A Review of Creel Survey Information on Flathead Lake
&
A Perspective on Lake Trout
1962 - 1996

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EXECUTIVE SUMMARY

The objective of this review is to evaluate the existing creel survey information on the Flathead Lake fishery and provide insight to the changes in the harvest of lake trout. The findings suggest that a comparison between the creel estimates (i.e. harvest, pressure, etc) from the existing onsite surveys from Flathead Lake can be misleading. This review found the 1981 creel survey to over estimate angler pressure and harvest. These errors are of concern in the assessment of the current and historic fishery. The method laid out here is a logical approach to deal with the available survey information and make qualified comparisons over time.

This review notes that a more diverse fishery existed in the 1960s with kokanee and yellow perch dominating the harvest. However, the native trout also supported a considerable amount of angler pressure and high harvest numbers. As early as the 1981 creel survey, the species composition in the harvest points to changing fish populations. Native trout harvest was down by 50% and lake trout harvest had increased 65% with only modest growth in angler pressure. In 1986 the kokanee population crashed due to a number of complex biological interactions, but clearly left *Mysis* shrimp, lake trout, and lake whitefish to dominate the system. By the mid-1990s angler pressure on Flathead Lake decreased by 50% from the mid-1980s and lake trout dominated the harvest. Current creel data indicate that angler pressure has stabilized but catch-per-unit-effort for lake trout continues to increase. The mid-1980s kokanee supported nearly 70% of the angler pressure on Flathead Lake. In 1992, lake trout supported 82% of the annual angler pressure. Perch, cutthroat trout, and bull trout historically were a much more important component of the fishery supporting more than 30% of the total angler pressure. Currently, the native species component of the fishery is almost non-existent and the perch fishery is severely depressed.

Increases in lake trout populations and reduced populations of native trout prompted more liberal lake trout harvest regulations. Reanalysis of harvest data from 1992 and 1996 suggest that higher harvest limits have little or no effect on total lake trout harvest. Harvest data also suggest that there is less opportunity to catch trophy lake trout than historically. Detailed and conclusive interpretations of the creel data on Flathead Lake are difficult due to the shortage surveys, rapidly changing fish populations, and regulation changes.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDEGMENTS

Although there was no fieldwork necessary for this report I feel it is appropriate to acknowledge all those involved in the previous reports reviewed in this document. Any creel survey on Flathead Lake is a huge undertaking and the information has proven to be valuable. Review of this report was provided by Mark Deleray, Joe DosSantos, Wade Fredenberg, Barry Hansen, and Jim Vashro. Special thanks to Barry Hansen, who insisted this project was worthwhile, contributed ideas, and provided several helpful reviews.

INTRODUCTION

Of the creel surveys on Flathead Lake four have estimated parameters on an annual basis (1962, 1981, 1985, and 1992) and three others have covered specific seasons and/or species (1984, 1990, and 1996). In addition to this information, there are angler pressure estimates from ten years of mail surveys (between 1969 and 1996). Objectives and methods of these surveys have differed, causing problems with comparison of results between surveys and across years (Graham and Fredenberg 1983; Hanzel 1985; Evarts et al. 1994). Because of its size and widespread access points, Flathead Lake presents a difficult survey problem. Generally, the more difficult a survey problem, the more assumptions are made and there is a higher chance of error (bias) in the resulting estimates. Without bias, independent survey methods with adequate precision would result in similar estimates of the same parameters. However, if a particular survey design is inappropriate or incorrectly administered the resulting bias in the estimates can be significant. Each survey design (mail, access, direct count, etc) has its own suite of potential biases and these may influence estimates in opposing ways. For example, mail surveys are known to underestimate angler pressure (i.e. only include licensed anglers) and have prestige bias (i.e. only remember the good days and big fish) (Brown et al. 1986, as cited in Brown 1991), while access site surveys run the risk of over estimating pressure, particularly when sites are heavily used for other forms of recreation.

Creel surveys often differ in objectives and focus; however, most measure angler pressure and fish harvest. This is generally accomplished by first deriving an estimate of angler pressure (hours fished), then interviewing anglers as to their fishing success (fish per hour). Assuming this is done correctly, it is a matter of multiplying the harvest rate by the angler pressure to estimate the fish harvest. However, if the pressure estimate is wrong then the harvest estimate will be off by the same proportion. In addition, rate statistics used to estimate harvest can be calculated a number of different ways which can further encumber comparisons of different surveys. It is possible that creel surveys that derive the same pressure estimates can predict different fish harvests by using different methods of calculating a rate statistic (Crone and Malvestuto1991).

These pitfalls are important considerations when comparing estimates from surveys using different methods. This review suggests that some of these problems are present, and direct comparisons between on-site angler surveys on Flathead Lake may be misleading. The intent of this report is to review the available creel information, identify problems, and make qualified comparisons to gain perspective on the current and historic fishery in Flathead Lake. Additional in-depth analysis and discussion of lake trout harvest characteristics are provided to assist in making current lake management decisions. The approach taken is to use available information from the reports and "adjust" estimates so that judicial comparisons over time can be made. Discussion of relevant survey problems is provided along with qualifiers on the resulting synthesis of information.

METHODS and RESULTS

Overview

Two general types of angler surveys have been conducted on Flathead Lake: mail surveys and on-site surveys. Estimates used in this review include all of the mail surveys and the four on site creel surveys that estimated angler pressure on an annual basis (Figure 1). Annual angler pressure estimates generated from mail and on-site methods display the same trends, but differ markedly in magnitude of the trend. This discrepancy suggests that comparisons between the on-site surveys over time are problematic. While the mail surveys provide consistent methodology across years, they do not provide estimates of fish harvest. Although the on-site surveys provide harvest estimates, if they are developed from pressure estimates derived by different methodologies, they may be subject to the biases discussed above.

A method is presented to address the problem. The method combines the mail survey angler pressure estimates with fish harvest data from the on-site creel survey reports to generate new estimates that can be compared over time. A brief review of each of the surveys, their methods, and the resulting estimates is provided. New pressure estimates are generated using the mail surveys as a baseline. The harvest rates are standardized by recalculating them using the same rate statistic developed from data in the individual reports. The resulting harvest rates are then used with the adjusted pressure estimates to calculate fish harvest. Lake trout specific catch-per-unit-effort (CPUE) was calculated from the reported data when possible, and harvest distribution tables were developed.

It is important to recognize the intent is to synthesize existing information in such a way as to deal with the perceived problem in a logical (versus scientific) manner. As such, the proposed method is non-standard, nor supported by the literature and can be easily criticized. Therefore, the following methods and results are brief, but more fully developed in the subsequent discussion.

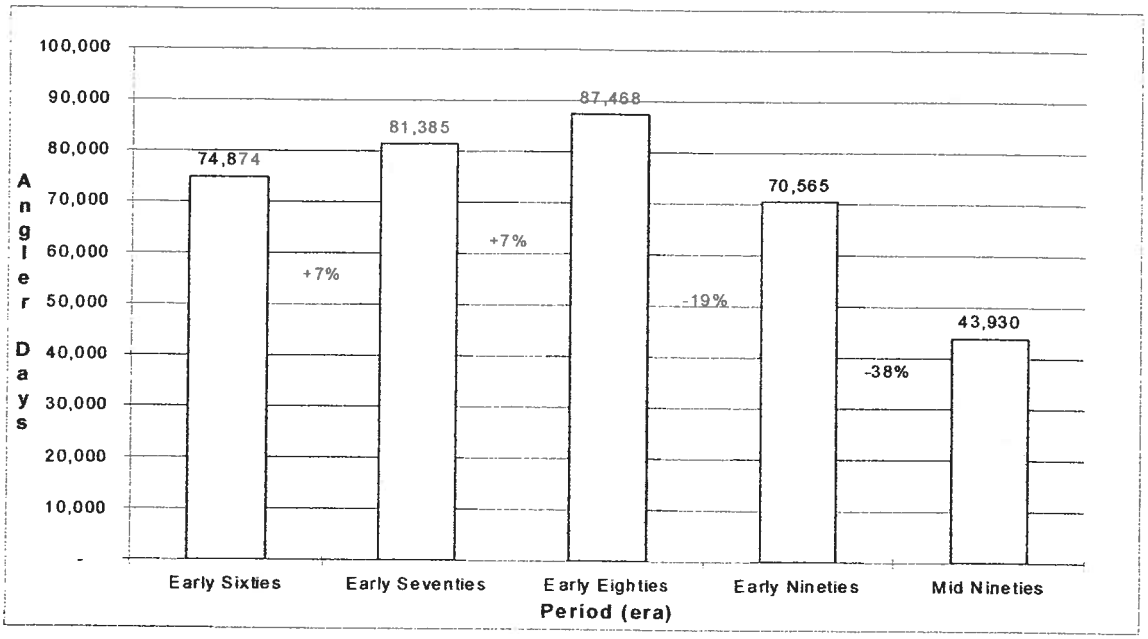

Figure 1. Angler pressure estimates from ten mail and four on-creel surveys from Flathead Lake; 1962 - 1996.

Historic Surveys, Methods, and Estimates

1962 Survey

The U.S. Bureau of Sport Fisheries and Wildlife funded and carried out creel investigations on Flathead Lake in the early 1960s. The 1962 creel estimates (Table 1) are the most difficult to interpret, but at the same time provide an important perspective on the historic fishery. The objectives were to "determine utilization and harvest, activities of fishermen, and characteristics of the fish resources." The pressure estimate was developed from a combination of on-site angler interviews and postal questionnaires (Robbins 1966). The interpretation of catch and harvest information is complicated because of the lack of distinction between "catch" and "harvest." The word "catch" is used throughout the document, including on the interview form; however, I can only assume the author meant, "harvest." There was no attempt to quantify species preference (i.e. target species); therefore, species specific catch rates could not be calculated for this analysis. Perhaps the most relevant and useful information for comparison is the species composition of the harvest.

Table 1. Angler pressure and fish harvest estimates from the 1962 creel survey.

Angler Days	129,000	
Species	Harvest*	% Composition
Kokanee	317,400	76.7%
Bull Trout	12,000	2.9%
Lake Trout	2,000	0.5%
Cutthroat Trout	8,400	2.0%
Yellow Perch	69,200	16.7%
Whitefish	4,200	1.0%
Bass	300	0.1%
Rainbow Trout	250	0.1%

* Referred to as "catch" in the actual report, but interpreted to mean harvest.

1981 Survey

The Environmental Protection Agency funded the 1981 angler survey (Table 2), which was carried out by Montana Fish, Wildlife and Parks (MFWP). The survey was "primarily designed to census boat fishermen during the spring, summer, and fall." The survey used car counters to generate the angler pressure estimate (Graham and Fredenberg 1983). Interviews for harvest characteristics were conducted both at access sites and by clerks roving in a boat. Species preference information was collected for 80% of the surveyed period (July 25, 1981 - May 14, 1982); however, no distinction was made between anglers targeting bull and lake trout; therefore, a species specific CPUE could not be obtained. Graham and Fredenberg (1983) reported that 21% of boat angling was "bull-lake trout boats." The data tables and summaries in the report are extensive, facilitating further analysis.

Table 2. Angler pressure and fish harvest estimates from the 1981 creel survey.

Angler Days	168,792	
Species	Harvest	% Composition
Kokanee	495,910	92.4%
Bull Trout	5,452	1.0%
Lake Trout	6,947	1.3%
Cutthroat Trout	6,910	1.3%
Yellow Perch	20,903	3.9%
Whitefish	748	0.1%

1985 Survey

A partial creel survey (excluding South Bay) was funded and conducted by MFWP during the summer of 1985 (Table 3) to determine use and harvest of game fish as well to characterize the angler population. Although the period was just twelve weeks long (June 16 through September 7, 1985), it encompassed 75% of the annual fishing pressure (Hanzel 1986). Hanzel (1986) expanded the pressure estimate to an annual estimate (72,117 angler days) using a seasonal pressure ratio developed from the 1981 creel survey data and other supporting information. The survey was a roving type survey with aerial counts and on-site angler interviews. Species preference was asked; however, like the 1981 effort, bull and lake trout anglers were lumped as "deep trollers." Data were available for further analysis here.

Table 3. Angler pressure and fish harvest estimates from the 1985 creel survey (June 16 - September 7).

Angler Days	53,895	
Species	Harvest	% Composition
Kokanee	132,693	96.6%
Bull Trout	1,265	0.9%
Lake Trout	2,428	1.8%
Cutthroat Trout	1,005	0.7%
Yellow Perch	0	0%
Whitefish	0	0%

1992 Survey

The 1992 survey was funded by Bonneville Power Administration (BPA) and conducted by the Confederated Salish and Kootenai Tribes (Table 4). This was a roving creel survey using aerial counts and interviews from both access sites and boat. The objectives were to quantify the fishery status prior to Hungry Horse Dam mitigation efforts and provide replicative survey methodology (Evarts et al. 1994). Species preference information was collected and species specific catch rates are provided in the report. Data were available for further analysis here.

Table 4. Angler pressure and fish harvest estimates from the 1992 creel survey.

Angler Days	47,883	
Species	Harvest	% Composition
Kokanee	0	0.0%
Bull Trout	196	0.5%
Lake Trout	23,605	54.9%
Cutthroat Trout	118	0.3%
Yellow Perch	11,795	27.4%
Whitefish	7,265	16.9%

1996 Survey

A multi-agency (CSKT, MFWP, and the U.S. Fish & Wildlife Service) creel survey funded by BPA was conducted from May 18 to September 15, 1996. The primary objective was to determine kokanee harvest and inform the public about the ongoing kokanee reintroduction efforts, and secondarily to collect lake trout specific CPUE (Carty et al. 1997). Angler pressure and fish harvest estimates were not survey objectives; however, the CPUE for lake trout is relevant to the discussion here. Emphasis was placed on the number of angler contacts and therefore the data were collected in a non-random manner. Interviews were conducted primarily at public access sites as anglers left the lake. The data were available for analysis and the results presented are here for discussion.

Table 5. Annual angler pressure estimates from MFWP's mail surveys.

Year	Angler days	Std. Err.	n
1969	64,996	na	na
1976	97774	na	na
1982	91944	12,312	675
1983	103,319	14,412	604
1984	77,734	12,587	278
1985	76,876	9,091	278
1989	67,737	4,208	1,238
1991	73,393	4,427	2,100
1993	46,811	3,312	1,251
1995	41,049	3284	1,054

1969 -1996 Mail Surveys

Montana Fish, Wildlife, and Parks conducted sporadic mail surveys up until 1985. From 1989 to the present, these angler pressure estimates are conducted on a statewide basis every other year. The methodology is described by McFarland (1989) and the estimates for Flathead Lake for years between 1996 and 1996 (Table 5) are used in this analysis.

Adjustment to Pressure Estimates

Adjusted angler pressure estimates were generated from the mail survey estimates by averaging near and similar estimates to represent an "era."' These averages are proposed as representative of the early 1970s, 1980s, and 1990s. The resulting averaged era estimates facilitate a way to calculate a reasonable estimate of angler pressure in the 1960s. The estimates (Table 6) show an increase in angler pressure of about 7% from the early 1970s to the early 1980s. I assume that this modest growth in angler pressure was due to human demographics (i.e. population growth, local economics, and life style), rather than significant changes in the fishery. Further, I assume similar demographic changes prevailed between the 1960s and 1970s. Then an estimated angler pressure for the 1960s can be calculated by projecting the trend of 7% growth in angler pressure back in time for ten years (Table 6).

Table 6. Mean pressure estimates for "eras."

Years Averaged	Average	Era
Projected	74,874	Early 1960s
'69 and '75	81,385	Early 1970s
'82, 83, 84 and 85	87,468	Early 1980s
89 and 91	70,565	Early 1990s
93 and 95	43,930	Mid-1990s

Recalculation of Harvest Estimates

The method and calculation of harvest rates were not fully described in the earlier reports; therefore, it is prudent to recalculate them for the purposes of comparisons between surveys. While this technique is an over-simplification, it does have the advantage of applying a standard method across all surveyed years. Annual angler pressure and harvest estimates from each annual on-site survey report (see Tables 1, 2, and 4) were used to back-calculate harvest rates as follows. Angler days were converted to angler hours by using mean trip length (with adjustments for percent shore and boat anglers from the reports). Harvest numbers were then divided by the resulting angler hours to calculate harvest rates. The resulting harvest rates were then applied to the mean angler pressure estimates for an era (from Table 6) to generate the new adjusted harvests figures (Table 7).

Table 7. Adjusted angler pressure and fish harvest estimates.

Survey Year	1962	1981	1992
Angler Pressure (Days)	74,874	87,468	43,930
Kokanee Harvest	167,531	256,981	0
Bull Trout Harvest	7,487	2,825	180
Lake Trout Harvest	1,248	3,600	21,656
Cutthroat Trout Harvest	5,241	3,581	108
Yellow Perch Harvest	43,177	10,832	10,821
Whitefish Harvest	2,621	388	6,665

Lake Trout Catch and Harvest Per Unit Effort

Angler catch-per-unit-effort (CPUE) over time is a good trend indicator and is often used as a measurement of fishing quality. The most appropriate measure for these purposes is

obtained by dividing the catch of a given species of fish by the angler-hours directed toward that species (Von Geldern 1972; Malvestuto 1983). With the exception of the 1992 and 1996 surveys, this type of information was not presented in the creel survey reports. Species preference information was collected in the 1981 and 1985 surveys, but analysis was grouped by classification of boats or fishing technique. Target species information was not collected in the 1962 creel survey, and collected only after the summer period in 1981. To make comparisons across years, I recalculated lake trout specific CPUE and harvest-per-unit effort (HPUE) from the 1985, 1992, and 1996 data sets from completed trips for the same season by boat anglers specifically targeting lake trout (Table 8).

Table 8. Quantity caught, CPUE, HPUE for lake trout by boat anglers calculated from the 1985, 1992, and 1996 data.

Survey/ Category	Number of lake trout	Percent Category	CPUE Mean	Std Dev	HPUE Mean	Std Dev
1985 Survey (June 16 through September 7) N = 66 party interviews (# anglers N/A).						
Total	52	100.0%	0.1246	0.23389	0.0661	0.11563
1992 Survey (May 17 through September 7) N = 254 party interviews (573 anglers).						
< 26 inches	335	77.7%	0.1561	0.30365	0.1021	0.23492
26 to 36 inches	57	13.2%	0.0241	0.06914	0.0000	0.00000
> 36 inches	39	9.0%	0.0144	0.07239	0.0022	0.01949
Total	431	100.0%	0.1946	0.33863	0.1066	0.23807
1996 Survey (May 19 through September 8) N = 245 party interviews (573 anglers).						
< 30 inches	806	97.7%	0.3255	0.42343	0.2330	0.34430
30 to 36 inches	18	2.2%	0.0095	0.05022	0.0000	0.00000
> 36 inches	1	0.1%	0.0005	0.00709	0.0005	0.00709
Total	825	100.0%	0.3354	0.43096	0.2334	0.34466

Regulation Changes

From the 1960s up to the 1982 fishing season, anglers could harvest 10 fish, not to exceed 10 pounds and 1 fish. Since the 1981 creel survey there have been seven changes in lake trout creel limits (Appendix A). The three most recent regulation changes are discussed here (1992, 1994, and 1996). In 1992, creel limit was liberalized to allow the harvest of 10 lake trout under 26 inches or nine under 26 inches and one over 36 inches. This alternative was selected to encourage harvest of lake trout while protecting the trophy component of the fishery. The slot limit was adjusted again in 1994 to 30 to 36 inches. In 1996, harvest limit was changed to 15 fish less than 30 inches and one fish over 36 inches. Neither the 1992 nor 1996 survey had the specific objective to evaluate lake trout harvest regulations. However, the data provided allow for limited analysis of the effects of regulations.

A harvest distribution table was developed by using completed trip data from the 1992 and 1996 surveys to show what effect creel limits might have on lake trout harvest (Table 9). The data pertain only to those fish harvested under the slot limit in effect for the year (i.e. 26 inches in 1992 and 30 inches in 1996). Although the data are presented in one table, the intent is not for comparison between years. The 1992 data represent an entire year and include all angler types (shore, boat, and ice). In 1992, 65.8 % of the anglers kept no lake trout at all. Of the anglers who

kept at least one fish, 61.7% kept only one fish and only 18.4% (7.5+5.9+5.0) kept more than two fish. While the 1996 survey included only boat anglers during the summer period (May 18 to September 15) this represents the majority of the annual angler pressure directed at lake trout.

Table 9. Harvest distribution of lake trout among anglers on Flathead Lake from the 1992 and 1996 creel surveys and projection of the potential effects of changing the bag limit.

1992 Survey				1996 Survey			
Harvest	Percentage of Anglers	Harvest per 100 Anglers	Percentage of Harvest	Harvest	Percentage of Anglers	Harvest per 100 Anglers	Percentage of Harvest
1	61.7	62	32.3	1	50.7	51	26.6
2	19.9	40	20.9	2	27.5	55	28.8
3	7.5	23	11.8	3	8.4	25	13.2
4	5.9	24	12.4	4	7.1	28	14.9
5 –10	5.0	25	13.1	5 – 15	6.3	32	16.5
	TOTAL	173			TOTAL	191	
Total number of completed trips = 1176				Total number of completed trips = 255			
Anglers who kept 0 lake trout = 774 (65.8%)				Anglers who kept 0 lake trout = 113 (44.3%)			
Effect of reducing harvest limit on lake trout:				Effect of reducing harvest limit on lake trout:			
From 10 to 4 = 2.9% reduction in harvest				From 15 to 4 = 3.3% reduction in harvest			
From 10 to 3 = 9.2% reduction in harvest				From 15 to 3 = 10.3% reduction in harvest			
From 10 to 2 = 19.9% reduction in harvest				From 15 to 2 = 21.5% reduction in harvest			
From 10 to 1 = 42.1% reduction in harvest				From 15 to 1 = 47.6% reduction in harvest			

Another aspect of lake trout regulations since the 1981 creel survey has been the implementation of minimum length limits or slot limits. The first size restriction was implemented in 1986 when the harvest regulations were changed to five lake trout with only one over 28 inches. The first slot limit on lake trout was implemented in 1992 with a no harvest restriction between lake trout of 26 and 36 inches in length. In 1994, the slot was adjusted to 30-36 inches. Information on the length distribution of lake trout in the harvest is limited to the 1992 survey. In 1992, the mean length of lake trout measured under the slot was 20.5 inches (s.d. = 2.92). Table 10 shows the length distribution in the harvest below the slot (26 inches). Eleven percent of the harvest was between 609 and 660 mm (24-26 inches), and 23% of the harvest was between 559 and 609 mm (22-24 inches). In 1992, 12% of the fish caught were in the slot and 2% over 36 inches (Evarts et al. 1994).

Table 10. Lake trout length distribution below the slot limit in the 1992 survey.

Length Group		Percent Represented in the Harvest
Inches	Millimeters	
24 to 26	609 to 660	11.0%
22 to 24	559 to 609	22.7%
20 to 24	500 to 559	31.7%
< 20	< 500	34.6%

DISCUSSION

The objective of this review is to evaluate the existing creel survey information on the Flathead Lake fishery and provide insight to the changes in the harvest of lake trout. This is not intended to be a complete review of angler use and harvest for the Flathead Lake fishery. It is important to note that, as a fishery, Flathead Lake cannot be separated from its tributary system. The river system provides a significant fishery that is supported by the lake and vise versa. This is particularly important when discussing the more migratory game species like kokanee salmon, bull trout, and cutthroat trout. Although all species are discussed to some extent, emphasis is on lake trout, which is a fishery almost wholly provided by the lake. A thorough review of the history of Flathead Lake's recreational fishery would include the river system.

Survey Comparisons and Problems

Past efforts to compare estimates between the on-site angler surveys have been complicated by unexplainably large reductions in angler pressure. Hanzel (1986) recognized this when reporting the results of the 1985 summer survey on Flathead Lake that showed a 104% decrease in angler pressure when compared to the same time period in 1981. He suggested the discrepancy was due to differences in angler count techniques and concluded that a direct count method produced results that are more accurate. Evarts et al. (1994) recognized the problem, suggested that direct quantitative comparisons between existing on-site surveys should not be made and recommended that only relative comparisons between the harvest estimates were appropriate. However, relative comparisons are of limited utility when addressing questions such as: What have been the current and historic levels of lake trout harvest? What effect have regulation changes had on the fishery? What effect did the loss of kokanee have on angler pressure on Flathead Lake? These are important considerations in evaluating the current lake trout population and for evaluating future management alternatives. The primary objective here is to evaluate the information in such a way that managers can make such comparisons in as accurate a fashion as the limitations in the data and differences in methods will allow.

Stated simply, the problem in making comparisons over time is the lack of agreement between onsite and mail surveys in the magnitude of the drop in angler pressure between the 1980s and 1990s. Mail survey estimates show loss a of 43,538 (50%) angler days (using the mean era estimate, from Table 6), compared to a drop of 120,909 (72%) angler days between the 1981 and 1992 from on-site creel surveys. Because this disagreement is between the angler pressure estimates, it affects harvest estimates as well. Which is right and how is it explained. The 50% drop in angler pressure is more defensible because the method of deriving it is consistent across years. This drop in pressure is also reflected in the two roving creel surveys conducted in 1985 and 1992. Because these independent methods show the same magnitude and direction of change in angler pressure, I assume that these estimates more accurately reflect the actual change. If this is true, then the 1981 creel survey estimates are about 100% too high.

If in fact it is true that the mail and/or roving surveys more accurately estimate the fishery parameters in the 1980s and 1990s, then the 1961 on-site survey estimates are questionable.

Although, there is less direct evidence that the 1961 survey estimates are high, it seems unlikely that angler pressure would have decreased 30% from the 1960s to the 1980s. If the 1961 and 1981 angler pressure estimates are both biased high, then the estimates of the fish harvest are also high. Although there are mail survey estimates of angler pressure for the historic kokanee fishery, the precision low and they do not provide harvest estimates. While this problem has been ignored in the past, the need for the accurate description of both present and historic fishery parameters on Flathead Lake has never been greater.

One explanation for the high estimates in the 1981 survey is the non-standard creel survey methodology employed. The investigators used car counters at 10 state-owned access sites and expanded these counts to angler pressure. The method was a "modified version" of a technique described by Mischon and Wyatt (1979) to measure recreation and attendance at Corps of Engineers projects (Graham and Fredenberg 1983). The method was modified to isolate angler attendance from the numerous other recreational activities (camping, picnics, sight seeing, etc) associated with these sites. In addition, typically less than half of the angler population utilizes state owned access sites (Robbins 1966; Graham and Fredenberg 1983, Hanzel 1986, Evarts et al. 1994).

Less can be speculated about the 1961 survey conducted by the Bureau of Sport Fisheries and Wildlife. The report adequately describes the methods employed, but it is poorly cited. While the methods employed by these investigators may have been standard for the time, they were likely lacking for the survey problem. The field of creel survey design was just budding at the time. Carlander et al. (1958) reviewed creel survey methods and stressed the need for a more in-depth approach to sampling techniques as applied to creel surveys. Many of the recent improvements had been published in literature not normally scanned by fisheries workers or in poorly accessible agency reports (e.g. Neuhold and Lu 1957). However, other than the fact that the estimates *appear* high relative to other estimates, there is no evidence that the 1961 estimates were inaccurate as in the case of the 1981 estimates.

In depth analysis of the methods and data used in these surveys is out of the scope of this review. An explanation of the cause is less important than a recognition of the problem. The basic overarching assumption of this synthesis of information is that the 1961 and 1981 creel estimates are biased high. Fairly good evidence supports this contention for the 1981 creel survey, less for the 1961 survey. The method used here to recalculate pressure and harvest provides more accurate comparisons between surveys.

Evaluation of the Method and Assumptions

I employ a method that preserves the trend reflected in the mail survey estimates while utilizing harvest rate information from the on-site surveys to generate adjusted harvest estimates. Near and like mail survey estimates are averaged to generate angler pressure for an era. Harvest rates from the appropriate annual on-site survey are recalculated to generate fish harvest using the era's pressure estimates. The accuracy of this method is based on my assumption that the mail and/or the roving survey estimates are the best reflection of the angler pressure on Flathead Lake. The main drawback to the approach is the lack of any estimate of statistical precision.

Averaging the mail surveys to represent an era helps smooth some of the vagaries of the Flathead Lake fishery. That is, to some extent the year-to-year variation seen in temporally close estimates may represent the year-to-year success (or failure) of the specialized fisheries of Flathead Lake. For example, ice cover (or lack of) dictates access to, and length of the popular winter fisheries (kokanee in Skidoo Bay and/or perch in South Bay). Spring weather may affect the historically popular South Bay perch fishery during the short spawning period. Beattie et al.. (1986) (as cited in Hanzel 1986) estimated 15,000 angler days of pressure in the Skidoo Bay winter kokanee fishery. Some of the variation may also be the result of reduced statistical precision from small sample sizes. Small sample sizes in the early 1980's mail surveys (see Table 5) may have contributed to wide confidence intervals around the estimates (Figure 2). Because of the inherent variation and poor statistical precision, using an average of the 1980s estimates is an advantage for the purposes here. In each case, the averaged estimate for an era is within the confidence interval of each of the individual annual estimates that make it up (Figure 2).

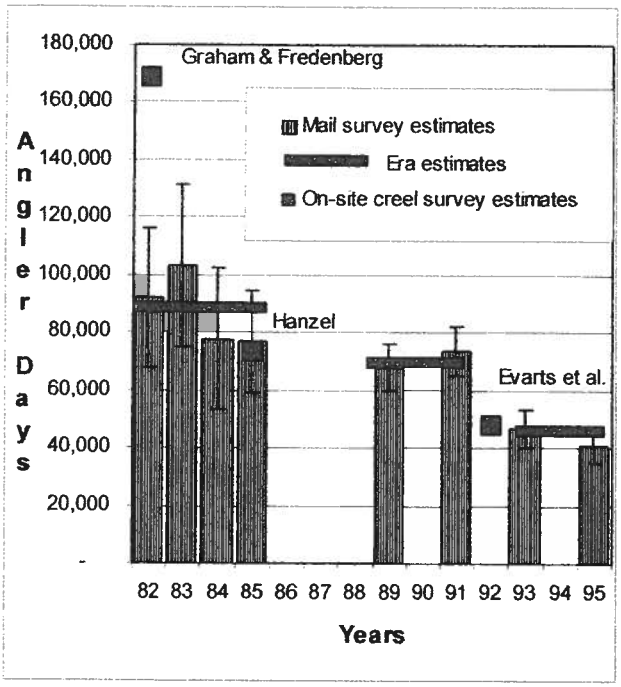

Figure 2. Comparison of onsite, mail, and era angler pressure estimates for Flathead Lake.

The approach taken to calculate angler pressure for the 1960s era is based on the most tenuous assumptions. This is likely the least accurate era estimate. The assumptions used could be investigated more thoroughly to gain confidence in the accuracy; however, it is not so important to the present discussion. It is safe to assume that angler pressure in the 1960s was less than that of the early 1980s. The mail survey estimate from 1969 supports this assumption (see Figure 1, Table 5). I also assume that the species composition and angling opportunity did not fluctuate wildly between the 1960s and 1980s causing large changes in angler pressure (as seen between the early 80's and 90's). In any case, the most insightful information from the 1962 survey is the diversity and composition of the catch.

Although, the overall approach produced useful results, the adjusted estimates still need the appropriate qualifiers. The method rests heavily on the level of agreement between the mail surveys and the on-site roving surveys (1985 and 1992) annual estimates. It is important to note that the 1985 creel survey did not actually comprise an entire year. The 1985 annual pressure estimate was expanded using seasonal ratios developed from the 1981 survey data and other information (Hanzel 1986). Readers are urged to review these assumptions for themselves, but they appear to be on solid ground. For example, when the same portion of the year in each

survey is compared, the same discrepancy in angler pressure exists, and this further supports the author's argument.

Perhaps more important, the 1992 on-site survey does not have a corresponding mail survey, but was conducted between the 1991 and 1993 mail surveys. While there is excellent agreement with the 1993 mail survey estimate (within 3%), there is less with the mail survey estimate in 1991 (15%) (see Figure 2). This begs the question, is the drop in angler pressure between the 1991 and 1993 mail survey estimates real? Moreover, why and when did it occur? This goes directly to the question of the appropriateness of using the 1992 harvest rates with the 1993 and 1995 pressure average (mid-1990s era) to generate harvest numbers.

Netting data, angler logs, and anecdotal information suggest that the East Bay perch fishery began to collapse in the early 1990s. Yellow perch in East Bay supported a large spring and winter (ice) fishery. The drop in pressure from the early-1990s to the mid-1990s era may be because of the loss of the perch fishery. Lake trout were first documented in South Bay ice fishery during the winter of 1991 (CSKT Fisheries file data). Although there are no site specific angler pressure estimates, it is believed that the spring and winter fishery for perch was not significantly reduced until after 1991. The1992 roving survey clearly documented a reduced spring fishery and although considerable ice angling occurred, relatively (to historic) few perch were harvested and significant numbers of lake trout and whitefish were in the catch. The "1992 survey" was conducted from May 17, 1992, to May 19, 1993, and therefore measured the spring of 1993 perch fishery. The large angler pressure directed at spawning perch historically occurred in April (Cross and DosSantos 1988). For these reasons, I suggest that the 1992 on-site roving survey estimates and harvest rates are more in line temporally with the 1993 and 1995 mail surveys (i.e. the mid-1990s era).

The method of recalculating the harvest rates requires few assumptions. This is a standard method of deriving a harvest-rate. The method was used in the 1992 creel survey and likely used in the other surveys (but not described). It is a total ratio estimator and is simply the mean number of fish per angler divided by the mean number of hours per angler; it could be called the mean rate of harvest (Malvestuto 1983). A violation of creel survey methodology required for this process is the application of harvest rates developed from one angler population to pressure estimates generated from a different population of anglers. While this practice is certainly open to criticism, the resulting potential biases are less offensive then the ones corrected for. None the less, these harvest estimates should be viewed with the appropriate skepticism.

The resulting adjusted angler pressure and fish harvest numbers are compared to1962, 1981, and 1992 on-site surveys (Table 11). The adjusted estimates for the 1960s and 19 80s are proposed as replacements for the 1962 and 1981 on-site creel estimates. The 1990s estimate is not suggested to replace the 1992 on-site creel estimates, but used to lengthen the period of comparable record. The 1992 survey estimates should be considered the most accurate because it uses a more contemporary standard creel survey methodology and provide standard statistical measures of precision that the other onsite surveys do not. Therefore, the "adjusted estimates for the 1990s" are meant to represent the mid-1990s era. The mid-1990s estimate is approximately 8% lower than that of the 1992 survey estimates. These mail surveys were conducted one and

three years after the 1992 onsite survey and the slight drop in pressure may be real or the result of different methodologies. However, a continued downward trend in angler pressure would seem more likely.

Table 11. Comparison of the adjusted (era) to reported creel survey estimates.

Year & Era	1962	1960s	1981	1980s	1992	1990s
Type	Survey	Adjusted	Survey	Adjusted	Survey	Adjusted
Angler Days	129,000	74,874	168,792	87,468	47,883	43,930
Species Harvest						
Kokanee	317,400	155,843	495,910	256,981	0	0
Bull Trout	12,000	6,965	5,452	2,825	196	180
Lake Trout	2,000	1,161	6,947	3,600	23,605	21,656
Cutthroat Trout	8,400	4,876	6,910	3,581	118	108
Yellow Perch	69,200	40,165	20,903	10,832	11,795	10,821
Whitefish	4,200	2,438	748	388	7,265	6,665

Angler Pressure and Fish Harvest

The following history is suggested for the Flathead Lake fishery from the adjusted estimates. Angler pressure increased modestly from the 1960s and 1970s to the 1980s. Angler pressure on Flathead Lake peaked in the early 1980s, with nearly 70% of the angler effort directed at kokanee. From the early 1980s to the early 1990s, angler pressure decreased due to the kokanee population crash (Figure 3). Angler pressure dropped further between the early and mid-1990s as other species declined and the lake became dominated by lake trout. Based on the most recent mail survey estimates, the decline in angler pressure since the kokanee population collapse has stabilized or is slowly declining (see Figure 2).

Prior to the mid-1980s, Flathead Lake supported a diverse fishery with opportunities to catch kokanee, yellow perch, whitefish, bull trout, westslope cutthroat trout, and lake trout. Data show that in the 1960s, fishing for the native trout species appeared to be popular and produced good catches (Table 12). Although the species targeted by the anglers in the '62 survey was not documented, the harvest composition suggests a much more diverse fishery where less of the overall angler pressure was directed at kokanee than in the 1980s. By the 1980s native species were in decline or at least being displaced in the harvest by lake trout (Figure 4) and kokanee (Table 12). These shifts in species composition of the harvest occurred during a 23-year period while regulations were unchanged (see Appendix A).

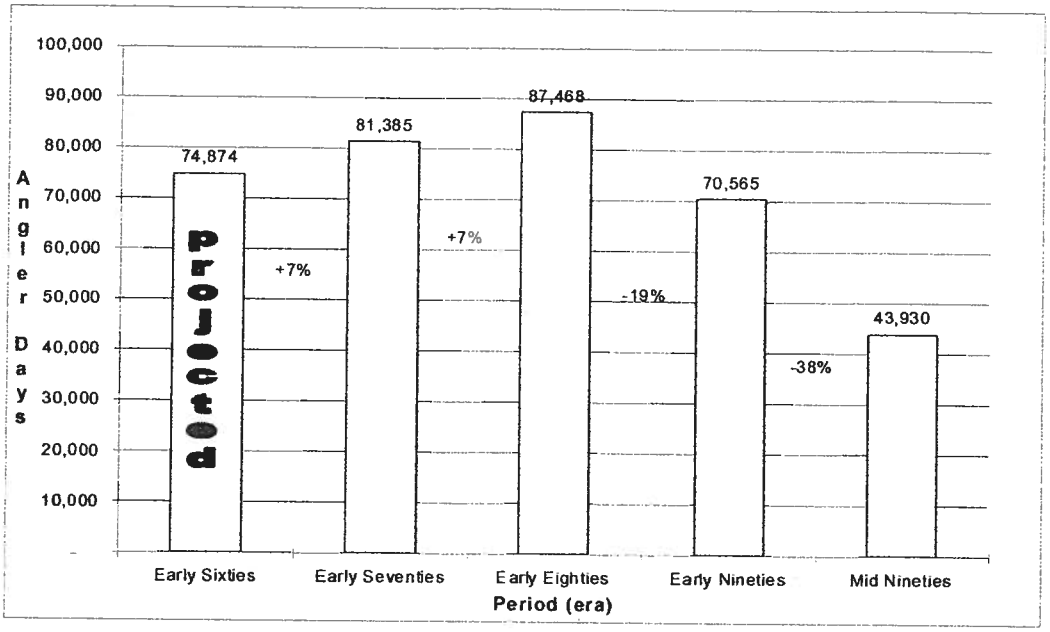

Figure 3. Estimated angler pressure (adjusted) for Flathead Lake.

Table 12. Adjusted estimates of angler pressure and harvest for Flathead Lake.

Year & Era	1960s	1980s	1992	1993-95
Angler Days	74,874	87,468	47,883	43,930
Harvest				
Kokanee	155,843	256,981	0	0
Bull Trout	6,965	2,825	196	180
Lake Trout	1,161	3,600	23,605	*21,656
Cutthroat Trout	4,876	3,581	118	108
Yellow Perch	40,165	*10,832	11,795	10,821
Whitefish	2,438	388	7,265	6,665

* considered low; see discussion for further explanation

In 1981, kokanee was the most sought after species receiving nearly 70% of the boat angler effort (Graham and Fredenberg 1983). However, due to the survey design, the 1981 creel likely underestimated the yellow perch angling activity in South Bay. The low harvest estimates for yellow perch in the 1981 survey support the suggestion that this portion of the fishery was underestimated. It is generally accepted that the perch fishery was not severely reduced until the early 1990s (Evarts et al. 1994) when the lake trout population expanded and they became common in South Bay. Cross and DosSantos (1988) report a harvest of 35,500 perch from South Bay during a survey in 1986. Therefore, it is likely that there was a much higher perch harvest in the 1980s than is reflected in the adjusted estimates.

The 1981 survey was primarily designed to measure boat anglers during the spring, summer and fall (Graham and Fredenberg 1983) and therefore likely underestimated the relative importance of the other species in the fishery. Because of the pelagic nature of kokanee, they tend to primarily support a boat fishery. The 1962 survey estimated 37% of the angler effort to be from the shore. Robbins (1964) also noted that shore angling "almost precludes any sizable numbers of this species [kokanee] in the creel ...." The exception was snagging from shore, but

this was minimal and occurred in both 1961 and 1981. The point is simply that collectively the other game species historically supported a significant portion of the angler pressure in the fishery. This is probably more true of the 1960s era, but was not directly measured. While kokanee was undoubtedly the primary species sought by anglers in the early 1980s, it was likely something less than the 70% documented in the boat fishery by Graham and Fredenberg (1983).

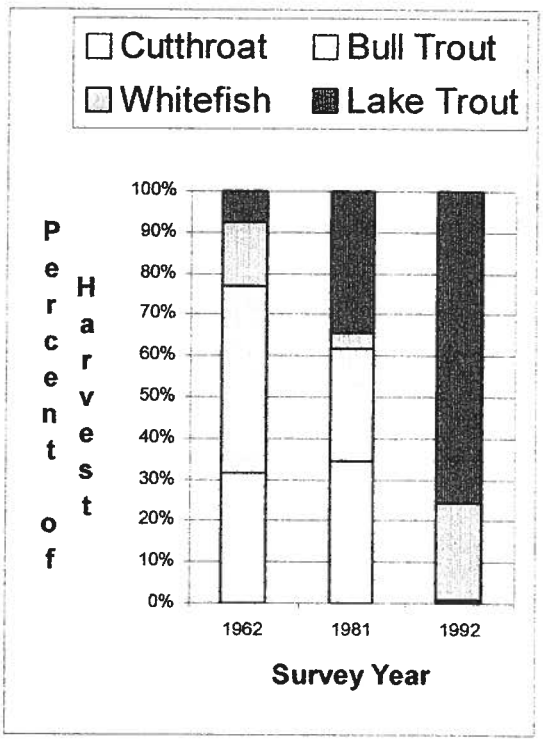

Figure 4. Species composition of the harvest for four species from three annual creel surveys on Flathead Lake.

It could be argued that the drop in angler pressure from the early 1980s to the early 1990s may be due to the loss of kokanee. The further drop in angler pressure from the early 1990s to the mid-1990s (see Figure 3) may be attributed to the slower decline of other species. The winter weather conditions in 1989 and 1991 provided for ice fishing, therefore the perch fishery contributed substantially to the annual angler pressure. In addition, a whitefish fishery became popular in the late 1980s that supported an undocumented share of the annual pressure. The lake whitefish population was deemed abundant enough in 1990 that MFWP opened the fishery to commercial harvest on the north half of the lake. The perch and whitefish fishery disappeared at about the same time. While the perch fishery is suppressed because of a reduced fish population (presumably lake trout predation), the whitefish fishery are thought to be under utilized because of poor catchability.

While there are obvious shifts in the species composition of the harvest between the 1960s and 1980s (Figure 4), the major ecological shift in Flathead Lake was manifested by the complete loss of the kokanee fishery in 1986. At this point, the increasing lake trout population had lost its primary prey species, which likely sealed the fate of many other species. By 1992, the fishery was dominated by lake trout with essentially no native species component. Two surveys in time, the 1981 and 1992 on-site creels, a decade apart, beg for comparison. In the past, comparisons have been made and are often couched as "pre-and-post" kokanee fishery, or the kokanee verses the lake trout fishery. At this point, it would be appropriate to make yet another comparison using the adjusted estimates for the 1980s (from Table 12).

The estimates show a 45% reduction (87,468 to 47,883) in angler pressure between the early 1980s and 1992. In 1981, 70% of an estimated 87,468 angler days was directed at kokanee (or 61,228 angler days) while in 1992, 90% of an estimated 47,883 angler days was directed at the lake trout (or 43,095 angler days). This represents a difference of 18,133 angler days, or a

30% of reduction pressure. Said another way, in 1992 lake trout supported 70% of the angler pressure directed at kokanee in early 1980s. While this may be considered an over simplification, it is likely closer to reality than the more casual comparison between the different on-site surveys. If the 1981 and 1992 on-site surveys were compared without caveats, it would appear there was a 72% (from 168,792 to 47,883 angler days) reduction in angler pressure on Flathead Lake because of the loss of the kokanee fishery.

Another often misleading presentation of creel data is the presentation of harvest composition and angler pressure estimates without clearly stating the pressure directed at different species. To the casual observer, the percent harvest is often mistaken to reflect how angler pressure is distributed among the species. Different survey objectives, harvest limits, shifting of game fish populations, angler attitudes (like catch and release), and species catchabilty all confuse analysis. This is not to say comparisons cannot or should not be made but simply that they should be made with the appropriate caveats. And in the case of Flathead Lake, all or most of these confusing factors are of concern.

Lake Trout Harvest, CPUE, and HPUE Characteristics

Because of different survey methods, survey objectives, changing fishing regulations, and shifting fish populations, it is difficult to make detailed interpretations of the lake trout information. The surveys in the 1980s generally focused on boat anglers and the kokanee fishery. The 1962 and 1992 surveys better captured the entire fishery on an annual basis but are three decades apart. The 1996 creel survey was a limited scope effort, focusing on the kokanee mitigation. This review attempts to pull data from each of the reports and summarize the information as it pertains to lake trout. In addition, the data sets from the 1985, 1992, and 1996 surveys were available for reanalysis.

Lake trout harvests were lowest in the early 1960s, with an adjusted harvest of 1,248 fish. By the early1980s, the harvest was up to 3,600 lake trout, a 65% increase in numbers harvested with only a moderate increase (assumed 14%) in angler pressure. All else being equal (i.e. angler species preferences etc...) and elevating the 1960s angler pressure to the same levels as the 1980s there would still be a 40% increase in lake trout harvest. The 1985 creel survey estimated 2,428 lake trout were harvested during a 12-week summer period. The high summer CPUE and smaller size of lake trout in the 1985 survey data suggest an expanding population. The first substantial increase in the lake trout creel limits was in 1986. By 1992, the annual harvest of lake trout was 23,600 fish. This represents an increase of 19 times over harvest of the early 1960s and 6.5 times over that of 1980s.

Lake trout harvest was not calculated in 1996 because angler pressure was not estimated. However, lake trout harvest rates were significantly higher ($p < 0.01$) in 1996 than 1992 (see Table 8). Summer boat angler HPUE for lake trout below the slot limit in 1996 was twice that documented in 1992. Therefore, assuming similar angler pressure and behavior, harvest during this period would have doubled. In 1992, this period (late May through early September) accounted for 74% (14,462 of 19,620) of the annual lake trout harvest by boat anglers. Boat anglers accounted for 83% (19,620 of 23,605) of the total annual harvest of lake trout in 1992

survey period. The mail survey estimates from 1993 and 1995 suggest a drop (8-10%) in annual angler pressure from 1992. However, even with this modest drop in angler pressure, the lake trout harvest in 1996 likely increased over 1992 levels. This suggests that the adjusted lake trout harvest for mid-1990s (see Table 12) is conservative. This is an artifact of using 1992 harvest rates rather than 1996 rates.

The mean length of lake trout harvested is hard to compare because of differences in report periods and regulations. Mean length decreased from 31.3 inches in 1981 to 27.5 inches in 1985 (mean difference = 3.8") with no changes to length restrictions in the regulations. However, these data are from an annual average for 1981 and a summer season in 1985. Mean length of lake trout below the slot (26 inches) in 1992 was 20.9 inches for the survey period. However, these data are not comparable to the 1980s data due to different length restrictions in the regulations. Length data were not collected in 1996; however, coarse scale comparisons of lake trout below, within, and above the slot limit can be made (see Table 8). The most significant observation is the decrease in trophy fish. While in 1992 trophy fish accounted for 9% of the catch, in 1996 they were barely detectable (0.1%) (see Table 8). The number of lake trout below and within the slot is difficult to interpret because of a change in slot size in 1994.

In 1994, the lower end of the slot was moved from 26 to 30 inches (see Appendix A). Between 1992 and 1996 the percent composition of the catch in the respective slots went from 13% to 2% (see Table 8). This constitutes an 85% reduction in catchable "slot size" fish with a 40% reduction in the range of the slot. One interpretation would be that only 15% of the catchable fish between 26 and 36 inches (pre-1994 slot) are between 30 and 36 inches. This would require a stable population structure over the four years between 1992 and 1996. Another interpretation might be a reduction in larger fish, similar to that demonstrated above the slot limit. In 1992 more than 10% of the lake trout harvested were within 2 inches of the slot (see Table 10) and 12% of all lake trout caught (and released) were in the 26 to 36 inch slot (Evarts et al. 1994). It appears there was a considerable component of the harvestable population in the slot or close to it. It seems logical to assume that size distribution within the slot would favor the lower one-half of the range. However, without length data from 1996, the only firm conclusion that can be drawn is that the regulation change opened up harvest on sizeable portion of the previously protected population.

CPUE for lake trout above, within, and below the slot limit in 1996 are significantly different ($p < 0.01$) from those in 1992. The increase in CPUE between the 1985 and 1992 surveys is likely due to an increasing population of lake trout. The increase in CPUE between 1992 and 1996 could result from increasing proficiency of anglers and/or increasing lake trout numbers, and/or data biases. The decrease in CPUE for lake trout above 36 inches suggests fewer trophy fish in the population. CPUE differences below and within the slot are confounded for the same reasons discussed above. Another potential confounding factor is gear selectivity and angler experience. The 1992 data demonstrate significant differences ($p < 0.01$) in the size of lake trout caught by anglers trolling and those jigging. Therefore, a large shift in gear type by anglers between years may result in shift of sizes of lake trout harvested.

Management Considerations and Regulation Changes

Fisheries managers need good creel information to assist them in making decisions on regulation changes. They also need to dissemination accurate information to the public. This review and synthesis of the information suggest the 1962 and 1981 survey estimates are biased high. Past use of this information may have resulted in unrealistic mitigation goals (DosSantos et al. 1993) and economic assessments of the historic kokanee fishery. Others have used the reported harvest estimates as the basis of biological assessments of the lake system (Beattie and Clancey 1991). In light of this review, managers and researchers should be cautious about using estimates from the 1981 or 1962 creel survey reports. Direct comparisons between the estimates from the on-site surveys on Flathead Lake should not be made.

The current impetus is the need to make informed decisions on lake trout management and Flathead Lake. This review provides some insight to the historic and present-day fishery and characterizes lake trout exploitation rates over time. The differences in the species composition of the harvest between 1962 and 1981 suggest that changes in the lake's fish populations and/or angler preferences were occurring by the early 1980s. In 1982, limits on all species became more restrictive. By 1985, lake trout CPUE increased and the average size in the harvest decreased suggesting an expanding lake trout population. Fisheries managers responded by increasing creel limits in 1986, then again in 1990, 1992, 1994, and 1996 (see Appendix A).

The survey in 1992 documented the highest lake trout harvest recorded. However, this analysis of data from the 1992 and 1996 surveys suggests that the liberal limits on lake trout have little effect on the level of harvest (see Table 9). Since 1986, restrictive limits on larger lake trout have been implemented generally restricting the harvest of fish over 26 to 28 inches. The first slot limit was implemented in 1992 restricting harvest of lake trout between 26 and 36 inches. The 1992 survey documented 33% of the lake trout harvest was between 22 and 26 inches (see Table 10) and 12% of all lake trout caught (and released) were in the slot.

The change in the lower limit of the slot regulation in 1994 from 26 to 30 inches opened harvest up to a segment of the population that had been afforded some protection since 1986. This likely substantially increased the opportunity for anglers to catch and keep large lake trout and affected the population size structure. Although lake trout length data were not collected during the 1996 survey, the numbers and CPUE of lake trout in three categories (below, within, and above the slot) suggest fewer large lake trout were being caught by anglers. The decrease in trophy lake trout cannot be attributed to the slot limit adjustment in 1994 because of the short time span since the slot regulation change. This component of the population is more likely being reduced through the overall increase in angler pressure on the species. A significant increase in angler pressure directed at lake trout likely results in higher overall harvest of large fish and increased hooking mortality on those fish caught and released. Based on age and growth information, it could take as much as 10 years for a lake trout to grow through the 30-to-36 inch slot (CSKT Fisheries file data). Therefore, the increase in harvest on the 26-to-30 inch fish that were opened to harvest in 1994 should not have effected the trophy component of the fishery by 1996. Although, the effects of recent regulation changes on the lake trout population could not be fully evaluated, angler harvest is likely the most significant source of mortality on large lake

trout (>26 inches). Evaluation of harvest size restrictions for lake trout should be an area of priority for future creel surveys.

A common theme throughout this review is the amount of speculation and assumptions needed to draw conclusions from the data. In part, this is due to using data that was not collected to answer the questions in before us today. However, a good portion of the problem comes from the scarcity of data and lack of access to raw data for reanalysis. Timelier creel information would be valuable in the future management of Flathead Lake. Future surveys should be less specific with fully scoped objectives to take full advantage of the opportunity. Regulation changes with specific objectives in mind should be evaluated. Raw data should be archived in a manner that it is retrievable for future analysis. In light of the difficulties, this discussion of the information is by no means the only interpretation.

CONCLUSIONS

Obviously, we would like to base our decisions on the best available information. I have attempted to raise some questions concerning comparisons of existing creel survey estimates on Flathead Lake. This synthesis of information suggests that the 1981 creel survey estimates are nearly 100% too high and therefore direct comparison of these estimates to others should not be made. Any critical review of the information would identify the problem and explain it away before making comparisons. I do not propose answers as much as highlight the problems and suggests *one way* to make judicial comparisons across years.

The changes in the Flathead Lake fishery over the past 15 years have been dramatic. In the early 1980s, it was considered a premiere kokanee fishery. A decade later it became a premiere lake trout fishery. Two creel surveys a decade apart (1981 and 1992) beg for comparison. Direct comparison of the estimates shows a 72% reduction in angler pressure. However, this analysis suggests that the reduction in angler pressure between the 1980s and 1990s is about 50%. Although, a portion of that (<35%) can be attributed to the loss kokanee; perch, westslope cutthroat, and bull trout historically supported a considerable amount of angler pressure. The contribution of these species to the overall recreational value of the fishery has not been adequately evaluated historically or in this review. A full accounting of the fishery and its potential would include an assessment of the tributary system.

The focus of this review is on lake trout and the results suggest there was an expanding population by the early 1980s. The 1981 creel data suggest that lake trout had begun to displace native trout in the harvest over a period of 23 years and consistent regulations. The 1985 creel data suggest a younger age structure and higher CPUE that suggest an expanding population. By the 1990s, lake trout had overwhelmed the lake to the detriment of all other popular game fish except lake whitefish. Harvest data from the 1992 and 1996 creel surveys suggest that the high creel limits implemented since 1986 have little effect on the level of the total annual lake trout harvest. Despite an annual harvest of greater than 24,000 lake trout, catch and harvest rates have increased substantially between 1992 and 1996 (see Table 8). However, opportunities to catch or harvest trophy lake trout larger than 36 inches during the same period have decreased.

There are no hard data or rigorous statistical methods used to derive some of the conclusion in this review. However, in the case of Flathead Lake, there are two independent sets of survey information: mail and on-site surveys, which are not in agreement. The discrepancy is too large to ignore and any critical review of the information would have to recognize it and deal with it in some way. Because the method employed here is more creative than scientific, it is easy to criticize. To those who choose to, I welcome your comments and suggestions.

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Appendix A

Flathead Fishing Regulation Summary

1. Lake Trout (LT)

Year	Lake	River	Comments
Pre 1959	15 fish, not to exceed 10 lbs and 1 fish*	Same*	
1959	10 fish, not to exceed 10 lbs and 1 fish*	Same*	
1982	1	5*	*Mysis* appear 1981: LT harvest 3,600
1983	1	5*	
1984	2 (or 1LT and 1 bull trout)	5, only 1> 14"*	
1985	2 (or 1LT and 1 bull trout)	5, only 1> 14"*	*Mysis* peak
1986	5 LT, only 1> 28 "	5, only 1> 14"*	Kokanee crashing
1988	5 LT, only 1> 28 "	5, only 1> 14"*	
1990	7, only 1 > 26"	5, only 1> 14"*	LT show up in River
1992	10<26" or 9<36" and 1>36"	Same as Lake	LT harvest: 23,600
1994	10<30" or 9<36" and 1>36"	Same as Lake	
1996	15 <30" and 1>36"	Same as Lake	
1998	15 <30" and 1>36"	Same as Lake	

* Western District standard trout limit

2. Bull Trout (BT)

Year	Lake	River	Comments
1952			First spawning tributaries closed
Pre 1952	15 fish, not to exceed 10 lbs and 1 fish*	Same*	18" minimum length
1959	10 fish, not to exceed 10 lbs and 1 fish*	Same*	
1982	1	1	
1988	1	1	Illegal to possess a live bull trout (high grade)
1990	1	1	Bull trout given separate limit from general trout
1992	1	1	Emergency closures on portions of the system
1994	Closed	Closed	

* Western District standard trout limit

3. Westslope Cutthroat Trout (WCT)

Year	Lake	River	Comments
Pre 1982	10 fish, not to exceed 10 lbs and 1 fish*	Same*	
1982	5	5	
1984	5	5, only 1>14"	
1990	5	5, only 1>14"	
1994	2, only 1> 14"	5, only 1>14"	
1998	Catch and release	Catch &release	

* Western District standard trout limit

4. Kokanee

Year	Lake	River	Comments
Pre 1982	35	35	Number that would fit smoker
1982	20	20	
1983	10	10	
1985	10	5	Snagging closed
1986	10	5	River lure fishery develops
1988	10 (5/1 - 11/30)	Closed	
1994	Closed	Closed	
1996	5 (3rd Sat. in May - Sept 15)	Closed	
1998	Standard Limit (20)	Standard Limit (20)	Salmon recovery halted, special regulations dropped, snagging still closed

Information complied by Montana Fish Wildlife and Parks, Region 1.