Results of a Broad-scale Monitoring Survey Conducted on Isabella Lake in 2011

File Report

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Isabella Lake is located in Christie Township, Parry Sound District. The lake has an approximate surface area of 179 hectares with a mean depth of 5.9 meters. The maximum depth of the lake is 14.6 meters. Water clarity is low with a mean secchi disk reading of 3 meters (Lake Fact Sheet, 2012). The lake is accessed via a public boat launch located at 170 Isabella Lake Road. The water level on the lake is not regulated and there are two major inflows, the Seguin River enters the lake from the east and the Little Seguin River from the south.

Isabella Lake has had a long history of fisheries management. Prior to 1960, the lake was reported to have an exceptional walleye fishery. In the latter half of the 1900's to present day, however, the walleye fishery has experienced a decline and is considered mediocre at best. This has led to many fisheries assessments and studies being conducted on the lake.

The decline of the walleye fishery has been attributed to many factors including low pH at spawning sites, high abundance of smallmouth bass and average abundance of northern pike as well as low dissolved oxygen throughout the thermocline (Lake Fact Sheet, 2012).

A survey completed between 1978 and 1980 investigated the downfall of the walleye fishery in Isabella Lake. It was concluded that one of the main spawning shoals (Seguin River inflow) had likely become too acidic for walleye reproduction (Kujala, 1981). As a result, walleye were left to spawn on the Duck Chutes shoal (the only other identified spawning shoal on the lake). Shoal enhancement was conducted at the Duck Chutes shoal including silt removal, placement of rubble and limestone, dredging and an increase to the size of the spawning bed to 200 square meters (Kujala, 1981).

A walleye trap net/gillnet survey done in 1983, post egg stocking (1978/79) and shoal enhancement work, indicated poor natural recruitment in the lake (Hoyle, 1983). The survey found walleye comprised of the greatest biomass of any species caught, however, the average age of walleye caught was 7.9 years with all but three fish being greater than 7 years of age (Hoyle, 1983). As a result it was concluded that the lake had very poor walleye recruitment.

Furthermore, a trap net survey conducted in 1998 by Blythe and Associates found that the lakes species composition had changed when compared to the 1983 trap net survey data. Ranked by biomass, white sucker represented the largest proportion of biomass caught (38.4%) followed by smallmouth bass (27.4%), northern pike (23.6%), rock bass (4.0%) and finally walleye (3.4%) (Blythe and Associates, 1998). This indicates a large decline in walleye in the lake as other species become more established.

Finally, a Fall Walleye Index Netting (FWIN) survey was completed in 2001 (unreported file data). The results for walleye were similar to previous surveys in that the catch was relatively low and the average size was large.

Walleye stocking was done in hope of enhancing the naturally reproducing walleye population in the lake (Table 1). Early on, however, there were little returns from any stocking programs. Stocking of walleye and smallmouth bass began in 1939 and continued periodically until 1995. In 2000, rainbow trout were stocked into the lake on a put-grow-take basis. Walleye were again stocked in 2011, this time on a trial put-grow-take basis with 10,000 walleye fingerlings being stocked.

The fish community is currently made up of the game fish species walleye, smallmouth bass, largemouth bass, northern pike and yellow perch. Rainbow smelt, white sucker, log perch, rock bass, pumpkinseed, brown bullhead, trout-perch, and blacknose shiner also inhabit the lake. The invasive species spiny water flea has also been reported in the lake since 1993.

A Broad-scale Monitoring Survey was completed by members of Laurentian University in 2011. The purpose of the survey was to collect data to study the effects of climate change on the

interactions between walleye and smallmouth bass. The data was provided to MNR and is summarized in this report.

Table 1 History of walleye stocking in Isabella Lake.

Year	Number of Fish	Type
2011	10000	fingerlings
1995	14053	fingerlings
1988	10370	fingerlings
1979	2000000	eyed eggs
1955	150000	eyed eggs
1953	300000	eyed eggs
1952	200000	eyed eggs
1951	200000	eyed eggs
1949	200000	eyed eggs
1948	200000	fry
1947	210000	fry
1944	200000	eyed eggs
1943	100000	fry
1941	100000	fry
1940	300000	fry
1939	300000	fry

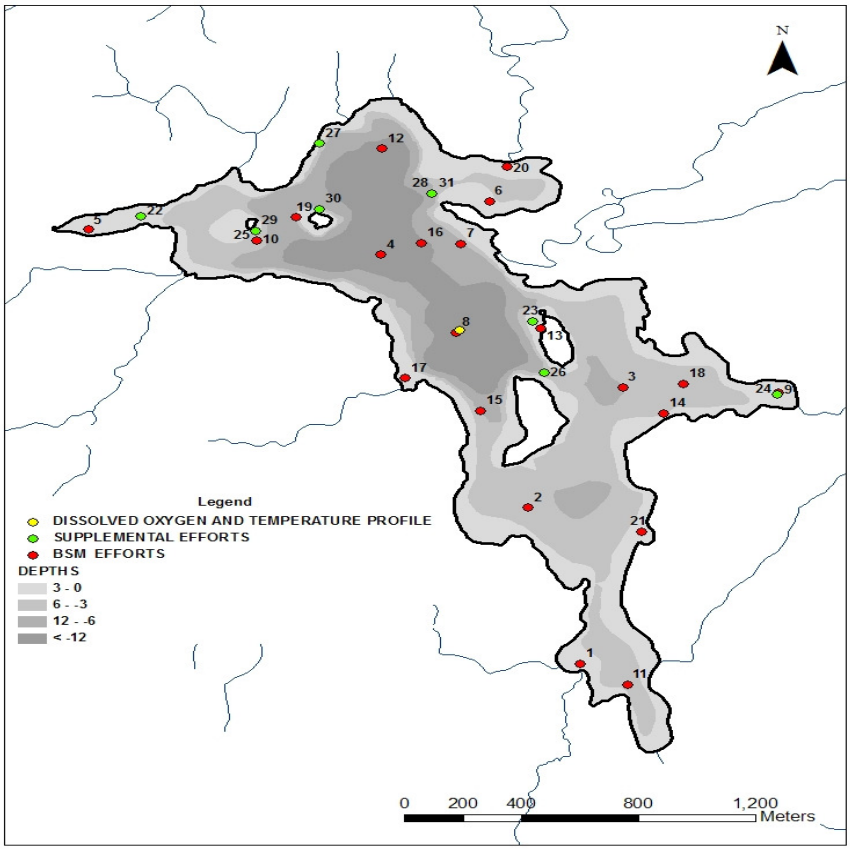


Figure 1 Location of BsM net sets and dissolved oxygen/temperature profile on Isabella Lake, Christie Township, July 08-12/2011.

Methods

The Broad-scale Monitoring protocol was followed (Lester et al., 2010). Gear consisted of large mesh (NA-1) and small mesh (ON-2) gill nets. The large mesh gill nets target fish larger than 20cm in length, typically the size range of interest to anglers. The net has a length of 24.8 m consisting of 8 panels per gang which are 1.8 meters high. Two gangs are generally attached to one another to equal one strap. The mesh sizes, in inches, are 1.50", 2.00", 2.50", 3.00", 3.50", 4.00", 4.50" and 5.00". The small mesh gill nets target smaller fish and are intended to detect the presence of other species in the lake. It has a length of 12.5m consisting of 5 panels and is 1.8m high. Its stretch mesh sizes, also in inches, are 0.50", 0.75", 1.00", 1.25" and 1.50" (Lester et al., 2010).

Nets were set between July 08, 2011 and July 12, 2011. Initially, the amount of nets and allocation to depth stratum were done according to Broad-scale Monitoring protocol, however, supplemental efforts were added to meet target levels for contaminant samples required for the project. Efforts were allocated over the depth strata 1-3, 3-6, 6-12 and 12-20 meters. Nets were set overnight between the time frame of 16-22 hours.

The supplemental efforts were set at non-random locations to target walleye, northern pike and smallmouth bass. Only large mesh nets were used. Efforts were allocated over the depth strata 1-3, 3-6, 6-12 and 12-20 meters. Nets were set at varying time frames between 4 and 22 hours.

The fork length was measured for all captured fish. Walleye, northern pike and smallmouth bass were subjected to full sampling, including length, weight, gender, gonad condition, stomach contents and tissues for contaminant analysis. Walleye and smallmouth bass had a variety of aging structures collected including spines, scales and otoliths. The cleithrum was removed for aging from all northern pike.

Temperature-dissolved oxygen profiles were collected to determine how the lake was thermally stratified and the availability of oxygen.

Results

Standard Broad-scale netting efforts occurred on July 8th, 9th and 10th. A total of 21 sets were completed of which 6 were in the 1-3 meter strata, 6 in the 3-6 meter strata, 5 in the 6-12 meter strata and 4 in the 12-20 meter strata (Figure 1, Table 2). Eleven were large mesh sets and 10 were small mesh sets.

The catch summary for the Broad-scale efforts (Table 3) is as follows: 11 walleye, 3 northern pike, 14 white sucker, 19 smallmouth bass, 14 rock bass, 1 cisco, 1 largemouth bass, 3 rainbow smelt, 9 blacknose shiner, 6 pumpkinseed, 71 yellow perch and 2 trout perch. Two species not previously documented in the lake were caught; blacknose shiner and trout-perch. Both are probably native to the lake.

Table 2 Net set details, Isabella Lake, 2011.

Effort	Easting	Northing	Set Date	Set Time	Lift Date	Lift Time	Gear	Total Gangs	Stratum	Depth Start	Depth Mid	Depth End
1	593249	5027224	08/07/2011	6:23:00 PM	09/07/2011	9:50:00 AM	1	2	01 - 03 m	1.0	1.8	1.7
2	593071	5027937	08/07/2011	6:31:00 PM	09/07/2011	10:12:00 AM	1	2	03 - 06 m	6.0	5.4	4.5
3	593393	5028486	08/07/2011	7:14:00 PM	09/07/2011	11:34:00 AM	1	2	06 - 12 m	7.5	7.7	7.4
4	592566	5029092	08/07/2011	6:41:00 PM	09/07/2011	10:45:00 AM	1	2	12 - 20 m	14.0	14.0	14.0
5	591564	5029210	08/07/2011	6:49:00 PM	09/07/2011	10:56:00 AM	2	2	01 - 03 m	2.1	2.6	3.0
6	592939	5029336	08/07/2011	7:03:00 PM	09/07/2011	11:14:00 AM	2	2	03 - 06 m	3.2	4.0	4.3
7	592841	5029143	09/07/2011	2:05:00 PM	10/07/2011	9:47:00 AM	2	2	06 - 12 m	6.1	10.0	12.0
8	592825	5028738	09/07/2011	2:11:00 PM	10/07/2011	9:59:00 AM	2	2	12 - 20 m	16.0	15.0	15.0
9	593928	5028461	09/07/2011	2:50:00 PM	10/07/2011	10:18:00 AM	1	2	01 - 03 m	1.0	2.5	3.1
10	592140	5029157	09/07/2011	3:26:00 PM	10/07/2011	11:15:00 AM	1	2	03 - 06 m	6.1	4.8	5.8
11	593411	5027129	09/07/2011	2:33:00 PM	10/07/2011	10:07:00 AM	1	2	06 - 12 m	6.0	7.8	8.4
12	592570	5029576	09/07/2011	3:15:00 PM	10/07/2011	11:09:00 AM	1	2	12 - 20 m	14.0	15.0	15.0
13	593114	5028755	09/07/2011	3:43:00 PM	10/07/2011	11:29:00 AM	2	2	01 - 03 m	2.0	2.5	2.8
14	593533	5028368	09/07/2011	2:58:00 PM	10/07/2011	10:54:00 AM	2	2	03 - 06 m	4.5	5.5	6.1
15	592908	5028380	10/07/2011	2:40:00 PM	11/07/2011	9:31:00 AM	2	2	06 - 12 m	11.0	9.9	8.8
16	592704	5029146	10/07/2011	2:58:00 PM	11/07/2011	9:58:00 AM	2	2	12 - 20 m	13.0	14.0	14.0
17	592648	5028528	10/07/2011	2:48:00 PM	11/07/2011	9:42:00 AM	1	2	01 - 03 m	1.0	2.4	1.0
18	593602	5028504	10/07/2011	3:42:00 PM	11/07/2011	11:07:00 AM	1	2	03 - 06 m	5.4	5.7	5.2
19	592277	5029263	10/07/2011	3:10:00 PM	11/07/2011	10:08:00 AM	1	2	06 - 12 m	10.0	6.4	11.0
20	592997	5029494	11/07/2011	3:20:00 PM	12/07/2011	10:46:00 AM	2	2	01 - 03 m	2.2	2.3	2.3
21	593459	5027827	11/07/2011	2:28:00 PM	12/07/2011	9:11:00 AM	2	2	03 - 06 m	3.1	4.6	4.6

Table 3 Catch Summary (BSM), gear type, Isabella Lake, 2011.

Species	Large	Small	Total
Walleye	8	3	11
Northern Pike	3	0	3
White Sucker	14	0	14
Smallmouth Bass	16	3	19
Rock Bass	10	4	14
Largemouth Bass	1	0	1
Cisco	0	1	1
Rainbow Smelt	0	3	3
Blacknose Shiner	0	9	9
Pumpkinseed	4	2	6
Yellow Perch	3	68	71
Trout Perch	0	2	2
Total	59	95	154

Supplemental efforts were completed on July 11th and 12th. These consisted of 10 large mesh nets set at non-random locations in depth strata 3-6m and 6-12m targeting specific species including northern pike, smallmouth bass and walleye (Table 4).

Table 4 Supplemental net set details, Isabella Lake, 2011.

Effort	Easting	Northing	Set Date	Set Time	Lift Date	Lift Time	Gear	Total Gangs	Stratum	Depth Start	Depth End
22	591745	5029267	11/07/2011	3:26:00 PM	12/07/2011	11:29:00 AM	1	2	03 - 06 m	3.2	4.2
23	593086	5028789	11/07/2011	3:35:00 PM	12/07/2011	11:49:00 AM	1	2	03 - 06 m	3.5	11.0
24	593923	5028455	12/07/2011	11:22:00 AM	13/07/2011	9:12:00 AM	1	2	03 - 06 m	3.0	3.3
25	592137	5029202	12/07/2011	11:43:00 AM	12/07/2011	3:50:00 PM	1	2	06 - 12 m	4.8	12.0
26	593124	5028555	12/07/2011	12:13:00 PM	13/07/2011	9:22:00 AM	1	2	06 - 12 m	6.6	8.3
27	592354	5029601	12/07/2011	12:20:00 PM	12/07/2011	4:00:00 PM	1	2	06 - 12 m	4.2	14.0
28	592742	5029373	12/07/2011	12:26:00 PM	12/07/2011	4:12:00 PM	1	2	03 - 06 m	3.7	7.6
29	592137	5029202	12/07/2011	3:56:00 PM	13/07/2011	10:29:00 AM	1	2	06 - 12 m	5.7	9.7
30	592354	5029301	12/07/2011	4:10:00 PM	13/07/2011	10:14:00 AM	1	2	03 - 06 m	2.5	14.0
31	592742	5029373	12/07/2011	4:21:00 PM	13/07/2011	9:56:00 AM	1	2	03 - 06 m	2.7	4.7

The catch was as follows: 12 walleye, 11 northern pike. 9 white suckers, 11 smallmouth bass and 6 rock bass (Table 5).

Table 5 Catch Summary (supplemental efforts) Isabella Lake, 2011.

Species	Large	Total
Walleye	12	12
Northern Pike	11	11
White Sucker	9	9
Smallmouth Bass	11	11
Rock Bass	6	6
Total	49	49

The 11 standard double-gang Broad-scale Monitoring net sets yielded 8 walleye or a catch-per-unit-effort (CUE) of 0.39 (S.E.: 0.29) walleye per gang (Table 6).

Table 6 Catch per unit effort of walleye from large mesh gill nets, by stratum and area-weighted strata combined, Isabella Lake, 2011.

Stratum	Area (ha)	Area (p)	Number of Nets	mean	S.E.
1-3	35.4	0.22	3	0.50	0.50
3-6	63.4	0.40	3	0.67	0.67
6-12	14.6	0.09	3	0.17	0.17
12-20	47.1	0.29	2	0.00	0.00
Total	160.5	1.00	11	0.39	0.29

The walleye population was comprised of a well distributed range of sizes (and probably ages), despite the small sample size (Figure 2). Fork lengths ranged between 213mm and 676mm with an average of 360mm.

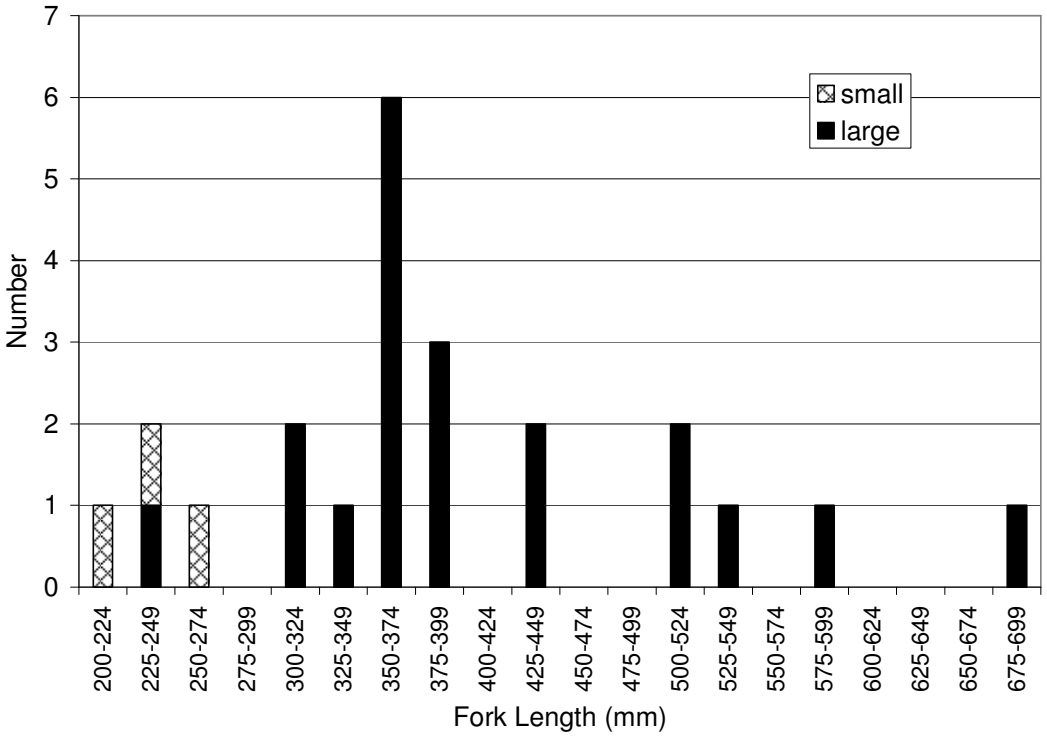


Figure 2 Fork length distribution of walleye, by gear, Broad-scale Monitoring survey, Isabella Lake, 2011.

The lake was thermally stratified at the time of sampling, with the thermocline occurring from about 3 to 7 m deep. The dissolved oxygen levels declined in the thermocline then recovered somewhat in the upper hypolimnion before declining to low levels near the bottom (Figure 3).

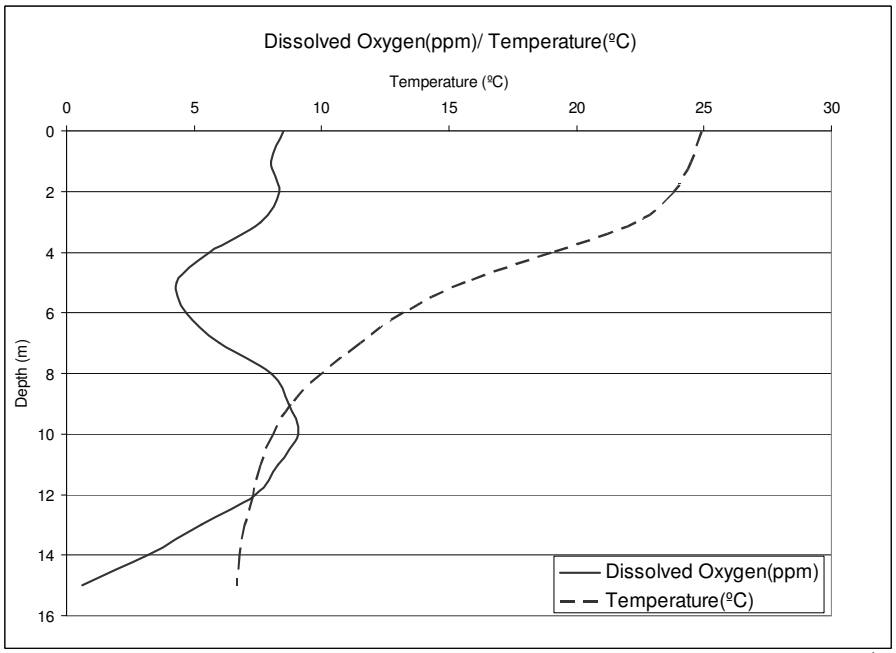


Figure 3 Dissolved oxygen and temperature profile from Isabella Lake, July 9th 2011.

Discussion

The netting done following the BsM protocol provides a good indication of the overall composition of the fish community, including walleye abundance, and the supplemental net sets increased the sample size of walleye, allowing a better interpretation of the walleye population structure.

Walleye were last stocked into Isabella Lake in 2011 as fry and in 1995 as fingerlings. The walleye stocked in 2011 would not have been catchable by Broad-scale gear and as a result any juvenile or small walleye caught in the survey are likely a result of natural reproduction. Some of the largest walleye may be a result of the 1995 stocking, but most adults are probably a result of natural reproduction as well.

Walleye abundance was relatively low compared to other lakes in FMZ 15 which have been sampled by the BsM protocol (Figure 4). This result is consistent with past FWIN and trap net assessments.

However, the size structure appeared relatively healthy with a balance of small and large fish. This contrasts somewhat with past assessments which have found a population dominated by larger, older fish. Some of the difference can be attributed to the use of small mesh gill nets in 2011 which caught several walleye less than 30 cm long; sizes that are less vulnerable to FWIN and especially trap net gear. The smallest walleye caught in the FWIN survey was about 45 cm, whereas a substantial portion of catch was between 30 and 45 cm in 2011, indicating that a real shift in the structure of the population has occurred. The change in size structure may be a cyclical event as large and small year classes enter and leave the population as no major changes to the lake environment or fish community have occurred that appear likely to greatly impact the walleye population.

It is difficult to speculate on the causes of the changes in the walleye population that have occurred, particularly the decline that occurred in the 1960's and 1970's, given the sporadic nature of assessments and the amount of time that has passed. Kujula (1981) attributed the decline to acidic conditions at the primary spawning area on the Seguin River, however, the continued low abundance despite recovery of pH since that time suggests other factors are at play. Rainbow smelt were first documented in the 1971 survey and, though the exact year of first occurrence isn't known, it was around that same time that the decline in walleye was observed. Smelt have been implicated in the decline in recruitment of several species including walleye (Kerr and Grant 2000) and the lack of recruitment observed in past assessments is consistent with interactions with smelt. We have no reliable information on the size of the smelt population over time but on a landscape scale smelt populations appear to have declined in recent years. The presence of young walleye in the catch is an encouraging sign that if smelt have had a major impact on the walleye population, that their influence may be waning.

Otherwise, although it hasn't changed drastically in recent years, the overall complexity of the fish community probably limits the potential size of the walleye population. Three species of bass, northern pike and smelt all potentially compete with and prey on walleye to greater or lesser degrees with the overall species composition influenced by the suitability of the habitat for each species.

A notable characteristic of the habitat of Isabella Lake that may affect walleye is the dissolved oxygen profile. A profile was measured on July 9th 2011 (Figure 4). Oxygen levels show acceptable amounts needed for walleye as levels are 5ppm (optimal level required by all life stages of walleye) or greater throughout habitat used by walleye (Morgan et al., 2003). However, at the end of the summer a second dissolved oxygen sample was taken. This sample showed a severe oxygen deficiency throughout the thermocline with levels dropping to 0.8ppm around 6 meters. This decrease in available oxygen could severely limit the abundance and success of walleye in the lake. The low oxygen levels would likely displace walleye and other species into

shallower waters where oxygen levels are higher. This would result in increased interactions between walleye and other species which could include competition for food and depredation on walleye than might otherwise be expected.

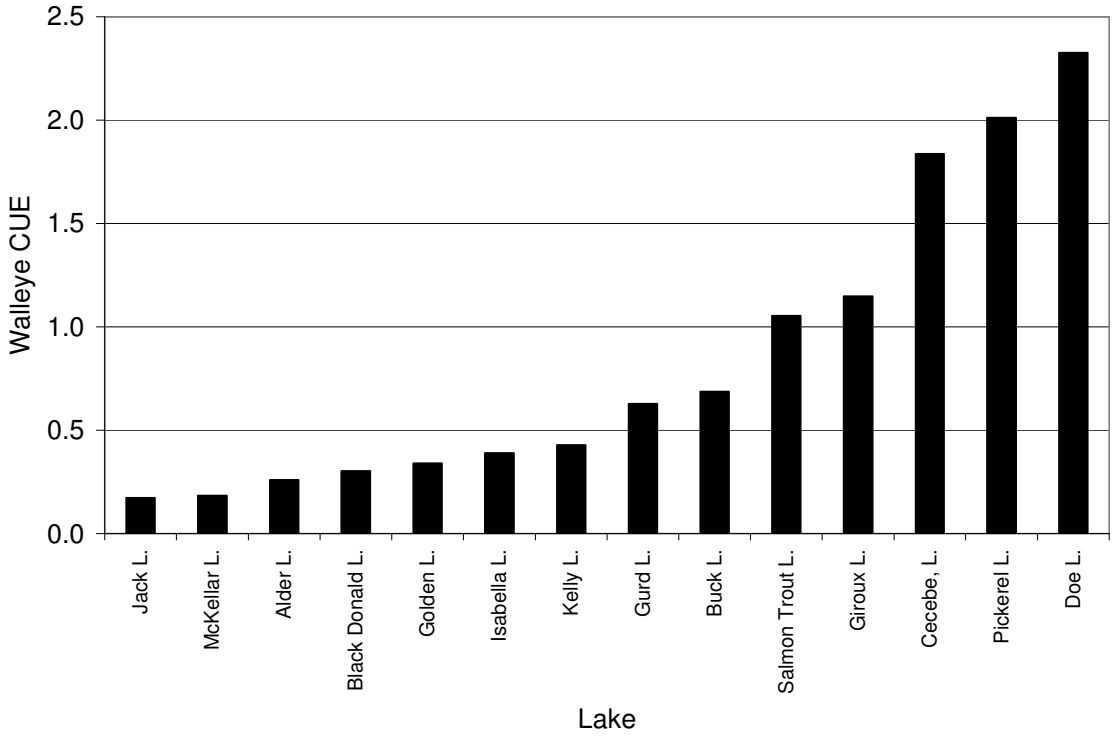


Figure 4 Comparison of CUE of walleye in Isabella Lake to other lakes in Fisheries Management Zone 15 where walleye was the target species sampled between 2008 and 2012 (provisional data).

In summary, the walleye population of Isabella Lake is at a low level of abundance, but has a relatively healthy population structure. The habitat for walleye seems good, with low water clarity and suitable river spawning locations. The low abundance is probably a result of interactions with a diverse fish community possibly exacerbated by seasonally low oxygen levels in the thermocline. Options are to manage for a self-sustaining population and accept the low abundance as the natural capacity of the lake to support walleye. Alternatively, given the low abundance and low potential for major improvement naturally, the lake could be stocked on a put grow take basis. The success of the 2011 trial stocking should be assessed to determine if reasonable returns of stocked fish can be obtained. Given the small life stage stocked, the likelihood is probably low. The netting in 2011 will provide a fortuitous opportunity to assess the population before and after stocking.

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