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CANADA - BRITISH COLUMBIA OKANAGAN BASIN
IMPLEMENTATION AGREEMENT

REVIEW OF OKANAGAN BASIN STUDY

RECOMMENDATIONS RELATING TO HEADWATER LAKES

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N O T I C E

This report was prepared for the Implementation Board under the terms of the Canada-British Columbia Okanagan Basin Implementation Agreement. The information contained in this report is subject to revision. The Implementation Board does not necessarily concur with opinions expressed in the report.

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1. SUMMARY

The Okanagan Basin Study (1971) recommended a % increase in stocking by 1980. Stocking rates have risen by 70%. The increase has been in terms of larger fish rather than greater numbers.

Catch success and fish size have stayed fairly constant through the 1970's, but angling use has increased nearly threefold. This increase greatly exceeds the expectations of the Basin Study even under the high population growth projection.

Anglers expressed satisfaction with the present catch success but many would like larger fish. Nearly one-half the fishermen interviewed favoured ice fishing bans, the use of artificial flies and the use of small motors only.

Several factors indicate that present harvest is at a maximum given the present system of mediocre management based upon scanty data. Recommendations are proposed to institute an intensive management program which would closely govern lake stocking and regulating. Under such a system some expansion of use could be accommodated while retaining present catch success and growth rates. Attempts should be made to redistribute use based upon the production capacity of lakes.

Eventually, the unused capacity of the Okanagan main valley lakes will be required to keep up with increased angler demand.

2. INTRODUCTION

The Okanagan Basin Study, conducted in 1971, offered recommendations for the management of all the water-based resources in the Okanagan drainage. Fisheries recommendations were separated into two categories: those dealing with large "main valley" lakes (including Wood, Kalamalka, Okanagan, Skaha, Vaseux and Osoyoos) and those dealing with the smaller "headwater" lakes. This report is concerned with headwater lakes only.

Okanagan Basin Study recommendations for headwater lakes called for a 23.5 percent increase in stocking by 1980, as well as additional angling and boating restrictions, and specialized fishery programs. This report examines the changes which have taken place in fisheries management since the Study and the effect these alterations have had on angler use, catch success and angler satisfaction.

3. METHODS

3.1 Stocking

Recent lake stocking rates (1975-1979) are compared with stocking rates at the time of the Okanagan Basin Study (1967-1971). For ease of comparison all stocking data are listed in fry equivalents. In other words, numbers of fingerlings or yearling trout have been converted into numbers of fry.

Conversion factors were selected from trout survival studies conducted earlier by the Fish and Wildlife Branch. These studies show that 10 times more fry are needed than yearlings, twice as many fry are needed than fingerlings, and seven times more fry are required than brook trout underyearlings (G. E. Stringer, personal communication). Consequently, if three lakes were stocked with 1,000 yearlings, 3,000 fingerlings and 3,500 brook trout their respective fry equivalents would be $1,000 \times 10 = 10,000$; $3,000 \times 2 = 6,000$; and $3,500 \times 7 = 24,500$.

The Okanagan Basin Study does not specify what conversion factor was used to reach fry equivalents. In order to make a fair comparison in stocking rates the present conversion factors were used in both pre and post Study stocking data.

3.2 Angler Use

Two hundred and eight lakes were flown in the aerial survey. However, many lakes provided insufficient data in either 1980 or 1971 to provide a reliable comparison. Sufficient data was available from 40 of the lakes.

Methods of determining fishing pressure were similar to those used in the original Okanagan Basin Study (see Task 161 - Angler and Boat Census, 1971; MacDonald, Molnar and Stent, 1971). Numbers of boats on a particular lake were recorded from the plane and then multiplied by

a conversion factor to get the total boat count for that day.

MacDonald et al constructed graphs showing the change in angler use throughout the day (Figure 1). They also determined that anglers averaged 3.5 hours of angling per day. The total daily count for a particular day and lake was determined from the graph as follows:

$$\text{Total Daily Boat Count} = \text{Observed Count at Time (T)} \times \text{Conversion Factor}$$

where Conversion Factor = $\frac{\text{area of use graph within a 3.5 hour span of time (T)}}{\text{total area of use graph}}$

Separate use graphs were developed for three different kinds of lakes: resort lakes with high day use; resort lakes with low day use; and high altitude lakes with low use both weekends and weekdays. The three types of graphs are taken directly from MacDonald et al and are illustrated in Figure 2. The correction factor for each type of lake at various times of the day is given in Table 1.

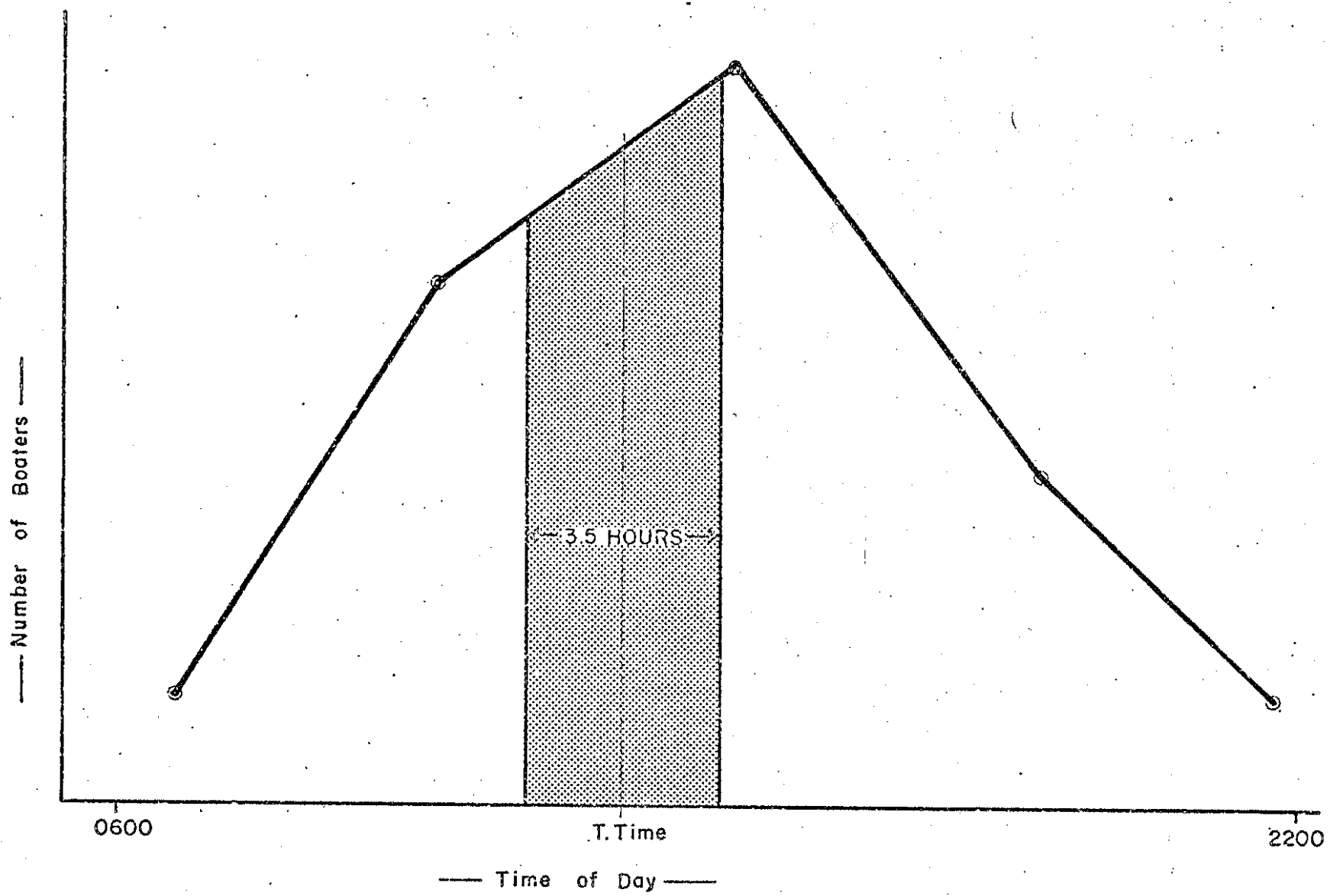


Figure: 1 ANGLER USE GRAPH (after MacDonald et. al., 1971.)

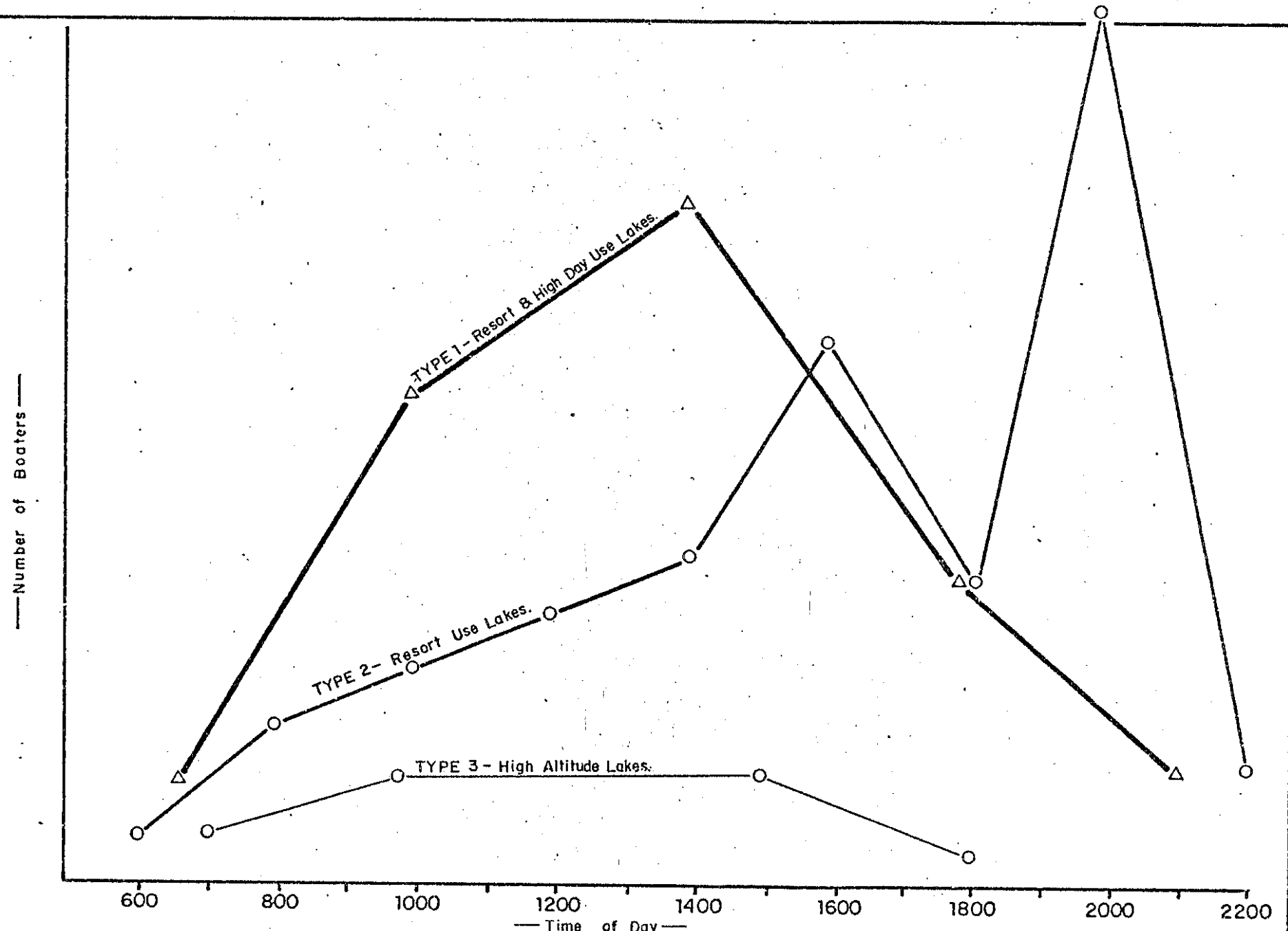


Figure: 2 TYPES of DAY USE CURVES for OKANAGAN BASIN LAKES. (after MacDonald et. al., 1971.)

TABLE 1 CORRECTION FACTORS FOR VARIOUS LAKE TYPES AT VARIOUS TIMES.

Time	Lake Type 1	Lake Type 2	Lake Type 3
0800	4.68	8.47	3.58
0900	4.68	8.47	3.58
1000	3.61	7.12	3.10
1100	3.31	6.31	3.07
1200	3.00	5.85	3.03
1300	2.83	5.15	3.01
1400	2.83	4.38	.08
1500	3.06	3.65	3.38
1600	3.64	3.54	3.92
1700	4.63	3.73	6.44
1800	5.88	3.46	9.81
1900	7.65	2.86	10.00
2000	10.58	2.78	12.48
2100	16.99	3.67	14.71

The classification of each type of lake is as follows:

Type 1: Resort and high day use lakes -

Browne	Jackpine
Dee Chain*	Lambly
Haynes	Swalwell
Hydraulic	

* Includes Dee, Island, Deer and Crooked.

Type 2: Resort use lakes -

Bouleau	Oyama	South
Headwaters 1	Pinaus	Square
Lady King	Postill	

Type 3: High altitude and/or moderate use lakes -

Becker	Ideal	Peachland
Deer (Tsu)	James	Ripley
Garnet	King Edward	Swan
Geen	Little Pinaus	Whitehead
Headwaters 2, 3, 4		

Some lakes were of sufficiently low use (5 boats per month or less) that the aforementioned method became too inaccurate to use (MacDonald et al, 1971). In those cases, we followed MacDonald and used the highest daily boat count as representative of total daily use. Low use lakes for the present study included:

Alex	Eneas Chain*	High
Bardolph	Echo	Kaiser Bill
Bear	Glen	Lost
Darke	Hereron	Wilma

* Includes East Eneas, West Eneas and Island Lakes.

One hundred sixty-eight other lakes were flown during the present study but results are considered unreliable due to insufficient data in either 1981 or 1971.

Several winter flights were made over the headwater lakes in the winter of 1980-81 but very few anglers were observed. This lends credibility to the statement of MacDonald et al, that ice fishing probably amounts to less than 2 percent of the annual total. Because of the low incidence of ice fishing, the summer use data was considered a sufficiently accurate estimate of total annual use.

Previous studies by MacDonald et al (1972) determined that on the average there are 2.04 anglers per boat. Consequently, total daily boat counts were multiplied by 2 to obtain daily angler counts.

Daily angler counts were separated into one of two categories: weekday counts or weekend and holiday counts. The mean number of anglers per weekday was multiplied by the total number of weekdays in the May 15

to November 15 fishing season to obtain the weekday total for 1980. The weekend total was calculated in a similar manner. The two categories were then summed to provide a total for the 1980 summer angling season.

Total use for the 1971 season was taken from Table 7.1 of Technical Supplement IX of the Okanagan Basin Study (Anon. 1974).

3.3 Catch Success and Fish Size

Where possible, a sample of 20 anglers on each lake were interviewed to determine the number of hours they fished and the number and size of fish they caught. Up to 20 angler caught fish from each lake were weighed and measured and scale samples were collected to determine age and, therefore, growth rate. Catch success generally falls throughout the warm summer months; therefore, one high use lake (Swalwell) was selected as a control and was checked in May, June and August.

Catch and size data for 1971 was obtained from Technical Supplement IX of the Okanagan Basin Study (Anon. 1974).

3.4 Angler Preference

Anglers who were checked during the creel census were invited to complete a questionnaire which dealt with fish stocking programs, fishing regulations and outboard motor regulations. Anglers were asked whether they would prefer a slightly better catch rate for slightly smaller fish or vice versa. In regard to angling regulations, they were asked whether they would prefer:

- a lower catch limit;
- no catch limit;
- catch and release;
- artificial flies;
- ice fishing ban;
- any other changes;
- no changes.

In regard to outboard motor regulations, anglers were asked whether they would prefer:

- no motors;
- electric motors only;
- 10 horsepower maximum;
- no change.

4. RESULTS

4.1 Stocking

The average number of fish stocked (Fry Equivalent) in 1975 - 1979 has increased significantly compared with numbers stocked at the time of the Basin Study (1967-71). Likewise, the number of lakes stocked has increased (Table 2). However, the average number of fish stocked per individual lake has increased only slightly. Fry Equivalent stocking densities increased in 36 lakes and decreased in 22 lakes (Appendix 1).

TABLE 2
STOCKING CHANGES PRIOR TO AND FOLLOWING
OKANAGAN BASIN STUDY

	PRE-STUDY (1967-1971)	POST-STUDY (1975-1979)	PERCENT INCREASE
No. of Lakes Stocked	63	77	22
Fry Equivalent Stocked/Yr.	2,187,672	3,711,960	70
Average Stocking Rate/Lake	34,725	48,207	39
True Number Stocked/Yr.	$\frac{2,427,986}{5}$	$\frac{2,431,900}{5}$	0

4.2 Angler Use, Catch Success and Fish Size

At the 40 lakes for which comparative data are available, angler use increased from 54,263 angler days in 1971 to 151,610 angler days in 1981 (Table 3). If this trend is consistent in the other lakes, total use has nearly tripled in the last decade.

In 1971, 70% of the effort occurred on Pinaus, Swalwell, Dee Chain, Lambly, Jackpine and Oyama Lakes. By 1980 these lakes were still receiving the majority of use but a few other lakes have become very important. These include the Hydraulic Chain (Hydraulic, Haynes and Browne), Headwaters 1 to 4, Bouleau and Postill Lakes. All these lakes possess common characteristics (Table 4) - they are large, have fishing camps on them, have some natural spawning and are heavily managed.

TABLE 4
COMPARATIVE FISHING DATA BETWEEN MAJOR FISHING LAKES
AND ALL THE OKANAGAN HEADWATER LAKES

	MAJOR LAKES	ALL LAKES	PERCENT OF TOTAL AT MAJOR LAKES
Number of Lakes	14	137	
Total Surface Area			
Average Surface Area			
Fishing Camps	10	10	100
Total Angling Hours			
Increase in Angling Hours Since 1971		3 times	

Comparative catch success (numbers of fish caught per hours) and fish size data are available from 12 lakes (Table 3). Stocking densities were increased on all but two of the lakes (Appendix 1) and catch success increased on more than one-half the lakes despite the tremendous increase in fishing effort.

Seasonal changes in catch success were recorded at Beaver Lake. A marked decline occurred throughout the summer (Figure 3). A similar trend is reported each year by fishermen on most of the Okanagan

TABLE 3

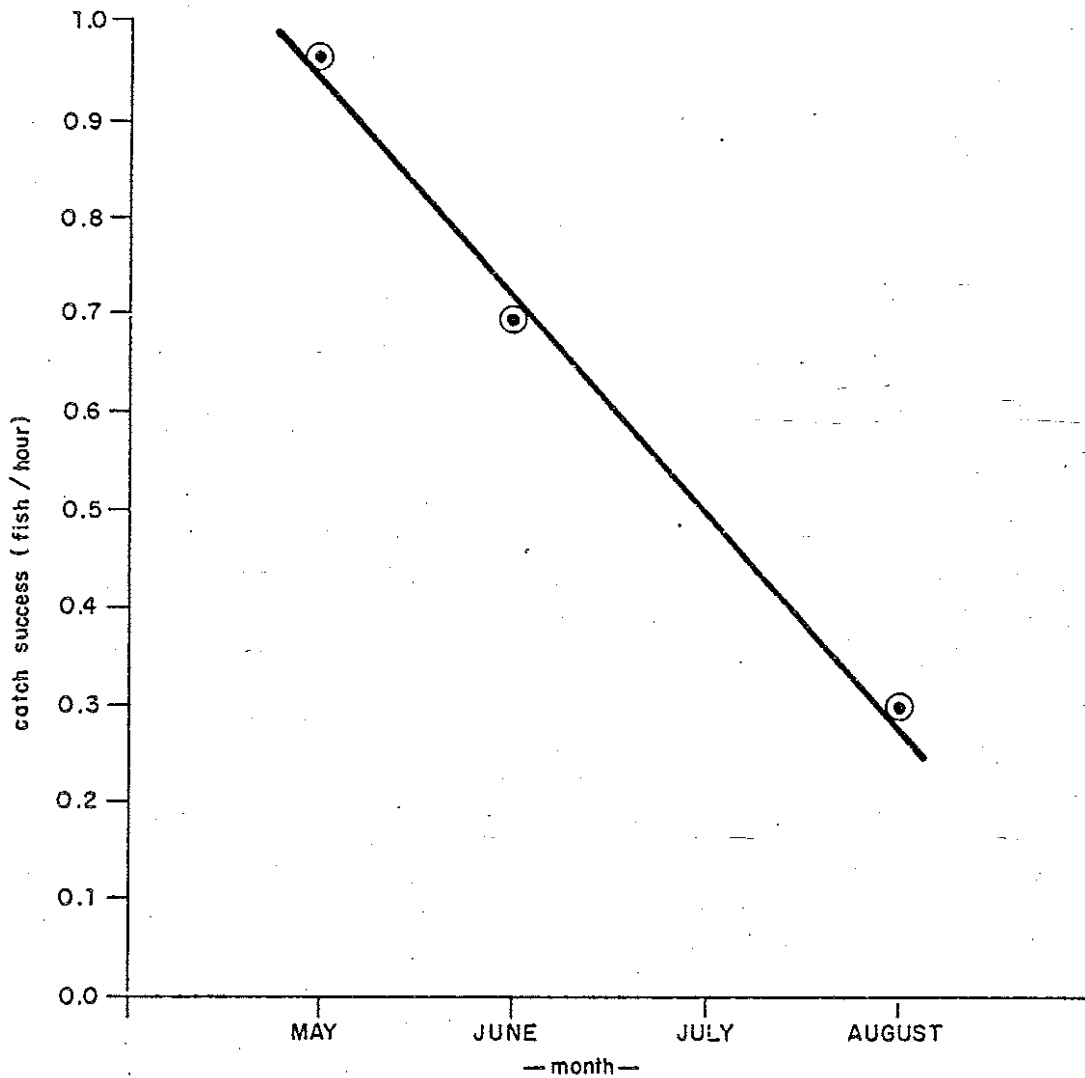
ANNUAL TROUT FISHING EFFORT, CATCH AND HARVEST
IN OKANAGAN HEADWATER LAKES IN 1980 AND 1971

LAKE	ANGLING DAYS 1980	ANGLING DAYS 1971	CATCH (NO.) PER HOUR 1980	CATCH (NO.) PER HOUR 1971	AVERAGE WT. (GRAMS) 1980	AVERAGE WT. (GRAMS) 1971
ALEX	24	30	-	-	-	-
BARDOLPH	53	167	-	-	-	-
BEAR	6	66	-	-	-	-
BECKER	1,600	95	-	-	-	-
BOULEAU	4,133	851	-	-	-	-
BROWNE	4,937	1,156	0.26	0.62	263	146
DARKE	30	1,326	0.50	0.61	141	187
DEE CHAIN ¹	19,466	6,596	0.97	0.55	146	101
DEER (TSUH)	1,876	282	-	-	-	-
ECHO	24	110	-	-	-	-
ENEAS ²	914	202	-	-	-	-
GARNET VALLEY	914	312	-	-	-	-
GEEN	879	74	-	-	-	-
GLEN	20	12	-	-	-	-
HAYNES	3,210	120	-	-	-	-
HEADWATERS #1	5,061	680	0.54	0.66	124	49
HEADWATERS #2	1,207	216	-	-	-	-
HEADWATERS #3	504	389	0.48	0.25	-	-
HEADWATERS #4	201	124	-	-	-	-
HERERON	18	26	-	-	-	-
HIGH	6	140	-	-	-	-
HYDRAULIC	11,770	184	1.19	0.10	107	213
IDEAL	6,241	244	-	-	-	-
JACKPINE	4,787	1,028	0.67	0.21	193	321
JAMES	2,495	48	-	-	-	-
KAISER BILL	6	83	-	-	-	-
KING EDWARD	1,745	155	-	-	-	-
LADY KING	1,726	490	-	-	-	-
LAMBLY	3,078	2,161	0.55	0.81	183	149
LOST	90	94	-	-	-	-
OYAMA	11,789	2,199	0.25	0.43	252	253
PEACHLAND	1,574	454	-	-	-	-
PINAUS	22,620	19,536	0.51	0.26	298	291
LITTLE PINAUS	1,205	130	-	-	-	-
POSTILL	5,955	1,899	0.88	0.71	-	-
RIPLEY	667	869	-	-	-	-
SOUTH	579	178	-	-	-	-
SQUARE	1,726	697	-	-	-	-
STREAK	1,110	544	-	-	-	-
SWALWELL	25,395	9,836	0.97	0.92	207	149
SWAN	1,929	342	-	-	-	-
WILMA	30	118	-	-	-	-
TOTAL	151,610	54,263	-	-	191	186

¹ Includes Dee, Island, Deer and Crooked.

² Includes Big Eneas, Little Eneas and Island.

lakes. Ideally, a correction factor should be applied to account for various dates. However, seasonal change data is sparse for 1980 and totally lacking for 1971, and any attempts at correction would probably increase error.



SEASONAL CHANGE IN CATCH SUCCESS AT BEAVER LAKE IN 1981.

Figure 3

Fish size was not consistently correlated with stocking rates or angler effort. Overall, the size of fish appears to be about the same as in 1971. With fish size and catch success similar to 1971 and effort tripled, harvest (total weight of fish from all lakes) is also some 3 times higher than in 1971.

4.3 Angler Preference

One of the questions anglers were asked was whether they would prefer more fish smaller than those presently in the lake; fewer larger fish; or no change. The majority of anglers at 12 of the 22 lakes preferred fewer fish of a larger size. The average weight of fish they were catching was 151 grams (Table 5).

At the remaining 10 lakes the majority of anglers preferred no change. At these lakes the fish averaged 323 grams in weight. There were no instances in which the majority of anglers wished to catch more fish if size would be reduced.

Anglers were also questioned on the desirability of having more stringent fishing and boating regulations. Nearly one-half the fishermen interviewed favoured limiting motor use to 10 horsepower or less, banning ice fishing and restricting gear to artificial flies only (Table 6). More complete information is listed in Appendix II.

Strangely, there appeared to be notable inconsistencies between what was practiced and what was preached. For instance, on Darke Lake 80% of the anglers professed a dislike for gas motors but 80% were using them. Likewise, on Darke Lake all 10 anglers were in favour of fly only regulation but only one was using a fly; whereas, at Rose Valley Reservoir all 7 anglers were using flies while only one favoured a fly only regulation. Generally, however, those favouring certain restrictions did tend to use matching methods.

Motor use increased with the size of lake. On lakes less than 25 acres in size about 43% of the anglers used motors, on lakes 25 to 50 acres about 55% used motors and on lakes over 50 acres about 70% used motors.

Roughly, 60% of all anglers interviewed were fishing with flies.

TABLE 5
ANGLER PREFERENCE IN REGARD TO STOCKING AND FISH SIZE

LAKE	PERCENT ANGLERS OPTING FOR MORE SMALLER FISH	PERCENT ANGLERS OPTING FOR FEWER BUT LARGER FISH	PERCENT ANGLERS WISHING NO CHANGE IN FISH SIZE	AVERAGE WEIGHT OF CATCH (GRAMS)	NUMBER ANGLERS INTERVIEWED
BROWNE	14	45	41	262.5	22
CHUTE	10	80	10	107.5	20
DARKE	10	60	30	140.5	10
DEE CHAIN	12	82	6	145.5	50
HEADWATERS #1	29	33	38	123.9	21
HEADWATERS #3	25	75	0	77.5	20
HYDRAULIC	15	85	0	106.6	20
JACKPINE	5	75	20	192.9	20
LAMBLY	0	68	32	183.4	19
MADDEN	5	30	65	417.2	20
OYAMA	5	40	55	251.5	20
PINAUS	9	15	76	297.9	33
POSTILL	9	76	24	132.6	21
SILVER	15	70	15	149.5	20
SWALWELL	35	40	25	206.9	20
WHITEHEAD	0	38	62	252.3	21
BULMAN	0	0	100	568.3	20
PEAR	20	20	60	104.7	10
IDABEL	0	70	30	106.0	20
DOREEN	25	15	60	292.2	20
IDLEBACK	20	15	65	443.6	20
YELLOW	15	20	65	466.7	20

TABLE 5

NUMBER AND PERCENT OF ANGLERS FAVOURING VARIOUS RESTRICTIONS
(491 ANGLERS WERE INTERVIEWED AT 25 LAKES)

TYPE OF REGULATION	NO. OF ANGLERS	PERCENT OF ANGLERS
<u>MOTOR RESTRICTIONS</u>		
10 h.p. maximum	237	48
Complete ban	111	23
Electric only	74	15
<u>FISHING RESTRICTIONS</u>		
Ice fishing ban	224	46
Artificial flies only	205	42
Lower catch limit	60	12
Catch and release	11	2
No limit	12	2

5. DISCUSSION

5.1 Sources of Error

Sources of error in the present study are not sufficient to invalidate the findings. However, they are of such magnitude that finds should be tempered with as much practical knowledge as possible and used cautiously in making management decisions.

Perhaps the greatest source of error stems from variations which occur from year to year. Catch success and fishing are particularly dependent upon prevailing weather patterns, and the years of record (1971 and 1980) may be far from typical.

Another source of error results from the impossibility of checking all lakes on the same dates. Findings from Beaver (Swalwell) Lake showed a steady decline in catch success, so that if the lake was checked in August catch success would be threefold less than if it were checked in May.

Sources of error inherent in the methods are not substantial with the exception of aerial angler counts. The methods of MacDonald et al derive large use estimates from low use counts. This, undoubtedly, results in serious errors. However, better methods were not available.

5.2 Fishery Status

Catch success and fish size appear to have held up despite the almost threefold increase in angling. This could be largely due to the 70% increase in stocking which, in many lakes, consisted of a switch from stocking fingerlings to stocking similar numbers of yearlings. The yearlings spend an additional six months growing in optimal hatchery conditions rather than relying on the available food supplies and winter temperatures of the lakes.

Redistribution of effort is another factor in the retention of good catch success and quality. One-half dozen of the larger headwater lakes are now used about six times more than they were in 1971. Management practices are partially responsible for this shift. For instance, experimental stocking was initiated on Postill Lake in 1971 and contributed 60% of the catch. Coarse fish control through trapping and introduction of brook trout was practiced at Headwaters Lake and both fish size and catch success was reported to improve remarkably. Stocking was reduced on the Hydraulic Chain in an attempt to improve fish size. An improvement of both size and catch success has been reported.

No doubt another important factor in the pressure increase on major use lakes has been fishing resort operations. Resorts at Swalwell, Postill and Headwaters have changed hands and new owners have improved facilities, access and advertising, and have eagerly served the public. At Darke Lake, on the other hand, the resort burned down and use dropped from 1,326 to 30 angler days.

Although catch success and fish size have held up under the pressure increase, there are very strong indications that no further increase can be borne unless management practices are altered and carefully monitored. The first indicator that harvest is reaching a critical level is total catch is catching up with numbers of fish stocked. Harvest in 1980 was nearly triple that in 1971 or $3 \times 125,000 = 375,000$ fish. The 1980 stocking program for the Okanagan Lakes included only 125,000 fish. A mortality rate of 75% is expected between yearling stage and 2 years old (i.e. catchable size); therefore, harvest rate must be nearly maximal. Natural reproduction is responsible for some of the catch but probably only a minor portion.

Another indication that further increases must be carefully planned is that the carrying capacity of Okanagan Lakes is getting close to what is now being used. The 1971 Study (Anon. 1974) estimated the total carrying capacity of all the headwater lakes to be

5.4 million fry. We are presently stocking the equivalent of 3.7 million fry annually. Anglers interviewed in the present study desired bigger fish rather than more smaller fish - a point which should be considered prior to further stocking.

One further possible indicator that present production is nearly maximal may be the seasonal fishing decline. Although this may be partially due to behavioural changes as fish respond to summer temperatures, it may also be largely due to fishing pressure. The heavy spring fishery takes a large number of the fish which have reached catchable size. Numbers of available catchables decrease as the fishing season progresses.

5.3 Management Options

The harvest of more fish of equal or better size cannot continue forever, but some further increase can be accomplished through careful management. Intensive inventory will be required to provide necessary data for an extremely efficient stocking program matching recruitment, harvest, catch success and growth. Along with this stocking program must come an equally thorough revision of angling and boating regulations. Finally, there will be a need to redistribute angling pressure amongst more lakes and more species (e.g. brook trout, bass, whitefish, ling and carp). Eventually, the large main lakes will have to be relied upon to ease the pressure of the headwater lakes. A management plan for the headwater lakes should be developed in unison with a plan for the main lakes, since only the latter remain endowed with undeveloped potential.

The alternative to the intensive management approach is to continue with mediocre management based on a scanty data base. The headwater lakes system is producing the maximum return which can be expected under this option and as pressure continues to increase, a reduction in catch success is inevitable.

6. RECOMMENDATIONS

1. Recognize the necessity of "Enhancement by Management" in dealing with the headwater lakes.
2. Institute a five-year program which will produce an efficient and intensive scheme for stocking and regulating headwater lakes.
3. Evenly distribute angling effort based upon lake productivity. This can be accomplished by ascertaining the reasons for present distributions and providing access, facilities, advertising, catch alternatives or whatever is required to redistribute effort.
4. Calculate costs and benefits of stocking fingerlings, yearlings and catchables.
5. For the fourteen major lakes determine as closely as practical natural production rates, stocking rates, harvest rates and carrying capacity. Plan for 300 gram fish and a catch rate of one fish/2 hours. Consider limit reductions and curtailing the winter fishery.

7. LITERATURE CITED.

MacDonald, S.J.; P.J. Stent and L.N. Molnar, 1971. Angler and Boat Census 1971. Task 161, Okanagan Basin Agreement, p. 15.

Anon. 1974. Technical Supplement IX, Canada-British Columbia Okanagan Basin Agreement. Fisheries and Wildlife in the Okanagan Basin, p. 249.

8: APPENDIX 1. Average annual stocking rates at 2,500/lb. fry equivalents in Okanagan Basin headwater lakes.

LAKE	1967-71 STOCKING RATE	1975-79 STOCKING RATE	PERCENT CHANGE
AILEEN	6,400	3,600	- 44
AGUR	20,460	27,000	+ 32
ALLENDALE	28,600	9,600	- 66
BAKER	3,200	0	--
BARDOLPH	20,580	13,800	- 33
BECKER	8,400	28,000	+233
BROWNE	54,720	25,600	- 53
BULMAN	4,000	8,000	+100
BURNELL	28,200	62,000	+120
CHRISTIE	0	9,800	--
CHURCHILL	0	5,600	--
CLARK, BIG	2,800	3,600	+ 29
CLARK, LITTLE	2,400	3,600	+ 50
CORPORATION	2,000	2,000	0
CRESCENT	4,000	7,200	+ 80
CULPER	1,200	2,400	+100
DARKE	50,400	62,000	+ 23
DEE CHAIN	202,000	520,000	+157
DEEP	8,000	8,000	0
DERENZY	4,400	4,000	- 9

APPENDIX I - Continued:

LAKE	1967-71 STOCKING RATE	1975-79 STOCKING RATE	PERCENT CHANGE
DIVIDE	3,200	3,200	0
DOBBIN	0	11,200	--
DUO VIA	0	7,000	--
ECHO	6,200	2,400	- 61
ERN	0	8,400	--
ESPERON	8,400	7,560	- 10
FISH	0	23,800	--
GALLAGHER	42,600	0	--
GARNET VALLEY	112,000	69,000	- 38
GEMMILL	0	6,000	--
GLEN	28,400	16,800	- 41
GLENMORE RES.	58,800	50,000	- 15
GOOSE	35,000	2,800	- 92
GREYBACK	10,000	124,000	+1140
HAYNES	10,800	30,000	+178
HEADWATERS 1	96,400	77,200	- 28
HEADWATERS 2	35,000	42,000	+ 20
HEADWATERS 3	12,600	96,000	+662
HEADWATERS 4	11,600	8,000	- 31
HIGH	1,200	3,600	+200
HOWARD	2,000	11,200	+460
HUDSON BAY	0	2,800	--
HYDRAULIC	24,000	110,000	+358
IDEAL	4,000	10,000	+150
ISINTOK	0	12,000	--

APPENDIX I - Continued:

LAKE	1967-71 STOCKING RATE	1975-79 STOCKING RATE	PERCENT CHANGE
ISLAHT	0	17,200	--
JACKPINE	32,800	52,000	+ 59
LADY KING	18,400	8,000	- 57
LAMBLY	95,434	200,000	+110
LOCH DRINKIE	0	3,560	--
LOST	6,800	3,200	- 53
McCALL	9,700	16,800	+ 73
MACDONALD	1,600	7,200	+350
McLEAN CLAN	2,800	2,600	- 7
MADDEN	31,000	64,000	+106
MINNOW	6,400	12,000	+ 88
MUNRO	12,000	8,000	- 33
NARAMATA	0	2,400	--
NORMAN	4,800	3,200	- 33
OTTER	0	20,000	--
OYAMA	24,000	80,800	+237
PEACHLAND	4,000	22,000	+450
PEAR	4,000	17,600	+340
PINAUS	211,200	540,000	+156
PINAUS, LITTLE	11,200	6,040	- 46
POSTILL	0	4,000	--
RIPLEY	30,930	51,600	+ 67
ROD	8,400	12,000	+ 43
ROSE VALLEY	49,400	82,400	+ 67
SILVER	13,600	37,600	+176

APPENDIX I - Continued:

LAKE	1967-71 STOCKING RATE	1975-79 STOCKING RATE	PERCENT CHANGE
SPRING	36,400	28,000	- 23
SQUARE	12,740	12,800	0
STREAK	0	4,800	--
SWALWELL	251,308	501,200	+ 99
SWAN	252,000	154,000	- 39
TURTLE	0	8,400	--
TWIN	88,000	157,800	+ 79
WHITEHEAD	4,000	20,000	+400
WILMA	10,800	10,000	- 7
TOTALS	2,187,672	3,711,960	69.68% INCREASE

8. APPENDIX II. Number of anglers favouring various regulation options.

LAKE NAME	No. Anglers Interviewed	Complete Motor Ban	10 H.P. Max.	Electric Only	Artificial Flies	Catch and Release	Lower Limit	No Limit	Ice Ban	No Change
Browne	22	4	18	0	9	1	2	0	17	0
Bulman	20	0	17	3	12	0	0	1	8	0
Chute	20	1	11	7	4	0	2	2	2	0
Darke	10	5	2	3	0	0	0	1	7	0
Dee Chain	50	16	14	2	40	0	11	0	18	6
Doreen	20	10	0	0	17	2	0	0	14	9
Headwaters 1	21	0	8	1	10	2	4	0	4	3
Headwaters 3	20	2	13	3	4	1	5	0	8	0
Idabel	20	0	18	0	1	0	2	0	7	0
Idleback	20	10	9	1	11	0	6	1	12	0
Jackpine	20	0	0	18	13	0	0	0	17	0
Lambly	19	0	0	19	6	0	1	2	12	0
Madden	20	1	9	2	4	1	3	0	13	0
McCulloch	20	5	9	1	4	0	0	1	5	1
Minnow	11	4	5	2	6	0	2	0	4	0
Oyama	20	0	17	1	6	0	0	1	6	0
Pear	10	8	1	1	6	0	0	0	2	0
Pinaus	33	1	32	0	15	0	5	0	13	0
Postill	21	1	17	0	2	0	0	3	10	1
Rose Valley	5	2	2	1	2	0	0	0	0	0
Silver	20	13	7	0	12	1	7	0	10	0
South	8	4	0	0	8	0	3	0	7	0
Swalwell	20	20	0	0	1	2	1	0	7	8
Whitehead	21	3	15	3	9	0	3	0	10	0
Yellow	20	1	13	6	7	1	3	0	11	0
Total 25	491	111	237	74	205	11	60	12	224	28