as a suppression tool on rainbow trout specifically, was minimal. To significantly suppress rainbow trout a considerable increase in angler effort focused at harvesting rainbow trout is likely necessary. If angler effort is constant and recruitment of new angler effort is not realistic then encouraging increased angler effort focused at rainbow trout should be weighed against the loss of angler effort on lake trout. Angler harvest was demonstrated to be an effective tool at suppressing lake trout.

RECOMMENDATIONS

- Continue monitoring angler exploitation as a tool for evaluating predator management activities
- Consider using angler incentive reported harvest as an estimate of a harvest in non-survey years
- Reevaluate angler effort trends as changes in the LPO fishery associated with predator management progress

ACKNOWLEDGEMENTS

We wish to thank Angela Hill and Danielle Beckett of Avista Corporation for their contribution to field data collection. We would also like to thank Bill Horton and Jim Fredericks of the Idaho Department of Fish and Game, Jon Hanson of Montana Fish, Wildlife, and Parks, Joe DosSantos of Avista Corp., and Larry Lockard of the U.S. Fish and Wildlife Service for their reviews of this report.

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