Ontario

Fisheries Management Plan for Fisheries Management Zone 17: 2010-2020

DRAFT for Discussion Purposes

2.0 Walleye Management Strategy

Peterborough, Aurora and Bancroft Districts

Ministry of Natural Resources

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2.0 WALLEYE MANAGEMENT STRATEGY

2.1. Population Trends and Information

An extensive amount of data has been collected on lakes in FMZ 17. The Kawartha Lakes Fisheries Assessment Unit (KLFAU) was established in the mid 1970s and implemented a rigorous monitoring program on Balsam, Buckhorn, Rice and Scugog Lakes, which collectively represent nearly 50% of the total lake surface area in FMZ 17. Other lakes have been assessed as part of regular duties of the MNR district offices, by partners and as specific projects.

Different netting techniques have been used through the years for a variety of purposes. The MNR utilizes Fall Walleye Index Netting (FWIN) as a provincial standard gill net assessment method for walleye populations. The KLFAU routinely conducts FWIN assessments on Balsam, Buckhorn, Rice and Lake Scugog. Periodic FWIN assessments have occurred, primarily as a part of the Southern Region Walleye State of the Resource project in 1999-2001, on Crowe, Belmont, Chemung, Pigeon, Four Mile, Dalrymple, Cameron, Sandy and Sturgeon Lakes. The End-of-Spring Trap Netting (ESTN) survey developed as a live-release walleye survey. ESTN surveys have been conducted on Balsam, Buckhorn, Chemung, Crowe, Pigeon, Rice, Scugog, Stony and Clear Lakes.

Based on recent netting surveys in FMZ 17 (Figure 2.1), Rice Lake had the highest catch rates (defined by catch per unit of effort (CUE)) and largest average size in the FWIN surveys among the lakes in FMZ 17. The CUE in FWIN surveys for fish greater than 45 cm was considerably higher on Rice Lake than the other FMZ 17 lakes, but has declined since the 1999 FWIN survey. Lake Scugog and Sandy Lake also had relatively high catch rates with walleye having a small average size on these lakes. Chemung, Pigeon and Buckhorn Lakes had a low CUE with a relatively high average size of walleye in both ESTN and FWIN surveys. The absence of small walleye in these surveys indicates low recruitment in these lakes.

A number of key pieces of information on walleye populations can be determined using FWIN data. Some, such as the number of age classes and maximum age, provide information relating to recruitment trends and survival rates. Generally, the higher number of age classes and maximum age are indicative of populations with successful recruitment and high adult survival. The abundance of females greater than 450 mm and the Spawner Diversity Index, provide a measure of the adult female spawning population – a critical factor in sustaining naturally reproducing walleye populations. With the exception of Rice and Four Mile Lakes, the CUE of walleye greater than 450 mm was less than one per net, below the average for Southern Ontario. The low abundance of large, old fish observed in most surveys is consistent with unhealthy walleye populations. The low CUE of fish less than 300 mm indicates potential recruitment issues on a number of lakes, but may also be attributed to rapid growth rates of small walleye. The biggest cause for concern is the low abundance of large fish, particularly mature females in the catch from most of the lakes (excluding Rice Lake).

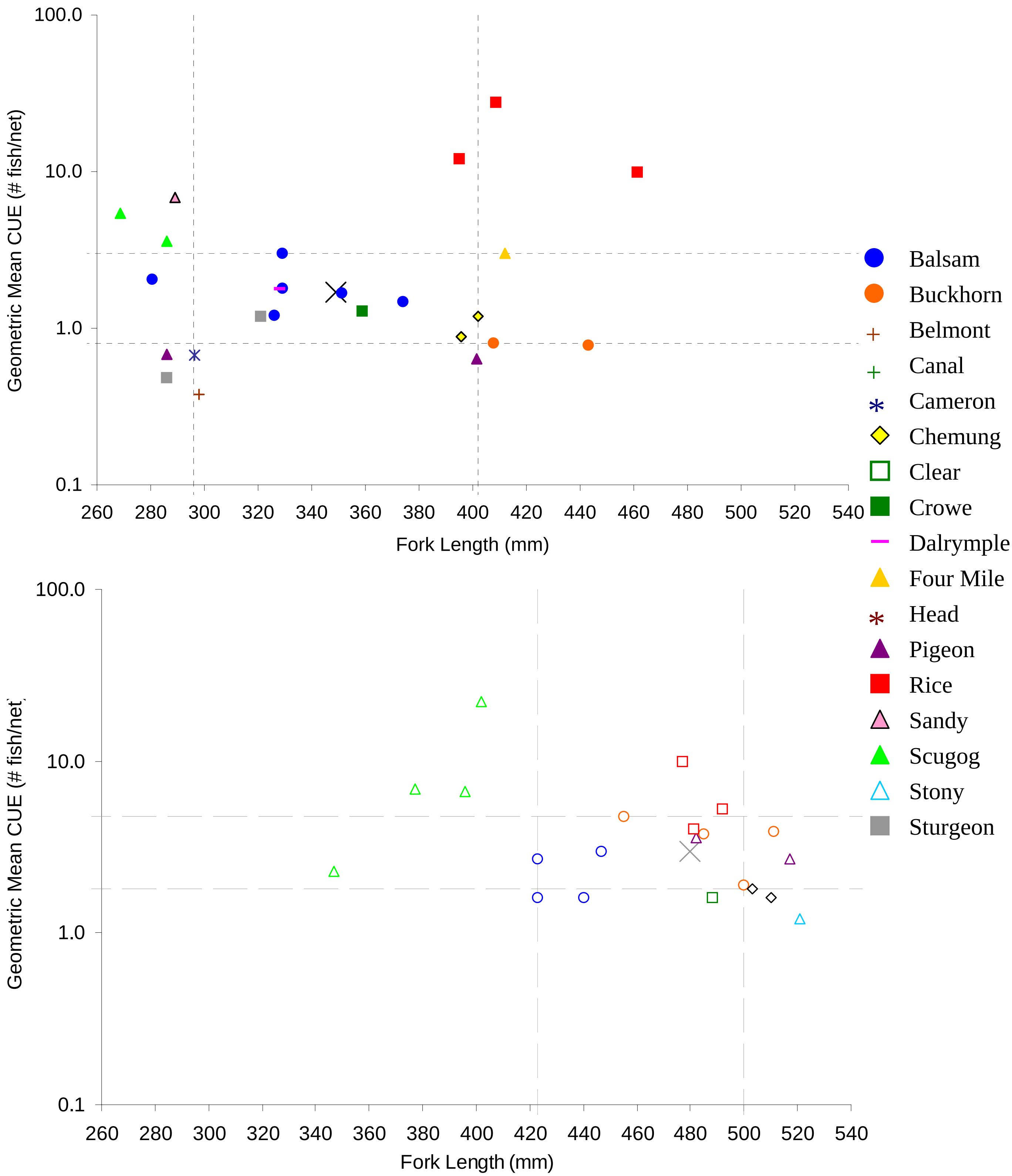

Figure 2.1: Relationship between mean fork length (mm) and geometric mean catch rate for walleye caught in FWIN (upper) and ESTN (lower graph, hollow data points) surveys conducted on lakes in FMZ 17. Dashed lines represent 25th and 75th percentiles, X represents median values.

Over the past 30 years, there is a general declining trend in walleye abundance on the four lakes routinely sampled by the KLFAU (Figure 2.2). The 1999 FWIN assessment on Rice Lake yielded a catch of 31.3 walleye per net (arithmetic mean). In 2003, the catch rate dropped to only 12.4 fish/net, representing a 60% reduction, but increased to 15.5 fish/net in the 2006 FWIN, largely driven by a strong 2005 year-class. A pronounced decline has also been observed on Lake Scugog since the early 1990s. On Balsam and Buckhorn Lakes, observed declines in abundance have not been as dramatic. This is, at least in part, due to the fact that initial abundance on these lakes was not as high as on Lake Scugog or Rice Lake.

The period of decline in walleye abundance corresponds with a significant increase in the abundance of either largemouth or smallmouth bass. These changes were associated decreases in total phosphorus and increases in both

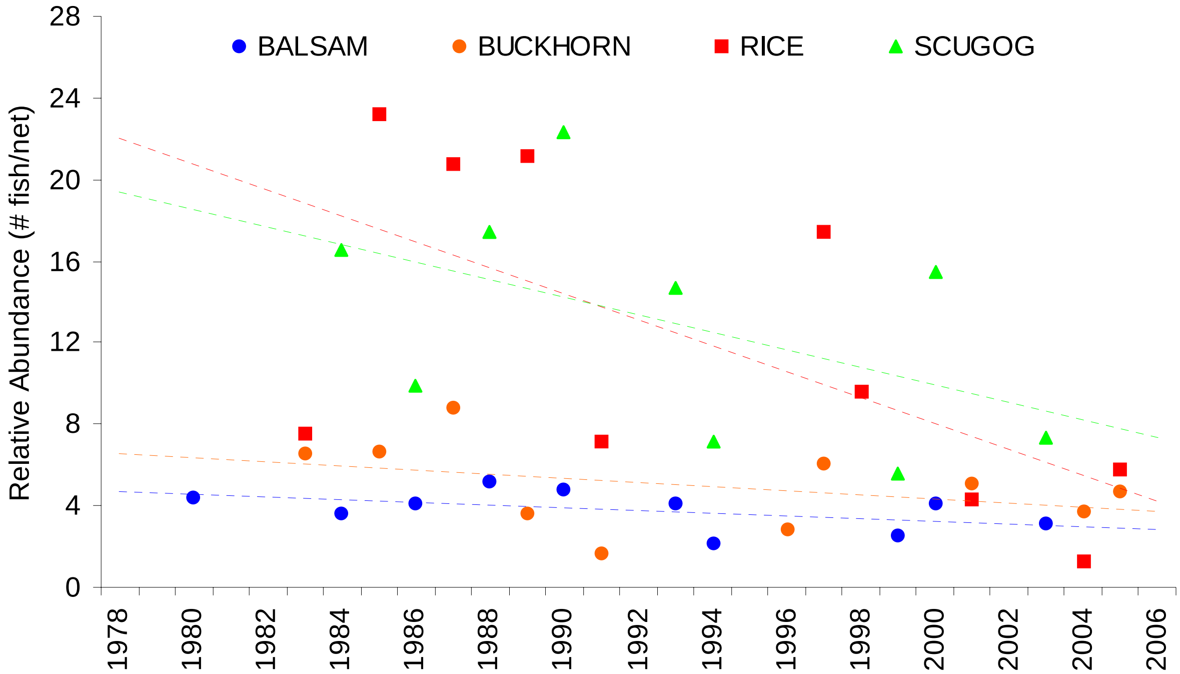

Figure 2.2: Relative abundance of walleye based on the combination of spring trap netting surveys conducted by the Kawartha Lakes Fisheries Assessment Unit.

summer water temperature and water clarity (Robillard and Fox, 2006). Increased water clarity reduces the competitive advantage that walleye possess over other species in turbid water conditions and potentially increases predation on young-of-year walleye by other species. Declines in the number of walleye may be a result of the reduction in the number of strong year classes (Rutherford et al., 1999). Although assessed only on four lakes, it is highly likely that similar trends in walleye abundance have occurred on the majority of waters in FMZ 17, based on information from anglers and the assessment information that is available. These declines are compounded by the direct removal of adult walleye from the population via angler harvest. Ultimately, the role of walleye as the dominant predator had been diminished in most FMZ 17 lakes. Fewer large walleye in the system means reduced predation of other species such as yellow perch, resulting in more yellow perch, which in turn feed on the juvenile walleye (Walters and Kitchell, 2001). Changes in the physical characteristics of the lakes and the fish community balance, coupled with reductions in year class strength likely limit the productive capacity of the walleye fishery. The effectiveness of management actions and the expectations of the walleye fishery must be considered within this context.

Indices of year class strength (the number of young walleye produced in a year) were calculated using CUE and age composition data from KLFAU spring trap netting surveys that were conducted periodically from 1980 to 2005. While walleye production was higher in some years than others, generally more walleye were produced in any given year on Rice Lake and Lake Scugog than on Balsam and Buckhorn Lakes. The 1980s were the period with the highest levels of walleye production in each of the four lakes, followed by a series of relatively weak year classes from the late 1990s through to the present (Figure 2.3). Variability in year class strength is expected in walleye populations, based on climate, food availability, habitat conditions, predation and other factors. The continuation of low production over a number of years is a concern and may be driven by observed changes in habitat (such as clearer water) and fish community (e.g. the introduction of black crappie and bluegill) in these lakes.

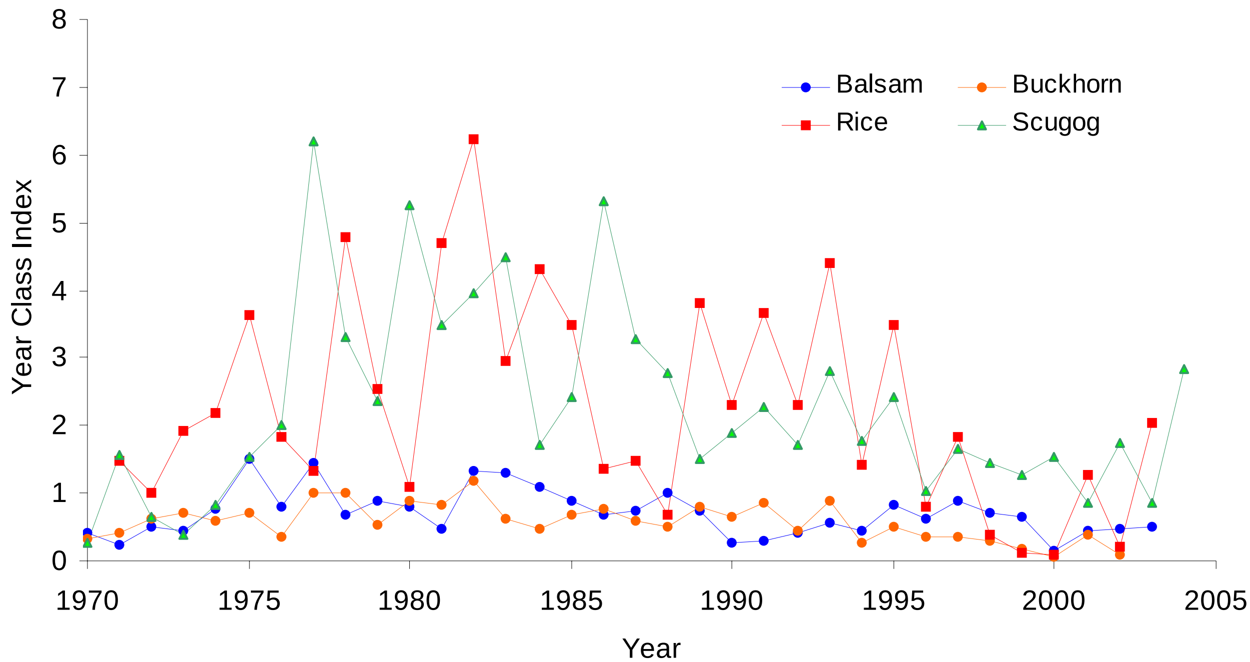

Figure 2.3: Year Class Index (YCI) values based on netting surveys conducted by the Kawartha Lakes Fisheries Assessment Unit.

2.2. Status of the Fishery

In recent 'on the water' angler creel surveys, walleye have been the most commonly targeted species, accounting for approximately one-third of all fishing effort. The majority of winter anglers on Crowe Lake and Lake Scugog are targeting walleye, or walleye and yellow perch – although these were the only species that could be legally harvested on Lake Scugog during the winter at the time of the most recent surveys. Among sport fish species, the release rate for walleye is lowest, with only one in four walleye released (including those required to be released by regulation).

Historically, walleye effort accounted for between 60-70% of total angling effort on Balsam, Buckhorn, Chemung, Pigeon and Scugog Lakes. Walleye targeted effort exceeded 30 rod hours per hectare during the early 1980s on Rice Lake and the Trilakes, but has since declined to approximately 10 rod hours per hectare. Effort on Balsam Lake and Lake Scugog has also declined, from approximately 15 rod hours per hectare to less than 10 rod hours per hectare in more recent surveys (Figure 2.4).

Walleye catch rates have varied within lakes through time, making interpretation of trends difficult. Catch rates have consistently been highest on Rice Lake, exceeding 0.20 walleye per hour in all years with the exception of 2004, where the walleye CUE was only 0.06 walleye per hour, the lowest catch rate from any survey. Catch rates on the Trilakes (Pigeon, Buckhorn, Chemung Lakes) exceeded 0.20 walleye per hour until the late 1990s and have since declined. Catch rates on Lake Scugog have generally increased. On Balsam Lake, catch rates have been lower than the other lakes, generally between 0.10 and 0.15 walleye per hour (Figure 2.5).

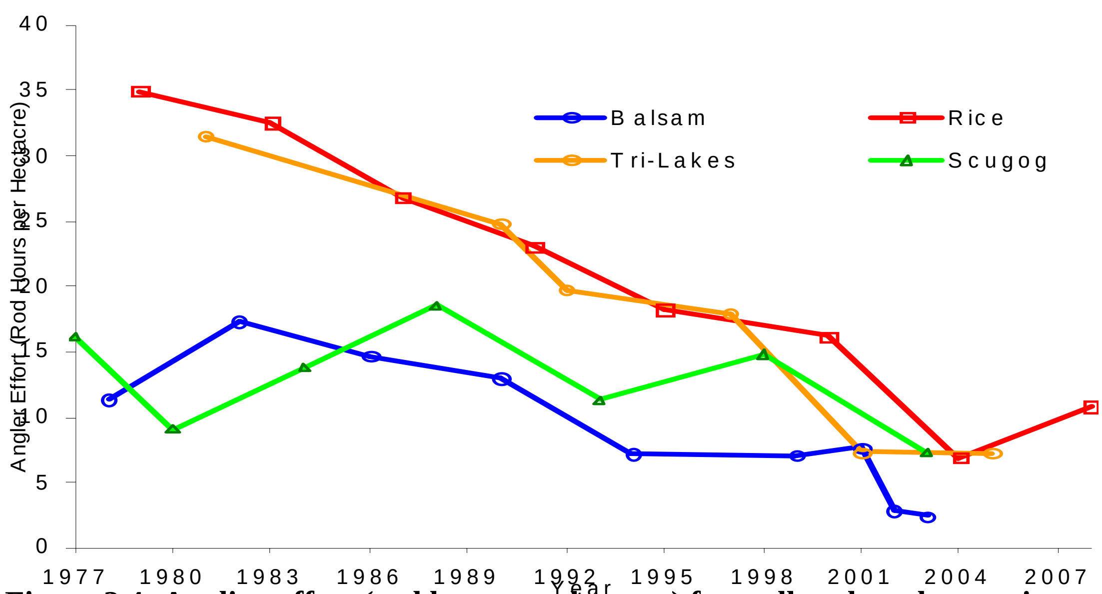

Figure 2.4: Angling effort (rod hours per hectare) for walleye based on roving creel surveys conducted by the Kawartha Lakes Fisheries Assessment Unit

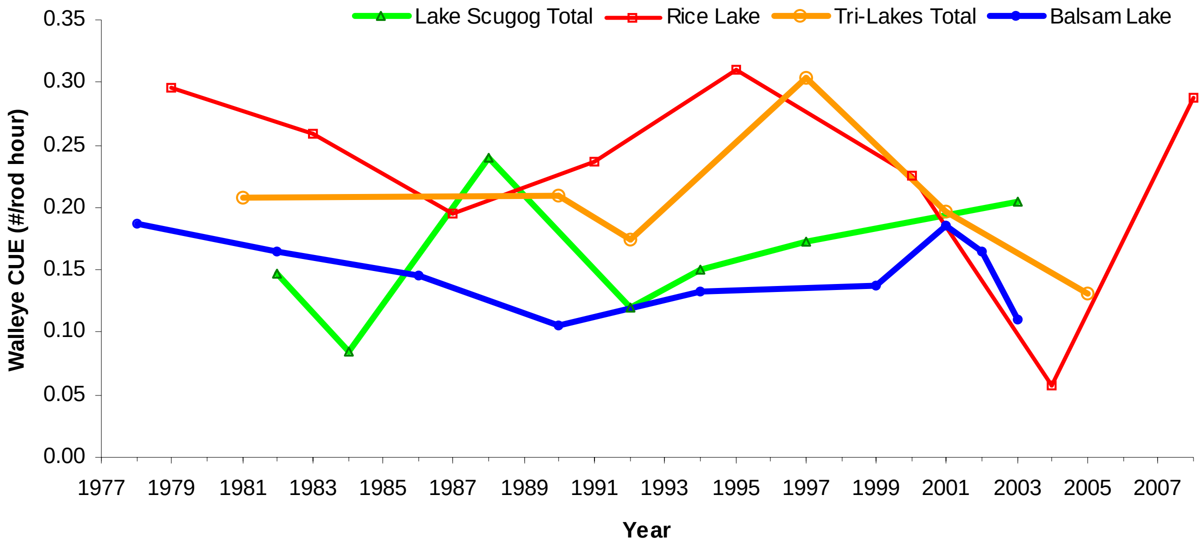

Figure 2.5: Walleye catch rates (number per angler hour) based on roving creel surveys conducted by the Kawartha Lakes Fisheries Assessment Unit

2.3. Walleye Regulations

The MNR announced new walleye regulations for southern Ontario in July 2006, which were implemented on January 1, 2008. The catch and possession limit has been reduced from six to four walleye for holders of a sport licence and remained at two for conservation licence holders. Only one fish may be greater than 46 cm (~18 inches) for both licence types. Prior to this, on most lakes in FMZ 17 anglers with a sport licence were subject to a six walleye limit, with no size restrictions and conservation licence holders two walleye (no size restrictions). These regulations were announced as an interim measure until the FMZ councils can provide input and direction for walleye management at an FMZ level.

Analysis of creel survey data suggested that less than 5% of anglers in FMZ 17 currently harvest four walleye or more in a single fishing trip. Analysis of the size distribution of the harvest showed a consistent trend across lakes and years, where approximately one in four walleye harvested exceeded 45 cm. Thus, the regulation implemented in 2008 affords little protection for walleye populations in FMZ 17. The results of population modeling indicated that this regulation may not provide sufficient protection to allow walleye populations in FMZ 17 to increase in abundance and therefore not achieve the walleye management objectives for FMZ 17.

The current walleye season in FMZ 17 opens on the second Saturday in May and closes on November 15th. The existing winter closure has been in place for a number of years and has been maintained because walleye populations could not sustain angling effort in addition to what occurred in the summer months. Open winter seasons are currently in place on Lake Scugog (January 1st – last day in February) and Crowe Lake (2nd Saturday in May – March 1st). These lakes were outside the administrative boundaries of the original winter closure and have been maintained to the present.

The current opening season dates, in concert with the existing sanctuaries, are thought to be effective in protecting walleye during and shortly following the spawning period. Anecdotal information suggests that large walleye are vulnerable to harvest during the fall period. Limited creel survey information estimates that the harvest of walleye between Labour Day and November 15th represents approximately 20% of the total annual harvest (KLFAU, unpublished data).

Based on an MNR review of walleye management in the 1990's, a catch and possession limit of four (4) walleye was recommended as the standard catch limit across the province with lower limits when additional protection is required (Kerr et al., 2004).

At present, the MNR has not finalized the walleye regulatory guidelines (toolkit), although principles of the draft toolkit were utilized to develop the regulatory options presented in this draft plan. More detailed analysis and description of the regulatory options considered is provided in Appendix 2.

2.4. Walleye Management in FMZ 17

2.4.1. Walleye Management Goal

The observed declines in walleye abundance and associated shifts in the structure of the fish community, have been identified as the highest priority fisheries management issue in FMZ 17. The MNR, with advice from the FMZ 17 council, have identified the following walleye management goal:

To reverse declines and rebuild existing, self-sustaining walleye populations to maintain and enhance benefits to the public

2.4.2. Walleye Management Challenges

A number of challenges to achieving this goal were identified by the MNR and the FMZ 17 council. Objectives and actions to overcome these challenges have been identified.

CHALLENGE #1.0: Spring water level and flow fluctuations may cause recruitment failure

OBJECTIVE 1.1: Protect, maintain and enhance critical habitats for naturally reproducing walleye populations and associated fish and aquatic communities

Walleye typically spawn at night and begin spawning shortly after the ice breaks up. Males may move into spawning grounds earlier than females and remain on the spawning ground for the duration of the spawning period. Females deposit the majority or all of their eggs during multiple spawning bouts within a single night and vacate the spawning grounds (Colby et al. 1979).

Walleye spawning habitat may vary from large boulders or coarse gravel shoals to sand or even muck substrates. Eggs between 1.5-2.0 mm in diameter are broadcast over shallow water substrate, typically less than 2.0 m deep. Eggs initially adhere to the substrate, but following water hardening, they begin to fall into crevices. Walleye offer no parental care for eggs or young (Scott and Crossman 1998).

The development of walleye eggs is directly related to incubation temperature, with eggs typically hatching in 2-3 weeks (Colby et al. 1979). Successful recruitment has been linked to steadily warming spring water temperatures, thought to aid in normal egg development. Extended incubation that results from low water temperatures is often associated with higher egg mortality (Koonce et al. 1977).

The timing of the walleye spawning period, as well as characteristics of their spawning activities (shallow water, no parental care), means that walleye spawning success can be influenced by changes in water levels and flows at the spawning grounds. In rivers, both water flows and levels need to be considered. Excessive flows impede access to spawning habitat, can scour eggs, or be harmful to hatching larval walleye. Low flows and levels can be harmful, particularly if they result in the exposure of all or portions of a spawning bed. This can either increase the risk of predation, or kill eggs if they are above water. In lakes, the same problem can occur if water levels recede following the spawning period.

MNR contracted Parish Geomorphic and Warme Engineering and Biological Services to complete a survey of walleye spawning protection and enhancement opportunities in the Trent River (Parish Geomorphic and Warme Engineering and Biological Services, 2003). These conclusions and recommendations can be applied to other walleye spawning locations. These values should provide reference points for the assessment of walleye spawning habitat in FMZ 17 (Table 2.1).

Dams and/or hydropower facilities control water levels and flows throughout most of FMZ 17. Many of these locations are identified as walleye spawning habitat. In many instances, sanctuaries have been created at these locations to protect walleye during their migrations, spawning period and post-spawning aggregations. The Kawartha Lakes are regulated by the Trent-Severn Waterway, based on the following considerations (D. Ness, personal communications):

- Public health and safety,
- Navigation along the canal route,
- Hydropower production,
- Preserving fish and wildlife habitat, and
- Appropriate levels and flows for other uses.

ACTIONS:

1.1.1 Identify critical walleye spawning locations within FMZ 17

1.1.2 MNR to meet on an annual basis with TSW in advance of the walleye spawning season to share information and to link water management with fisheries values

1.1.3 Monitor spawning locations to:

- **Identify and verify spawning locations;**
- **Estimate the number of walleye utilizing a spawning site;**
- **Identify the quality habitat on a site specific basis (using criteria in Table 2.1);**
- **Identify habitat rehabilitation/creation/alteration priority areas; and**
- **Develop site-specific water management plans**

1.1.4 Develop spawning-site specific action plans where required

1.1.5 Rehabilitate/create critical spawning habitat where existing habitat is degraded

1.1.6 Support the evaluation of the effects of climate change on local weather patterns, and in turn how they might influence water management practices

1.1.7 Initiate research to determine impacts of current water level management, with emphasis on determining effects on recruitment and population dynamics

Table 2.1: Summary of walleye spawning targets for hydraulic habitat assessments (from Parish Geomorphic and Warme Engineering and Biological Services, 2003)

Depth	
0.6 – 4.0 m	Resting/holding water depth in proximity to spawning grounds and beds
0.3 – 1.5 m	Optimum depth over spawning grounds
0.3 – 0.8m	Optimum depth over eggs on spawning beds
Velocity	
<1 m/sec	Optimum for spawning migration and over spawning grounds
1 – 1.3 m/sec	Fair for spawning migration and over spawning grounds
1.3 – 2 m/sec	Adversely high for migration, spawning and egg scour
>2 m/sec	Virtually no migration and chronic adverse egg scour
Substrate	
2.5-25 cm	Preferred range over which spawning takes place
2.5-15 cm	Range for highest production of embryos
Supporting Diagnostics	
Threshold velocity for minimum preferred substrate size => 2.5 cm = 0.91 m/sec	
Threshold velocities for identified egg size range* => 1.5-2 mm = 0.25 – 0.50 m/sec	
Threshold shear stress for minimum preferred substrate size => 2.5 cm = 26 N/m^2	
Threshold shear stress for identified egg size range* => 1.5-2 mm = 1.5 - 2.1 N/m^2	

*assumes water hardening of eggs and comparable specific weight of equivalent sediment size

NOTE: Threshold velocities based on USDA Isbash Curve Method (USDA, 1994) and threshold shear stress based on Shield's entrainment function (in Newbury and Gaboury, 1993b)

CHALLENGE #2.0: Decreased adult abundance has reduced productive capacity of walleye populations

OBJECTIVE 2.1: Increase walleye abundance and improve population structure to promote population recovery. Measures from index netting surveys include:

- **Walleye CUE (relative abundance);**
- **CUE of adult walleye >450mm;**
- **Number of age classes;**
- **Maximum age; and**
- **Diversity of adult female walleye**

Historical harvest rates exceeded the theoretical maximum harvest (known as MSY or maximum sustainable yield) using two different measures, on all lakes except Lake Scugog. On Rice Lake in the late 1970s, harvest exceeded MSY by more than 150%. Since the 1980's harvest rates have declined to well below critical values, but subsequent increases in population size have not been observed. If we use a more cautious approach to estimating maximum harvest, the current harvest levels exceed critical values on Lake Scugog and Rice Lake and was exceeding critical levels until the late 1990s on Pigeon, Chemung, Buckhorn and Balsam Lakes. This data suggests that historical harvest may have contributed to declines in walleye populations, however current angler harvest is not the only factor limiting walleye abundance. As mentioned previously, changes to both the physical habitat and changes to the structure of the fish communities are likely playing a significant role.

Walleye populations across most of FMZ 17 have declined in recent years. A decrease in adult numbers reduces the abundance of spawning walleye and thus the total number of eggs produced in a lake. Lower adult abundance reduces the stability of populations, as reproductive success is based on fewer individuals. An adult population with representation from a diverse range of sizes and ages is consistent with healthy walleye populations in other areas of Ontario. Increasing the number of eggs produced in a lake will increase the odds of some small fish surviving their first year. The largest threat to adult walleye is harvest. One of the most effective tools to protect adult walleye and improve the structure of walleye populations is angling regulations.

ACTIONS:

2.1.1 Maintain existing sanctuary locations to protect walleye at critical times of the year

2.1.2 Maintain existing open-water season (2nd Saturday in May to November 15th) and review existing winter walleye seasons

2.1.3 Maintain a catch and possession limit of 4 walleye for sport licence holders, reduce the conservation licence limit to 1 walleye

2.1.4 Implement one of the following size-based regulation to protect adult walleye (see Table 2.2):

- **Protected Slot between 40 and 60 cm (15.8 and 23.6 inches). All walleye within the length slot must be released. Sport Fishing Licence holders may harvest only one fish over 60 cm (23.6 inches).**
- **Harvest Slot Option of 35 to 50 cm (13.8 to 19.7 inches). Only walleye within the slot may be kept with the exception that Sport Fishing Licence holders may keep one fish over 70 cm (27.6 inches).**
- **Maximum Size of 45cm (17.7 inches). All walleye over 45cm must be released.**

Table 2.2: Summary of the proportion of the catch from index netting and creel surveys for the various regulation options (sport licence), along with the predictions from the Fisheries Management Support System simulations. FMSS model predictions are independent of FWIN, ESTN or Creel data.

	FWIN	ESTN	CREEL	FMSS Model
4 fish limit, Protected Slot 40-60cm, only 1-over 60 cm	19%	61%	42%	Population increase – strong
4 Fish Limit, Harvest Slot 35-50 cm, with 1-over 70 cm	73%	37%	31%	Population increase – moderate
4 fish Limit, Maximum 45 cm	17%	55%	18%	Population increase - strong
4 Fish Limit, 1-over 45 cm (current regulation)*	Can't predict		Limited	Population decline
2 Fish Limit*	Can't predict		30%	Population decline

* Not being proposed for implementation because they are not predicted to achieve management objective

2.1.5 Maintain a volunteer presence to monitor spawning locations

2.1.6 Quantify current levels of harvest by First Nation communities

CHALLENGE #3.0: Changes to the fish community, decreased production of juvenile walleye

OBJECTIVE 3.1: Increased survival of juvenile walleye

A number of new fish species have become established in the Kawartha Lakes in recent years. Some, such as black crappie and bluegill, may impact walleye productivity by direct predation on larval walleye or by competition for resources decreasing the survival of juvenile walleye. On some lakes, successful recruitment has occurred less frequently than in previous years. Even when successful year classes do occur, they often are not as strong as historical levels.

Other species, such as largemouth and smallmouth bass, have increased in numbers (Robillard and Fox, 2006). Largemouth bass have been shown to have a negative association with walleye populations (Fayram et al., 2005). Bass may prey on walleye at various stages. Increases in bass populations may largely be driven by changes in climate and are expected to continue. A warmer climate is better suited to warm water species such as bass than cool-water walleye. Collectively, these changes to the piscivore community and the introduction of predators and competitors of young walleye, may be decreasing walleye recruitment, which subsequently lowers adult walleye populations.

ACTIONS:

3.1.1 Protect adult walleye to increase the predation on competitor species of juvenile walleye (see Challenge 2 above) and enhance the number of eggs produced

3.1.2 Increase harvest of predator and competitor species (see Panfish Management Strategies)

3.1.3 Review current research to determine viable management tools to reverse changes in fish community structure

CHALLENGE #4.0: Physical changes to the lakes that have made them less suitable to walleye and more suitable for other species

OBJECTIVE 4.1: Increase public awareness regarding changes to the aquatic ecosystems to manage expectations

The spread of zebra mussels has increased water clarity and decreased the nutrients available to lower levels of the food chain. This has likely decreased the overall productive capacity of the lakes and contributed to observed fish community shifts, creating more favourable conditions for some species (i.e. bass, muskellunge) and less favourable conditions for others (i.e. walleye). The aggressive feeding behaviour of zebra mussels has resulted in increased water clarity as they filter plankton from the water column. As water clears, the amount of habitat for the light sensitive walleye is reduced and predation on young walleye is likely to increase. Water clarity is thought to have a very dramatic effect on the productivity (yield) of walleye in inland lakes (Lester et al. 2004).

If changes to the lakes have decreased their suitability for walleye, public expectations of walleye fisheries should reflect the current productive capacity for walleye rather than historic values.

ACTIONS:

4.1.1 Develop educational materials to inform anglers and the general public of the changes to the productive capacity of walleye resources as a result of physical changes to the lakes

4.1.2 Develop strategies to prevent further introductions of invasive species and subsequent changes to the aquatic ecosystem (see Invasive Species management strategies – Section 8.0)

4.1.3 Monitor the fisheries and aquatic ecosystems as they continue to change in response to environmental variables

CHALLENGE #5.0: Reduction in walleye-targeted angling effort in many lakes

OBJECTIVE 5.1: Provide walleye angling and harvest opportunities based primarily on naturally reproducing walleye populations

OBJECTIVE 5.2: Provide Put-Grow-Take (PGT) walleye angling opportunities with more liberal regulations to deflect angling pressure away from naturally reproducing populations

Creel surveys were routinely conducted by the KLFAU on the Tri-Lakes, Rice Lake, Balsam Lake and Lake Scugog since the inception of the KLFAU. In addition, Peterborough district completed creel surveys on Crowe Lake in 1999 (open water) and 2000 (winter season). These surveys provide representation from most of the FMZ; however, a number of large lakes (e.g. Sturgeon, Stony) and rivers are not included. The lakes where recent creel surveys (e.g. within the last 10 years) exist represent nearly two thirds of the total lake area in FMZ 17 and, given the prominence of the lakes included account for an even greater proportion of the total effort on the lake fisheries in the FMZ.

Across FMZ 17, walleye angling effort has declined. In most instances, the decline in angling effort is consistent with observed declines in walleye abundance. The most critical step in increasing angling opportunities for walleye is to improve the quality of walleye fisheries. These fisheries will be based primarily on naturally reproducing, self-sustaining populations. This document identifies a number of strategies that should increase the abundance of walleye and subsequently improve the quality of the walleye fishing experience in FMZ 17. Opportunities exist to diversify angling opportunities in the zone. Lakes stocked for Put-Grow-Take (PGT) purposes would no longer be managed for naturally reproducing walleye populations, but rather for the sole purpose of providing angling and harvest opportunities. The establishment of PGT walleye fisheries within the zone would allow for more liberal regulations on some waterbodies and may absorb angling pressure from more sensitive lakes within the zone. The contribution of stocked walleye to a fishery in complex ecosystems is typically poor. In the face of this uncertainty, establishment of PGT walleye fisheries is being considered on a pilot basis at this time, based on the criteria identified in Appendix 3.

ACTIONS:

5.1.1 See items above to increase walleye abundance, but select actions with recognition of the social and economic values of the fishery

5.1.2 Implement an angler satisfaction survey

5.1.3 Implement provincial monitoring program to monitor angler effort

5.2.1 Establish Put-Grow-Take walleye fisheries on a pilot basis following identified lake selection criteria

5.2.2 Implement liberal regulations (e.g. seasons, catch limits, size restrictions) on PGT waterbodies