Spring Littoral Index Netting Report
For Otter Lake (Foley Geographical Township)
1999

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Executive Summary:

The status of the lake trout population on Otter Lake was assessed during the spring of 1999 using the Ministry's Provincial standard – *Spring Littoral Index Netting* (SLIN) survey protocol. A total of seven species (lake trout, yellow perch, cisco, northern pike, black crappie white sucker and rainbow smelt) cumulatively weighing 109.8 kilograms were caught in 30 short-duration gillnet sets. Northern pike comprised 57.3% of the catch biomass; cisco 24.3%; lake trout 16.8% and the remaining four species accounted for less than 2%. A total of 10 lake tout were caught in 8 gillnet sets for a 'probability of capture' (percentage of nets that caught any number of lake trout) of 27%. Catch-per-unit-effort (CUE) by number for lake trout was 0.33 ± 0.23 (P<.05) lake trout per net set. Lake trout CUE by weight was 615 grams per net set. These indices point to a low abundance of lake trout on Otter Lake relative to other Parry Sound lake trout lakes as well as 84 lakes in the Provincial database. Five of the 10 lake trout caught were from the 1994 planting. Mean size of lake trout sampled was 1845 grams round weight, total length of 53.5 cm. and fork length of 49.1 centimeters. Conditions (length – weight relationship) of these fish is equivalent to the provincial average. Only one lake trout caught was a natural (non-clipped) fish. The almost total absence of natural fish is a strong indicator of reproductive and /or recruitment failure of lake trout on Otter Lake.

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1.0 Introduction

Otter Lake is a medium size (506 hectares) native lake trout lake in the Parry Sound Area. It is also locally known as Big Otter Lake. It is connected to downstream Little Otter Lake by a narrow passage that was created to facilitate the overhead CPR trestle and a bridge at the site. It is located in the Geographic Township of Foley, now part of the Municipality of Seguin. It is readily accessible by vehicle with numerous public access points. Shoreline development is relatively heavy compared to most Parry Sound Area lakes. A 1993 (OMNR, 1993) inventory of development recorded 298 cottages, 38 year-round residences, 6 commercial establishments (marinas, tourist resorts) and 90 vacant lots.

The fish community is quite varied, consisting of lake trout (*Salvelinus namaycush*), smallmouth bass (*Micropterus dolomieui*), largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), yellow perch (*Perca flavescens*), northern pike (*Esox lucius*), cisco (a.k.a. lake herring) (*Coregonus artedii*), common white sucker (*Catostomus commersoni*), rainbow smelt (*Osmerus mordax*), and pumpkinseed (*Lepomis gibbosus*) (OMNR, 1971). Lake trout are native to the lake (Robson, 1981), however regular biannual plantings of lake trout have occurred from the mid 1950's to present day (OMNR, no date). Maximum depth is 44.8 meters (147 feet) and mean depth 10.8 meters (35 feet).

Water quality is high and quite suitable to support cold-water fish species such as lake trout and cisco. Secchi readings of 5.9 (1971) and 5.5 – 6.5 meters (1989) have been recorded. In 1989, average spring phosphorus was 2.8 µg/l. The Ministry of the Environment ranks this lake as "Level 1" in trophic status – indicating excellent water quality based on low spring phosphorus levels. Late summer optimal lake trout habitat (water with temperature less than 10 ^{o}C. and dissolved oxygen greater than 6 ppm) has been calculated at 33% of total lake volume in 1980 and 44% in 1996. *Mean volume weighted hypolimnetic dissolved oxygen* (MVWHDO) was 8.01 ppm. in 1996 (Can-Tec Resource Management, 1998).

Previous studies to assess lake trout population status were conducted in 1989 (Deary, 1990), 1977 (Thurston, 1977) and 1976 (Thurston, 1976). Lake trout catches were similar for all of these surveys. Collectively they comprised a total of 46 over-night gillnet sets using 'lake survey' gill nets. A total of 44 lake trout were caught of which 16 were natural fish. At the time of these studies there was not a standard Provincial methodology for assessing lake trout lakes. Lake trout abundance seemed to be stable between surveys as they consistently averaged approximately one lake trout per net set. Noteworthy however is the fact that approximately half (16 of 30) of the lake trout caught by Thurston in 1976 and '77 were natural fish, but Deary caught no <u>*natural*</u> lake trout in the 1989 survey. This suggests that *natural* lake trout abundance (and natural recruitment success) was diminishing and being replaced by artificially planted fish by 1989.

Several extraneous bits of creel data are present in Ministry files and reports, but they do little in terms of providing meaningful information on the historical nature of fishing activities on this lake. This is an unfortunate gap in MNR data for this lake.

In an effort to more conclusively establish the status of the lake trout population on this lake, the Provincial standard *Spring Littoral Index Netting* (SLIN) protocol was employed in 1999. Results from this survey assisted the Ministry in its review of fishery regulations on "natural lake trout lakes" which was conducted for the Parry Sound Area in 1999 (OMNR, 1999).

2.0 Methods

Sampling protocol was according to the "*Field Manual For Spring Littoral Index Netting (SLIN) Surveys*" (McKay, 1985), FAU update 94-2 (OMNR, 1994) and subsequent revisions (Lester, 1995). Netting was conducted after ice out and prior to surface temperatures rising to 13 ^{o} Celsius. Three standard SLIN monofilament gillnets were used. All nets were 300 feet in length. One net was comprised of 38-mm (1 ½") mesh size; another 51-mm (2") mesh size and the 3rd 64-mm (2 ½") mesh.

Nets sets were of 90-minute duration. Where possible nets were set perpendicular to shore with an orientation as depicted in Figure 1. Netting sites were randomly selected. They were however 'clustered' on any particular netting day to minimize travel time between sets. Minimum distance between simultaneous net sets was kept to 400 meters to eliminate competition between nets. The shoreline of Otter Lake was sectioned into 394 segments approximately 100 meters in length and numbered sequentially (Appendix E) (One side of the shoreline of the '*Long Arm'* was omitted as it represented habitat identical to the opposite shore). Thirty prospective netting sites and 10 alternate sites were then selected from a table of random numbers to determine set locations. Net set data (date, set number, grid location, mesh size, depth, set duration/time) was recorded for each set (Appendix A).

Complete catch enumeration was conducted for all sets (Appendix B). Standard biosampling data was collected for all lake trout caught (Appendix C). Mean weights were determined for other species caught (Appendix D).

Figure 1 – Map

3.0 Results and Discussion

3.1 Lake Trout Catch and Relative Abundance Indices:

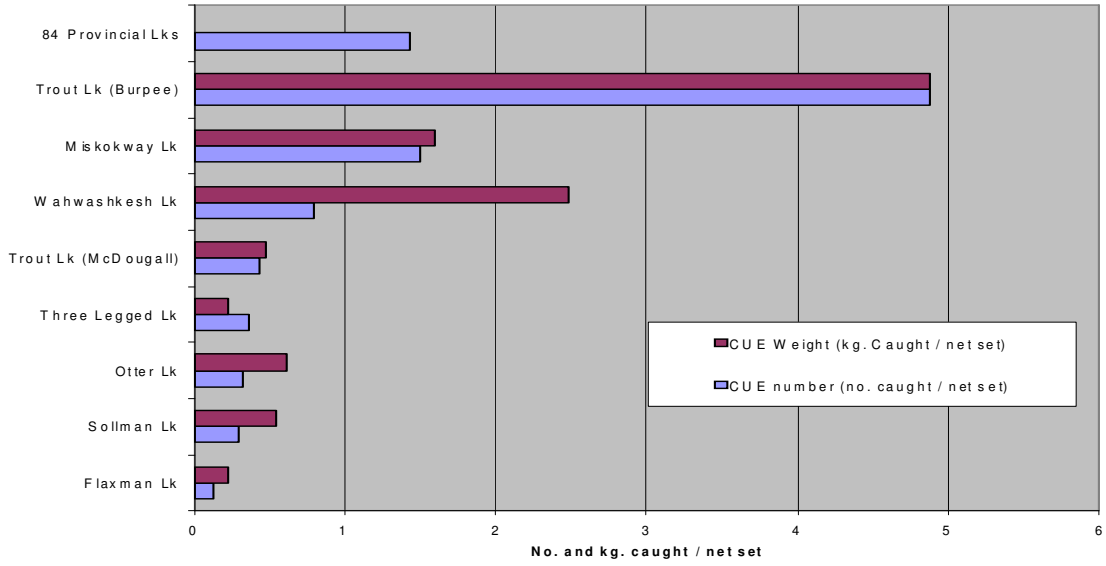
A total of 10 lake trout were caught in 8 of the 30 gill net sets for a 'probability of capture' (percentage of nets that caught any number of lake trout) of 27% (Appendix B).

The catch-per-unit-effort (CUE) by number for lake trout was 0.33 ± 0.23 (P>0.05) lake trout per net set (Appendix B). Lake trout CUE by weight was 615 grams per net set.

Compared to other Parry Sound Area lakes as well as the average CUE for 84 other Provincial lake trout lakes (Figure 2), these are low value CUEs on Otter Lake that are indicative of a low abundance of lake trout. Relative to 84 lakes currently in the Provincial database, Otter Lake's CUE (number) is in the lower 25 percentile (Dosser, 1999). . These relative abundance indices on Otter Lake are similar to other planted lake trout lakes in the Parry Sound Area (Flaxman Lake, Trout Lake – McDougall Tp.)

Due to variation in methodology, it is not possible to objectively compare the CUE from this study with previous studies to assess lake trout population status. In the 1989 survey (Deary, 1990), CUE was 1.27 lake trout per net set (14 lake trout were caught in 11 over-night gillnet sets). In 1977 (Thurston, 1977), the CUE was 1.0 (15 were caught in 15 over-night gillnet sets). And in 1976 (Thurston, 1976), CUE was 0.75 (15 were caught in 15 over-night gillnet sets). Thurston (1977) considered a CUE of 1.0 or higher as indicating "an adequate population of lake trout" and that the lake would continue to be managed for lake trout.

Figure 2. Comparison of lake trout relative abundance indices (catch-per-unit-effort for both number and weight caught per net set) for lakes surveyed using the SLIN methodology in the Parry Sound Area and the Provincial average.



Today's relatively low abundance of lake trout on Otter Lake is in spite of 'fairly regular' biannual plantings that have occurred since 1956 (Parry Sound OMNR stocking records) to the present day. It would appear that these planted fish must have been suffering high mortality rates. The reason(s) for this is unknown. Otter Lake does have seemingly satisfactory water quality for lake trout (Can-Tec Resources, 1998) suggesting that this is probably not the problem. Unfortunately there is next to no creel data available for Otter Lake to indicate fishing quality or angling mortality. Present day, it appears that the lake is lightly fished (McIntyre, 1997). It does not have a reputation for providing quality angling. The apparent lack of survival of stocked fish in this lake seems to demonstrate that repetitive plantings is no guarantee of artificially maintaining a large population and providing quality, artificial angling opportunities.

3.2 Biosampling Data:

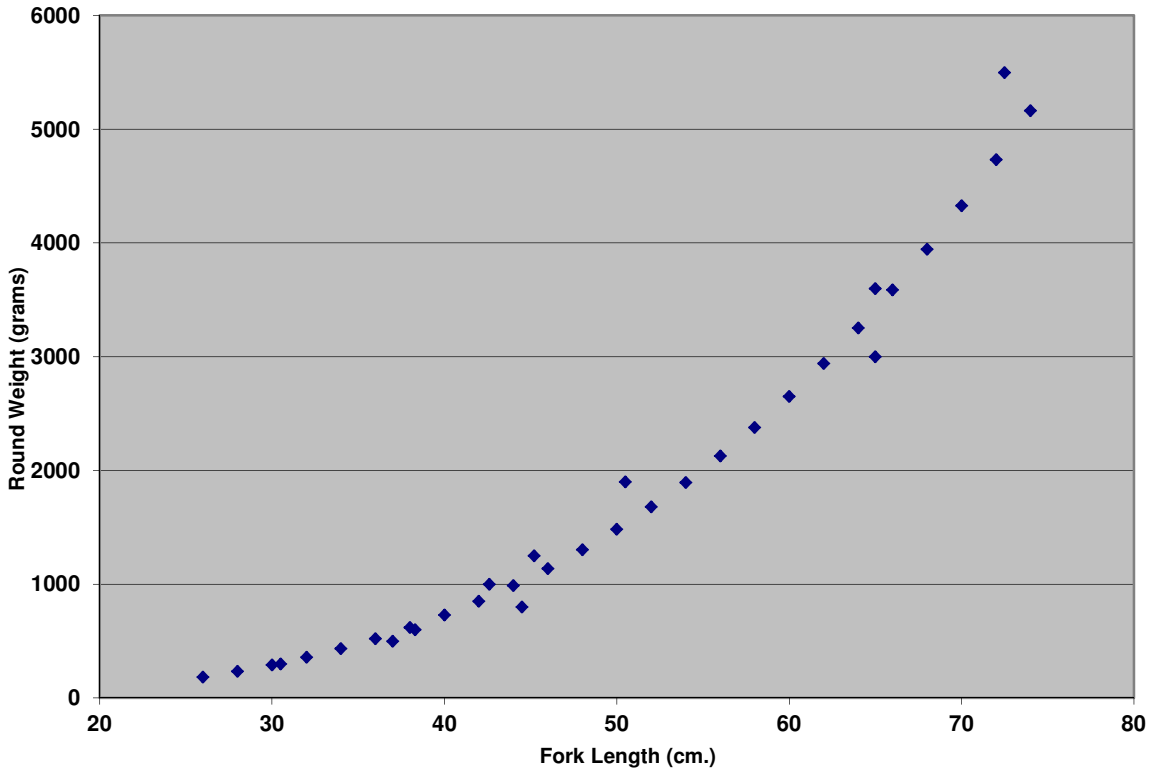
Mean size of lake trout was 1845 grams round weight, total length 53.5 cm. and fork length 49.1 cm. (Appendix C). This mean size is based on a small sample of 10 lake trout. Relative to other lakes in the Provincial database, this *mean size* is in the upper 25% (Dosser, 1999). Although lake trout abundance is low, some planted fish have demonstrated considerable longevity.

The ten fish we observed represented a wide distribution in size of lake trout caught (Figure 3). Five of these fish (ranging from 33.3 – 46.7 cm. total length) were from the 1994 planting (Appendix C) of 3000, LV clipped lake trout. For unknown reasons, this is the only planting which seems to have 'decent' survival. Only one of the ten lake trout observed was a natural fish as indicated by the absence of a fin clip (Appendix C). The almost total absence of natural fish is a strong indicator of reproductive and /or recruitment failure of natural lake trout on Otter Lake. The precise reasons for this are unknown. However, repetitive plantings of non-native lake tout is now considered to have a significant detrimental impact on native lake trout populations (Evans et al, 1991a; Evans et al, 1991b; Olver et al. 1991). To what degree this and other factors are responsible for the almost negligible recruitment of natural lake trout in Otter Lake is unknown.

The relationship between weight and length of a fish is known as '*condition*'. Condition reflects the status or well being of individual fish in a population (Payne et al. 1990). The condition of a fish is dependent both on genetic factors and nutrition (Lester et al. 1991). If the amount (or quality) of food decreases, so will condition. This is reflected in a lower weight of fish relative to its length. Likewise, if food abundance increases so will condition. Therefor, changes in lake trout condition can be expected to change in direct response to population abundance that regulates intraspecific (between lake trout) competition for food.

Payne et al (1990) used data from 23 Ontario lakes to develop the following weight-length standard for Ontario trout lakes: Wt (grams) = 3.88×10^{-6} x Fork length (mm.) $^{3.18}$. This relationship is shown as a solid line in Figure 3 below. Samples from Otter Lake cluster fairly closely both above and below this line, indicating that the condition of these fish is equivalent to the Provincial average. Theoretically, this is somewhat surprising. One would imagine that the low abundance of lake trout and resulting low levels of intraspecific competition would result in an abundance of lake tout food that would contribute to lake trout condition being superior to the Provincial average. Indeed, our catch data (Appendix B) suggest that there is an abundance of lake trout forage in the form of cisco in the lake. Nevertheless, this has seemingly not translated into a more robust condition of lake trout.

Figure 3. Fork Length – Weight relationship of lake trout observed on Otter Lake during the 1999 Spring Littoral Index Netting Survey.



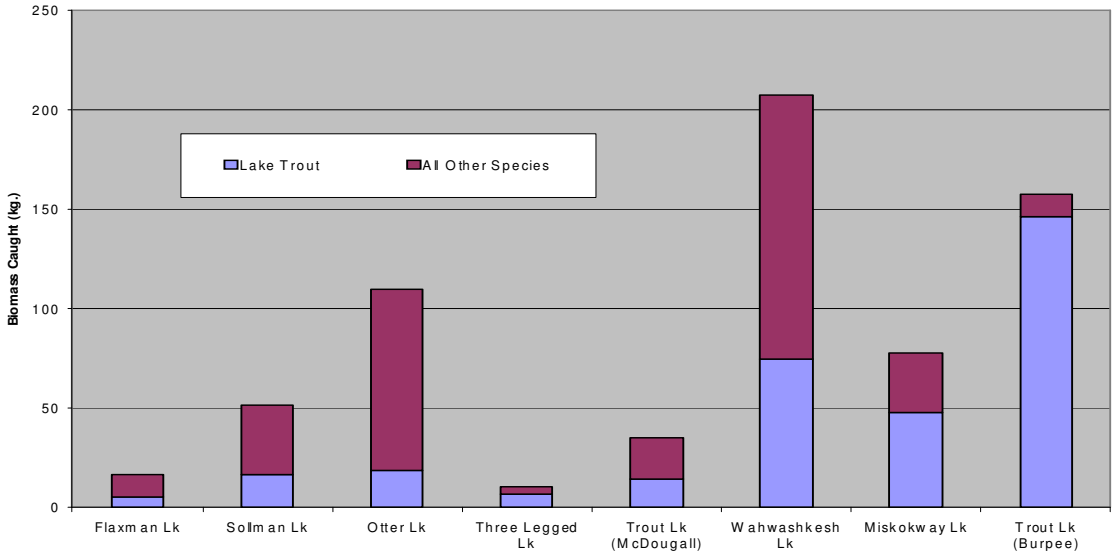
The solid line represents the 'average' length – weight relationship (condition) of lake trout in Ontario (from Payne et al. 1990). Data points that are circled are samples from Otter Lake. A double circle further highlights the single natural lake trout caught.

3.3 Fish Community Implications:

A total of seven species (lake trout, yellow perch, cisco, northern pike, black crappie, white sucker and rainbow smelt), cumulative weighing 109.8 kg. were caught in 30-gill net sets during the survey. The catch biomass was however dominated by three species with northern pike accounting for 57.3%, cisco 24.3% and lake trout 16.8% (Appendix B). The remaining four species accounted for less than 2%.

SLIN nets are intended specifically to target lake trout. However, by the very nature of gill nets other species which contact the gear are susceptible to varying degrees of capture dependent on mesh size and netting material as well as a host of other variables. We present data (Figure 4) on the biomass of all fish species caught as a general indicator of fish productivity. Relative to other lakes in the Parry Sound Area, fish productivity in Otter Lake is good – being surpassed only by Wahashkesh Lake and Trout Lake (Burpee Tp.).

Figure 4. Comparison of lake trout biomass and 'other species' biomass, for lakes in the Parry Sound Area for which SLIN surveys have been conducted.



The high abundance of northern pike in the catch may be a contributing factor to the low abundance of lake trout. Carl et al. (1990) observed that lake trout gillnet CUE (weight) was strongly negatively correlated with the presence of walleye, burbot, northern pike or combinations thereof. It appears that lakes containing these predatory fish have lower lake trout abundance due to predation and/or competition (Carl et al. 1990). This however does not explain the near absence of natural lake trout, as northern pike would prey upon and compete indiscriminately with both natural and planted lake trout.

Coregonines (cisco, round and lake whitefish) and smelt have also been reported to have negative impacts on lake trout populations through predation and competition (Carl et al. 1990). To what degree these species are impacting the Otter Lake lake trout population is unknown. The relative high abundance of cisco in the catch (24% of total biomass; Appendix B) suggest that it may be considerable.

3.0 Recommendations:

During the summer of 1999, the Ministry of Natural Resources proposed a number of fishing regulations changes for 'natural' lake trout lakes in the Parry Sound Area (OMNR, 1999). Public input for Otter Lake clearly demonstrated a desire to continue to manage this lake for a natural, self-sustaining lake trout population. It is therefor recommended that the management objective for Otter Lake be one of rehabilitation. To this end, the following regulatory and management recommendations are made:

- Open season extends from the 3rd Saturday in May to September 30th. (i.e. winter closure to lake trout fishing)

- Protected slot size of 40 – 55 cm. total length (i.e. fish in the slot have to be released). This will further reduce harvest and protect 'spawning size' lake trout that are most vulnerable to angling.

- One line only for winter angling (to reduce hooking mortality of inadvertently caught lake trout).

- Cease all plantings of non-native lake trout.

- Inventory, conclusively identify and evaluate the condition of lake trout spawning sites on Otter Lake. Either the amount of spawning habitat or the condition of such habitat may be a significant factor contributing to reproductive failure of lake trout in Otter Lake. It is planned that this work will be done by underwater investigation in the fall of 2000. Depending on the results of such investigations, additional egg deposition and hatching success studies will be conducted.

- Intensive monitoring of dissolved oxygen / temperature profiles should be conducted for at least the next three years to conclusively assess the status of *optimal lake trout habitat* in Otter Lake under varying annual environmental conditions.

- Contact Cottage Associations and local anglers to obtain creel data on a voluntary basis.

- After a 'rehabilitation period' of 5 – 10 years, re-assess lake trout population by a SLIN survey which duplicates that done in 1999.

5.0 Acknowledgements

Jim Palmer supervised field operations with able assistance from Dean Timson, Dan Murphy and Rollie Fry.

Map preparation was by Rob Viejou, Parry Sound District GIS staff.

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Appendix A

Spring Littoral Index Net Set Data – (Big) Otter Lake (Foley Geo. Tp.), 1999

Date 1999	Set No.	Set Location (Grid No.)	Mesh Size (inches)	Net Depth (meters)			Time Set	Time Lifted	Surface Temp. ^{o} C.
				Near Shore	Mid Depth	Off-Shore			
Apr 19	1	39	1 ½	2.5	11.9	11.6	10:00	11:30	6
Apr 19	2	350	2	2.5	20.1	18.9	10:30	12:00	6
Apr 19	3	344	2 ½	2.5	12.8	12.8	10:45	12:15	6
Apr 19	4	64	1 ½	2.5	13.7	21.3	12:00	13:30	6
Apr 19	5	314	2	2.5	10.7	7.0	12:20	13:50	6
Apr 19	6	232	2 ½	2.5	17.1	6.1	12:50	14:20	6
Secchi reading 4.0 at 9:45 a.m. & 4.5 at 13:00, surface rippled; winds 0 – 10 k; 60 – 75% overcast									
Apr 20	7	54	1 ½	2.5	18.3	25.9	9:30	11:00	7
Apr 20	8	356	2	2.5	16.8	18.3	9:45	11:15	7
Apr 20	9	373	2 ½	2.5	21.3	24.4	10:10	11:40	7
Apr 20	10	386	1 ½	2.5	21.6	27.4	12:20	13:50	7
Apr 20	11	85	2	2.5	16.5	17.7	12:45	14:15	7
Apr 20	12	181	2 ½	2.5	9.4	11.6	13:10	14:40	7
Secchi reading 7.0 m at 09:15, surface calm; no wind; clear									
Apr 21	13	17	2 ½	1.8	7.9	8.2	9:45	11:15	8
Apr 21	14	5	2	2.5	12.5	13.7	10:05	11:35	8
Apr 21	15	264	1 ½	2.5	22.8	22.5	10:20	11:50	8
Apr 21	16	394	1 ½	2.5	9.4	9.1	12:50	14:20	8
Apr 21	17	292	2	2.5	11.3	13.4	13:05	14:35	8
Apr 21	18	242	2 ½	2.5	7.6	9.4	13:20	14:55	8
Secchi reading 4.0 at 09:30 and 5.0 m. at 14:00, surface rippled; winds 2 – 5 k; 70 – 90% overcast									
Apr 22	19	166	2 ½	2.5	5.2	5.8	9:30	11:00	9
Apr 22	20	133	2	2.5	10.4	11.2	9:55	11:25	9
Apr 22	21	111	1 ½	2.5	5.5	5.8	10:10	11:40	9
Apr 22	22	95	2 ½	2.5	10.7	11.2	11:15	12:45	9
Apr 22	23	380	2	2.5	4.6	9.7	12:25	13:55	9
Apr 22	24	215	1 ½	2.5	7.3	4.6	12:40	14:10	9
Secchi reading 5.0 m., 9:30 a.m., surface rippled; winds 10 – 20 k; 60% overcast									
Apr 23	25	138	1 ½	2.5	5.2	5.8	9:45	11:15	
Apr 23	26	191	2	2.5	16.4	20.7	10:30	12:00	
Apr 23	27	74	2 ½	2.5	22.5	24.7	10:50	12:20	
Apr 23	28	390	2 ½	2.5	12.2	21.9	12:40	14:10	
Apr 23	29	30	2	2.5	11.6	12.5	13:10	14:40	
Apr 23	30	20	1 ½	2.5	4.0	5.5	13:20	14:50	
Secchi reading 4.5 at 09:20, surface wavy; wind gusty 8 – 20 k.; 60 – 80% overcast									

Appendix B Catch Record Summary , Otter Lake, Spring Littoral Index Netting Survey, 1999.

Set Number	Catch						
	Lake Trout	Y. Perch	Cisco	N. Pike	Bl. Crappie	Wt. Sucker	Smelt
1	1	0	0	0	0	0	0
2	0	0	1	0	0	0	0
3	0	0	0	1	0	0	0
4	0	0	24	2	0	1	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	1	0	182	1	0	0	0
8	1	0	1	1	0	0	0
9	0	0	0	1	0	0	0
10	2	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0
13	0	0	0	2	0	0	0
14	0	0	1	1	3	2	1
15	0	0	125	1	0	0	3
16	0	0	0	1	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0
20	0	0	0	2	0	0	0
21	0	0	0	2	0	0	0
22	0	0	0	6	0	0	0
23	0	0	0	2	0	0	0
24	0	0	0	1	0	0	0
25	0	1	0	0	0	0	0
26	2	0	0	0	0	0	0
27	1	0	0	1	0	1	0
28	0	0	0	4	0	0	0
29	1	0	0	0	0	0	2
30	1	1	0	2	0	0	2
Total No. Caught	10	2	334	31	3	4	8
Mean	0.3333333	0.0666667	11.133333	1.03333333	0.1	0.1333333	0.266667
95% Conf. Interval	0.2264629	0.0947362	14.80847	0.50464272	0.20452308	0.1621228	0.276201
Standard Error	0.1107273	0.0463206	7.2404885	0.24674121	0.1	0.0792687	0.135046
Standard Deviation	0.6064784	0.2537081	39.657789	1.35145728	0.54772256	0.4341725	0.73968
Sample Variance	0.3678161	0.0643678	1572.7402	1.82643678	0.3	0.1885057	0.547126
From Appendix D:							
Mean Wt. (gr)	1845	60	80	2030	50	306	33
Total Biomass (kg.)	18.45	0.12	26.7	62.93	0.15	1.22	0.26
% of tot. biomass	16.80%	< 0.1%	24.30%	57.30%	< 0.1%	1.10%	0.18%

catch of 109.83 kg.

Appendix C

Lake Trout Biosampling Data - Otter Lake (Foley Geo. Twp.) Spring Littoral In 1999.

Set Number	Round Wt. (grams)	Total Lg. (cm.)	Fork Lg. (cm.)	Fin Clip	Calculated Age
1	3000	71	65	LP	16+ (probably 1984 planting)
7	1900	54.4	50.5	RV	8+ (1992 planting)
8	1250	50.1	45.2	Nil	
10	600	41.4	38.3	LV	6+ (1994 planting)
10	1000	46.7	42.6	LV	6+ (1994 planting)
26	500	39.1	37	LV	6+ (1994 planting)
26	800	49.5	44.5	LV	6+ (1994 planting)
27	300	33.3	30.5	LV	6+ (1994 planting)
29	5500	78.2	72.5	RV	18+ (probably 1982 planting)
30	3600	71.2	65	Ad	13 or 14+ (probably 1987 or 88 planting)
Summary Stats					
Mean	1845	53.49	49.11		
95% Conf. Interval	1208.421	10.83857	9.954553		
Standard Error	534.1894	4.791252	4.400466		
Standard Deviation	1689.255	15.15127	13.91549		
Sum	18450				

Appendix D

Other Species' Biosampling Data - Otter Lake Spring Littoral Index Netting Survey, 1999.

Species	Round Wt. (grams)	Total Length (cm.)	Fork Length (cm.)
Northern Pike	2000	65	61
Northern Pike	2000	68	64.5
Northern Pike	2500	70	66.5
Northern Pike	1000	51.8	48.8
Northern Pike	2500	74.1	70
Northern Pike	2600	76.3	71
Northern Pike	2100	71.1	67.5
Northern Pike	1000	53.3	50
Northern Pike	3200	81.5	77
Northern Pike	2300	71.1	68
Northern Pike	800	51	48.5
Northern Pike	3200	78	73
Northern Pike	2300	73.2	68.6
Northern Pike	2400	72.9	68.6
Northern Pike	700	46.6	43.7
Northern Pike	3700	83	79.2
Northern Pike	3200	73.5	69.3
Northern Pike	1700	66	62
Northern Pike	900	51.9	48.4
Northern Pike	1100	55.2	52.5
Northern Pike	1600	62.4	58.6
Northern Pike	2600	74	69.6
Northern Pike	1900	70	66
Northern Pike	550	47.3	44.4
Northern Pike	3600	82	77.5
Northern Pike	2100	69	65
Northern Pike	1100	57.2	53.7
Northern Pike	1600	64.7	60.5
Northern Pike	1500	64.5	60.7
Northern Pike	2800	74.2	70.2
Northern Pike	2400	70.5	66.2
Mean	2030.645161	66.7516129	62.91935484
95% Conf. Interval	320.1452382	3.795663859	3.610989884
Sum	62950		
Count	31	31	31

White Sucker	400		
White Sucker	100		
White Sucker	300		
White Sucker	425		
Mean	306.25		
Sum	1225		

Appendix D Continued

Black Crappie	50
Black Crappie	50
Black Crappie	50
Mean	50
Sum	150

Rainbow Smelt	40
Rainbow Smelt	40
Rainbow Smelt	20
Mean	33
Sum	100

Yellow perch	10
Yellow perch	50
Mean	30
Sum	60

Cisco	100
Cisco	50
Cisco	100
Cisco	70
Cisco	75
Mean	80
Sum	395