Management Plan Fisheries Management Zone 10

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Ministry of Natural Resources and Forestry

Ontario

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Ontario would like to acknowledge the long history of First Nation and Métis peoples whose traditional and treaty territories intersect with FMZ 10. This acknowledgment is important for reaffirming the Province's commitment and responsibility to improving relationships with Indigenous Nations and for improving our own understanding of First Nation and Métis peoples, their cultures, histories, and their relationships with the lands, waters and all living things. The Province greatly values and appreciates the contributions of those First Nation and Métis communities whose input informed the content of FMZ 10.

Executive Summary

The management plan for Fisheries Management Zone (FMZ) 10 is intended to outline the status of the fisheries in the zone, document existing challenges and opportunities, describe management objectives and ultimately provide direction for management of fisheries in the zone.

Management planning is a key component of recreational fisheries management in Ontario. Fisheries management planning is aligned with the fisheries policy principles stated in Ontario's Provincial Fish Strategy – Fish for the Future. It is also consistent with the Ministry of Natural Resources and Forestry's (the ministry) current five-year strategic plan, Naturally Resourceful, and the goals and objectives of the Ontario Biodiversity Strategy. The plan is a dynamic document designed to be flexible and adaptable to a wide range of future conditions. The plan identifies monitoring that will take place to ensure that progress is being made towards meeting the management objectives and targets. The plan will be amended as required, with assistance from the Advisory Council and Indigenous Communities.

Purpose and Scope of the Plan

The Draft FMZ 10 Management Plan was developed by the ministry with input and advice from the FMZ 10 Advisory Council. The FMZ 10 Advisory Council is comprised of a broad range of perspectives, including First Nation and Métis communities, local anglers, the tourism sector, environmental non-government organizations, local business representatives, cottage owners, and the general public. The planning area extends from north of Lake Huron and Georgian Bay, with an eastern border extending northwards from the mouth of the French River to Elk Lake, with a western border that follows the east shore of Lake Superior from Sault Ste. Marie, north to Wawa and includes the cities of Sudbury, Espanola, and Blind River. Manitoulin, Cockburn, St. Joseph and Michipicoten Islands are also contained within FMZ 10.

The fisheries management plan describes management objectives, establishes targets and proposes actions to meet stated objectives. The stated objectives and targets were guided by broad goals laid out in Ontario's Provincial Fish Strategy. The intent of the plan is to assist the ministry in balancing the demands placed on the resource within the biological capacity of the supporting ecosystems. This "Draft" plan also presents proposed recreational fishing regulation changes, and in some cases presents multiple options for a particular proposal.

Goal Statements:

- Collaboration with First Nation and Métis Communities:
  Work cooperatively with First Nation and Métis communities to improve engagement and collaboration with First Nation and Métis communities in the management of the fisheries and associated ecosystem and economic benefits.
- Fish Populations: Manage for the improvement of fisheries beyond a minimally sustainable condition, including healthy natural fish populations. Enhance harvest and recreational opportunities while providing a safe food source.
- Aquatic Ecosystems: Maintain healthy aquatic ecosystems and restore damaged aquatic ecosystems, while minimizing the risk of invasive species.
- Education: Improve the public's understanding of natural resources, their awareness of ethical practices around aquatic ecosystems, and their knowledge of regulatory principles and practices.
- Socio-Economic: Provide diverse ways for users to experience and interact with resources and promote a fair valuation of those resources to broaden appreciation of their socio-economic benefits.

Management Objectives:

Management objectives were developed from known management issues, challenges and opportunities, and the current status of the resource. This information was used to create the following management objectives that support the long-term sustainability of the fisheries.

- Increase or maintain fish abundance;
- Develop a habitat protection and restoration strategy;
- Increase awareness of fisheries management;
- Provide sustainable fishing opportunities; and
- Prevent the arrival, establishment and spread of non-native and invasive species.

This management plan is made up of a series of broad management strategies that reflect management priorities within the FMZ. First Nation and Métis objectives and management actions were developed by the First Nation and Métis Task Team and support using new approaches towards collaboration. For recreational fisheries, each strategy identifies the management issues, challenges or opportunities, the status, the associated objectives, and management actions. Strategies have been developed for:

- Recreational fisheries management for walleye, northern pike, lake trout, brook trout, largemouth and smallmouth bass, muskellunge, yellow perch, and lake whitefish and lake herring;
- Monitoring Programs;
- Education;

- Fish Stocking;
- Fish Diseases
- Water Management; and
- Ecosystem Changes.

Walleye Management

The current walleye regulation (sport fishing license: 4 fish, conservation fishing license: 2 fish, no more than 1 greater than 46 cm) was put into place in 2008. There have been small improvements since 2008 in some indicators of walleye status within FMZ 10, however several indicators suggest that walleye populations remain stressed. To improve walleye abundance within FMZ 10 regulation change options are proposed.

Northern Pike Management

Northern pike populations in FMZ 10 have been recognized since the late 1990s as having lower abundance and smaller average size compared with other northern zones. Many FMZ 10 lakes continue to be dominated by small northern pike and there are concerns with a lack of quality sized fish. To protect mature sized northern pike within the zone, regulation change options are being considered.

Largemouth and Smallmouth Bass Management

Most bass populations in FMZ 10 are introduced and compete with native species for resources. However, bass populations also provide valuable recreational fisheries. Climate change is predicted to promote the expansion of bass within FMZ 10. Regulation changes were implemented in 2014 to encourage angling effort and harvest targeting bass. Monitoring data demonstrates that smallmouth bass populations remain very healthy 8 years after the change, and further changes are proposed that will provide simplified regulations and additional opportunities to harvest bass.

Lake Trout Management

Lake trout populations have been stressed for several decades in FMZ 10. The main drivers in the northeast region were identified as overfishing, introduced species, and increased road access. A significant regulation change was made in 2010 to protect these important populations. The status of natural lake trout populations in FMZ 10 has been improving since 2010, but because of the longevity of this species, not enough time has passed to warrant a change to the current regulation, and therefore there is no proposed changes.

Brook Trout Management

The losses of natural and stocked brook trout lakes in FMZ 10 and Northeastern Ontario are thought to be significant and, in many cases, are due to the introduction of new species through various pathways of spread, particularly the illegal use of non-baitfish and the illegal dumping of unused bait. The Advisory Council recommended zone-wide changes to restrict the use of live baitfish in natural brook trout lakes. Restrictions on the use of live baitfish in natural brook trout lakes is anticipated to be implemented provincially in the near future as part of Ontario's Sustainable Bait Management Strategy (2020).

Muskellunge Management

A thorough review of Muskellunge regulations in FMZ 10 was completed during FMZ planning, and benefited significantly from input and advice provided by Muskie Canada Inc. In FMZ 10, available information demonstrates that several populations exhibit the growth potential to justify a moderate minimum size limit (MSL), and Zone-wide changes were made in 2020 to increase the minimum size limit for muskellunge to 122 cm. Additionally, a few muskellunge populations exist to justify the largest of the minimum size limit options, and these populations are all associated with rivers flowing into Lakes Huron and Superior. No zone wide changes are proposed. Regulation change options are being proposed for selected Great Lakes tributaries to increase the minimum size limit to 137 cm.

Sanctuaries

Sanctuaries that exist within the zone were reviewed to determine current applicability. After the review**,** a number of sanctuaries were identified for revision. These proposed revisions are based on changes in spawning behaviour and timing, changes in rehabilitation efforts, and opportunities to provide additional urban fishing opportunities. (See section 9.17)

Baitfish Exception – Invasive Species

Rainbow smelt, an invasive species have been documented colonizing new lakes in FMZ 10 during the past decade or longer and are known to impact natural fish populations, particularly lake trout. Current restrictions on the use of live rainbow smelt exist across most of the province. However, the use of dead rainbow smelt is currently allowed in FMZ 10. The ministry, with support from the Advisory Council are proposing to restrict the use of dead rainbow smelt.

Stocking

Fish stocking is an important fisheries management tool. Stocking objectives related to the overall functioning of the stocking program and operational guidance with regards to meeting specific species, waterbody, or fisheries management objectives in FMZ10 are described in this plan. The appropriate use of fish stocking as a management tool is directed by Ontario's Provincial Fish Strategy, Fish for the Future (OMNRF 2015b) and the Guidelines for the Stocking of Inland Lakes (2002). This plan summarizes these guidelines and supports the practice that natural reproduction of fish populations will remain the primary strategy for management within FMZ 10, with enhancements via rehabilitation, Put-Grow-Take (PGT) and Put–Take stocking to create fisheries exclusively for public enjoyment.

Review and Amendment

This draft FMZ 10 management plan is intended to facilitate further First Nation, Métis and public participation in the planning process via consultation. Amendment of the plan and decisions for proposed management actions (such as, regulation change options) will occur following a review and consideration of all feedback received during consultation of this "draft" plan. Furthermore, after the plan has been finalized, the plan will be reviewed periodically to assess the level of achievement of the management objectives and to identify sections of the management plan requiring updates.

Résumé

Le plan de gestion de la zone de gestion des pêches (ZGP) 10 vise à décrire l'état des pêches dans la zone, à documenter les difficultés et les possibilités existantes, à décrire les objectifs de gestion et, finalement, à fournir une orientation sur la gestion des pêches dans la zone.

La planification de la gestion est un élément clé de la gestion des pêches récréatives en Ontario. La planification de la gestion des pêches respecte en outre les principes de la politique sur les pêches, énoncés dans la politique stratégique provinciale relative à la pêche pour l'Ontario : assurer la pérennité des ressources halieutiques. Il est également conforme au plan stratégique de cinq ans actuel du ministère des Richesses naturelles et des Forêts (le ministère), *Naturally Resourceful*, et aux buts et objectifs de la Stratégie de la biodiversité de l'Ontario. Le plan est un document dynamique conçu pour être flexible et adaptable à un large éventail de conditions futures. Le plan détermine quelles activités de surveillance seront réalisées afin de réaliser des progrès dans l'atteinte des objectifs et des cibles de gestion. Le plan sera modifié au besoin, avec l'aide du conseil consultatif et des collectivités autochtones.

Objet et portée du plan

La version préliminaire du plan de gestion de la ZGP 10 a été élaborée par le ministère avec la participation et les conseils du conseil consultatif de la ZGP 10. Le conseil consultatif de la ZGP 10 est composé d'un large éventail de points de vue, dont ceux des collectivités des Premières Nations et des Métis, des pêcheurs à la ligne locaux, du secteur du tourisme, des organisations non gouvernementales de l'environnement, des représentants des entreprises locales, des propriétaires de chalets et du grand public. La zone de planification s'étend du nord du lac Huron et de la baie Georgienne, avec une frontière orientale qui s'étend vers le nord de l'embouchure de la rivière des Français à Elk Lake, avec une frontière occidentale qui suit la rive est du lac Supérieur de Sault Ste. Marie, au nord jusqu'à Wawa et comprend les villes de Sudbury, d'Espanola et de Blind River. Les îles Manitoulin, Cockburn, St-Joseph et Michipicoten font également partie de la ZGP 10.

Le plan de gestion de la pêche décrit les objectifs de gestion, établit des cibles et propose des mesures pour atteindre les objectifs fixés. Les objectifs et les cibles énoncés ont été guidés par les buts généraux énoncés dans la politique stratégique provinciale relative à la pêche de l'Ontario. Le but du plan est de proposer des mesures qui aideront le ministère à trouver un équilibre entre les demandes d'utilisation des ressources et la capacité biologique des écosystèmes qui produisent ces ressources. Ce « projet » de plan présente également des propositions de modifications aux

règlements de la pêche récréative et, dans certains cas, présente plusieurs options pour une proposition particulière.

Énoncé des objectifs :

- Collaboration avec les collectivités des Premières nations et des Métis : Travailler en collaboration avec les collectivités des Premières nations et des Métis afin d'améliorer leur mobilisation et leur collaboration dans la gestion des pêches et des avantages écosystémiques et économiques associés.
- Population de poissons : Assurer une gestion visant l'amélioration des pêches au-delà d'une condition minimale durable, y compris des populations naturelles saines de poissons. Améliorer les possibilités de récolte et de loisirs tout en fournissant une source de nourriture sûre.
- Écosystèmes aquatiques : Maintenir des écosystèmes aquatiques sains et restaurer les écosystèmes aquatiques endommagés, tout en minimisant le risque d'espèces envahissantes.
- Éducation : Mieux sensibiliser le grand public à la problématique des ressources naturelles, et aux pratiques éthiques qu'il convient de respecter dans des écosystèmes aquatiques et lui faire connaître les principes et les pratiques réglementaires.
- Socio-économique : Procurer aux utilisateurs différentes façons d'appréhender les ressources et d'interagir avec elles; promouvoir la « juste valeur » des ressources, pour qu'il y ait une compréhension par le plus grand nombre des avantages socio-économiques liés à celles-ci.

Objectifs de gestion :

Les objectifs de gestion ont été élaborés à partir des problèmes de gestion, des défis et des occasions connus ainsi que de l'état actuel de la ressource. Ces renseignements ont été utilisés pour créer les objectifs de gestion suivants qui soutiennent la durabilité à long terme des pêches.

- Accroître l'abondance de poissons ou maintenir les niveaux atteints.
- Élaborer une stratégie de protection et de restauration des habitats.
- Accroître la sensibilisation de la gestion des pêches.
- Offrir des possibilités de pêche durables;
- Prévenir l'arrivée, l'établissement et la propagation d'espèces non indigènes et envahissantes.

Ce plan de gestion est composé d'une série de stratégies de gestion générales qui reflètent les priorités de gestion au sein de la ZGP. Les objectifs et les mesures de

gestion des Premières nations et des Métis ont été élaborés par l'équipe de travail des Premières nations et des Métis et cadrent avec l'utilisation de nouvelles approches de collaboration. Pour la pêche récréative, chaque stratégie détermine les problèmes de gestion, les défis ou les occasions, le statut, les objectifs associés et les actions de gestion. Des stratégies ont été élaborées afin de poursuivre les objectifs suivants :

- gestion des pêches récréatives relativement au doré jaune, au grand brochet, au touladi, à l'omble de fontaine, à l'achigan à grande et à petite bouche, au maskinongé, à la perchaude, au grand corégone et au hareng de lac;
- programmes de surveillance;
- éducation :
- empoissonnement;
- maladies des poissons;
- gestion de l'eau;
- changements de l'écosystème.

Gestion du doré jaune

Le règlement actuel sur le doré jaune (permis de pêche sportive : 4 poissons, permis de pêche de conservation : 2 poissons, dont pas plus de 1 de 46 cm) est entré en vigueur en 2008. Il y a eu de légères améliorations depuis 2008 dans certains indicateurs de la situation du doré jaune dans la ZGP 10, mais plusieurs indicateurs laissent penser que les populations de doré jaune restent stressées. Pour améliorer l'abondance du doré jaune dans la ZGP 10, des options de modifications au règlement sont proposées.

Gestion du grand brochet

Depuis la fin des années 1990, on sait que les populations de grand brochet de la ZGP 10 sont moins abondantes et de taille moyenne plus petite que celles des autres zones nordiques. De nombreux lacs de la ZGP 10 continuent d'être dominés par de petits brochets et l'on s'inquiète du manque de poissons de bonne taille. Pour protéger les grands brochets de taille adulte dans la zone, des options de modifications au règlement sont envisagées.

Gestion de l'achigan à petite bouche et à grande bouche

La plupart des populations d'achigan dans la ZGP 10 sont introduites et concurrencent les espèces indigènes pour les ressources. Cependant, les populations d'achigan fournissent également de précieuses pêches récréatives. On prévoit que le changement climatique favorisera l'expansion de l'achigan dans la ZGP 10. Des modifications au règlement ont été mis en œuvre en 2014 pour encourager l'effort de pêche à la ligne et la récolte ciblant l'achigan. Les données de surveillance montrent que les populations

d’achigan à petite bouche restent très saines huit ans après la modification, et d’autres modifications sont proposées pour simplifier le règlement et offrir des possibilités supplémentaires de récolter l’achigan.

Gestion du touladi

Les populations de touladi sont stressées depuis plusieurs décennies dans la ZGP 10. Les principaux facteurs relevés à ce titre dans la région nord-est sont la surpêche, les espèces introduites et l’augmentation de l’accès routier. Une modification importante a été apportée au règlement en 2010 pour protéger ces importantes populations. L’état des populations naturelles de touladi dans la ZGP 10 s’améliore depuis 2010, mais en raison de la longévité de cette espèce, il ne s’est pas écoulé suffisamment de temps pour justifier une modification du règlement actuel, et il n’y a donc pas de modification proposée.

Gestion de l’omble de fontaine

On pense que les pertes de lacs naturels et empoissonnés d’omble de fontaine dans la ZGP 10 et le nord-est de l’Ontario sont importantes et, dans de nombreux cas, sont liées à l’introduction de nouvelles espèces par diverses voies de propagation, en particulier l’utilisation illégale de poissons qui ne sont pas des poissons-appâts et le déversement illégal d’appâts non utilisés. Le conseil consultatif a recommandé des modifications à l’échelle de la zone pour restreindre l’utilisation de poissons-appâts vivants dans les lacs naturels d’omble de fontaine. Des restrictions sur l’utilisation de poissons-appâts vivants dans les lacs naturels d’omble de fontaine devraient être mises en œuvre à l’échelle provinciale dans un proche avenir dans le cadre de la Stratégie ontarienne de gestion durable des appâts (2020).

Gestion du maskinongé

Un examen approfondi du règlement relatif au maskinongé dans la ZGP 10 a été effectué au cours de la planification de la ZGP, et a bénéficié de façon significative de la contribution et des conseils de Muskie Canada Inc. Dans la ZGP 10, l’information disponible démontre que plusieurs populations présentent un potentiel de croissance justifiant une limite de taille minimale (LMS) modérée, et des modifications ont été apportées à l’échelle de la zone en 2020 pour augmenter la limite de taille minimale du maskinongé à 122 cm. En outre, il existe quelques populations de maskinongé qui justifient la plus grande des options de limite de taille minimale, et ces populations sont toutes associées à des rivières qui se jettent dans les lacs Huron et Supérieur. Aucune modification à l’échelle de la zone n’est proposée. Des possibilités de modification du règlement sont proposées pour certains affluents des Grands Lacs afin de porter la taille minimale à 137 cm.

Sanctuaires

Les sanctuaires qui existent dans la zone ont été examinés pour déterminer leur applicabilité actuelle. Après l'examen**,** un certain nombre de sanctuaires ont été retenus pour les besoins d'une révision. Ces révisions proposées sont fondées sur les changements dans le comportement et le calendrier de frai, les changements dans les efforts de restauration et les possibilités de fournir des possibilités supplémentaires de pêche urbaine. (Voir le point 9.17.)

Exception pour les poissons-appâts – Espèces envahissantes

Au cours de la décennie passée, on a documenté une colonisation par l'éperlan arc-en-ciel (une espèce envahissante) de nouveaux lacs dans la ZGP 10. On sait que cette espèce a une incidence sur les populations naturelles de poissons, en particulier le touladi. Des restrictions actuelles sur l'utilisation d'éperlans arc-en-ciel vivants existent dans la majeure partie de la province. Cependant, l'utilisation d'éperlans arc-en-ciel morts est actuellement autorisée dans la ZGP 10. Le ministère, avec le soutien du conseil consultatif, propose de restreindre l'utilisation de l'éperlan arc-en-ciel mort.

Empoissonnement

L'empoissonnement est un important outil de gestion des pêches. Les objectifs d'empoissonnement liés au fonctionnement général du programme d'empoissonnement et les orientations opérationnelles relatives à l'atteinte d'objectifs liés à des espèces particulières, de plans d'eau ou d'objectifs de gestion des pêches dans la ZGP 10 sont décrits dans ce plan. La politique stratégique provinciale relative à la pêche pour l'Ontario : assurer la pérennité des ressources halieutiques (MRNF 2015b) et les *Guidelines for the Stocking of Inland Lakes* (2002) fournissent une orientation relative à l'utilisation appropriée de l'empoissonnement comme outil de gestion. Le plan résume ces lignes directrices et soutient la pratique selon laquelle la reproduction naturelle des populations de poissons restera la principale stratégie de gestion dans la ZGP 10, avec des améliorations par le biais de la restauration, de l'empoissonnement au moyen de l'empoissonnement-croissance-pêche (ECP) et de l'empoissonnement-pêche pour créer des pêches exclusivement destinées à la jouissance du public.

Révision et modification

Ce projet de plan de gestion de la ZGP 10 vise à faciliter une plus grande participation des Premières Nations, des Métis et du public au processus de planification par le biais de consultations. La modification du plan et les décisions relatives aux mesures de gestion proposées (telles que les options de modification au règlement) interviendront après l'examen et la prise en compte de tous les commentaires reçus au cours de la

consultation de l’« ébauche » de plan. En outre, une fois que le plan se terminé, il sera revu périodiquement pour évaluer le niveau de réalisation des objectifs de gestion et pour repérer les sections du plan de gestion qui nécessitent des mises à jour.

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1 Introduction

Ontario has the largest freshwater recreational fishery in Canada and one of the largest in the world. The fishery, dependent on high quality fish habitat and healthy aquatic ecosystems, is a renewable resource that provides considerable benefits to Ontario.

The Ministry of Natural Resources and Forestry (the ministry) manages fishery resources and their use across Ontario – taking into consideration the differences in socioeconomic and ecological objectives that exist throughout the province. This requires the integration of management objectives and actions for many species and their habitats, in the context of varied human activities and multiple stressors.

In 2010, more than 1.2 million anglers actively fished in Ontario waters. The recreational fishing industry employs 44,000 people and more than $1.6 billion dollars is spent annually on fishing. The economic benefits of Ontario's recreational fisheries are of particular importance to the local economies of Northern Ontario that are dependent on resource-based tourism.

A variety of fisheries management tools are available to structure the delivery of the ministry's mandate. Fisheries management planning is one of these tools and development of a fisheries management plan is a critical component of the planning process. This management plan provides direction for the management of fisheries resources within Fisheries Management Zone (FMZ) 10.

During all stages of planning and in the preparation of this management plan, the ministry was advised by a Fisheries Advisory Council and First Nation and Métis Task Team subcommittee for FMZ 10. The Council provided important advice to the ministry during the development of objectives, strategies, and selection of proposed management actions. Their active participation was critical in developing the plan and is very much appreciated.

This document describes the area that FMZ 10 covers, the strategic direction and guiding principles that drive the planning process, and describes the stakeholders involved in this process. In section 9, this document goes into detail identifying management goals and action items for recreational fish species, environmental goals, and educational outreach. The supporting science will be found in the background documents located in appendices.

1.1 Description of Fisheries Management Zone 10

FMZ 10 lies north of Lake Huron and Georgian Bay. Its eastern border extends northwards from the mouth of the French River to the Town of Elk Lake. The western border follows the east shore of Lake Superior from Sault Ste. Marie north to Wawa. Some of the major cities within FMZ 10 include Sudbury, Sault Ste. Marie, Espanola and Blind River. Manitoulin, Cockburn, St. Joseph and Michipicoten Islands are also contained within FMZ 10.

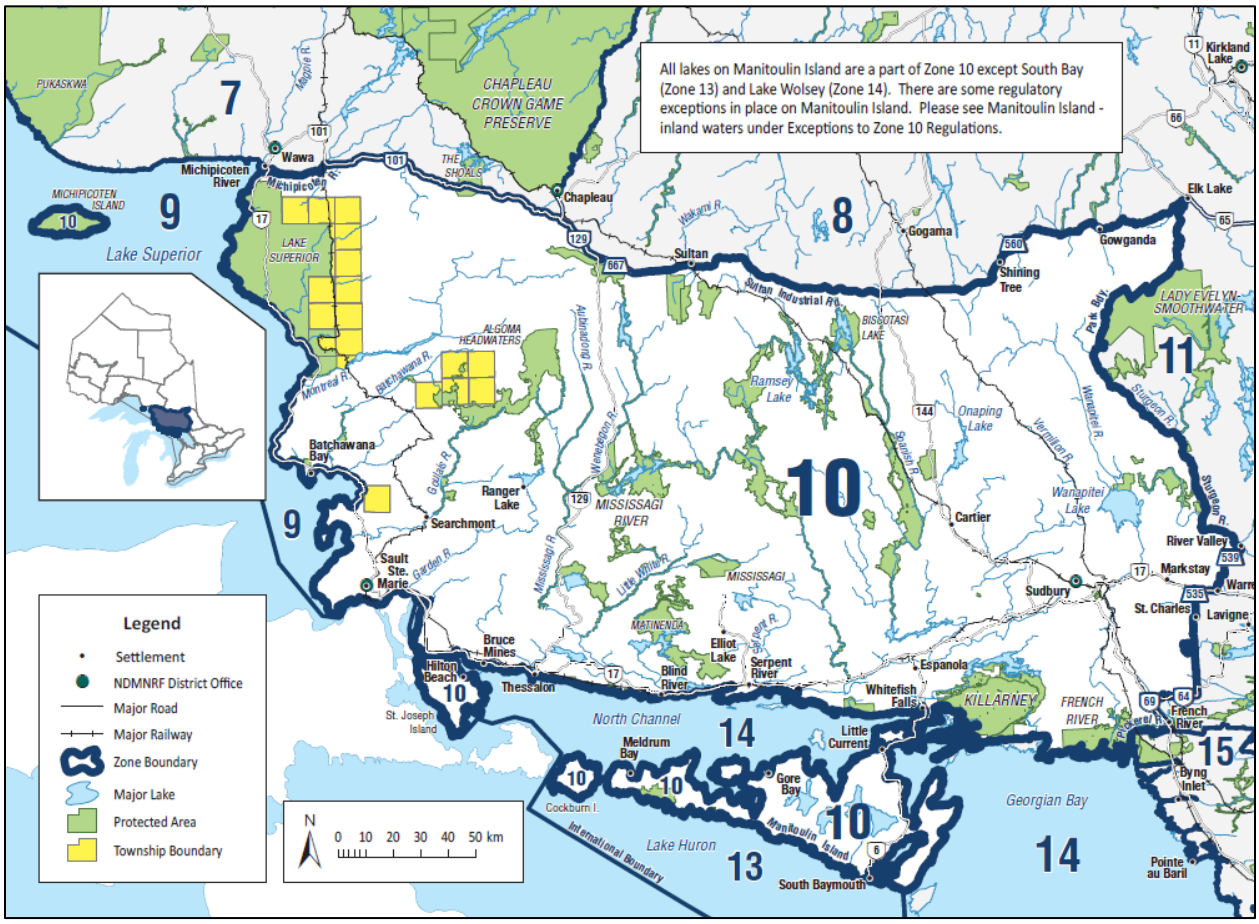


Figure 1.1: Boundary map of Ontario's Fisheries Management Zone 10 (FMZ 10). Zone boundaries are indicated with dark blue lines.

This zone has the highest road and human population density of all the Northeast Region zones. Except for Manitoulin and St. Joseph Islands, the landscape is characterized by the Canadian Shield's shallow soils and ancient bedrock. Forest cover transitions from Great Lakes-St. Lawrence to Boreal species. This zone also has more lake trout lakes and brook trout lakes than any other zone in the province. Numerous streams flow into Lakes Superior and Huron and the inland lakes are generally small, deep and clear.

In addition to the zone supporting First Nations subsistence fisheries for thousands of years, more recently the zone has also supported a recreational fishery since at least the early 1900s and supports diverse fish communities which offer a wide range of angling opportunities. The focus of this document is on the recreational fishery which is an important economic and social driver within FMZ 10 as it contributes to a significant local tourism industry. Angling pressure is widely distributed across the zone, but typically higher in the southern range of the zone (Figure 1.2).

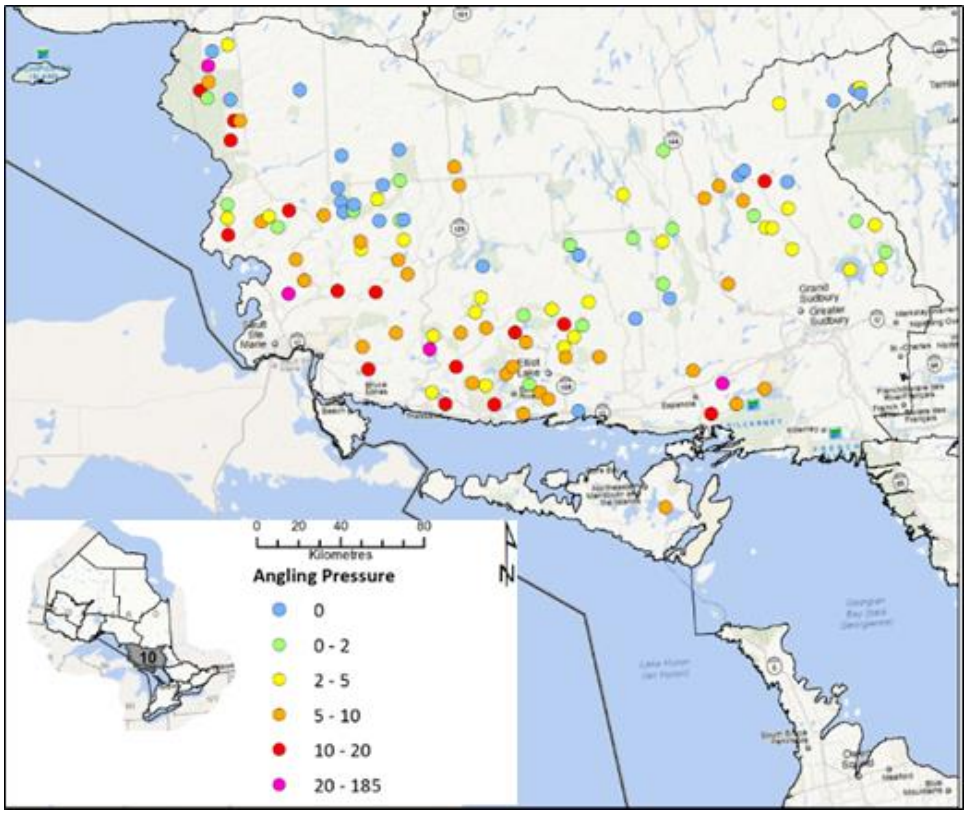


Figure 1.2: Distribution of angling pressure (angler hrs/ha) in FMZ 10 as measured by BsM Cycle 1. Angling pressure displayed is the sum of summer and winter combined.

1.2 Areas of Special Interest within FMZ

1.2.1 Migratory Fish Populations

FMZ 10 contains numerous flowing waters (streams and rivers) that span the landscape and connect with adjacent fisheries management zones. Although the current Broad-scale Monitoring (BsM) program collects fisheries information from lakes at present, it is critical to recognize the importance of riverine systems to fish populations, especially in situations where fish may migrate between management areas. At present, many of

these waters have been identified as important features for fish spawning and migration and have been provided enhanced management and protection, while others may be identified during plan implementation.

Several migratory fish populations inhabit the running waters of Manitoulin Island, the Northshore of Lake Huron and the eastern shore of Lake Superior in FMZ 10. These rivers and streams flow into FMZs 14 and 9, supporting important fisheries within those zones. Migratory fish populations include native walleye and muskellunge in the larger rivers like the Spanish, Mississagi, and Goulais; and introduced populations of rainbow trout, Chinook salmon, Coho salmon, and pink salmon in many rivers. The relative amount of time spent in inland waters versus the Great Lakes varies but generally adults return annually to streams and rivers for spawning. After hatching, juvenile fish spend different lengths of time in these flowing waters before returning to the open water of the Great Lakes to grow and mature before returning to the inland streams and rivers to spawn.

1.2.2 Manitoulin Island and St. Joseph Island

Manitoulin Island and St Joseph Island are ecologically unique within FMZ 10. In many ways these islands are more akin to southern Ontario than northern Ontario. From a fisheries perspective, the islands have higher thermal input (growing degree-days), different geology (limestone vs. Precambrian shield), and ultimately higher aquatic species diversity and productivity (see Crins et al. 2009). Unfortunately, given proximity to Lake Huron, Manitoulin waters also have higher prevalence of invasive species (such as zebra mussels, spiny water fleas, rainbow smelt, etc.) and in some cases the presence and combination of these invasive species is compromising the stability of native fish communities. Given the innate differences from the rest of FMZ 10 it is recognized that in some circumstances regulatory exceptions will be required to meet the needs of these fisheries. Current regulatory exceptions exist for Manitoulin Island for lake trout, northern pike, rainbow trout, and yellow perch.

1.2.3 French River

The French River flows from Lake Nippissing in FMZ 11, through FMZ 10, before emptying into Georgian Bay. The area of the French River downstream of Highway 69, including the French River Delta, is within FMZ 10. Historically, walleye has been the preferred target species in the French River, and fishing pressure for this species has been highest in the portion that is now within FMZ 10. In the 1990s, it was recognized that the walleye fishery in the River was declining, subsequently, work went into monitoring and restoring the French River fisheries (particularly walleye populations) through the French River Community Fisheries Enhancement Committee. Based on this work, slot-size and possession limit exceptions were established for walleye, sauger,

northern pike, large and smallmouth bass, and muskellunge to reduce stress on these populations and maintain consistency with other parts of the river. Council discussed progress made since that time and several species have recovered and doing quite well (such as, bass). Regulation changes are proposed in relevant sections for recreational fisheries for muskellunge, bass, northern pike, walleye.

1.2.4 Competitive Fishing events

Organized competitive fishing events (including derbies, tournaments, and contests) have been increasing in popularity in Ontario for several decades. In 1991, there were approximately 100 competitive fishing events in Ontario (Schramm et al., 1991). This number rapidly increased to about 429 events on inland waters (and 89 on the Great Lakes) by 1998 (Kerr 1999) and to over 785 events on inland waters (and 283 on the Great Lakes) by 2012 (Kerr 2012). The events occurred primarily in the inland waters of southern Ontario, but several events are held annually in FMZ 10. Some of these events provide benefits to local economies, in addition to prizes for participants. Despite the high interest in competitive fishing, it is estimated that only 5% of recreational anglers participate in these events (OMNRF 2014).

2 FMZ 10 Background Information

FMZ 10 Background Document; Recreational Fisheries in FMZ 10: Distribution of Species, Supply and Demand (Kaufman and Houle 2008) gave an overall description of the zone based on available information at that time. The background report documented water body characteristics; the relative availability and spatial distributions of the major sportfish species; key life history parameters relating to productive potential of lake trout, walleye, and northern pike; and patterns of recreational angling effort for lake trout and walleye across the zone.

In addition to the 2008 background document, several species-specific reference materials were developed by the ministry in partnership with the FMZ 10 Advisory Council between 2010 and 2018. These materials were developed and made publicly available on Ontario.ca to support management actions related to bass and lake trout. These materials were:

- Bass in Fisheries Management Zone 10 (2010)
    - outlined management strategies and proposed regulation options regarding bass within zone 10.
- Lake Trout in Fisheries Management Zone 10 (2012)

- Status of Lake Trout Populations in Northeastern Ontario (2000-2005), (Selinger et al., 2006).
    - contained a description of FMZ 10, general lake trout biology, factors influencing lake trout populations, current status of lake trout in FMZ 10, and the ministry's management actions undertaken to maintain sustainability of lake trout populations.

However, new and updated monitoring results that reflects current knowledge and which was used to update and develop objectives indicators and targets within this management plan is provided in Appendix A.

FMZ 10 contains 3,170 waterbodies greater than 20 hectares, with a combined surface area of 376,796 hectares. Fish communities within all three thermal guilds (coldwater, coolwater, and warmwater) are found within FMZ 10. Cold water communities (such as lake and brook trout) are generally located in the central and western portions of the zone, while cool water communities (such as walleye and northern pike) inhabit the eastern and northern portions of the zone. FMZ 10 is dominated by walleye (*Sander vitreus*) and lake trout (*Salvelinus namaycush*) fisheries. It also contains brook trout (*Salvelinus fontinalis*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), northern pike (*Esox lucius*), muskellunge (*Esox masquinongy*), and yellow perch (*Perca flavescens*). lake whitefish (*Coregonus clupeaformis*), and lake herring (*Coregonus artedi*) providing alternative angling opportunities within the zone. Lake sturgeon (*Acipenser fulvescens*) (threatened), northern brook lamprey (*Ichthyomyzon fossor*) (special concern), redside dace (*Clinostomus elongatus*) (endangered), silver lamprey (*Ichthyomyzon unicuspis*) (special concern) and the shortjaw cisco (*Coregonus zenithicus*) (threatened) are fish species at risk that were historically present within the zone. Some populations persist, while other populations have decreased or are now extirpated.

Table 2.1:Description of lakes of FMZ 10 partitioned into size bins; 20-50, 50-500, 500-1500, 1500 – 5000, 5000-250000 ha. The total number of lakes known to support three sport fish species (walleye, lake trout, brook trout), and the total surface area of lakes within FMZ 10.

FMZ 10	**Lake Size Class (ha)**					**Total**
	20-50	**50 - 500**	**500 - 1500**	**1500 - 5000**	**5000 - 250000**	

Lakes (#)	1913	1156	73	21	7	3,170
Walleye Lakes (#)	64	207	45	16	7	339
Lake Trout Lakes (#)	176	373	41	13	4	607
Brook Trout Lakes (#)	416	263	11	6	2	698
Surface Area (ha)	58,962	148,869	61,677	51,646	55,962	376,796

Most lakes in FMZ 10 are typical boreal shield, oligotrophic lakes, characterized as relatively deep, with a relatively small littoral zone, clear and nutrient poor. The littoral zone of lakes is generally defined as the near shore area where sunlight penetrates all the way to the sediment and allows aquatic plants to grow. The specific definition used here is the proportion of lake area shallower than 4.6 m. The assessment of the littoral zone area is often used as a predictor of available habitat important to species including walleye, bass, and northern pike. FMZ 10 has the second lowest average percent littoral zone area in Ontario, and on average the lakes with FMZ 10 contain much less littoral zone area than lakes in other Northern zones (Figure 2.1**Error! Reference source not found.**).

The climate in FMZ 10 is moderate in relation to other FMZs in Ontario. In FMZ 10, most lakes are relatively deep and clear. The area weighted mean depth of lakes in FMZ 10 is 14.56 m while the provincial area weighted mean depth is 10.13 m (Figure 2.1). The average summer Secchi depth, used to measure water clarity, for FMZ 10 is 5.93 m compared to the provincial average of 3.72 m (Figure 2.1). The provincial BsM program measures water clarity using a black and white metal disc, known as a Secchi disc, that is lowered into the water until it can no longer be seen. In general, lower productivity lakes are associated with greater Secchi depths, where readings are greater than 5 m, while medium-productivity lakes are generally between 2 and 5 m, and highly productive lakes are generally less than 2 m in depth. As seen in Figure 2.1, FMZ 10 has the highest average Secchi depth in Ontario. These habitat indicators suggest that FMZ 10 lakes characteristically have less productive capacity compared to other Fishery Management Zones.

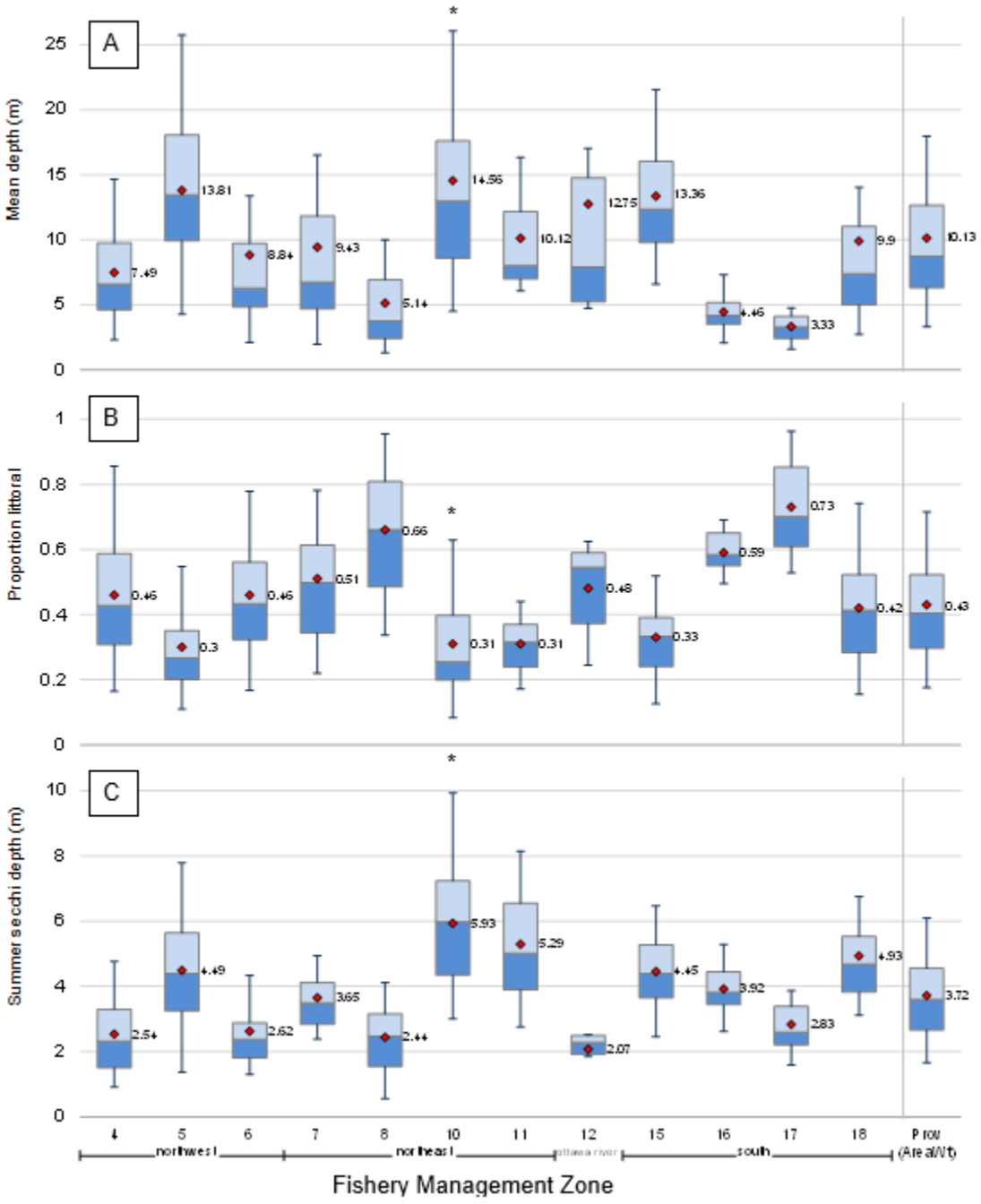


Figure 2.1: Data represents all lakes monitored by BsM (cycle 1: 2008-2012) per Ontario Fisheries Management Zone (FMZ). Graph A: mean lake depth, Graph B: proportional littoral, Graph C: Secchi depth (water clarity). Red diamond indicates data mean. Provincial area weighted average is represented as "Prov (AreaWt)". FMZ 10 is represented with an asterisk"". For details of box plot interpretation see Figure B-2 in Appendix B.*

In 2015, the summary of bait harvesters and bait dealers indicated that there was a total of 33 bait dealers and a total of 47 bait harvesters within the districts of Sudbury and Sault Ste. Marie which make up the majority of FMZ 10 (MNRF 2015c). Commercial bait license holders are governed by the provisions of the *Fish and Wildlife Conservation Act* (FWCA) and the Ontario Fishery Regulations (OFR) of the federal *Fisheries Act*. Baitfish dealers are governed by guidelines which clearly outline the procedures required to safely harvest and sell baitfish within the province of Ontario with the intention of reducing the risk associated with invasive species and pathogens.

3 Strategic Direction and Guiding Principles

In 2005, the province recognized the need for a stronger emphasis on landscape level management of fisheries (Lester et al. 2003). In January 2008, the ministry took a new approach to fisheries planning and management, establishing 20 FMZs that replaced the former 37 Fishing Divisions. The new FMZ boundaries were based on ecological factors and angler use patterns, and reflect the province's climate zones, watershed boundaries, fishing pressure, and road networks. These zones are now the primary unit of management for most fisheries in Ontario and form the basis for fishing regulations such as catch limits and seasons.

In April 2015, the ministry launched the Provincial Fish Strategy-Fish for the Future, to provide up-to-date direction for the management of Ontario's fish, fisheries and supporting ecosystems. The Strategy was developed through extensive input and the engagement of Indigenous people, agency partners and key stakeholders.

The primary purposes of this strategy are to:

- improve the conservation and management of fisheries and the habitat on which fish communities depend; and
- promote, facilitate and encourage fishing as an activity that contributes to individual well-being and the social, cultural and economic well-being of communities in Ontario

The Strategy identifies a set of overarching management approaches: landscape management, risk-informed approach, and adaptive management; and other principles that provide program-level direction for the management of fisheries.

The planning process is also guided by the Precautionary Principle which states that where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent resource

degradation. This is particularly important for fisheries with past or ongoing challenges, those at higher risk, and those of significant social, economic or ecological importance.

Cumulative impacts are also considered during planning. Cumulative impacts may be additive (such as impact of repeated activities in the same area over time) or synergistic (such as combined impact of a warmer climate, increasing human development in the watershed, and deteriorating water quality). Cumulative impacts can be challenging to assess, so the Precautionary Principle must be used in evaluating actions or policies with the potential to contribute to cumulative impacts on fisheries.

3.1 Guiding Principles

The following principles of ecology and conduct are values that were used to guide fisheries management planning and decision making and are considered key to achieving the desired future state of fisheries resources in Ontario. They are derived from broader ministry Strategic Direction (MNRF 2015b).

3.1.1 Ecological Principles

Natural Capacity: There is a limit to the natural capacity of aquatic ecosystems and hence the benefits that can be derived from them. Self-sustaining populations can provide long-term benefits when harvested at levels below Maximum Sustainable Yield.

Naturally Reproducing Fish Communities: Self-sustaining fish communities based on native fish populations will be the priority for management. Non-indigenous fish species that have become naturalized are managed as part of the fish community, consistent with established fisheries management objectives.

Ecosystem Approach: Fisheries will be managed within the context of an ecosystem approach where all ecosystem components including humans and their interactions will be considered at appropriate scales. The application of the ecosystem approach includes the consideration of cumulative effects.

Protection: Maintaining the composition, structure and function of ecosystems, is the priority for management, as it is a lower-risk and more cost-effective approach than recovering or rehabilitating ecosystems that have become degraded.

Restore, Recover and Rehabilitate: Where native fish species have declined or aquatic ecosystems have been degraded, stewardship activities such as restoration, recovery and rehabilitation will be undertaken.

Fish and Aquatic Ecosystems are Valued: Fisheries, fish communities, and their supporting ecosystems provide important ecological, social, cultural, and economic services that will be considered when making resource management decisions.

3.1.2 Principles of Conduct

Aboriginal and Treaty Rights: First Nation and Métis rights and interests in fisheries resources will be recognized and will help guide the ministry's plans and activities. Ontario is committed to meeting its constitutional obligations in respect of the Aboriginal and treaty rights of First Nation and Métis peoples. Ontario has a duty to consult with Aboriginal peoples where its actions may adversely affect an established or credibly asserted Aboriginal or treaty right.

Informed Transparent Decision Making: Resource management decisions will be made in the context of existing management objectives and policies, using the best available science and knowledge in an open, accountable way through a structured decision-making process. The sharing of scientific, technical, cultural, and traditional knowledge will be fostered to support the management of fish, fisheries and their supporting ecosystems.

Collaboration: While the ministry has a clear mandate for the management of fisheries in Ontario, successful delivery of this mandate requires collaboration with other responsible management agencies, Indigenous communities, and others who have a shared interest in the stewardship of natural resources (MNRF 2015b).

4 Legislative and Policy Framework for Fisheries Management in Ontario

Under Canada's *Constitution Act*, responsibility for fisheries management is divided between the federal government, which has authority over the seacoast and inland fisheries, and the provinces, which have authority over natural resources, management and sale of public lands, and property and civil rights. At the federal level, Fisheries and Oceans Canada (DFO) has primary responsibility for fisheries; in Ontario, the primary agency is the Ministry of Natural Resources and Forestry.

The protection of fish and fish habitat is a responsibility of the federal government, regulated under the federal *Fisheries Act.* The purpose of the Act is to protect fish and fish habitat, ensure passage of fish, prevent detrimental impacts to fish populations, and provide a framework for the proper management and control of fisheries. DFO has created a Fisheries Protection Policy Statement that outlines how DFO and its regulatory partners (including the ministry) will apply the Fish and Fish Habitat

Protection Provisions of the *Fisheries Act*, guide the development of regulations, standards and codes of practice, and provide guidance to proponents of projects on the application of the Fish and Fish Habitat Protection Provisions of the *Fisheries Act*.

The ministry is the agency responsible for administering and enforcing the Ontario Fishery Regulations under the Fisheries Act, including allocation and licensing of fisheries resources, fisheries management (e.g., control of angling activities and stocking), fisheries management planning, fish and fish habitat information management, and fish habitat rehabilitation. Ontario works with DFO to help achieve the requirements of the Fisheries Act through agreements and protocols.

The ministry also has fisheries responsibilities under the federal Aboriginal Communal Fishing Licenses Regulations, and the Ontario *Fish and Wildlife Conservation Act*. Under Ontario's Environmental Bill of Rights, the ministry is required to consider the ministry's Statement of Environmental Values in evaluating each proposal for instruments, policies, statutes, or regulations that may significantly affect the environment.

The ministry's mission is to manage our natural resources in an ecologically sustainable way to ensure that they are available for the enjoyment and use of future generations. The ministry is committed to the conservation of biodiversity and the use of natural resources in a sustainable manner.

Effective enforcement following development of the fisheries management plan and its associated regulations is important. Compliance is encouraged through a combination of outreach, education, enforcement and by means of developing strong working relationships with the public, our partners and interested stakeholders. Without enforcement there is serious risk that unregulated fishing activities could compromise the implementation of the management plan and impact the resource.

5 Fisheries Management Goals

As stewards of Ontario's fisheries resources, the ministry governs the strategic direction and guidance documents that are intended to support the fisheries management planning process. This management plan seeks to incorporate strategic direction and guiding principles specific to the needs of the zone's fisheries.

The following are long-term, aspirational fisheries management goals within the Province of Ontario as described in Ontario's Provincial fish strategy – Fish for the future (MNRF 2015b):

1. Healthy ecosystems that support self-sustaining native fish communities.

2. Sustainable fisheries that provide benefits for Ontarians.
3. An effective and efficient program for managing fisheries resources.
4. Fisheries policy development and management decisions that are informed by sound science and information.
5. Informed and engaged stakeholders, partners, Indigenous communities and general public.

Working with the Advisory Council and First Nation and Métis Task Team, as part of the FMZ 10 Management Planning process, five goal statements were developed to guide the development of more detailed objectives, and targets for FMZ 10.

Goal Statement – Collaboration with First Nation and Métis Communities

Work cooperatively with First Nation and Métis communities to improve engagement and collaboration with First Nation and Métis communities in the management of the fisheries and associated ecosystem and economic benefits.

Goal Statement – Fish Populations

While employing the precautionary principle, manage for the improvement of fisheries, including healthy natural fish populations, beyond a minimally sustainable condition, enhance urban opportunities and provide a safe food source.

Goal Statement – Aquatic Ecosystems

While minimizing the risk of invasive species and considering climate change, maintain healthy aquatic ecosystems, and restore damaged aquatic ecosystems.

Goal Statement – Education

Improve the general public's respect for natural resources, their awareness of ethical practices around aquatic ecosystems and their knowledge of regulatory principles and practices.

Goal Statement – Socio Economic

Provide diverse ways for users to experience and interact with resources and promote a fair valuation of the resources so that there is a broad appreciation of the socio-economic benefits that resources furnish.

6 Fisheries Management Planning

6.1 Planning Considerations

The purpose of the planning process is to gather all relevant pieces of information related to the resource and to develop a document that clearly identifies the management objectives and strategies (Figure 6.1). These must identify specific targets and timelines that will assist with and guide the management of the recreational fisheries in an open and transparent way that solicits input from the Indigenous communities, general public and stakeholders. The end result will be a plan that is comprehensive, provides clear direction with measurable and achievable objectives that support the long-term sustainability of the fisheries. Plan development was based on the current status of the resource, known management issues, challenges and opportunities.

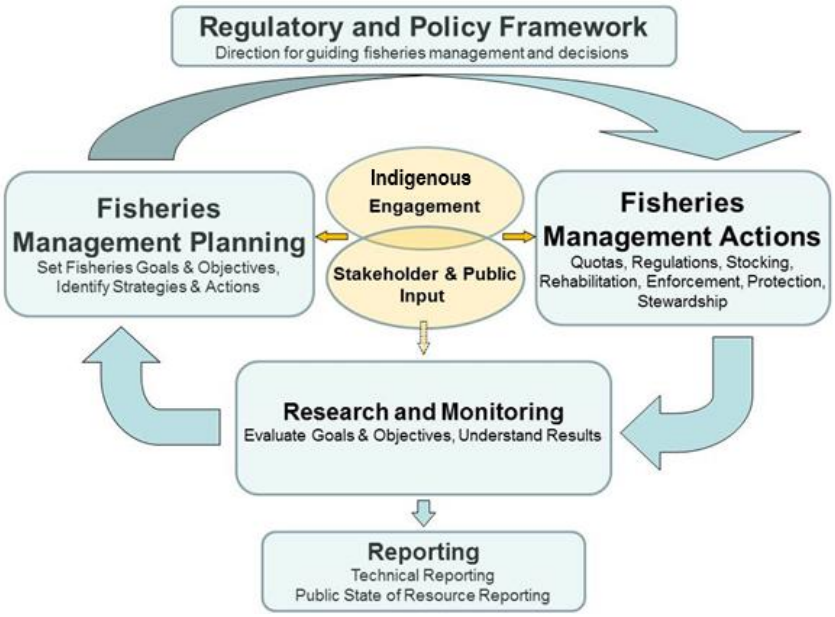


Figure 6.1: Management Objective and Management Strategy development process

6.1.1 Management Issues and Challenges

The FMZ 10 Advisory Council and ministry staff undertook an extensive discussion of the management issues and challenges facing the fisheries resources of FMZ 10. They can be grouped into four broad categories:

1. exploitation,

2. ecosystems and habitat,
3. invasive/introduced species,
4. and education.

6.1.2 Management Objectives, Indicators, Benchmarks, Actions and Targets

Objectives have been developed based on the guiding principles, Advisory Council goals and a review of issues, challenges and opportunities. This approach allows for clearer identification of management intent, including identification of measurable targets. Both fisheries managers and the public will be able to assess the success of management.

Objectives describe what you want to achieve in the future or the desired result. Objectives need to contribute to the broad fisheries management goal for the zone, be consistent with strategic direction and the guiding principles. Objectives should be specific, measurable, achievable, relevant and time-bound. Objectives can reflect biological, economic or social considerations.

Indicators are variables that are measured to track progress toward fisheries objectives, for example the measured fishing mortality rate of a fish population.

Benchmarks are reference values associated with indicators used to assess progress towards achieving fisheries management targets/objectives. Benchmarks describe the baseline state or starting point for the indicators. Benchmarks will be compared to the future indicator status to measure progress towards the target and achievement of the objectives.

Targets translate a management objective that is described in words into one that is described in measurable numbers that describe a desired future value or describe the direction the indicator must move to achieve the objectives. Since they are very specific measures of an indicator, targets help the public and resource managers understand when an objective is achieved.

Actions are the specific tasks proposed or completed that intend to help meet management objectives.

7 First Nation and Métis Community and Public Involvement

A summary of the involvement of First Nation and Métis communities, stakeholders and members of the public in plan development, as well as a summary of the planned consultation process for the draft plan is provided in Appendicies C. Informed transparent decision making and collaboration were identified as key principles of

conduct during the development of this fisheries management plan. Recreational fisheries can be more effectively managed through the sharing of information and knowledge between the ministry, Indigenous communities and stakeholders and by working together on shared goals and towards common objectives. Engagement with Indigenous communities and stakeholders through the decision-making process is a key component of the structured, adaptive approach. Engagement occurs through direct and meaningful involvement at multiple stages of the decision-making process. In addition to receiving input from the FMZ 10 Advisory Council and associated First Nation and Métis Task Team subcommittee, the planning team connected with and sought input from adjacent fisheries management zones resource managers in order to ensure planning decisions were aligning with other resource management plans or, at the minimum, were not going to negatively impact resources in the neighboring zones.

7.1 FMZ 10 Advisory Council

Fisheries management policy in Ontario stresses the importance of enhanced public involvement and stewardship. The primary mechanism for involvement by stakeholders and Indigenous communities in fisheries management decision making is through Fisheries Management Zone Advisory Councils. The members of the FMZ 10 Advisory Council represented a diverse group of local stakeholders fisheries users and interests across the zone (see Appendix D). Members took the role to actively network with their communities or constituents to collect feedback from other community members, anglers, resource users and/or stakeholder groups through the planning process. The Advisory Council worked well in gathering information on fishery uses, user expectations, opportunities, concerns and potential stressors for the fisheries within FMZ 10.

Through stages of the preparation of the management plan, the Advisory Council provided critical insight and information that shaped the management plan to reflect local interests and concerns. Their active and purely voluntary participation in the plan development process is very much appreciated.

The FMZ 10 Advisory Council was established in 2007, at the outset of planning. Members were encouraged to keep their respective groups apprised of the developments in draft plan preparation throughout the planning period. The council, in concert with ministry staff, developed and distributed literature on various species and their status in FMZ 10 during this period. In addition to deliberating on the development of the plan, council members were also instrumental in acting as stewards of the zone’s fisheries by means of communicating key messaging and participating in the open house sessions.

Current and past affiliation of FMZ 10 Advisory Council Members:

- Algoma Fish and Game Club
- Anglers at Large
- Anishinabek/Ontario Fisheries Resource Centre (A/OFRC)
- Aundeck Omni Kaning First Nation
- Baitfish Industry - Baitfish Advisory Committee for the North (BACN)
- Brunswick House First Nation
- Fisheries Retail
- French River Stewardship Council
- Garden River First Nation
- Local Citizen's Committee
- Manitoulin Island Fisheries Advisory Committee
- Matachewan First Nation
- Mattagami First Nation
- Métis Nation of Ontario, Land and Resources
- Métis Nation of Ontario, Region 3
- Métis Nation of Ontario, Region 4
- Métis Nation of Ontario, Region 5
- Mississauga First Nation
- Muskies Canada Incorporated (MCI)
- Nature and Outdoor Tourism Ontario (NOTO)
- Ontario Federation of Anglers and Hunters (OFAH)
- Resource Based Tourism
- Sault Naturalists - Ontario Nature
- St. Joseph Island Hunters and Anglers Association
- Wahnapitae First Nation
- Whitefish River First Nation

7.2 First Nation and Métis Involvement

Section 35 of the *Constitution Act, 1982* recognizes and affirms the existing Aboriginal and treaty rights of the Aboriginal peoples of Canada. The ministry has a legal duty to consult affected First Nation and Métis communities when a proposed activity or decision has the potential to adversely impact Aboriginal and/or treaty rights.

First Nation and Métis communities have a long history of, and strong interest in, fisheries resources management. First Nation and Métis rights and interests help guide fisheries management planning and activities in Ontario. First Nation and Métis

involvement has been encouraged during the development of this Fisheries Management Plan. The following communities and representative organizations were invited to participate in information centers held in 2017 and 2019 to support information sharing to feed into the development of the fisheries management plan for FMZ 10:

- Atikameksheng Anishnawbek
- Aundeck Omni Kaning First Nation
- Bar River Métis Community
- Batchewana First Nation
- Brunswick House First Nation
- Chapleau Cree First Nation
- Chapleau Ojibwe First Nation
- Dokis First Nation
- Flying Post First Nation
- Garden River First Nation
- Henvey Inlet First Nation
- Matachewan First Nation
- Mattagami First Nation
- M'Chigeeng First Nation
- Métis Nation of Ontario Region 3
- Métis Nation of Ontario Region 4
- Métis Nation of Ontario Region 5
- Michipicoten First Nation
- Missanabie Cree First Nation
- Mississauga First Nation
- Sagamok Anishnawbek
- Serpent River First Nation
- Sheguiandah First Nation
- Sheshegwaning First Nation
- Taykwa Tagmou First Nation
- Temagami First Nation
- Thessalon First Nation
- Wahnapitae First Nation
- Whitefish River First Nation
- Wikwemikong Unceded Territory
- Zhibaahaasing First Nation

The First Nation communities and representative Métis organizations that attended, or expressed interest in attending, one of the information sharing sessions were invited to identify a representative to sit on the FMZ 10 Advisory Council. Twelve communities identified representatives to sit on the FMZ 10 Advisory Council. A list of Advisory Council members can be found in Section 7.1.

Throughout the preparation of the FMZ 10 plan and during Advisory Council meetings, the First Nation and Métis representatives on the Advisory Council provided important insight and information that helped to guide the development of the management plan.

Recognizing the importance of a collaborative relationship, a First Nation and Métis Task Team subcommittee was formed composed of the First Nation and Métis representatives on the Advisory Council. The Task Team environment allowed for more in-depth discussion of fisheries management planning and space to discuss First Nation and Métis interests in the FMZ 10 plan. The Task Team also provided a first point of contact to work collaboratively with on the development and review of applicable sections of the plan. In addition, the Task Team provided insight into broader First Nation and Métis community engagement to support review of the draft plan.

See Appendix C for additional information on First Nation and Métis community engagement in the planning process and for a summary of the First Nation and Métis community engagement plan to support draft plan review.

8 First Nation and Métis Objectives and Management Actions

Fisheries have been an integral food source for First Nation and Métis communities and the animal inhabitants which share Turtle Island since time immemorial. The right for First Nation and Métis communities to fish is a constitutionally protected Aboriginal and/or treaty right. First Nation and Métis communities provide stewardship to the waterbodies on their traditional territory and harvesting areas to ensure sustainable fishing for seven generations in the future. Indigenous communities have observed and maintained the fisheries for generations and hold key knowledge on changes to the environment and quality of fish. Many First Nation and Métis communities' fish in the spirit of "take only what you need". Fishing is more than the action of removing fish for food, it is viewed by many communities as an essential part of cultural teachings. Historically and in modern day, fishing is an opportunity for communities to gather. It is a social and networking opportunity and allows for communities to come together and give appreciation to the fish and the water. Pre and post European contact, fish were viewed as an economic source and were used to barter between other communities and European settlers. Fish were commonly traded for furs, medicines, wild rice, etc. Sustainable practices such as fish spawning, creation of habitat and community-based decisions such as community limits or moratoriums have positively affected fisheries for generations.

Traditional ecological knowledge has been gathered and shared by First Nation and Métis peoples since time immemorial. First Nation and Métis rights and interests help guide fisheries management planning and activities in Ontario. The ministry acknowledges the importance of traditional ecological knowledge in decision making and continues to explore opportunities to increase First Nation and Métis involvement in fisheries management through collaborative partnerships.

The ministry recognizes that fisheries management provides an opportunity to support new approaches to collaboration with First Nation and Métis communities and nation-to-nation relationship building. In addition, sharing information will contribute to an overall understanding of use patterns and aid in management solutions for the betterment of the fisheries.The FMZ 10 First Nation and Métis Task Team, taking into account input received during the First Nation and Métis information sharing centers, has identified the following objectives and associated management actions to support the implementation of plan's goal to work cooperatively with First Nation and Métis communities to improve engagement and collaboration in the management of the fisheries and associated ecosystem and economic benefits.

Objectives:

Determine and implement opportunities to:

1. utilize traditional knowledge to assess ecosystem health and population status.
2. educate public, industry and the ministry staff on fisheries pre and post contact and traditional fishing practices.
3. support First Nations and Métis capacity as it relates to fisheries.
4. better collaborate and share information between the ministry and First Nation and Métis communities on fisheries management.

Management Actions:

The following management actions have been identified by FMZ 10 First Nation and Métis Task Team as actions to support the implementation of one or more of the above identified objectives:

- Include a First Nation and/or Métis Elder and youth on the FMZ 10 Advisory Council.
- Support more active First Nation and Métis participation in fish monitoring studies, including identifying and implementing opportunities for reciprocal training, mentorship and information sharing.
- Identify and implement opportunities to incorporate holistic approaches into fisheries management planning.

- Partner with First Nation and Métis communities to provide education/awareness to the ministry staff, businesses and the public on sustainable fisheries, fisheries pre and post contact and traditional fishing practices; use social media/videos and fish monitoring studies as opportunities to provide enhanced awareness.
- Have the ministry participate in First Nation and Métis community events (e.g. festivals, gatherings, fish derbies, open houses, career fairs, etc.); invite FMZ 10 Advisory Council members.
- Work with First Nation and Métis communities to develop a strategy to assess the positive and negative impacts of aquaculture and fish hatcheries.

The ministry intends to work with the FMZ 10 First Nation and Métis Task Team to prioritize the above identified management actions and advance consideration of priority action items.

9 FMZ 10 Goals, Objectives and Strategies

The social and cultural benefits of recreational fishing are more difficult to define, but important to recognize. In addition to the opportunity to catch fresh, healthy food, fishing provides a variety of non-material benefits such as spiritual enrichment, relaxation, anxiety and stress relief, aesthetic experience, exercise, healthy lifestyles, and activities that build social cohesion and connections. Fishing is an activity that initiates, builds and strengthens intergenerational relationships, where values and skills are passed on and generations share healthy outdoor activity together (MNRF 2015d).

In FMZ 10, approximately 100,000 anglers fish annually, and typically 80% of anglers are Ontario residents. Walleye remains the most preferred species targeted by anglers, followed by bass, lake trout, and northern pike (MNRF 2020).

In the following sections we provide description of issues and challenges and outline key objectives and management strategis for several species. In addition to species specific objectives and management strategies, there are more broadly applicable strategies (such as stocking and education) that can be found in section 9.

Detailed background information (such as distribution, habitat, angling pressure, and indicator status) for each of these species can be found in Appendix A. In this section (9.0), indicators used to determine status of these species are presented, along with benchmarks and targets for each indicator (see section 6.1.2 for description of benchmarks, targets, etc.)

9.1 Walleye

For detailed information about walleye distribution, habitat, angling pressure, and status see Appendix A: Fisheries Background Report

Walleye are the most targeted sport fish species among recreational anglers in FMZ 10 in summer and 2nd most targeted in winter (MNRF 2020). . Monitoring data collected between 1993 and 2001 showed that abundance of FMZ 10 walleye populations was lower than the Northeast regional benchmarks and among the lowest in the province (Kaufman and Houle 2008, Morgan et al. 2002). More recent Provincial monitoring results show that abundance of walleye in FMZ 10 lakes is among the lowest of northern FMZs, and particularly adult walleye abundance is below levels considered sustainable. There have been small improvements in some indicators of walleye status since recreational regulation changes were implemented in 2005; however, several indicators suggest that walleye populations remain stressed (see Appendix A). Management actions are being considered and options are described below.

9.1.1 Walleye Management Strategy

The following summarizes the management strategy for walleye outlining the management issues, goal, objectives, indicators, benchmarks, targets, assessment of indicators, and management action options.

Management Issues and Challenges:

- High expectations about the zone's ability to produce walleye;
- Catch rates can remain high and don't necessarily reflect the decline in the fisheries;
- Ability of modern anglers to easily travel throughout the zone coupled with advancements in technology/equipment which lends to challenges when trying to control the magnitude of harvest on an open-access fishery;
- Unauthorized stocking efforts into waters not naturally occupied by walleye;
- Lack of ability to reliably track the number of walleye lakes across the zone;
- Invasive species (spiny water flea) and other potential species such as rusty crayfish (*Orconectes rusticus*), and transmission of diseases (such as, viral hemorrhagic septicemia);
- Habitat loss, unfavourable water level manipulation and other unforeseen circumstances which the fisheries may face in the future;
- Potential gaps in knowledge of walleye harvest during sensitive periods/locations (such as, pre-spawning staging areas and migration routes);
- Conflicting tradeoffs between angler preferences for trophy sized fish, importance of large mature fish for population sustainability, and fish consumption guidelines.
- Concern over the effects of tournament fishing on walleye populations.

Goal:

To ensure self-sustaining walleye populations with emphasis on abundance of mature fish while continuing to provide fishing opportunities in FMZ 10.

Objectives:

1. Increase the percent of walleye lakes where fishing mortality and biomass meet sustainability benchmarks.
2. Maintain the quantity and quality of angling opportunities for walleye in FMZ 10 through effective regulations and stocking practices
3. Protect and improve walleye habitat within the zone.

Table 9.1: Summary of walleye management strategy for FMZ 10, (AW –area weighted average, CUE – catch per unit effort, number of fish per net)

Objective	**Indicator**	**Benchmark (BsM Cycle 1)**	**Target**
Objective 1 & 2	Percent of FMZ 10 walleye lakes where fishing mortality is sustainable (F ≤0.75 x M)	30%	Increase
	Percent of FMZ 10 walleye lake area where Biomass (kg fish in lake) is sustainable (Biomass ≥1.3 Biomass Maximum Sustainable Yield)	10%	Increase
	Number of recruited size walleye AW CUE fish per net (total length ≥350mm)	0.76	Increase

Objective	Indicator	Benchmark (BsM Cycle 1)	Target
	Number of mature size walleye AW CUE fish per net (total length ≥450mm)	0.48	Increase
	Number of walleye cohorts (age classes) AW average	8.03	Increase
	Mean age of recruited size walleye (AW, total length >350mm)	7.03	Increase
Objective 3	Number and frequency of updates to available information on walleye spawning habitat within the zone	Plan start status	Increase
	Inclusion of fish (walleye) habitat considerations in FMZ 10 within other processes, such as: Class Environmental Assessments, shoreline development permitting, and water management planning.	Plan start status	Provide input on 100% of the EA (or other screenings submitted under relevant Acts, and plans.

9.1.2 Rationale for Proposed Walleye Management Actions

The management issues regarding walleye in FMZ 10 along with the assessment of each of the abundance, growth, age structure, and sustainability benchmark indicators were examined to develop recommended regulation change options (Table 9.3). Adittionally, a review of regulation changes over the past 2 decades was considered. The options were developed with support and input from the FMZ 10 Advisory Council.

An extensive review of walleye populations across Northeast region occurred in the early 2000s and involved a Regional Fisheries Advisory Committee (RFAC). In 2001 the RFAC recommended two regulation change options that showed most promise of recovering popualtions.

1. Four fish per day Creel limit with none allowed greater than 46cm, or
2. Four fish per day Creel limit with none allowed between 41 and 56 cm, with one walleye allowed over 56 cm

Option 2 was implemented in 2002, however, efforts to streamline walleye regulations across the North resulted in a 2005 change, since which time the current regulation (4 fish limit with 1 greater than 46cm allowed) has been in place.

During planning and writing of this management plan, anglers suggested that populations responded to the protective slot even though it was in place for only 2 years, and abundance of larger fish was observed during that time. Additionally, the ministry frequently hears concerns expressed by advisory council members and tourism opperators with allowing anglers to keep walleye over 46 cm.

Proposed changes for walleye regulations across the FMZ are based on the current assessment of walleye status and the recognition that reductions in harvest, particularly of mature fish, is necessary.

Primary measures of success for Objective 1 and for Objective 2 is an increase in the percentage of walleye lakes where both the fishing mortality and biomass estimates meet sustainability benchmarks. Comparing most recent monitoring results to our sustainability benchmarks demonstrates that fishing mortality remains high, with only 30% of lakes having sustainable fishing mortality. There was a slight increase in the percent of lakes where biomass is estimated to be sustainable, however this change was an increase from 10% to 14%, and most lakes remain well below target biomass levels. Assessment of the sustainability of fishing mortality and biomass estimates relative to target reference points indicate that populations are well below what should be characterized as sustainable.

Secondary indicators of success for Objective 1 and for Objective 2 are an observed increase in the abundance, growth, and age structure indicators. Data obtained during the cycle 2 of the BsM program was compared to the benchmark (cycle 1 BsM) for each of the indicators for walleye abundance, growth and age structure (Table 9.2). Abundance indicators show signs of improvement, with both recruited size walleye and mature size walleye increasing in abundance as observed during cycle 2 of BsM. However, the increases are small, and overall abundance of walleye in FMZ 10 lakes remains well below other northern FMZs. The growth and age structure indicators all showed movement towards the target over the past decade, however the changes were small and insignificant ($p > 0.1$).

Table 9.2: Summary of walleye indicator comparisons of cycle 1 and cycle 2 for FMZ 10 (paired t-test, α= 0.1, AW - area weighted averages, CUE – catch per unit effort).

Indicator	Benchmark (BsM cycle 1)	Assessment (BsM cycle 2)	Statistical Difference*
Percent of FMZ 10 walleye lakes where fishing mortality is sustainable (F ≤0.75 x M)	30%	30%	Not Applicable
Percent of FMZ 10 walleye lake area where biomass (kg fish in lake) is sustainable (Biomass ≥1.3 Biomass Maximum Sustainable Yield)	10%	14%	Not Applicable
Number of recruited size walleye CUE fish per net (total length ≥350mm)	AW = 0.76 Mean = 0.71 (SD = 1.05),	AW = 0.95 Mean = 1.05 (SD 1.48)	Yes (p = 0.014, Power = 0.84)
Number of mature size walleye CUE fish per net (total length ≥450mm)	AW = 0.48 Mean = 0.41 (SD 0.64)	AW = 0.51 Mean = 0.53 (SD 0.83)	Yes (p = 0.071, Power = 0.60)
Number of walleye cohorts (age classes)	AW = 8.03	AW = 8.12	No (p = 0.136, Power = 0.46

Indicator	Benchmark (BsM cycle 1)	Assessment (BsM cycle 2)	Statistical Difference*
	Mean = 6.90 (SD 3.18)	Mean = 8.05 (SD 4.39)	
Mean age of recruited size walleye (total length >350mm)	AW = 7.03 Mean = 7.35 (SD = 2.82)	AW = 7.65 Mean = 7.67 (SD = 2.35)	No (p = 0.693, Power = 0.12)

*Statistical difference was determined through a paired t-test was conducted on the un-weighted means and assessed against a α= 0.1.

Considering all available information there is minimal movement towards achievement of the stated objectives, with the sustainability estimates of fishing and biomass mortality indicating that the zone is well below the ability to be classified as self-sustainable. Regulation options identified as likely to improve populations, are being proposed (Table 9.3).

French River

Proposed changes for walleye in the French River (also see northern pike and smallmouth and largemouth bass) are in response to advice from the Advisory Councils in FMZ 10 and FMZ 11. Although no recent monitoring data exists, it is believed that restrictive regulations implemented in the 1990s have successfully enhanced the quality of these populations and council members felt that it is appropriate to now align regulations with the surrounding FMZ. Aligning with the broader FMZ is appropriate because, the historically more restrictive regulations on the French River are now much closer to what is currently in place or is being proposed in FMZ 10 and FMZ 11.

Spanish River

Proposed changes for walleye in the Spanish River are also in response to advice from the Advisory Council who expressed concerns about high harvest pressure and the current sustainability of this locally important fishery. Monitoring data collected in 2016 and 2017 confirms that walleye in the Spanish River experience the highest rate of fishing mortality among Lake Huron populations monitored. Observed age structure shows good recruitment of young fish most years but harvesting pressure on the adult population is considered unsustainable. Public tag returns indicate harvest is occurring throughout the River and the North Channel of Lake Huron where there also a commercial fishery that harvests walleye. Observed recreational angling pressure on

this population has been the highest of all Lake Huron populations being monitored for at least the past 2 decades. Proposed changes for walleye regulations in the Spanish River are based on this assessment and the need to reduce harvest. Currently, planning is also underway in neighboring FMZ 14 where a walleye management plan is being developed. The proposed changes here are intended to be an interim response until the completion of FMZ 14 management plan, at which time further changes may be proposed for the Spanish River in FMZ 10.

La Cloche Lake

Recovery efforts for walleye in La Cloche Lake have been ongoing for more than three decades. Since the mid-1990s, the Sagamok Anishinawbek First Nation and the local La Cloche Lake Cottagers' Association have made efforts towards rehabilitating the walleye population in La Cloche Lake. The recreational fishery has been closed since 1997 at which time the Sagamok Anishinawbek First Nation also initiated a moratorium on the walleye fishery. The ministry stocked the lake with walleye fingerlings on a nearly annual basis between 1987 and 2004. Monitoring surveys conducted by Anishinabek/Ontario Fisheries Resource Centre (AOFRC) in 1996, 2001, 2006 and 2010 demonstrated that walleye stocking was successful in that fish survival and growth was very good. However, it also showed that although there was mature walleye in the lake, natural reproduction was very limited or non-existant. It is now recognized that because of a number of factors related to changes in lake habitat and species diversity, that establishing a naturally reproducing population of walleye in La Cloche Lake is highly unlikely.

Proposed changes for walleye in La Cloche Lake represent a change in management approach, following nearly three decades of recovery efforts. Good survival and growth of stocked walleye provides an opportunity to enhance the locally important fishery. The ministry proposes to resume stocking on La Cloche Lake to support the locally important fishery. The ministry will work with Sagamok Anishinawbek First Nation and the La Cloche Lake Cottagers' Association to develop mutually agreeable objectives, a stocking strategy, and a monitoring strategy.

Table 9.3: Proposed management action options to meet walleye objectives

Option 1: Retain current recreational angling regulation as follows:	**Option 2: Modify season size limits:**	**Option 3: Modify season size limits:**
Season: • Open Jan 1- Mar 31, 3rd Saturday in May to Dec. 31 Catch and Possession Limits: • Sport Fishing License – 4; • Conservation License – 2; Size Limit - no more than 1 greater than 46 cm	Season: • Open Jan 1- 3rd Sunday in March, 3rd Saturday in May to Dec. 31 Catch and Possession Limits: • Sport Fishing License – 4. • Conservation License – 2; Size Limits: none above 46 cm	Season: • Open Jan 1- 3rd Sunday in March, 3rd Saturday in May to Dec. 31 Catch and Possession Limits: • Sport Fishing License – 4. • Conservation License – 2; Size Limits: none between 43-60 cm, no more than 1 greater than 60 cm.

Advisory Council Advice

Maintaining the **current regulation** was considered by the FMZ 10 Advisory Council and received minor support for the following reasons:

- Concern regarding public understanding of management actions.
- Concern about impact on tournaments across the zone.

Option 2 was recommended by the majority of the Advisory Council and **Option 3** was recommended by a minor portion of the FMZ 10 Advisory Council for the following reasons

- Alignment of seasons across FMZs is important.
- BsM data does not indicate any significant increase among the sustainability indicators and only marginal increases among the abundance growth and age structure indicators.
- Concern that the current regulation is not protecting the mature sized walleye.
- Concern about promoting the consumption of trophy sized walleye.
- Reviewed the results from the application of a similar regulation in neighbouring FMZ 11.
- Concern about impact on tournaments across the zone.

Table 9.4: Proposed management action options to meet walleye objectives for La Cloche Lake, French River, and Spanish River.

Walleye exception	**Option 1: Retain current regulation as follows**	**Option 2**	**Option 3**
La Cloche Lake - Harrow Township	Walleye – Closed all year	Season: January 1st to 3rd Sunday in March, 3rd Saturday in May to Dec. 31st Limits: S -1, C-0.	Season: January 1st to 3rd Sunday in March, 3rd Saturday in May to Dec. 31st Limits: S -2, C-0., none greater than 46 cm or none between 43-60, 1>60
French River (Waters in FMZ 10 & FMZ 11)	Season; - Open Jan 1- Mar 31, 3rd Saturday in May to Dec. 31 Limits: S-4 and C-2; none between 40-60 cm, not more than 1 greater than 60 cm	Season: January 1st to 3rd Sunday in March, 3rd Saturday in May to Dec. 31st Align entire river with FMZ 11 zone limits; S-4 and C-2; none between 43-60 cm, not more than 1 greater than 60 cm	NA
Spanish River	Sanctuary; no fishing from Jan 1st to Friday before 3rd Saturday in May and October 1st to December 31st. Limits: same as zone.	Retain Sanctuary Limits: S -2, C-1., none greater than 46 cm	Retain Sanctuary Limits: S -2, C-1; none between 43-60 cm, not more than 1 greater than 60 cm

9.2 Northern Pike

For detailed information about northern pike distribution, habitat, angling pressure, and status see Appendix A: Fisheries Background Report.

Northern pike have a wide distribution throughout FMZ 10. Northern pike populations in FMZ 10 have been recognized, since the late 1990's, as having lower abundance and smaller average size than other northern zones. They were the 3rd most sought after species by recreational anglers in both summer and winter in 2010 and 2015 (MNRF 2020). Many anglers have concerns with a lack of quality sized fish.

9.2.1 Northern Pike Management Strategy

The following summarizes the management strategy for northern pike outlining the management issues, goal, objectives, indicators, benchmarks, targets, assessment of indicators, and management action options (Table 9.4).

Management Issues and Challenges:

- Many FMZ 10 lakes are dominated by small northern pike and lack of quality sized fish. such as, recruitment sized fish (≥500 mm);
- Given that many northern pike are released after capture, northern pike survival may be dependent on good handling and release practices;
- Water level management may result in drawdown of water inhibiting access to spawning grounds for this early spring shallow water spawning species;
- Conflicting user values; tradeoffs between protecting mature fish and providing consumption opportunities.
- Threat to northern pike populations from diseases (such as VHS);
- Evidence that climate change may reduce northern pike recruitment as they prefer 15 to 22°C waters (Casselman 2013);
- Northern pike is a species that is involved in unauthorized introductions to the detriment to all species of trout.
- Concern over the effects of tournament fishing on northern pike populations.

Goal:

- Maintain sustainable populations.

Objectives:

1: Maintain current abundance but increase proportion of large fish by promoting healthy northern pike age structure by protecting larger pike.

2: Maintain opportunities for northern pike angling and harvest.

Table 9.5: Summary of the northern pike management strategy for FMZ 10 *(EW – equally weighted average, CUE – catch per unit effort, number of fish per net)*

Indicator	Benchmark (BsM Cycle 1)	Target
Number of recruited size pike EW CUE, fish per net (total length ≥500mm)	0.15	Maintain/Increase from Benchmark
Number of northern pike cohorts (age classes) (EW average)	3.85	Increase from Benchmark
Mean age of recruited size northern pike (EW, total length >500mm)	5.70	Increase from Benchmark
Pre-recruit growth rate (mm/year) up to recruit size (total length >500mm)	175	Maintain/decrease from Benchmark
Mean total length of largest 5% after removing the top 2% of lengths (Lmax_25)	648	Increase from Benchmark

9.2.2 Rationale for Proposed Northern Pike Management Actions

Data obtained during the cycle 2 of the BsM program was compared to the benchmark (cycle 1 BsM) for each of the indicators for northern pike abundance, growth and age structure (Table 9.6). The number of recruited size northern pike collected during cycle 2 of BsM compared to the benchmark (BsM cycle 1) showed a small yet statistically significant increase ($p = 0.019$), (Table 9.6). Biologically, the increase was small, and a larger increase is desired. The age structure and growth indicators, showed some signs of improvement from BsM cycle 1 to BsM cycle 2. However, populations remain well below other northern zones for most indicators (see Appendix A), and larger improvements are desired.

Table 9.6: Summary of northern pike indicator comparisons of cycle 1 and cycle 2 for FMZ 10 (paired t-test, α= 0.1 EW – equally weighted average)

Indicator	Benchmark (BsM cycle 1)	Assessment (BsM cycle 2)	Statistical Difference*
Number of recruited size northern pike EW CUE, fish per net (total length ≥500mm)	EW = 0.15, Mean = 0.17 (SD = 0.17)	EW = 0.27, Mean = 0.26 (SD 0.27)	Yes (p = 0.019, Power = 0.80)
Number of northern pike cohorts (age classes)	EW = 3.85, Mean = 4.04 (SD 1.73)	EW = 5.39, Mean = 4.96 (SD 2.10)	Yes (p = 0.029, Power = 0.73
Mean age of recruited size northern pike (total length ≥ 500mm),	EW = 5.7, Mean = 5.55 (SD = 1.25),	EW = 6.32, Mean = 5.48 (SD = 1.26),	No (p = 0.849, Power = 0.12)
Pre-recruit growth rate (mm/year) up to recruit size (total length >500mm)	EW = 175, Mean = 177.84 (SD = 67.52)	EW = 186, Mean = 159.51 (SD = 38.16)	No (p = 0.216, Power = 0.55)
Mean total length of largest 5% after removing the top 2% of lengths (Lmax_25)	EW = 648 Mean = 633.56 (SD = 104.63)	EW = 665 Mean = 641.93 (SD = 116.80)	No (p = 0.715, Power = 0.12)

*Statistical difference was determined through a paired t-test was conducted on the un-weighted means and assessed against a α= 0.1.

Considering FMZ 10 habitat characteristics, the relatively low abundance, poor age structure, and growth rate of northern pike, and the management issues regarding northern pike in FMZ 10, regulation change options were reviewed with the FMZ 10 advisory council. In addition, exception regulations in the zone were also reviewed, and proposed changes were brought forward that aligned with the overall objectives for the zone.

Proposed changes for northern pike in the French River are in response to advice from the Advisory Councils in FMZ 10 and FMZ 11. Although we have no recent monitoring data for the French River in FMZ 10, it is believed that restrictive regulations

implemented in the 1990s have successfully enhanced the quality of these populations and council members felt that it is appropriate to now align regulations with the surrounding FMZ. Aligning with the broader FMZ is appropriate because, the historically more restrictive regulations on the French River are now much closer to what is currently in place or is being proposed in FMZ 10 and FMZ 11.

The change options being considered for zone-wide changes are presented in Table 9.7 along with rational and level of support by the council.

Table 9.7: Proposed management actions options to meet northern pike objectives

Option 1: Retain current regulation as follows:	**Option 2: Modify size limits:**	**Option 3: Modify size limits:**
Season: • open all year Catch and Possession Limits: • Sport Fishing Licence - 6 • Conservation Licence - 2 Size Limits: • (S): not more than 2 greater than 61cm, of which not more than 1 is greater than 86cm. (C): not more than 1 greater than 61cm, none greater than 86cm.	Season: • open all year Catch and Possession Limits: • Sport Fishing Licence - 6 • Conservation Licence - 2 Size Limits: • (S/C): none between 70 - 90 cm, and not more than 1 greater than 90 cm.	Season: • open all year Catch and Possession Limits: • Sport Fishing Licence - 6 • Conservation Licence - 2 Size Limits: • (S): not more than 1 greater than 61cm, none greater than 86cm. • (C): none greater than 61cm.

Advisory Council Advice

Retaining the current regulation was not supported by the FMZ 10 Advisory Council.

Option 2 was developed based on information from FMZs in Northwestern Ontario which suggests that this regulation has helped to maintain and/or increase abundance of larger pike.

Changes to the northern pike season were considered, but preference was to maintain year-round opportunities for pike angling.

Option 3 was recommended by the majority of the FMZ 10 Advisory Council for the following reasons:

- There does not appear to be an issue with the abundance of northern pike in the zone, there appears to be a problem with the abundance of mature pike.
- The value of pike across the zone would increase if the abundance of larger pike was increased.
- Concerned with quality of fishery impacting the ability of users of the resource to consume larger fish.

Table 9.8: Proposed management action options to meet northern pike objectives (French River)

<u>Option 1:</u> Retain current regulation as follows:	**<u>Option 2:</u> Align entire French River (FMZ 10 & 11) northern pike season with current FMZ 11 pike and walleye season (same as proposed FMZ 10 walleye season)**	**<u>Option 3:</u> Align entire French River (FMZ 10 & 11) northern pike season with current FMZ 11 pike and walleye season (same as proposed FMZ 10 walleye season)**
Season: Open January 1 to March 31 and third Saturday in May to December 31 Catch and Possession Limits: Sport Fishing Licence - 4 Conservation Licence - 2 Size Limits: • (S & C): none between 53 – 86 cm, and not more than 1 greater than 86 cm.	Season: Open January 1 to 3rd Sunday in March and third Saturday in May to December 31 Catch and Possession Limits • Sport Fishing Licence - 4 • Conservation Licence - 2 • (S/C)**:** none between 70 - 90 cm, and not more than 1 greater than 90 cm.	Season: Open January 1 to 3rd Sunday in March and third Saturday in May to December 31 Catch and Possession Limits • Sport Fishing Licence - 4 • Conservation Licence - 2 Size Limits: •(S): not more than 1 greater than 61 cm, none greater than 86 cm. •(C): none greater than 61 cm.

9.3 Smallmouth and Largemouth Bass

For detailed information about bass distribution, habitat, angling pressure, and status see Appendix A: Fisheries Background Report.

Largemouth bass are rare in FMZ 10 but are known to exist in a few lakes. Smallmouth bass are distributed across much of FMZ 10 and populations are healthy. Bass distribution has spread northward in recent decades as a result of historic, and ongoing, unauthorized introductions. The increasing range of bass, into waters they are not native to, poses significant risks to valued native species. The detrimental impacts of bass introductions was recognized by the FMZ 10 Advisory Council and significant recreational regulation changes were implemented in 2014 to provide additional angling opportunities and encourage anglers to target and harvest bass. However, bass populations also provide valuable recreational fisheries and, in 2015, bass were identified as the 2nd most preferred species in summer for FMZ 10 anglers (MNRF 2020).

9.3.1 Smallmouth and Largemouth Bass Management Strategy

The following summarizes the management plan for smallmouth and largemouth bass outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies.

Management Issues and Challenges:

- Range expansions due to unauthorized introductions and need for education/ enforcement;
- Bass becoming a dominant component of fish communities where they were not previously because the growing season is longer, which has resulted in increased survival of young fish.;
- High density bass populations impacting other sportfish populations (such as lake trout and brook trout);
- Detailed/precise current range extent and population status of bass in FMZ 10 is unknown (resulting in challenges in monitoring expansions);
- Encouraging the harvest of bass for consumption may be difficult;
- Evidence that climate change may favour bass (annual increase in recruitment/abundance) at the disadvantage of other species;

- **Goal:** Prevent new introductions, but where populations currently exist, limit recruitment of juveniles by increasing abundance of large bass in populations.

Objectives

1. Maintain angling opportunities for bass, while enhancing population size structure, consistent with the sustainability of populations
2. Prevent the extension of the current bass distribution through unauthorized introductions.

Table 9.9: Summary of the smallmouth bass management strategy for FMZ 10 (EW – equally weighted average, CUE – catch per unit effort, number of fish per net)

Objective	Indicator	Benchmark (BsM Cycle 1)	Target
Objective 1	Number of recruited size bass EW CUE, fish per net (total length ≥200mm)	0.61	Maintain
	Proportional Stock Density - Memorable EW CUE (fish per net) (total length 390-489mm)	0.16	Increase
	Proportional Stock Density - Trophy EW CUE (fish per net) (total length >490mm)	0.01	Increase
	Number of bass cohorts (age classes) (EW average)	7.01	Maintain
	Mean age of recruited size bass	6.23	Increase

	(EW, total length >200mm)		
Objective 2	Number of known lakes in FMZ 10 supporting smallmouth bass	351	Maintain/decrease

9.3.2 Rationale for Proposed Smallmouth and Largemouth Bass Management Actions

Indicator Assessment

Data obtained during the cycle 2 of the BsM program was compared to the benchmark (cycle 1 BsM) for each of the indicators for smallmouth bass abundance, growth and age structure.

A small but insignificant increase in abundance of recruited size smallmouth bass was observed from BsM results when comparing cycle 1 to cycle 2. When examining the proportional stock density for memorable (390-489mm) and trophy (>490mm) sized smallmouth bass there was an observed slight increase between results of BsM cycle 1 compared to cycle 2, however these results were marginal. The age structure indicators (number of age classes, average age) showed small insignificant changes as well.

Table 9.10: Summary of smallmouth bass Indicator comparisons of cycle 1 and cycle 2 for FMZ 10 (paired t-test, α= 0.1 EW – equally weighted average)

Indicator	Benchmark (BsM Cycle 1)	Assessment (BsM Cycle 2)	Statistical Difference*
Number of recruited size bass CUE, fish per net (total length ≥200mm)	EW = 0.61, Mean = 0.569 (SD 0.486)	EW = 0.82, Mean = 0.641 (SD 0.447)	No (p = 0.467, power = 0.18)
Proportional Stock Density - Memorable EW CUE (fish per net)	0.16	0.2	NA

(total length 390-489mm)			
Proportional Stock Density - Trophy EW CUE (fish per net) (total length >490mm)	0.01	0.02	NA
Number of bass cohorts (age classes)	EW = 7.01 Mean = 7.05 (SD 2.80)	EW = 7.41 Mean = 7.091 (SD 2.86)	No (p = 0.937, Power = 0.10
Mean age of recruited size bass (total length >200mm)	EW = 6.23 Mean = 6.48 (SD = 1.77)	EW = 6.82 Mean = 6.63 (SD = 1.68)	No (p = 0.778, Power = 0.11)

*Statistical difference was determined through a paired t-test was conducted on the un-weighted means and assessed against a α= 0.1.

The assessment of each of the abundance, growth, and age structure indicators were examined, and data presented here demonstrates that Smallmouth bass populations remain very healthy 8 years after recreational regulation changes were implemented. This assessment, in conjunction with the identified management issues was used to develop further regulation change options, intended to further increase harvest opportunities for anglers. The recommendation to increase the conservation license limit was supported by the input of the FMZ 10 Advisory Council. In addition, exception regulations in the FMZ were reviewed, and proposed changes were brought forward that aligned with the overall objectives for the zone.

Table 9.11: Proposed management action options to meet bass objectives

<u>Option 1:</u> Retain current recreational angling regulation as follows:	**<u>Option 2:</u> Modify Catch and Possession Limits:**
Season: • Open 3rd Saturday in June to November 30 • Open all year in: All waters north of Highway 17 and all waters west of where the east bank of the Serpent River crosses Highway 17 Catch and Possession Limits: • (S) – 6 • (C) – 2	Season: • Open 3rd Saturday in June to November 30 • Open all year in: All waters north of Highway 17 and all waters west of where the east bank of the Serpent River crosses Highway 17 Catch and Possession Limits: • (S) – 6 • (C) – 3

Advisory Council Advice

Retaining current regulations was supported by a minority of the FMZ 10 Advisory Council for the following reason:

- Believed that conservation license holders are not interested in harvesting bass

Option 2 was recommended by the majority of the FMZ 10 Advisory Council for the following reasons:

- Concern about the impact of the introduction of bass on trout populations.
- Support increasing opportunities for bass fishing by increasing the conservation licence limit to at least half of the sport licence limit.

The current regulation is relatively new and there was a lot of thought and effort put into developing it, not in favour of making a large change to the regulation.

Table 9.12: Proposed management action options to meet bass objectives for French River

Option 1 **Retain current recreational angling exception regulation:**	**Option 2**
Size Limits: • (S) - 4 • (C) - 2 none between 33-43 cm, not more than 1 greater than 43 cm Seasons: FMZ 10 portion: open third Saturday in June to November 30th, FMZ 11 portion: open January 1 to third Sunday in March and third Saturday in May to December 31.	*Remove current slot size limits and align with FMZ 11 zone Catch and Possession Limits:* (S) – 4; (C) – 2 Season: align season with FMZ 11 season. January 1 to third Sunday in March and third Saturday in May to December 31.

Advisory Council Advice

Comments received from members of the FMZ 10 Advisory Council expressed that there isn't a concern about the sustainability of bass populations and that the French River slot size limits should be removed, and limits should be aligned with the zone.

9.4 Lake Trout

For detailed information about lake trout distribution, habitat, angling pressure, and status see Appendix A: Fisheries Background Report.

Ontario boasts nearly 2300 lake trout lakes, 25% of the global distribution (Olver et al. 1991). The species has stringent habitat requirements (deep, cold, well-oxygenated lakes with clean, windswept rock rubble shorelines for spawning) and is sensitive to habitat change. Biological attributes, such as slow growth and late maturity, limit reproductive potential and sustainable harvest levels. FMZ 10 has the highest number

of lake trout lakes in the province and are highly valued by anglers. In summer months, lake trout were the 3rd most preferred species among anglers in FMZ 10 in 2005, and the 4th most preferred species in both 2010 and 2015 (MNRF 2020). Lake trout have been the most preferred species by winter anglers in FMZ 10 for several decades.

Lake trout populations have been recognized as being stressed for several decades in FMZ 10. Monitoring information collected in the past indicated that only 28% of natural lake trout lakes were considered healthy (Selinger et al. 2006). The main drivers impacting sustainability of populations were identified as overfishing, introduced species, and increased road access (Selinger et al. 2006). With input from the FMZ 10 Advisory Council, the ministry prepared Lake Trout Operational objectives and Management Strategies to guide landscape management within FMZ 10. The ministry sought public input of the objectives and strategies in 2009. The majority of the public approved of the objectives and strategies and the regulation changes implemented in 2010 to achieve the objectives. In 2018/19 the lake trout objectives were reviewed by the ministry and FMZ 10 Advisory Council and updated to reflect changes in monitoring data available. A review of most recent monitoring data (see Appendix A) demonstrated improvements in lake trout populations, and with input from the Advisory Council a lake trout management strategy was developed.

9.4.1 Lake Trout Management Strategy

The following summarizes the management plan for lake trout outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies.

Management Issues and Challenges:

- Past impairment or losses of lake trout populations due to acidification of waterbodies and challenges with recovery;
- Unauthorized introductions of species (smallmouth bass and rainbow smelt) into lake trout waters;
- Threats from invasive species (spiny water flea) and other potential species (rusty crayfish) and transmission of diseases (such as viral hemorrhagic septicemia);
- Poorly timed water level variations in regulated systems, for example, impairing or exposing overwintering embryos.
- Increased nutrient loading due to poor shoreline practices and lakeside developments;
- Uncertainty about the effects of climate change and its direct effects, specifically, on cold water species through changing conditions that benefit competitors (such as bass).

- Impacts of forestry operations increasing access to remote lake trout lakes,
- Concern over the effects of tournament fishing on lake trout populations.

Goal:

Protecting lake trout while continuing to provide fishing opportunities in FMZ 10.

Objectives:

1. Increase abundance and improve age structure of lake trout with an emphasis on mature lake trout.
2. Maintain the quantity and quality of angling opportunities for lake trout in FMZ 10 through effective regulations and stocking practices.
3. Maintain lake trout habitat recognizing that they are significant components of cold-water fish communities.
4. Identify and work with partners to monitor and restore where possible, acid-damaged lake trout lakes.
5. Prevent remote lake trout lakes from being easily accessed.

Table 9.13: Summary of the lake trout management strategy for FMZ 10 *(AW –area weighted average, CUE – catch per unit effort, number of fish per net)*

Objective	Indicator	Benchmark (BsM Cycle 1)	Target
1 & 2	Number of recruited size lake trout AW CUE, fish per net (total length ≥350mm)	0.48	Increase
	Number of mature size lake trout AW CUE (fish per net) (total length ≥400mm	0.39	Increase

Objective	Indicator	Benchmark (BsM Cycle 1)	Target
	Number of lake trout cohorts (age classes) (AW average)	8.95	Increase
	Mean age of recruited size lake trout (AW, total length ≥350mm)	11.05	Increase
	Pre-recruit growth rate (mm/year) up to recruit size (total length >350mm), AW	83	Maintain/decrease
	Number of stocked lakes	39	Maintain
3	Number and frequency of updates to available information on lake trout spawning habitat within the zone	Plan start	Increase
	Inclusion of fish (lake trout) habitat considerations in FMZ 11 within other processes, such as: Class Environmental Assessments, shoreline development permitting, and water management planning.	n/a	Provide input on 100% of the EA (or other screenings submitted under relevant Acts, and plans.

Objective	Indicator	Benchmark (BsM Cycle 1)	Target
4	Number of historically acid damaged lake trout lakes that have a pH suitable or marginal for lake trout (pH >5.5 are considered suitable, pH 5 – 5.5 are considered marginal, pH < 5 are acidic.	77 marginal and suitable lakes*	Increase
	Number of lakes with extinct population (stock status E (Appendix A, Table A-2)	30 lakes*	Decrease
	Number of lakes being stocked for recovery or reintroduction (stock status I2, R, R2 (Appendix A, Table A-2)	34 lakes *	Add lakes to stocking program when recovery is likely to be successful and remove where a self-sustaining population has established or if it has been determined stocking is unlikely to lead to recovery.
	Number of self-sustaining re-introduced populations of lake trout in historically acid damaged lakes (R1) (Appendix A, Table A-2)	9 lakes*	Increase
5	Number of remote nature lake trout lakes easily accessed by road or 4x4 trail	TBD	Maintain/decrease

* Benchmarks are from Table 13 from the lake trout Selinger et al. (2006) report that encompasses all of northeastern Ontario which the majority are in Fisheries Management Zone 10.

9.4.2 Rationale for Maintaining Current Lake Trout Regulation

The FMZ 10 Advisory council and the ministry decided to make its first focus for FMZ 10 on lake trout given the recent information from the Northeast Lake Trout Project (2000-2005). This facilitated management decisions at a landscape scale with the change from the pre-2010 regulation of 3 fish any size (Jan 1 to Sept 30th) to the current regulation of; 2 fish (only 1 > 40cm, Jan 1st to Labour Day).

Data obtained during the cycle 2 of the BsM program was compared to the benchmark (cycle 1 BsM) for each of the indicators for lake trout abundance, growth and age structure. Abundance indicators showed signs of improvement and all three of the growth and age structure indicators showed strong movement towards the target. It is encouraging to see movement in this direction, following the 2010 regulation changes.

Table 9.14: Summary of lake trout indicator comparisons of cycle 1 and cycle 2 for FMZ 10 *(AW –area weighted average, CUE – catch per unit effort, number of fish per net)*

Indicator	Benchmark (BsM Cycle 1)	Assessment (BsM Cycle 2)	Statistical Difference*
Number of recruited size lake trout CUE, fish per net (total length ≥350mm)	AW = 0.48, (Mean = 0.54 (SD = 0.41)	AW = 0.58, Mean = 0.64 (SD 0.68)	No (p = 0.183, Power = 0.39)
Number of mature size lake trout AW CUE (fish per net) (total length ≥400mm)	AW = 0.39, Mean = 0.42 (SD 0.31)	AW = 0.46, Mean = 0.50 (SD 0.52)	No (p = 0.15, Power = 0.43)
Number of lake trout cohorts (age classes)	AW = 8.95, Mean = 9.83 (SD 3.97)	AW = 10.69, Mean = 11.28 (SD 5.20)	Yes (p = 0.025, Power = 0.76

Mean age of recruited size lake trout (AW, total length ≥350mm)	AW = 11.05, Mean = 10.26 (SD = 2.67)	AW = 12.5, Mean = 11.74 (SD = 2.93)	Yes (p = 0.0003, Power = 0.99)
Pre-recruit growth rate (mm/year) up to recruit size (total length >350mm)	AW = 83, Mean = 75.23 (SD = 20.84)	AW = 70, Mean = 75.23 (SD = 20.84)	Yes (p = 0.093, Power = 0.55)

*Statistical difference was determined through a paired t-test was conducted on the un-weighted means and assessed against a α = 0.1.

The establishment of the 2010 recreational fishing regulations for lake trout, the management issues regarding lake trout in FMZ 10, and the assessment of each of the abundance, growth, and age structure indicators were examined when recommending that the current regulation be maintained, the recommendation was supported by the input of the FMZ 10 Advisory Council (Table 9.15).

Table 9.15: Proposed management actions to meet lake trout objectives

Proposed Lake Trout Management Actions	**Retain current recreational angling regulation as follows:** Season: • Open January 1 – Labour Day Catch and Possession Limits: • Sport Fishing License – 2 • Conservation License – 1 Size Limit - not more than 1 greater than 40cm.

Advisory Council Advice

Retaining the current regulation was recommended by the FMZ 10 Advisory Council for the following reasons:

- Generally, the public has adjusted to the regulation.

There has been relatively little time since the current regulation was put into place (2010) and any benefits are only marginal at present. Would like to see more monitoring information before recommending a change.

9.5 Brook Trout

For detailed information about brook trout distribution, habitat, angling pressure, and status see Appendix A: Fisheries Background Report.

Estimates of angling effort generated from results of the national survey of recreational fishing 2005 and 2010. The survey indicates that in both 2005 and 2010 brook trout were ranked the 5th most preferred species within FMZ 10 (MNRF 2015d).

Brook trout is a coldwater species with very specific habitat requirements. It is well recognised that the sustainability of brook trout populations is primarily driven by maintenance of quality habitat. Brook trout are fast growing, with high mortality rates, and rarely exceed 8 years of age. In many cases, the loss of brook trout populations is due to the introduction of new species through various pathways of spread, particularly the illegal use of baitfish and the illegal dumping of unused bait.

Although the losses of natural and stocked brook trout lakes in FMZ 10 and Northeastern Ontario are thought to be significant, FMZ 10 is home to the highest concentration of brook trout waters in the province and represents a stronghold for wild brook trout populations in the province.

9.5.1 Brook Trout Management Strategy

The following summarizes the management plan for brook trout outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 9.16).

Management Issues and Challenges:

- Loss of historic brook trout, populations, has been poorly documented as many losses preceded inventory initiatives (1970s);
- The present status of many natural brook trout lakes in FMZ 10 is unknown;
- Maintaining the ecological integrity of ecosystems required to sustain brook trout populations is critically important;
- Angler expectations about brook trout, based mainly on stocked lakes may be unrealistic Relatively few users have experienced fully natural lacustrine populations in FMZ 10;

- Small, natural, remote lakes are vulnerable to overfishing and introductions of non-native species, often through dumping of bait buckets;
- Introduced species, dumping of bait buckets and unauthorized fish introductions most often yellow perch, rock bass and sunfishes, have led to documented losses of natural and stocked brook trout populations;
- The impact of access, new development of roads and trails into high quality brook trout waters is concerning.
- There is a lack of monitoring information for streams and rivers.
- To educate anglers on the fragility of brook trout fish communities and of the potential for the loss of brook trout populations (stocked or natural) to invasive species and permanency of introduced species.

Goal:

Protecting brook trout while continuing to provide fishing opportunities in FMZ 10.

Objectives:

1. Maintain the quantity and quality of brook trout populations in FMZ 10 and provide angling opportunities through effective regulations and stocking practices.
2. Maintain fish community composition and abundance of natural brook trout waters with emphasis on minimizing the introduction and spread of aquatic invasive species.
3. Maintain remoteness of naturally reproducing brook trout populations.

Table 9.16: Summary of the brook trout management strategy for FMZ 10 (EW – equally weighted average, CUE – catch per unit effort, number of fish per net)

Objective	**Indicator**	**Benchmark (BsM Cycle 1)**	**Target**
Objective 1.	Number of recruited size brook trout EW CUE, fish per net (total length ≥250mm)	0.81	Increase
	Number of brook trout cohorts (age classes) (EW average)	3.67	Increase

Objective	Indicator	Benchmark (BsM Cycle 1)	Target
	Mean age of recruited size brook trout (EW, total length ≥250mm)	3.46	Increase
	Pre-recruit growth rate (mm/year) up to recruit size (total length >250mm), EW	145	Maintain/decrease
Objective 2	Number of species in brook trout lakes (Fish_nTaxa)	8.13	Maintain/decrease
Objective 3	Number of brook trout lakes with remote lakes AOC applied	Plan start	Maintain/decrease

9.5.2 Rationale for Maintaining Current Brook Trout Regulations

Recognizing the resiliency of brook trout populations to harvest, provided other factors remain static, it is anticipated that changes in several indicators will be naturally erratic. However, it remains valuable to report and track potential trends in these indicators. Data obtained during the cycle 2 of the BsM program was compared to the benchmark (cycle 1 BsM) for each of the indicators for brook trout abundance, growth and age structure, and community complexity (**Error! Reference source not found.**)

As described in Appendix A, the age structure indicator of Fish_nTaxa (number of fish species per lake), is the most important indicator of status of brook trout populations in FMZ 10. In Table 9.17 we see that community complexity in FMZ 10 brook trout lakes increased in cycle 2 compared to cycle 1. The remainder of the indicators showed small changes, none being statistically significant.

Table 9.17: Summary of brook trout indicator comparisons of cycle 1 and cycle 2 for FMZ 10 (paired t-test, α= 0.1 EW – equally weighted average)

Indicator	Benchmark Cycle 1	Assessment Cycle 2	Statistical Difference*
Number of recruited size brook trout CUE, fish per net (total length ≥250mm)	EW = 0.81, Mean = 0.71 (SD = 0.90)	EW = 1.13, Mean = 1.04 (SD 1.20)	Yes (p = 0.0024, Power = 0.94)
Number of brook trout cohorts (age classes)	EW = 3.67, Mean = 3.65 (SD = 1.48)	EW = 3.58, Mean = 3.73 (SD 1.43)	No (p = 0.744, Power = 0.12)
Mean age of recruited size brook trout (total length ≥250mm)	EW = 3.46, Mean = 3.21 (SD = 0.57)	EW = 3.45, Mean = 3.39 (SD 0.84)	No (p = 0.288, Power = 0.27)
Pre-recruit growth rate (mm/year) up to recruit size (total length >250mm),	EW = 145, Mean = 142.1 (SD = 23.85)	EW = 135, Mean = 141.8 (SD 43.1)	No (p = 0.969, Power = 0.10)
Number of species in brook trout lakes (Fish_nTaxa)	8.13	9.05	NA

*Statistical difference was determined through a paired t-test was conducted on the un-weighted means and assessed against a α= 0.1.

The management issues regarding brook trout in FMZ 10, and the assessment of each of the abundance, growth, age structure, and community complexity indicators were examined when recommending that the current seasons, and catch and possession limits regulations be maintained, the recommendation was supported by the majority of the FMZ 10 Advisory Council.

However, recognizing the significant impact resulting from introduced species of fish into natural brook trout lakes, the Advisory Council recommended zone-wide changes to restrict the use of live baitfish in natural brook trout lakes. Restrictions on the use of live and dead baitfish, and leeches in natural brook trout lakes is anticipated to be implemented provincially in the near future as part of Ontario’s Sustainable Bait Management Strategy (2020).

Ontario's Sustainable Bait Management Strategy

In 2020, during the preparation of this plan, the province released Ontario's Sustainable Bait Management Strategy 2020 (OMNRF 2020b). The strategy states that the use and storage of bait will be prohibited in native brook trout lakes. The determination of what constitutes a native brook trout lake for the purposes of the bait strategy is ongoing.

Table 9.18: Proposed management actions to meet brook trout objectives

Proposed Brook Trout Management Actions	**Retain current recreational angling regulation as follows:** Season: • January 1 to September 30 Catch and Possession Limits: • Sport Fishing License – 5 • Conservation License – 2;
Advisory Council Advice	Modifications to the current regulation did not receive support from the FMZ 10 Advisory Council for the following reasons: • There does not appear to be a sustainability issue with brook trout, as related to fishing pressure. • There is a concern about unauthorized introductions into brook trout waters. • Concern about the protection of brook trout streams

9.6 Muskellunge

For detailed information about muskellunge distribution, habitat, angling pressure, and status see Appendix A: Fisheries Background Report.

Unlike other harvested game species, there is no angling-related overharvest issue for muskellunge in FMZ 10. Optimizing the reproductive potential of muskellunge through habitat protection is the most significant challenge for the species in the FMZ 10. Zone-wide changes were made in 2020 to increase the minimum size limit for muskellunge to 122 cm. In FMZ 10, available information suggests that few muskellunge populations exhibit the growth potential to justify the largest of the minimum size limit options, and these populations are all associated with rivers flowing into Lakes Huron and Superior. Further changes are proposed here to increase the minimum size limit to 137 cm on selected waterbodies with demonstrated growth potential that justifies the change.

9.6.1 Muskellunge Management Strategy

The following summarizes the management plan for muskellunge outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 9.19).

Management Issues and Challenges:

- The potential for anglers to misidentify muskellunge as northern pike;
- Angler education on catch and release practices
- Viral hemorrhagic septicemia (VHS) monitoring and prevention;
- Lack of monitoring data;
- Critical habitat protection, spring water levels, physical habitat destruction;
- Protection of mature fish.

Goal:

To maintain or enhance healthy populations of muskellunge in FMZ 10 where they currently exist.

Objectives:

1. To ensure healthy, self-sustaining muskellunge populations throughout their native range within FMZ 10.
2. To recognize and promote the significant social and economic value of muskellunge trophy fisheries relative to the impact on the resource.

Table 9.19: Summary of muskellunge management strategy for FMZ 10

Objective	**Indicator**	**Benchmark**	**Target**
Objective 1	Muskies Canada Inc. (MCI) angler diary program data (eg. Avg size, CUE >114cm)	5-year average prior to 2020	Maintain or Increase
Objective 2	Produce public education materials illustrating how muskellunge regulations work to ensure sustainable populations.	No education products have been developed to date.	Actively promote muskellunge as a high value component of fish communities and an important recreational fishery.

Management Actions

Based on recommendations of the FMZ 10 Advisory Council and following public and First Nation and Métis consultation conducted in 2019, two changes to muskellunge regulations in FMZ 10 were implemented January 1st, 2020. These changes were implemented to address concerns about sustainability of muskellunge populations across the zone. First, the zone-wide minimum size limit was increased to 122 cm, as many populations demonstrate the growth potential to justify the increase. Second, the season exception on the French River was removed and is now aligned with the zone-wide season to begin on the 3rd Saturday in June as opposed to the 1st Saturday in June. This change was based on angler reports of muskellunge in the French and Pickerel Rivers systems still spawning in early June and that muskellunge needed protection from angling during this vulnerable time. Concurrent with the recommendations implemented Jan 1st, 2020, was a recommendation supported by the Advisory Council (Table 9.21) for regulation changes on several Great Lakes Tributaries that have muskellunge populations with demonstrated growth potential to justify the largest of the minimum size limits used in Ontario (137 cm).

Moving forward the Ministry and advisory council will work with the local Muskie Canada Inc. chapters to increase participation in the diary program. Increased participation will allow us to better track changes through time.

Table 9.20: Proposed management actions to muskellunge objectives

Proposed Muskellunge Management Actions	*Retain current zone-wide recreational angling regulation as follows***:** Season: • Open third Saturday in June to December 15 Catch and Possession Limits: • Sport Fishing License – 1 • Conservation License – 0 S-1; must be greater than 122 cm, and C-0
Advisory Council Advice	Retaining the current zone-wide regulations was recommended by the FMZ 10 Advisory Council for the following reasons: • Changes were made in 2020 to encourage the sustainability of muskellunge in FMZ 10, no further zone-wide regulation changes are recommended (but see exception regulation change proposals below).

Table 9.21: Proposed regulation exception changes to meet muskellunge objectives

Muskellunge Exception	Current regulation	Proposed Regulation change
Great Lake Tributaries 1. Goulais River – Upstream to the area known as Whitman Falls. 2. Echo River including Echo lake – Upstream to dam at 46.574046, -83.935321 3. Thessalon River – Upstream to Rydal Dam in Plummer township at 46.36537, -83.74196 4. Mississagi River –upstream to dam at Red Rock Falls. 5. Serpent River –upstream to Hwy17 6. Wanapitae River – Portion upstream of confluence with French River to Sturgeon Chutes 7. French River – all waters of FMZ10 & FMZ 11	**Season:** • Open 3rd Saturday in June to December 15th. **Limits:** • Sport Fishing License -1; must be greater than 122 cm, • Conservation License - 0	**Season:** • Open 3rd Saturday in June to December 15th. **Limits:** • **Sport Fishing License - 1; must be greater than 137 cm,** • Conservation License - 0
8. Spanish River –downstream from the dam at Espanola, including Gagans pond.	Closed all year for muskellunge	Downstream from Hwy 6 bridge (also include Aux Sables river from confluence with Spanish River, upstream to Hwy 17). Season: • Open 3rd Saturday in June to December 15th. Limits: • Sport Fishing License -1; must be greater than 137 cm,

Muskellunge Exception	Current regulation	Proposed Regulation change
		Conservation License - 0

Advisory Council Advice

- Advisory council supportive of increasing minimum size limit to 137 cm on 7 identified rivers.
- Advisory council supportive of removing the current muskellunge sanctuary on the Spanish River.

9.7 Yellow Perch

For detailed information about yellow perch distribution, habitat, angling pressure, and status see Appendix A: Fisheries Background Report.

In FMZ 10, yellow perch are considered to be in relatively high abundance and no sustainability issues have been identified.

9.7.1 Yellow Perch Management Strategy

The following summarizes the management plan for yellow perch outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 9.22).

Management Issues and Challenges:

- Yellow perch have a high success rate and are likely to establish and spread within a watershed, once introduced.
- Yellow perch are easily introduced through natural and human-mediated activities, such as live bait.
- The presence of yellow perch in a lake can be detrimental to resident species as they are known competitors and predators of small fish, including juvenile trout.
- Most perch populations fail to reach a reasonable size for harvest – leading to limited angling opportunities.

Goals:

To maintain sustainable populations of yellow perch that support quality fisheries.

Objectives:

1. Maintain yellow perch populations recognizing their importance as a game species and an important part of the ecosystems where they naturally occur.

2. Preferentially manage for native fish populations (at both the individual lake and the zone level) to reduce the spread of yellow perch beyond their historical range and to minimize the potential/possibilities for them to outcompete native species.

Table 9.22: Summary of yellow perch management strategy for FMZ 10 (EW – equally weighted average, CUE – catch per unit effort, number of fish per net)

Objective	Indicator	Benchmark (BsM Cycle 1)	Target
Objective 1	CUE fish per net, EW, (NA1 nets)	1.12	Monitor
	CUE fish per net, EW, small mesh (ON nets), EW	9.78	Monitor
	Mean total length (mm), EW	171	Monitor
Objective 2	Yellow perch distribution across the zone.	Current distribution of yellow perch.	Maintain the current distribution of yellow perch.

Indicator Assessment

Data obtained during the cycle 2 of the BsM program was compared to the benchmark (cycle 1 BsM) for each of the indicators for yellow perch abundance, growth and age structure. There was no significant differences among these indicators between cycle 1 and cycle 2.

Table 9.23: Summary of yellow perch indicator comparisons of cycle 1 and cycle 2 for FMZ 10 *(paired t-test, α= 0.1 EW – equally weighted average)*

Indicator	Benchmark (BsM cycle 1)	Assessment (BsM cycle 2)	Statistical Difference*
CUE fish per net (NA1 nets)	EW = 1.12 Mean = 1.018 (SD = 1.49)	EW = 2.54 Mean = 1.176 (SD =1.89)	No (p = 0.314, Power = 0.28)
CUE fish per net, small mesh (ON nets), EW	EW = 9.78 Mean = 9.88 (SD = 8.56)	EW = 9.18 Mean = 10.44 (SD = 11.92)	No (p = 0.624, Power = 0.24)
Mean total length (mm)	EW = 171 Mean = 174.25 (SD = 15.95)	EW = 178 Mean = 173.22 (SD = 19.27)	No (p = 0.850, Power = 0.12

*Statistical difference was determined through a paired t-test was conducted on the un-weighted means and assessed against a α value of 0.1.

9.7.2 Rationale for Retaining Current Yellow Perch Regulation

The management issues regarding yellow perch in FMZ 10 along with the assessment of each of the abundance, growth, and age structure indicators were examined to develop rational for maintaining the current regulation (Table 9.24). Additionally, there is an exception regulation that exists for Manitoulin Island, which will remain unchanged.

Table 9.24: Proposed management actions to meet yellow perch objectives

Proposed Yellow Perch Management Actions	**Retain current zone-wide recreational angling regulation as follows:** *Season:* • *Open All year* *Catch and Possession Limits:* • *Sport Fishing License – 50* • *Conservation License – 25*

	Manitoulin Island - inland waters including Cockburn Island • *Open from January 1 to March 31 and third Saturday in May to December 31* *Catch and Possession Limits:* • *S-25; possession limit of 50,* *C-12; possession limit of 25*
Advisory Council Advice	No concerns around the sustainability of yellow perch populations within FMZ 10 by the council. Recommended to retain current regulations with no changes.

9.8 Coregonids: Lake Whitefish and Lake Herring (Cisco)

For detailed information about Coregonids distribution, habitat, angling pressure, and status see Appendix A: Fisheries Background Report.

No sustainability issues were identified with lake whitefish and lake herring In FMZ 10.

9.8.1 Coregonid Management Strategy

The following summarizes the management plan for Coregonids outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 9.25).

Management Issues and Challenges:

- The potential for lake herring or lake whitefish to dominate lake trout communities if adult lake trout numbers become depleted;
- These species receive little management attention despite the notable role they play as competitors and prey in northeastern Ontario lakes;
- Educating the public that these species, where they currently exist, are highly valuable components of balanced cold-water fish communities;

- Increasing interest in lake whitefish and lake herring as suitable table fare and as significant angling opportunities, particularly for lake whitefish, that can complement lake trout angling.
- Increased interest in these species could theoretically assist with lake trout recovery in those cases where recovery is being hindered by fish community effects.

Goals:

To maintain sustainable populations of lake whitefish and lake herring that support quality fisheries.

Objectives:

1. Manage lake whitefish and lake herring as valued components of FMZ 10 aquatic resources while recognizing their ability to influence stressed cold-water fish communities.

Table 9.25: Summary of lake whitefish and lake herring management strategy for FMZ 10 (EW – equally weighted average, CUE – catch per unit effort, number of fish per net)

Objective	**Indicator**	**Benchmark (BsM Cycle 1) Equally Weighted Average**	**Target**
Objective 1	CUE fish per net	1.48	Monitor
	Lake herring (Cisco) Catch per Unit Effort (CUE) (NA1)	1.62	Monitor
	Lake whitefish Mean Total Length (mm)	440	Monitor
	Lake herring Mean Total Length (mm)	250	Monitor

Indicator Assessment

Data obtained during the cycle 2 of the BsM program was compared to the benchmark (cycle 1 BsM) for each of the indicators for lake whitefish and lake herring abundance and growth.

There does not appear to be any change in the abundance or measured length of lake whitefish and lake herring between cycle 1 and cycle 2 suggesting that the population is remaining stable (**Error! Reference source not found.**).

Table 9.26: Summary of lake whitefish and lake herring indicator comparisons of cycle 1 and cycle 2 for FMZ 10 (paired t-test, α= 0.1 EW – equally weighted average)

Indicator	Benchmark (BsM Cycle 1)	Assessment (BsM Cycle 2)	Statistical Difference*
Lake Whitefish Catch per Unit Effort (CUE) (NA1)	Mean = 1.738 (SD = 1.439), EW = 1.48	Mean = 1.760 (SD = 1.594), EW = 1.48	No (p = 0.89, Power = 0.10
Lake Herring (Cisco) Catch per Unit Effort (CUE) (NA1)	Mean = 2.179 (SD = 2.869), EW = 1.62	Mean = 2.015 (SD = 2.592), EW = 1.56	No (p = 0.5937, Power = 0.12
Lake Whitefish Mean Total length (mm)	Mean = 428(SD =109.5), EW = 440	Mean = 443 (SD = 109.3), EW = 462	No (p =0.11 , Power =0.50)
Lake Herring Mean Total Length (mm)	Mean = 243(SD =46.39), EW = 250	Mean = 240(SD =47.82), EW = 240	No (p =0.758 , Power =0.11)

*Statistical difference was determined through a paired t-test was conducted on the un-weighted means and assessed against a p value of 0.1.

9.8.2 Rationale for Retaining Current Coregonids Regulation

The management issues regarding Coregonids in FMZ 10 along with the assessment of each of the abundance and growth indicators were examined to develop rational for maintaining the current regulations (Table 9.27). Additionally, the regulation for non-angling methods of capturing fish for lake whitefish and lake herring was examined and the recommendation was to maintain the current regulations. FMZ 10 lake whitefish regulations provide an opportunity for harvest that anglers rarely take advantage of and there are no current indications of overexploitation.

Table 9.27: Proposed management actions to meet lake whitefish and lake herring objectives

Proposed Lake Whitefish Management Actions	**Retain current recreational angling regulation as follows:** *Season:* • *Open all year* *Catch and Possession Limits:* • *Sport Fishing Licence – 12* • *Conservation Licence – 6*
Advisory Council Advice	• No concerns around the sustainability of the lake whitefish populations within FMZ 10 by the council. • Important food source for Métis communities within FMZ 10.

9.9 Other Species

Several other species are present within FMZ 10 that are important to the recreational fishery. The presence of other species provides diverse fishing opportunities across the zone. However, these species are either not widely targeted or there is relatively little concern over their sustainability within the zone. Therefore, species level objectives, targets, and management actions were not developed.

9.9.1 Salmon

Both Atlantic and Pacific salmon exist within the Great Lakes tributaries within FMZ 10. The current regulation is as follows:

Atlantic salmon

- Season: January 1 to September 30
- Limits: S-1 and C-0

Pacific salmon

- Season: open all year

- Limits: S-5 and C-2

9.9.2 Splake, Rainbow Trout, Brown Trout

Splake, rainbow trout, and brown trout are stocked throughout the zone to provide additional finishing opportunities.

Splake are a hybrid of a male brook trout and a female lake trout and are called F1 splake. Splake retain properties of both parent species. Splake prefer colder waters than brook trout, however they have demonstrated some ability to compete with spiny rayed species such as yellow perch. Like brook trout, they rarely succeed in fish communities that include smallmouth bass, northern pike or lake herring. Like lake trout, they have been known to exceed 4kg, on occasion. The current regulation for splake is as follows:

Splake

- Season: open all year
- Limits: S-5 and C-2

To provide additional fishing opportunities across the zone the brown trout fishing regulation was modified in 2020 to open the season all year, the current regulation for brown trout is as follows:

Brown Trout

- Season: open all year
- Limits: S-5 and C-2

Rainbow Trout

Rainbow trout were introduced by the ministry stocking program into various waters throughout FMZ 10. Resident and migratory populations exist in tributaries to Lakes Superior and Huron. Additionally, a few naturalized populations exist in inland lakes. Rainbow trout sanctuaries were implemented to protect rainbow trout within spawning areas associated with small streams that flow into the St. Mary's River and Lake Superior or connecting waters (e.g. Whitefish Channel) from April 15th to June 15th. However, based on observations of rainbow trout now spawning as early as April 1st extending the closed period to begin 2 weeks earlier is proposed. See section 9.17.

9.9.3 Crappie, Sunfish, Channel Catfish

Panfish species, such as crappie, sunfish, and channel catfish; are present in the zone. They are relatively rare and are generally observed in the Southern portion of the zone. There is no concern with the sustainability of these species. Therefore, it was recommended to retain the current regulations as follows:

Crappie

- Season: open all year
- Limits: S-30 and C-10

Sunfish

- Season: open all year
- Limits: S-50 and C-25

Channel catfish

- Season: open all year

Limits: S-12 and C-6 Monitoring Programs

9.10 Education

Education Management Strategy

Fisheries management involves not only the consideration of biological trends but also includes the engagement of stakeholders with the stewardship of the resource. Education plays a big role in proper resource management and developing the relationship for generations to come. For that reason, it was recognized by the advisory council that the FMZ 10 fisheries management plan should have a goal and management actions to work towards improving the publics respect for fisheries in the area.

Management issues, Challenges and Opportunities:

- Angler awareness on proper handling and successful catch and release techniques;
- Resource user awareness and acceptance of management actions and how regulations support sustainable populations;

- Increase communication with the public, stakeholder groups, and Indigenous communities;
- Better communication and information sharing for provincial aquatic monitoring results;
- Education on habitat/life history requirements for different species;
- Understanding the impacts and drivers of invasive species and unauthorized introductions of species;
- Understanding the impacts of transmission of fish disease (such as, VHS) and the impacts of transfer of live bait;

Goals:

Improve the general public's respect for natural resources, their awareness of ethical practices and their knowledge of regulatory principles and practices.

Objectives:

1. Increase education efforts within FMZ 10 to increase awareness of population sustainability, fishing practices, habitat requirements, introductions, and fish diseases.
    a. To promote education and awareness of the principles of walleye management and to foster a respect for walleye life history.
    b. To recognize and promote the values associated with northern pike populations and their ability to provide consumptive, high quality and trophy fishing opportunities for both zone residents and tourism.
    c. Educate the public on the ecological implications of bass range extension, focus on compliance regarding unauthorized introductions and promote small fish harvest.
    d. Educate the public on the consequences of yellow perch introductions to native fish populations in order to reduce the spread of yellow perch
    e. Educate stakeholders about the life history and managing expectations of the recovering FMZ 10 lake trout populations.
    f. To educate anglers on the fragility of brook trout fish communities and of the potential for the loss of brook trout populations (stocked or natural) to invasive species and permanency of introduced species.
    g. Enhance the profile of lake whitefish as an alternative species for harvest.

h. To increase public awareness of the value of an ecosystem-based fishery management approach which aims to conserve the structure and function of aquatic ecosystems, in addition to conserving the fishery resource.
i. In collaboration with key partners (OPG, PSPC, private operators), to increase public awareness of the management practices employed on regulated waters and, more specifically, how that management relates to positive and negative outcomes for aquatic ecosystems and the fisheries of FMZ 10.
j. In cooperation with partners, to enhance public knowledge regarding fish identification, the value of natural aquatic habitats and the ecological implications of species and disease introductions.

Management Actions:

To address the management issues that were brought forward regarding education, objectives, indicators, targets and management actions were developed to work towards addressing these issues (Table 9.28).

Table 9.28: Summary of education management strategy for FMZ 10

Objectives • Objectives 1a to 1j
Indicators Number of educational materials distributed through various formats.
Targets Develop educational material for FMZ 10 and distributed
Management Actions Producing education and compliance-based literature. Utilizing the following communications tools: • Social media, websites • Public & community meetings; • Education events; • School presentations/education material; • Tradeshows; • Factsheets;

9.11 Fish Stocking in FMZ 10

Stocking is an important tool used in fisheries management across FMZ 10. This plan outlines the stocking program, common practices being used, objectives, targets and management actions. The Ontario's Provincial Fish Strategy, Fish for the Future (OMNRF 2015b) and the Guidelines for the Stocking of Inland Lakes (2002) are documents that provide guidance on the appropriate use of fish stocking as a management tool. This plan highlights how stocking strategies like rehabilitation, Put-Grow-Take (PGT) and Put-Take are used for within FMZ 10 to enhance and create fisheries for public enjoyment.

The ministry and its partners stock hundreds of lakes across FMZ 10 to create, diversify, and improve fishing opportunities; and rehabilitate native fish populations. Stocking efforts focus primarily on salmonids such as brook trout (including a colour variant known as Aurora trout), lake trout, rainbow trout, and splake; but also include some localized walleye stocking. In FMZ 10 over a five year period from 2015 – 2019 approximately, 93 splake, 39 lake trout, 430 brook trout, 26 rainbow trout, 6 brown trout, 13 walleye and 2 Aurora trout Lakes were stocked for recreational fishing. In the zone, over half of the walleye stocking is conducted by the ministry, with partners also contributing. Multiple community partners in FMZ 10 are also actively involved with an educational initiative where walleye and brook trout micro-hatcheries are run in elementary schools and Indigenous communities to promote stewardship of fisheries and the environment.

In general, stocking effort in FMZ 10 is mainly focused on creating PGT fisheries; where sub-catchable-sized fish (i.e. fingerlings, yearlings) are stocked, allowed to grow, and ultimately provide angling opportunities. These artificially maintained fisheries not only provide additional fishing opportunities but are utilized strategically to divert angling pressure away from natural and/or sensitive fish populations. The PGT strategy may also be used in combination with special regulations (i.e. size/limit restrictions) to create quality or trophy fishing opportunities. Due to the finite availability of suitable habitat and compatible aquatic community structure there are limited opportunities to expand PGT salmonid stocking in the zone.

Another strategy utilized in select waterbodies is stocking on a Put-Take basis, where catchable-sized fish are stocked to provide immediate angling opportunities. Examples include an accessible urban rainbow trout fishery within the City of Sault Ste. Marie; a splake fishery that supports an annual winter fishing derby for children on St. Joseph Island; and an initiative to maintain high quality Splake fisheries during the winter months across the zone to support angler recruitment and divert pressure away from natural brook trout and lake trout lakes. Another unique opportunity in the Sudbury

district is the brown trout put and take fishery in Alaska's Lake, Johnson Lake and Loon Lake. In FMZ 10, Carol Lake in Beulah Township and Lake 21 in Tyrell township are stocked with Aurora trout to provide unique angling opportunities. For more information on the introduction of Aurora trout and the rehabilitation efforts of lake trout in acid damaged lakes refer to Appendix A.

The Ontario's Provincial Fish Strategy (OMNRF 2015b) recognizes the benefits and risk of stocking. While sometimes necessary to achieve fisheries management goals, stocking carries ecological risks, including the potential for loss of genetic integrity in native fish stocks and changes to community structure, such as the predator/prey balance. This comes into consideration during the practice of supplemental stocking, defined as stocking in waters where adequate natural reproduction occurs. This stocking strategy has been largely phased out of the stocking program in FMZ 10. In some cases, supplemental stocking continues to occur in areas that receive heavy angler pressure and the natural residing population is limited with little natural reproduction.

Some policies that support this change in the stocking program include, the Lake Trout Synthesis (OMNR 1991) reported that found stocking fish overtop of a natural population increased angler effort which, in turn, depleted the natural trout population. The intended results of supplemental stocking, to increase angler success, was often unsuccessful in improving fish quality. This was also a finding in the Percid Synthesis (OMNR 2004), where stocking was unlikely to increase abundance or availability of walleye if a natural population already occurred. The ministry's strategic direction Naturally Resourceful (OMNRF 2020c) also recognizes that supplemental stocked fish seldom contribute to natural reproduction, is inefficient and seldom cost-effective. In essence, supplemental stocking is identical to put-grow-take stocking and is generally incompatible with managing populations for natural reproduction. Supplemental stocking is therefore discouraged in most instances. To learn more about the stocking program and how the ministry coordinates its efforts refer the Appendix A.

9.11.1 **Stocking Management Strategy**

Management Issues, Opportunities and Challenges:

- Stocking often results in inflated angler expectations of harvest success within both stocked and natural waters;
- Many anglers assume that fisheries issues can always be remedied with stocking, including issues of overharvest, disease, habitat loss, invasive species or introductions.
- Requests for supplemental stocking, particularly of walleye, due to a perceived lack of fish;

- Limited new waters available for stocking that meet the criteria for effectiveness and cost while providing a meaningful socio-economic benefit without impacting other aquatic ecosystems in the watershed
- Unauthorized introductions of species into waters not naturally occupied by walleye, northern pike, smallmouth bass, and rainbow smelt are known to be detrimental to cold water species.
- Range expansions due to unauthorized introductions and the need for education/ enforcement;
- The stocked lakes in FMZ 10 are of especially high value as they constitute the readily useable waters that anglers rely on for brook trout angling opportunities;
- Districts have limited resources for monitoring and assessing their stocking programs and therefore rely on public input to assess the effectiveness of stocking.

Goals:

To create, maintain or enhance angling opportunities. As well as, re-establish self-sustaining populations and preserve genetic stocks.

Objectives:

1. Protect and restore native fish populations and sustain their genetic diversity.
2. Create, diversify, and enhance fishing opportunities in stocked waters across FMZ 10.
3. Provide unique and/or trophy fishing opportunities in strategic locations to meet the needs of Ontarians and promote tourism.

Management Actions:

There are practical limits to the ability to enhance and expand the stocking program and limits assessments of these waterbodies. The number of suitable waterbodies for stocking has also been impacted by the movement and introduction of spiny-rayed fish.

To address the management issues that were brought forward, a stocking management strategy was developed that identified objectives, indicators, targets and management actions to work towards addressing these concerns (Table 9.29).

Table 9.29: Summary of stocking management strategy for FMZ 10

Objective	**Indicator**	**Target**	**Management Actions**
Use stocking as a way to divert angling pressure and to protect and restore native fish populations.	Angler satisfaction with opportunities to fish stocked waters.	Maintain or increase the number of high performing stocked waters in FMZ 10. Maintain stocking of 27 acidified lake trout lakes for the purpose of restoration.	Maintain stocking program for targeted species to increase angling opportunities and work towards population recovery where the program has shown to be successful. Review effectiveness of stocking practices (such as, effectiveness of supplemental stocking). Continue to undertake restoration stocking of acid-damaged lake trout waters. Educate anglers on stocking science and practices and effects of unauthorized introductions.

Objective	Indicator	Target	Management Actions
Create, diversify, and enhance fishing opportunities in stocked waters across FMZ 10.	Number and location of stocked waters Between 2015 and 2019 there were 93 splake, 39 lake trout, 430 brook trout, 26 rainbow trout, 6 brown trout, 13 walleye and 2 Aurora trout stocking events.	Maintain or increase the number of high performing stocked waters in FMZ 10.	Review effectiveness of regulations and stocking practices (i.e. fiscally responsible management, annual review). Creating a list of stocked waters, with optimal frequency and density. For underperforming stocked waters, consider the option of stocking other products, altering stocking density/species or ceasing stocking. Use information from angler reports, fish and habitat monitoring. Use tools like angler reporting through fish-online and recreational fishing survey as a means to gather information on stocked fish performance. Determine viability of existing stocked lakes, and conduct environmental assessment on potential new waterbodies.

Objective	Indicator	Target	Management Actions
Provide unique and/or trophy fishing opportunities in strategic locations to meet the needs of Ontarians and promote tourism.	Current unique fishing opportunities in FMZ 10: 2 Aurora trout 24 rainbow trout 6 brown trout	Maintain or increase opportunities.	Determine new locations for opportunities, possibly previously stocked lakes where other species have not been successful. Provide angling opportunities for unique species, hybrids and/or varieties such as Aurora trout, rainbow trout, and brown trout where socially and ecologically appropriate. Promote Aurora trout angling as an opportunity unique to north-eastern Ontario. Monitor the success of the Put, Grow and Take (PGT) Aurora trout fisheries and take corrective measures as necessary. Stocking to introduce new species to waters where they did not naturally occur is considered following the completion of an Environmental Assessment.

Based upon the stocking objectives and targets the following changes to seasons and limits for stocked lakes are being proposed in Table 9.31.

Table 9.30: Proposed management actions for stocked lakes

Species	**Proposed Lakes**	**Preferred Option**	**Current**	**Objective**
Brook Trout	Finn Lake (Aweres Township) Kaufman Lake (Jarvis Township) Brilliant Lake (Jarvis Township) Jarvis Lake 9 (Jarvis Township) Broder Lake 23 Jackson Lake (Street Township) One of the following lakes in Reilly Township.: Laurence Lake Franks Lake Jones Lake	Season: Open all year Limits: S-5 and C-2	Season: January 1 to September 30 Limits: S-5 and C-2	Provide additional fishing opportunities for Sault Ste Marie, cottage communities of Ranger Lake, Northland Lake, Heyden Lake and Upper/Lower Island Lakes; a canoe route in Jarvis Township, and two near-urban lakes in Sudbury District

Species	Proposed Lakes	Preferred Option	Current	Objective
Lake Trout	Johnnie Lake (Carlyle Township, Killarney Provincial Park) Bell (Goschen Township, Killarney Provincial Park)	Johnnie Lake - lake trout season open third Saturday in May to Labour Day. Bell Lake – Establish lake trout season – open third Saturday in May to Labour Day.	Lake trout season closed all year	Remove lake trout closure during species reintroduction to provide limited fishing opportunities while stocking is ongoing. This is consistent with approach taken for other lake trout lakes in the FMZ.

9.12 Ecosystem Changes

Aquatic ecosystem monitoring involves measuring and monitoring biological indicators of change. Biological indicators provide resource managers with information about changing climate, habitats, water quality and respond to changing resource use over time. For FMZ 10, some of the biological parameters that we can track using BsM information are related to lake chemistry, thermal regime, species and community composition and the cumulative health of keystone species and aquatic habitat. Ultimately these parameters will help to track the larger effects on the ecosystem such as acid precipitation, water quality, climate change, species at risk, invasive and introduced species, and fish habitat.

Ecosystem Change Status in FMZ 10

Ecosystem changes in Ontario and, more specifically, in FMZ 10 are a result of several local, provincial and global disturbances such as acid precipitation and climate change.

Acid Precipitation

In FMZ 10, as in most of Northeastern Ontario, one of the most widespread ecosystem issues in the past 50 years has been acid precipitation. The impacts of “acid rain”, including drastic increases in the pH of affected lakes, were verified in Ontario in the 1960s and intensively studied in the Sudbury Basin, during the early 1980s. The losses of aquatic species, including fish was significant.

Beginning in the 1970s, reductions in production at Sudbury smelter operations caused substantial reductions in emissions. Emissions were further reduced by legislation in the early 1990s, resulting in chemical recovery of many, but not all, waters during the latter 1990s. Restorative fish stocking began during the 1990s to help bolster dwindling populations. However, the long-term leaching of calcium from northeastern Ontario waters remains an issue as calcium is required for all life, particularly for those species that have high calcium demands such as crustaceans (Cairns and Yan, 2009). Measures of impact of acid precipitation and recovery have been identified above including monitoring of pH and Calcium concentrations.

A number of lakes lost their fish populations due to acid precipitation during the 1970s and 1980s. Some acid-damaged lakes, have retained a remnant fish population and are in some stage of recovery due to improving water chemistry.

Considerable progress has been made in restoring lake trout to acid damaged lakes in FMZ 10. From 2000 to 2005, a ministry led project assessed the status of lake trout in the Northeast Region of Ontario. This included about 100 lake trout lakes that had been affected by acid precipitation, mostly in FMZ 10. Around one quarter of acid damaged lake trout lakes retained their original lake trout population. At that time, 10 lake trout populations had been successfully restored through stocking, and stocking was underway in an additional 34. As of 2005, most of the remaining lakes required further chemical recovery before restoration could be attempted (Selinger et al. 2006)

Beginning in 2019, the Living with Lakes Center began the Community Restoration of Acid Damaged Lakes (CRADL) project, as part of this project, the status of acid damaged lake trout lakes is being re-assessed. Data collection and analysis for this project is ongoing, but preliminary results show natural reproduction is occurring in additional lakes where restoration stocking has occurred since 2005 (Louste-Fillion et al., 2019; T. Johnston, pers. Comm.2020; J. Gunn pers comm.2020). A few formerly acidified lake trout lakes also now have reproducing populations through colonization from upstream stocked lakes. In addition, data collected by CRADL and the Ministry of Environment, Conservation and Parks show that a number of lakes that required further chemical recovery in 2005 now have improved pH. The results of the CRADL project will allow the ministry to refine its restoration stocking program, by adding new lakes that have now chemically recovered, and reducing or eliminating stocking of lakes where natural reproduction is now occurring.

Climate Change

In recent decades, climate change has been demonstrated by unpredictable weather conditions including above-average temperatures in summer and winter as well as earlier ice-out and reduced precipitation. The consequences of these changes can lead to drought as well as more frequent extreme weather events.

Higher than average water temperatures are detrimental to cold-water species (e.g. lake trout, brook trout, lake herring and lake whitefish) and have been documented to have a negative effect on northern pike reproduction. Low spring runoff may result in earlier closing of reservoir dams to capture water for recreation or waterpower which in turn may reduce or eliminate flows for spring spawning species such as northern pike, walleye, white sucker and lake sturgeon.

Ecosystem Change Management Priorities in FMZ 10

Species Recovery

It is the goal to manage for and promote healthy ecosystems that support self-sustaining native fish communities. However, where native fish species have declined or aquatic ecosystems have been degraded, stewardship activities such as restoration, recovery and rehabilitation will be undertaken to reverse the decline.

Invasive and Introduced Species

Amongst the most significant threats to aquatic communities in FMZ 10 are the arrival, establishment and spread of aquatic invasive species such as spiny water flea, round goby (*Neogobius melanostomus*), rusty crayfish, zebra mussels, rainbow smelt and a host of non-native aquatic vascular plants. The introduction of these non-native flora and fauna are primarily the unintended result of live fish transfers including baitfish, recreational angling and boating activity, landscaping activities (such as water gardens) and the pet trade (aquaria). Further, the potential for disease transmission, such as VHS via live fish transport, can result in the loss of key predators such as northern pike and muskellunge and important forage communities. The transfer of species and their diseases by anglers can result in permanent ecosystem damage.

Actions can be taken by anglers and watercraft operators to ensure these and other invasive species are not transported from one water body to another by thoroughly cleaning hulls, trailers and gear and draining live wells between trips and before entering new waters. The public can also report sightings of invasive species and learn more about invasive species at: Invading Species; or by reporting to the invasive species hotline at 1-800-563-7711.

Rainbow Smelt

Understanding the impact of rainbow smelt on the natural population of recreational fish, particularly lake trout populations, the Advisory Council put forward the recommendation to restrict the use of dead rainbow smelt as baitfish across FMZ 10 (Table 9.32). Currently, the use of live smelt as bait is prohibited in much of the province, including all of FMZ 10. However, new occurrences of smelt populations in FMZ 10 waters continue and it is hoped that by prohibiting the use of dead smelt will further reduce the likelihood of new introductions. (See https://www.ontario.ca/page/rainbow-smelt-0 for additional information on rainbow smelt).

Table 9.31: Proposed management actions to meet invasive species objectives

Bait	**Preferred Option**	**Current**	**Advisory Council Advice**
Rainbow Smelt	Rainbow smelt may not be used as bait or possessed for use as bait in FMZ 10.	Currently, the restriction on the use of live smelt as bait applies to the entire province. There is no restriction on the use of dead rainbow smelt in all of North East Region (FMZ 7, 8, 10, 11).	The Advisory Council supported the proposed restriction of use of rainbow smelt (dead or alive) as bait.

Habitat Alterations

Cumulative impacts on fish habitat occur in local ecosystems with the development of shoreline riparian areas, removal of aquatic vegetation and interruption of shoreline processes with in-water structures.

Species that are greatly sought by anglers (such as, walleye and lake trout), are generally sensitive to fluctuating water flows and levels.

A further stressor for many species, especially cold-water species, is nutrient loading which has the potential to limit the suitability of critical deep-water habitat for juvenile lake trout, lake herring and lake whitefish, resulting in reduced recruitment.

Loss of Keystone Species and Harvest

Many of the species that anglers target (such as, walleye, northern pike and muskellunge) are apex predators and therefore keystone species in fish communities: species that, through their life history, play a critical role in the structure of an aquatic ecosystem. Overharvest of these species, when combined with invasive organisms, alteration to water chemistry, the effects of climate change and habitat degradation, can reduce the effectiveness of keystone species in regulating and balancing aquatic ecosystems.

Resiliency in Response to Change

To recover from ecosystem changes, the resiliency of an ecosystem is essential to its health. Our ability to predict the introduction of invasive species or disease and prevent its transmission is becoming extremely limited. Ecosystems that are biologically diverse and have limited inherent stress are far more likely to resist unforeseen invasive or disease stressors (this is known as the Portfolio effect). Combining natural resiliency with a precautionary approach that recognizes and eliminates obvious vectors of invasion and disease is the most prudent approach to maintaining healthy aquatic ecosystems.

Ecosystem Change Management Strategy

Management Issues

- Predicting and mitigating the impacts of climate change in aquatic communities;
- The effects of acid deposition and the loss of productive capacity in lakes due to calcium depletion;
- Provisions for aquatic ecosystems in regulated waters (reservoirs and rivers with control structures);
- The loss of productive capacity in waters colonized by invasive or introduced species;
- Degradation or destruction of aquatic and shoreline habitat due to human-mediated causes including development, pollution and vandalism.

Goals:

Biodiversity

- Champion implementation of a renewed biodiversity strategy for Ontario to reduce threats to biodiversity, halt species losses, advance their recovery and inspire greater conservation action.

Aquatic Ecosystem Management

- Work with other ministries, conservation authorities and other agencies to sustain aquatic ecosystems, including the maintenance and restoration of ecosystem

structure, composition and function. This includes sustaining water resources and their hydrological function, maintaining water quantity and quality to sustain aquatic life, and protecting and restoring riparian and aquatic habitats.

Protected Areas

- Manage provincial parks and conservation reserves to permanently protect representative ecosystems, biodiversity, and provincially significant elements of Ontario's natural and cultural heritage, and to maintain ecological integrity.

Objectives:

1. To take an ecosystem-based management approach with specific aims to conserve the structure and function of aquatic ecosystems in addition to conserving fishery resources.
2. To increase public awareness of the value of an ecosystem-based fishery management approach which aims to conserve the structure and function of aquatic ecosystems, in addition to conserving the fishery resource.

Management Actions

To address the management issues that were brought forward regarding ecosystem changes, objectives, indicators, targets and management actions were developed to work towards addressing these concerns.

Table 9.32: Summary of the ecosystem change management strategy for FMZ 10

Objective	Indicator	Target	Management Actions
To take an ecosystem-based management approach with specific aims to conserve the structure and function of aquatic ecosystems in addition to conserving fishery resources.	**Fisheries Related Changes:** Changes to species biomass, abundance and age class distributions, body condition and growth rate from BsM. **Fish Habitat:** Baseline mapping of critical fish habitat (spawning, nursery, rearing, foraging) to track changes through time. **Invasive Species and Disease Related Changes:** Presence/absence from BsM; VHS monitoring **Water Quality Related Changes:** Nutrient loads/levels, blue-green algae blooms, changes to the level of dissolved	Annually, or as per frequency defined in standardized protocols, collaborate with key partners (e.g. MECP, Laurentian University, Indigenous communities, Cooperative Freshwater Ecology Unit) to monitor, assess and track changes through time of ecosystem indicators via each agency's respective field programs.	Biological: 1) Resource Managers and Planners to consider this objective when conducting plan development or plan input and review for projects within FMZ 10. 2) Restore damaged ecosystems through development of comprehensive restoration plans that minimize anthropogenic stressors. 3) The ministry, in collaboration with key partners (e.g., Ontario Parks, Indigenous communities, Laurentian University MECP, Cooperative Freshwater Ecology Unit) to continue to monitor cumulative effects that could impact aquatic ecosystems by anticipating, preventing and, where feasible, mitigating significant ecological impacts on habitats or species (e.g., SAR, water quality, food web dynamics, fish mortality).

Objective	Indicator	Target	Management Actions
	oxygen, especially in deep water. **Climate Related Changes:** Water temperature, ice-off dates, wind and storm events, water levels, effects on significant fish habitat (spawning, nursery, rearing, foraging), depth of thermocline. **Acid Precipitation-Related Changes:** Calcium and pH values in study lakes within FMZ 10 (Sudbury Environmental Studies), acid damaged lakes that have returned to natural recruitment, survival of fish stocked for fish community restoration.		

9.13 Water Management

In 2000, the *Lakes and Rivers Improvement Act* (LRIA) was amended to establish statutory authority for the ministry to order the preparation of a water management plan for the operation of waterpower facilities and associated water control structures and ensure compliance with that plan.

The *Maintaining Water Management Plans* Technical Bulletin (MNRF 2016) provides policy direction for the long-term maintenance of those existing simplified and complex Water Management Plans (WMPs) prepared according to the ministry's 2002 *Water Management Planning Guidelines for Waterpower*. WMPs prepared under LRIA Section 23.1 are the ministry's primary tool for ensuring that waterpower facilities and their associated water control structures provide for the purposes of the Act, and that there is a long-term mechanism in place for adaptive management. WMPs are long term resource management and regulatory documents that will not have an expiration date, a mandatory review or a plan term. Adaptive management of a WMP may result in amendments following ongoing public and First Nations and Métis community engagement or consultation, monitoring, implementation reporting and the consideration of WMP amendments as required. All WMPs have been amended to incorporate mandatory changes regarding plan amendments, standing advisory committees, monitoring and reporting and implementation reporting. Anyone may request a WMP amendment.

The amendment process provides a framework for screening amendment requests, developing the proposed amendment and ministry review and decision on the amendment. Plan proponents will work together to assess an amendment request. The ministry will review proposed amendments to ensure that plan proponents screen and process amendments consistent with the Technical Bulletin. The approval of a WMP amendment under the LRIA does not relieve the proponent from compliance with other applicable regulatory requirements. Changes to the operating regime or plan objectives, or changes that could be expected to generate a high level of public interest or might adversely affect Indigenous treaty rights would be subject to a major amendment. A major amendment is subject to public, First Nations and Métis community engagement or consultation. For proposed major amendments, the ministry will complete a review within 60 days of receipt of a complete submission. If an amendment is approved by the ministry, the WMP will be revised and a record of the amendment will be appended to the approved WMP, and the ministry will provide the proponent and any third-party requester with written confirmation of the decision.

Twelve WMPs, who boundaries fall completely or partially with FMZ 10, have been completed:

1. Montreal River WMP
2. Sultan Mini-Hydel WMP
3. Blind River WMP
4. Crystal Creek WMP
5. Kagawong River WMP
6. Mississagi River WMP
7. Serpent River WMP
8. Sister River WMP
9. Spanish Vermillion River WMP
10. Stanleigh Effluent Treatment Plan WMP
11. Wanapitei River WMP
12. Mattagami River WMP

Two WMPs remain in draft form as of January 2020: The River Aux Sables and the Mikel Creek/Boland River WMP.

In some cases, individual waterbodies have water level regimes that have been developed to ensure optimum benefit for aquatic resources while, in other cases, recreational water levels or waterpower production have taken precedence.

Status of Water Management in FMZ 10

Effective management will require review and reporting on all water level control structures whether operated by the ministry, private entities, Ontario Power Generation (OPG) or Public Services and Procurement Canada (PSPC) to document which facilities have provisions for critical fish life history requirements such as spawning and incubation. There are a variety of regulated water conditions that may be detrimental to fisheries. The most common deficiencies are the absence of base flow or seasonal flow requirements, and winter drawdowns that strand eggs of fall spawning species.

Water Levels Management Strategy

Management Issues:

- Absence of prescriptive flows and levels to mitigate the effects of water regulation on critical fish habitats during critical periods (base flows) as identified in each species section in the plan;
- Operator objectives for reservoirs may directly conflict with those of fisheries (such as, winter drawdowns on natural lake trout lakes).
- Gathering the appropriate fish habitat and flow/level information to determine whether there is a requirement for mitigation.

Goals:

Ensure that flows and levels are incorporated into facility compliance plans and facility specific OMS (Operation, Monitoring and Surveillance) manuals via input to Water Management Plans development and amendments.

Objectives:

1. Maintain or enhance water levels in regulated systems to ensure healthy aquatic ecosystem structure, function and diversity to aid in the conservation of biodiversity by supporting a healthy, sustainable, naturally-reproducing native fish community. Protect and restore native fish populations and sustain their genetic diversity through judicious use of fish stocking.
2. To ensure that water regulation within FMZ 10 recognizes and incorporates the socio-economic contributions of aquatic ecosystems in planning strategies and that future development includes the maintenance of flows and levels that provide for the balanced needs of the public and aquatic ecosystems within FMZ 10.

Management Actions:

The following summarizes the management plan for water levels outlining the objectives, and management actions.

Table 9.33: Summary of the water levels management strategy for FMZ 10

Objective	Management Action
Maintain or enhance water levels in regulated systems to ensure healthy aquatic ecosystem structure, function and diversity to aid in the conservation of biodiversity by supporting a healthy, sustainable, naturally-reproducing native fish community.	Ministry to ensure that water management priorities will include the maintenance of aquatic ecosystems through mitigation of flows and levels to account for the needs of both the public and the environment (fish habitat). In support of aquatic ecosystem and species-specific objectives, establish provisions for compliance flows and levels at water regulation facilities during planning where they do not presently exist.
To ensure that water regulation within FMZ 10 recognizes and incorporates the socio-economic contributions of aquatic ecosystems in planning strategies and that future development includes the maintenance of flows and levels that provide for the balanced needs of the public and aquatic ecosystems within FMZ 10.	Where new facilities (dams or power generating stations) are proposed within the FMZ 10 watershed or existing facilities are considering plan amendments, resource managers and planners to ensure that, early in the process, flows and levels are established for each facility that minimize cumulative ecological impacts, support species and aquatic ecosystem objectives and provide for the needs of the public and the environment (fish habitat).

9.14 Informing Other Planning Processes

Fishery management planning is influenced by the activities of many other planning processes that also take place within the boundary of FMZ 10. In the development of the Fisheries Management Plan for FMZ 10, it was recognized how important it is to ensure that objectives being put forward in the FMZ 10 management plan are also being recognized in other planning processes on the land base.

Table 9.34: Summary planning activities management plan for FMZ 10

Objective	Management Action
Integrate FMZ 10 objectives into the district resource management planning review and approval processes:	Continue to integrate FMZ 10 objectives into the district resource management planning review and approval processes: 1) Crown Land use planning and approvals. 2) *Public Lands Act* and *Lands and Rivers Improvement Act* permitting and approvals. 3) *Fish and Wildlife Conservation Act* approvals. 4) Forest management planning and approvals. 5) Water management planning and operations approvals. 6) Activities reviewed under the ministry's Class Environmental Assessment for Resource Stewardship and Facility Development 7) Aquaculture and Community Hatchery Program permitting and approvals.

9.15 Species at Risk

Species at Risk (SAR) have been designated as being very rare or declining and at risk of extinction for a variety of anthropogenic and natural reasons (such as, over-harvest and habitat loss). There are currently five fish species at risk found within FMZ 10, northern brook lamprey (special concern), redside dace (endangered), silver lamprey (special concern), the shortjaw cisco (threatened); and both the Great Lakes-Upper St. Lawrence population of lake sturgeon (threatened), and the Southern Hudson Bay-James Bay population of lake sturgeon (special concern).

Some species at risk play an important role as indicators of ecosystem health and provide important information to resource managers that ecosystem changes have occurred which are resulting in an imbalance.

Redside Dace

Redside dace was listed as endangered in Ontario in 2009. This species has a discontinuous distribution that includes tributaries of the five Great Lakes, with most populations occupying streams flowing through the Greater Toronto Area into Lake Ontario. The western portion of the range in Canada includes part of FMZ 10, and a small population persists on St. Joseph Island, representing the northernmost extent of the species range. Habitat loss and degradation caused by urban and agricultural development are the most significant threats to redside dace. Urban and rural habitat is frequently altered by removal of riparian vegetation, leading to warmer thermal regimes and reduced availability of terrestrial insects. In Ontario, much of the habitat historically occupied by this species has become urbanized. The redside dace is found in pools and slow-moving areas of small coolwater streams and headwaters with a gravel bottom. The usual association of redside dace with cool, clear waters suggests the species is an indicator of good habitat quality.

Lake Sturgeon

Lake sturgeon once supported both recreational and commercial fisheries. Lake sturgeon decline has been impacted by several factors such as fragmentation (building of hydroelectric generating stations), pollution and overexploitation. The province closed all commercial lake sturgeon fisheries in the 1980s and recreational fisheries in 2009. It is standard practice to close fisheries for endangered or threatened species at risk to reduce sources of mortality potentially impeding their recovery. Over 95% of FMZ 10 is intersected by part of the Great Lakes-Upper St. Lawrence lake sturgeon population, which is based on the Great Lakes-St. Lawrence Primary Watershed. The remainder of FMZ is intersected by the Southwestern Hudson Bay Primary Watershed, and part of the Southern Hudson Bay-James Bay population of lake sturgeon.

Shortjaw Cisco

There is currently little information on the status and distribution of shortjaw cisco within the zone. As this species is not typically targeted, management direction included within this plan is simply to acknowledging it as a fish SAR and recognize that it is governed under the *Endangered Species Act* (2007). Management direction and guidance will be provided by means of the approved recovery strategy for the species.

Lamprey

Northern brook lamprey and silver lamprey are also found within isolated areas within the zone. Like the shortjaw cisco, little information is known on these two species, which will also be considered in this plan as non-game species governed under the *Endangered Species Act* (2007) with resource management direction and guidance being provided by means of the approved recovery strategy for the species.

9.16 Fish Diseases

One fish disease that currently presents minimal risk to native fish populations within FMZ 10 is Viral Hemorrhagic Septicemia (VHS) which is an infectious fish disease. It was first detected in Lake Ontario in 2005. Outbreaks are most common in the spring when temperatures are fluctuating and fish are spawning. The Great Lakes strain of the virus affects both game fish and baitfish species. Game fish that can be impacted include; walleye, yellow perch, muskellunge, smallmouth bass, rock bass, Chinook salmon, black crappie, and white bass. While baitfish such as emerald shiners, bluntnose minnows, and spottail shiners could be impacted by VHS.

VHS spreads in water, and by contact with infected fish and their body fluids. The virus can travel from one waterbody to another on anything it has contacted, including: fish, water, boats, and equipment.

The ministry created two management zones to slow the spread of VHS. A VHS management zone in 2007 and a Lake Simcoe Management Zone in 2012. The VHS management zone overlaps FMZ 10 along its southern boarder (Figure 9.1).

The ministry is acting to slow the spread of VHS. management strategies include:

- education and awareness efforts for anglers
- restrictions on the movement of commercial baitfish
- restrictions on the collection of and treatment of wild spawn for stocking
- random sampling across Ontario
- sampling from high-risk lakes and from reported die-offs

More information concerning VHS can be assessed at: https://www.ontario.ca/page/viral-hemorrhagic-septicemia-vhs.

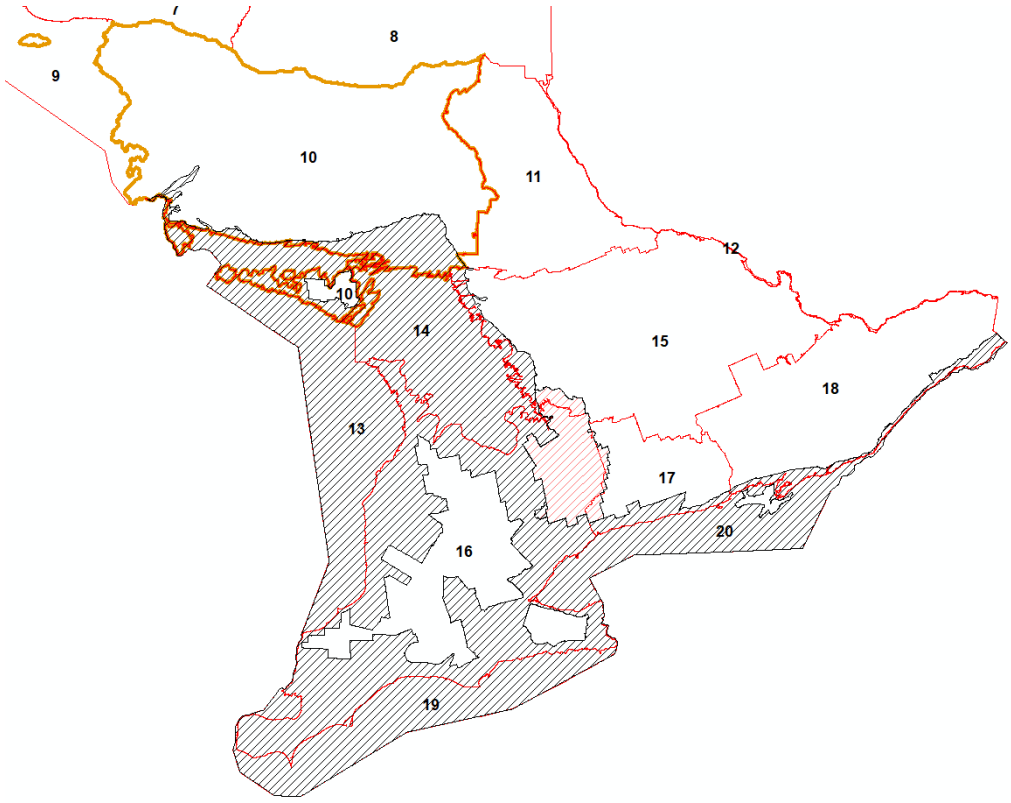


Figure 9.1: Viral hemorrhagic septicemia (VHS) Management Zone 2007

9.17 Sanctuaries

Current sanctuaries were reviewed within FMZ 10 during the development of this management plan. Several regulation changes are proposed based on that review. The changes proposed are related to:

- observed changes in the timing of spawning activities
- a desire to provide additional urban fishing opportunities
- consistency with approach taken for other lakes in the FMZ recovering from acidification and where stocking efforts are ongoing.
- Removing sanctuaries established from research needs where research is no longer occurring

Table 9.35: Summary of sanctuaries management actions in FMZ 10

Species	Location	Current	Proposed Change	Rationale
Rainbow Trout	Sanctuaries for streams running into Lake Superior	Closed: April 15th - June 15th	Closed: April 1st - June 15th	Observed changes in spawning behaviour. Advisory Council was supportive of proposed change.
Rainbow Trout	East and West Davignon Creeks, the Bennett-Davignon Diversion Channel and Bennet Creek and Tributaries	No fishing - April 15 to June 15	Remove the sanctuary status for the East and West Davignon Creeks, the Bennett-Davignon Diversion Channel and Bennet Creek and tributaries	No sustainability concerns. Provide urban fishing opportunities (rainbow trout; and other species prior to June 15 - i.e. brook trout). Young fishers also enjoy targeting large-bodied cyprinids (i.e. creek chub) in these systems. This proposal would allow for earlier access to these waters.
Multiple species	Middle Lake - Broder Township	No fishing – closed all year	Remove sanctuary	Formerly an acidified, fishless lake. Sanctuary was put in place to study lake recovery without fishing pressure. Lake has now recovered from acidification, sport fish are present, and research is no longer occurring.

Species	Location	Current	Proposed Change	Rationale
Multiple species	Lohi Lake - Broder Township	No fishing – closed all year	Remove sanctuary	Formerly an acidified, fishless lake. Sanctuary was put in place to study lake recovery without fishing pressure. Lake has now recovered from acidification, sport fish are present, and research is no longer occurring.
Lake Trout	Johnnie Lake (Killarney PP)	Lake Trout season closed all year	Modify sanctuary to: Lake Trout season third Saturday in May to Labour Day	Remove Lake trout exceptions during species reintroduction to provide fishing opportunities while stocking is ongoing. This is consistent with approach taken for other Lake trout lakes in the FMZ.
Lake Trout	Bell Lake (Killarney PP)	Lake trout season closed all year	Modify sanctuary. Lake trout season third Saturday in May to Labour Day	Remove lake trout exceptions during species reintroduction to provide fishing opportunities while stocking is ongoing. This is consistent with approach taken for other lake trout lakes in the FMZ

9.18 Little Chiblow Lake

Little Chiblow Lake is in the administrative boundary of FMZ 10 and is connected to Chiblow Lake. Currently, FMZ 10 has a zone-wide lake trout season of January 1st to Labour Day. Several lakes, including Chiblow lake and Little Chiblow lake, have exception regulations and/or sanctuary seasons. The current sanctuary on Chiblow lake and Little Chiblow lake prohibits recreational fishing for any species between January 1st and the fourth Saturday in April. This has primarily provided protection to lake trout, a species that can be susceptible to fishing pressure especially in the winter.

Proposed changes for Little Chiblow lake represent a local economic development opportunity as well as collaboration between the ministry and first nation communities as identified in Objective 4 in section 8 of the draft Fisheries Management Plan for FMZ 10. Mississauga First Nation has identified that adjustment of the sanctuary dates on Little Chiblow Lake will allow for additional recreational angling opportunities and thus local economic development. After review of recent monitoring data (2008, 2013) it was recognized that the Lake Trout population in Little Chiblow Lake is healthy and likely able to support additional fishing pressure. Increases in rock bass and smallmouth bass have also been observed and are considered a potential risk factor for lake trout. Monitoring of both lakes will continue into the future and allow for periodic assessment of any changes in fish population health.

In the table below, options for change are presented. Option 1 is to maintain the current regulations. Option 2 maintains the sanctuary status (closed all species) but modifies the season to be open to angling 1 month in the winter. This lake trout season is in place on 19 other lakes in FMZ10 (pg 81 Fishing Regulation Summary). Option 3 is to remove the sanctuary, providing additional fishing opportunities for species like smallmouth bass, lake whitefish and pike during springtime (smallmouth and largemouth bass season: open all year, pike spring season).

Table 9.367: Proposed management action options for Little Chiblow Lake (also known as Denman Lake – Montgomery and Patton Townships)

Option 1: Current sanctuary.	**Option 2:** Change in sanctuary season– open one month in winter.	**Option 3:** Remove sanctuary and create Lake Trout season exception.
Season: No fishing (all species) - January 1 to Friday before fourth Saturday in April and October 1 to December 31.	**Season:** No fishing (all species) - January 1 to February 14 and March 16 to Friday before fourth Saturday in April and October 1 to December 31.	**Season:** February 15 to March 15 and third Saturday in May to Labour Day.
Limits: Lake Trout: S-2; not more than 1 greater than 40 cm, and C-1.	**Limits:** align with FMZ 10 zone limits and size – e.g., Lake Trout: S-2; not more than 1 greater than 40 cm, and C-1.	**Limits:** align with FMZ 10 zone limits and size – e.g., Lake Trout: S-2; not more than 1 greater than 40 cm, and C-1.

10 Reporting, Review, and Amendment Process

Fisheries management plans are developed and implemented following adaptive management principles. Since the plan must be adaptive, it is necessary to commit to monitoring and assessment towards meeting objectives. Indicators must be evaluated and compared with benchmarks and targets to measure progress and success of achieving the objectives and goals.

An implementation plan may be developed to allow for prioritization of management actions outlined herein.

The FMZ 10 Advisory Council will maintain the role as an advisory body and will be provided timely updates on the status of the measurables identified within the plan.

Zone Fisheries Management Plans are reviewed in response to resource issues and changes in status based on monitoring and assessment. The current BsM program monitors waters on a five-year schedule. Status updates will be prepared, based on BsM, and will describe the trajectory of the resource towards objective achievement.

The purpose of review will be to confirm the validity of goals and objectives and to identify sections of the management plan requiring updates. Depending upon the nature of the changes, public consultation may or may not be required.

Amendment of the plan can occur prior to a review being conducted. It is anticipated that amendments to the plan would only occur if there was a significant management issue that would have an immediate effect on fisheries across the zone.

11 References

Cairns, A. and N. Yan. 2009. A review of the influence of low ambient calcium concentrations on freshwater daphniids, gammarids, and crayfish. Environmental Reviews 17: 67–79.

Bonar, S.A., W.A. Hubert, and D.W. Willis, editors. 2009. Standard methods for sampling North American freshwater fishes. American Fisheries Society, Bethesda, Maryland.

Carl, L., 1997. Lake Trout Recruitment Concerns in Inland Lakes. Ontario Ministry of Natural Resources Management Brief. 2 pp.

Casselman, J.M. 2005. Age, growth, and environmental requirements of pike. In: J.F. Craig, editor, Pike biology and exploitation. Chapman and Hall, London. pp. 69-101.

Casselman, J.M. 2007. Determining minimum ultimate size, setting size limits, and developing trophy standards and indices of comparable size for maintaining quality muskellunge (Esox masquinongy) populations and sports fisheries. Environ Biol Fish (2007) 79:137–154

Casselman, J. 2013. Muskellunge and Northern Pike: Identification, Biology, Ecology, and Environmental Requirements". Presentation to United Walleye Clubs, April 6, 2013 Sudbury, ON.

Chapman, L.J. and W.C. Mackay. 1990. Ecological Correlations of Feeding Flexibility in Northern Pike (*Esox lucius*). Journal of Freshwater Ecology 5:313-322.

Colby, P.J., and Nepszy, S.J. 1981. Variation among stocks of Walleye (Stizostedion vitreum vitreum): management implications. Can. J. Fish. Aquat. Sci. 38(12): 1814–1831.

COSEWIC. 2011. COSEWIC report on the eligibility for the Aurora Trout Salvelinus fontinalis timagamiensis in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 27 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm).

DFO (Department of Fisheries and Oceans). 2012. 2010 Survey of Recreational Fishing in Canada. Fisheries and Oceans Canada. Ottawa, Ontario. 27 pp.

Durant; Derek Elliott,D., Larry Ferguson, Douglas Hobden, John Gunn; Chuck Mccrudden, Lauren McDonald, Ed Morris, Kevin Pinkerton, Derrick Romain, Raymond Tyhuis and Chris Wilson (2013*)*. Northeast region Aurora Trout Management Strategy 2013-2023 Ontario Ministry of Natural Resources, Timmins, Ont.

Fraser, J.M. 1978. The effect of competition with yellow perch on the survival and growth of planted brook trout, splake and rainbow trout in a small. Transaction of the American Fisheries Society. 107(4). Transaction of the American Fisheries Society. 107(4).

Gunn, John & Mills, Kenneth. (2002). The Potential for Restoration of Acid-Damaged Lake Trout Lakes. Restoration Ecology. 6. 390 - 397. 10.1046/j.1526-100X.1998.06409.x.

Harvey, B. 2009. A Biological Synopsis of Northern Pike (*Esox lucius*). Can. Manuscr. Rep. Fish. Aquat. Sci. 2885: v + 31pp.

Hogg, S.E, N.P. Lester, and H. Ball. 2010. 2005 Survey of Recreational Fishing in Canada: Results for Fisheries Management Zones of Ontario. Applied Research and

Development Branch. Ontario Ministry of Natural Resources. Peterborough, Ontario. 32pp + appendices.

Houle, J. and K. Vascotto. 2012. Brook Trout Background Report – Ontario Ministry of Natural Resources, FMZ 10 Technical Report. 27pp.

Kaufman and Houle, 2008. FMZ 10 Background Document: Recreational Fisheries in FMZ 10: Distribution of Species, Supply and Demand.

Keller, William. Jocelyne Heneberry, and Brie A. Edwards. (2018) Recovery of acidified Sudbury, Ontario, Canada, lakes: a multi-decade synthesis and update. *Environmental Reviews*. 27(1): 1-16. https://doi.org/10.1139/er-2018-0018

Jackson, D.A., and Mandrak, N.E. 2002. Changing fish biodiversity: Predicting the loss of cyprinid biodiversity due to global climate change. Fisheries in a Changing Climate, Am. Fish. Soc. Symp. 32: 89-98.

Leon M. Carl and Fiona McGuiness. 2006. Lake whitefish and lake herring population structure and niche in ten south-central Ontario lakes. Environmental Biology of Fishes.

Lester, N. P., A. J. Dextrase, R. S. Kushneriuk, M. R. Rawson, and P. A. Ryan. 2004. Light and temperature: Key factors affecting Walleye abundance and production. Transactions of the American Fisheries Society 133:588-605.

Lester, N. P., and W. I. Dunlop. 2004. Monitoring the state of the Lake Trout resource: a landscape approach. Boreal shield watersheds: Lake Trout ecosystems in a changing environment. CRC Press, Boca Raton, Florida (2004): 293-321

Lester, N., B. J. Shuter, P. Venturelli and D. Nadeau. 2014. Life-history Plasticity and Sustainable Exploitation: A Theory of Growth Compensation Applied to Walleye Management. Ecol. Applications 24(1), 2014: pp 38-54. Ecological Society of America.

Loppnow, G. L., K. Vascotto and P. A. Venturelli. 2013. Invasive Smallmouth Bass: History, Impacts and Control. Management of Biological Invasions, Vol.4 Issue3: pp 191-206.

Louste-Fillion, J. Edwards, B. Johnston, T and Gunn, J. 2019. Recovery of Lake Trout (*Salvelinus namaycush*) Lakds and Other Test Lakes Within Sudbury's Acid Deposition Zone. Draft Report of the 2019 Survey Results. Cooperative Freshwater Ecology Unit, Vale Living with Lakes Centre, Laurentian University, Sudbury, Ontario. 29 pp.

Malette, M. D. and G. E. Morgan, 2005. Provincial Summary of Northern Pike Life History Characteristics Based on Ontario's Fall Walleye Index Netting (FWIN) Program

1993-2002. Cooperative Freshwater Ecology Unit, Dept. of Biology. Laurentian University.

MNRF (Ontario Ministry of Natural Resources and Forestry). March 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Second Edition, Toronto: Queen's Printer for Ontario. 248 pp.

MNRF (Ontario Ministry of Natural Resources and Forestry). 2013. Taking a Broader Landscape Approach – A Policy Framework for Modernizing Ontario's Approach to Natural Resource Management. Ontario Ministry of Natural Resources and Forestry. 28 pp.

MNRF. 2015A. Horizons 2020. Toronto: Queen's Printer for Ontario. 10 pp.

MNRF. 2015b. Ontario's Provincial Fish Strategy; Fish for the Future. Fisheries Policy Section, Species Conservation Branch, Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. 64pp.

MNRF. 2015c. Annual Summary. Licenced Commerical Bait in Ontario.

MNRF. 2015d. 2010 Survey of Recreational Fishing in Canada: Results for Fisheries Management Zones of Ontario. Ontario Ministry of Natural Resources and Forestry. Peterborough, Ontario. 38 pp.

Ontario Ministry of Natural Resources and Forestry. 2020. 2015 Survey of Recreational Fishing in Canada: Results for Fisheries Management Zones of Ontario. Fish and Wildlife Policy Branch. Ontario Ministry of Natural Resources and Forestry. Peterborough, Ontario. 61pp.

Ontario Ministry of Natural Resources and Forestry (OMNRF). 2015b. Ontario's Provincial Fish Strategy: Fish for the Future. Fisheries Policy Section, Species Conservation Branch. 66 pp.

Ontario Ministry of Natural Resources (OMNR). 2002. Guidelines for stocking fish in inland waters of Ontario. Fisheries Section, Fish and Wildlife Branch, Ontario Ministry of Natural Resources, Peterborough.

Ontario Ministry of Natural Resources and Forestry (OMNRF). 2020c. Ministry of Natural Resources and Forestry Strategic Plan 2020 – 2025: Naturally Resourceful. Queen's Printer for Ontario, Toronto, Ontario. 13 p.

MNRF. 2016. Maintaining Water Management Plans. Ministry of Natural Resources and Forestry. 32 pp.

Morgan, G.E., M.D. Malette, R.S Kushneriuk, S.E. Mann. 2002. Regional Summaries of Walleye Life History Characteristics Based on Ontario's Fall Walleye Index Netting (FWIN) Program 1993 to 2001. Diagnostic and Sampling Standards Working Group. Ontario Ministry of Natural Resources. 90 pp.

Pierce, R. B. and C.M. Tomcko. 2005. Density and Biomass of Native Northern Pike Populations in Relation to Basin-Scale Characteristics of North-Central Minnesota Lakes. Transactions of the American Fisheries Society 134:1, 231-241.

Powell, M. J., M.-F. Bernier, S. J. Kerr, G. Leering, M. Miller, W. Samis and M. Pellegrini. 1986. Returns of Hatchery-Reared Lake Trout from Eight Lakes in Northeastern Ontario. Ontario Ministry of Natural Resources, Ontario Fisheries Technical Report Series No. 22.

Quinn, N. W., R. M. Korver, F. J. Hicks, B. P. Monroe, and R. R. Hawkins. 1994. An empirical model of lentic brook trout. North American Journal of Fisheries Management 14 : 692-709.

Ryder, R.A. 1965. A method for estimating the potential fish production of north-temperate lakes. Trans. Am. Fish. Soc. 94:214-218.

Sandstrom, S, M. Rawson and N. Lester. 2013. Manual of Instructions for Broad-scale Fish Community Monitoring; using North American (NA1) and Ontario Small Mesh (ON2) Gillnets. Ontario Ministry of Natural Resources. Peterborough, Ontario. Version 2013.2 35 pp. + appendices.

Schlesinger, D.A. and H.A. Regier. 1982. Climatic and Morphoedaphic Indices of Fish Yields from Natural Waters. Trans. Am. Fish. Soc. 111:150.

Sass, G.G. and J.F. Kitchell. 2005. Can growth be used as a surrogate measure of Walleye (Sander vitreus) abundance change? Canadian Journal of Fisheries and Aquatic Sciences. 62(9): 2159-2168.

Scott, W.B. and E.J. Crossman, 1998. Freshwater fishes of Canada. Fisheries Research Board of Canada Bulletin 184. 966 pp.

Selinger, W., D. Lowman, S. Kaufman, and M. Malette. 2006. The status of Lake Trout populations in northeastern Ontario (2000–2005). Ontario Ministry of Natural Resources. Timmins. Ont. 65 pp.

Smith, B.J., Blackwell, B.G, Wuellner, M.R., Graeb, B.D. and D.W. Willis. 2017. Contact selectivity for four fish species sampled with North American standard gill nets. North American Journal of Fisheries Management 37(1): 149-161.

Shuter, B.J., MacLean, J. A., Fry, F.E.J., and H.A Regier. 1980. Stochastic simulation of temperature effects on first-year survival of Smallmouth Bass. Trans. Am. Fish. Soc. 109: 1-34.

Suski, C. and M. Ridgway, 2007. Climate and Body Size Influence Nest Survival in a Fish with Parental Care. Journal of Animal Ecology 76: 730-739.

Vander Zanden, M.J., Casselman, J.M. and J.B. Rasmussen. 1999. Stable isotope evidence for the food web consequences of species invasions in lakes. Nature 401(6752), pp.464-467.

Vander Zanden, M. J., J. Olden, J. H. Thorne and N. E. Mandrak. 2004. Predicting Occurrences and Impacts of Smallmouth Bass Introductions in North Temperate Lakes. Ecological Applications 14(1):134-148.

Venturelli, P. A., N. P. Lester, T. R. Marshall, and B. J. Shuter. 2010. Consistent patterns of maturity and density-dependent growth among populations of Walleye (Sander vitreus): application of the growing-degree-day metric. Canadian Journal of Fisheries and Aquatic Sciences 67:1057–1067.

Walker, S., P. Addison, S. Sandstrom, and N. Lester. 2013. Contact retention selectivity of three types of gillnet gangs. Ontario Ministry of Natural Resources Aquatic Research Series 2013-07. 32pp

Appendix A: Fisheries Background Report

Walleye

Distribution of Walleye

Currently, there are 366 lakes known to support walleye within FMZ 10, with 275 of those lakes greater than 50 ha (Section 2, Table 2.1). Walleye have a wide distribution throughout FMZ 10 inhabiting most of the zone (Figure A-1).

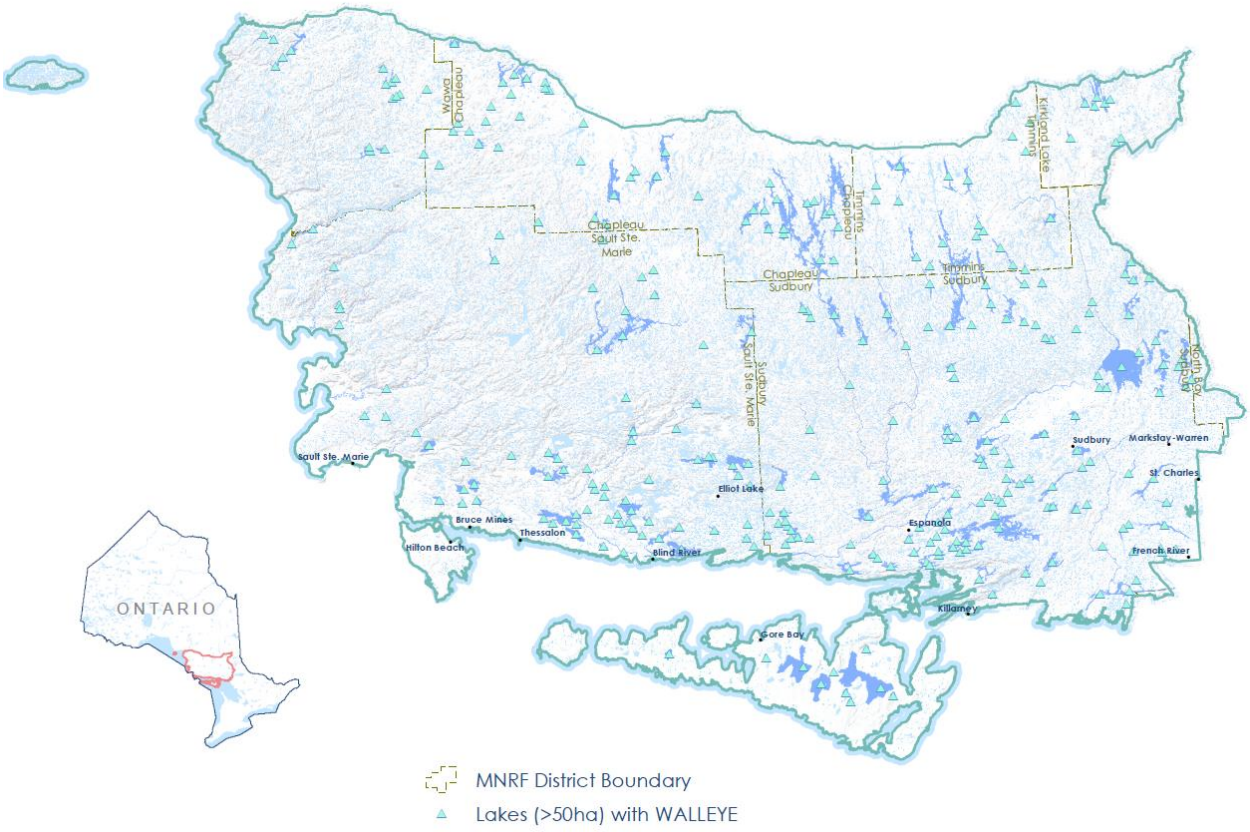


Figure A-1. Distribution of walleye within FMZ 10. Data is captured from 2019 LIO's ARA_Water_Poly_Segment and a review by respective ministry district offices. Includes lakes, ponds and rivers throughout FMZ 10 greater than 50 ha.

Habitat

Like most fish species, the most important factor determining walleye abundance and life history characteristics in FMZ 10 is the quality and quantity of available habitat. Walleye populations do best in dark (low Secchi), nutrient rich water with enough epi-benthic (above thermocline) habitat (Lester et al., 2004). Climate (Growing Degree Days; GDD) is a major predictor of life history characteristics of walleye populations,

where populations that occur in relatively warm climates grow faster and consequently have higher mortality rates (shorter life expectancy) (Colby and Nepszy1981, Venturelli et al. 2010).

In FMZ 10, in relation to other FMZs in Ontario, the climate is moderate and lakes are relatively clear, with the least epi benthic habitat across all zones (see Figure 2.1 in Section 2 of plan). These habitat indicators suggest that FMZ 10 characteristically has less productive capacity compared to other Fishery Management Zones. The limited walleye habitat in FMZ 10, combined with the presence of other competing species (i.e. lake trout, northern pike and smallmouth bass) results in walleye populations that persist at lower densities than those found in other FMZ's. This assessment is consistent with the results obtained previously by Kaufman and Houle (2008) in their analysis of FMZ 10.

Angling pressure

Creel surveys conducted on walleye lakes across Northeast region provide a pre 1990s estimate of approximately 7 angler hours per hectare. Kaufman and Houle (2008) provided estimates of winter and summer effort on walleye lakes from aerial angler counts made between 2000 and 2005 but acknowledges that data were only available for four lakes. Winter effort was negligible; only one of four lakes received any effort and it was less than one hour per hectare. Mean open water effort was greater than nine hours per hectare but ranged from 3.9 to 14.9 hours per hectare (Kaufman and Houle (2008)).

The estimated effort (all species) on lakes > 20 ha in FMZ 10 from 2005 and 2010 are 15 hrs/ha and 10 hrs/ha respectively. These estimates are generated from results of the national survey of recreational fishing are available for 2005 and 2010 (MNRF 2015d).The percentage of anglers targeting walleye was 32% in FMZ 10 (MNRF 2015d). Applying this estimate to the total angling effort results in walleye specific effort estimates of 4.8 hrs/ha and 3.2 hrs/ha for 2005 and 2010 respectively

The results of Broadscale Monitoring (BsM) aerial angler counts conducted during BsM cycle 1, indicate that the zone wide, area weighted average angling effort on FMZ 10 walleye lakes is 5.24 angler hrs/ha (sum of winter (1.18) and summer (4.06) (Figure A-2). However, angling effort on a few individual lakes approaches 20 hrs/ha. Additionally, angling effort is highest on medium (500-1500 ha) lakes in both the summer (open water) and winter seasons. It should be noted that although these methods do supply reasonable estimates of total fishing effort, one cannot partition fishing effort to a particular species, thus it is unknown how much of this effort is directed towards walleye, particularly on lakes which contain other sport fish species (i.e. lake trout, northern pike, smallmouth bass).

Considering all available data for angling effort in FMZ 10, this suggests that effort increased during the late 90s and early 2000s, followed by a decline in the most recent decade.

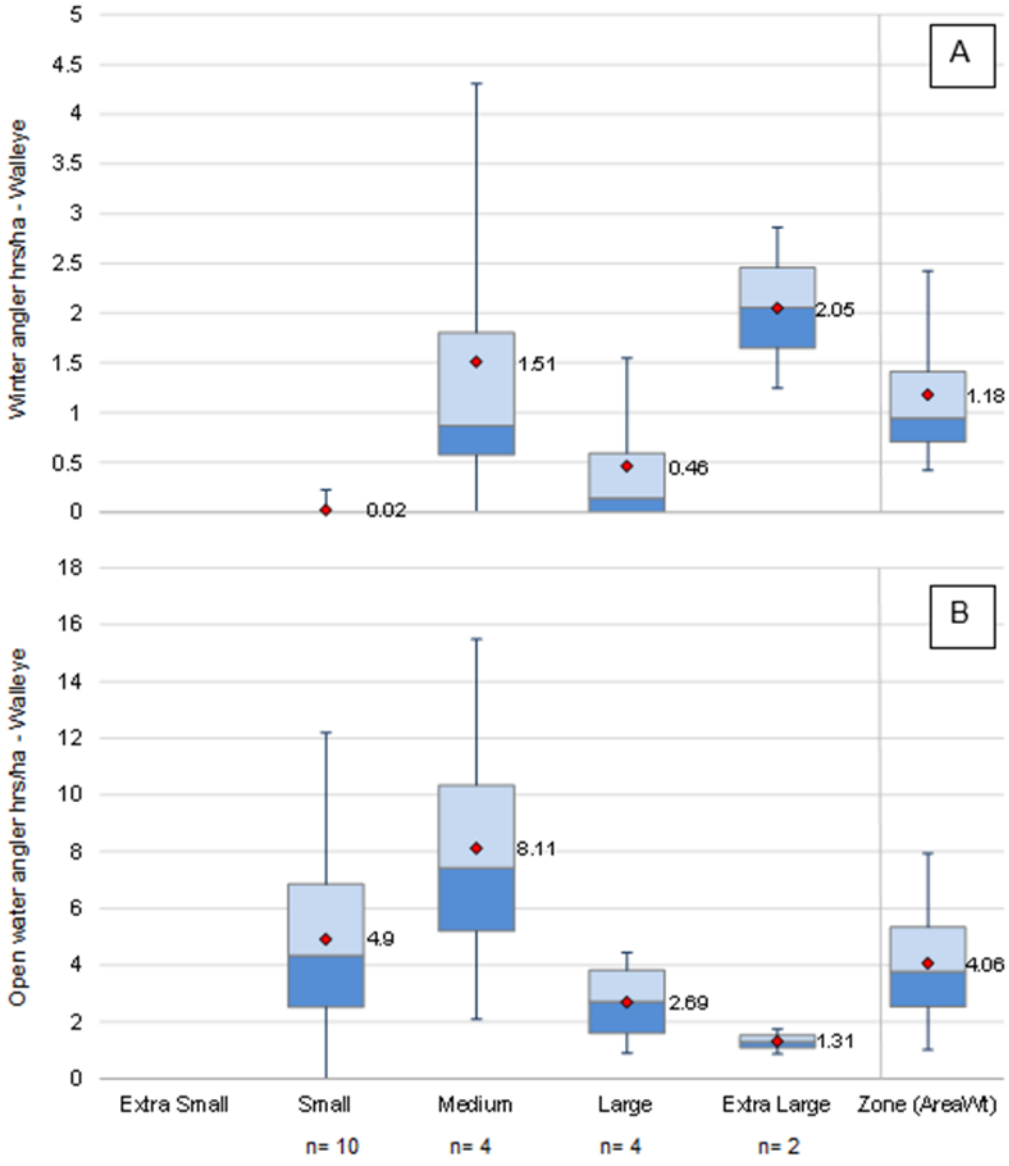


Figure A-2. Estimated angling intensity (hrs/ha) for winter (A) and summer (B) on FMZ 10 walleye trend lakes as measured by BsM Cycle 1 (2008-2012).

Walleye Indicators and Benchmarks

Abundance

Recruited Size Walleye

Abundance of walleye, as a zone wide indicator of status, is assessed by making use of area weighted (AW) zone average catch per unit effort (CUE), where analytical methods are described in the assessment section of this document. The AW average CUE of recruit (≥ 350 mm) size walleye from walleye trend lakes in FMZ 10 during the first cycle of the BsM program was 0.75 fish per gang (Figure A-3). Comparing results from FMZ 10 to other FMZs with similar lake characteristics and productive capacity (i.e. FMZ 5 and 11) we see that observed abundance among these zones is similar and the lowest among northern zones. The observed trends in BsM data from FMZ 10 support the results of previous monitoring and assessment efforts (Kaufman and Houle (2008) and Morgan et al. (2002)), where abundance of FMZ 10 walleye populations was lower than the Northeast regional benchmark and typically among the lowest in the province.

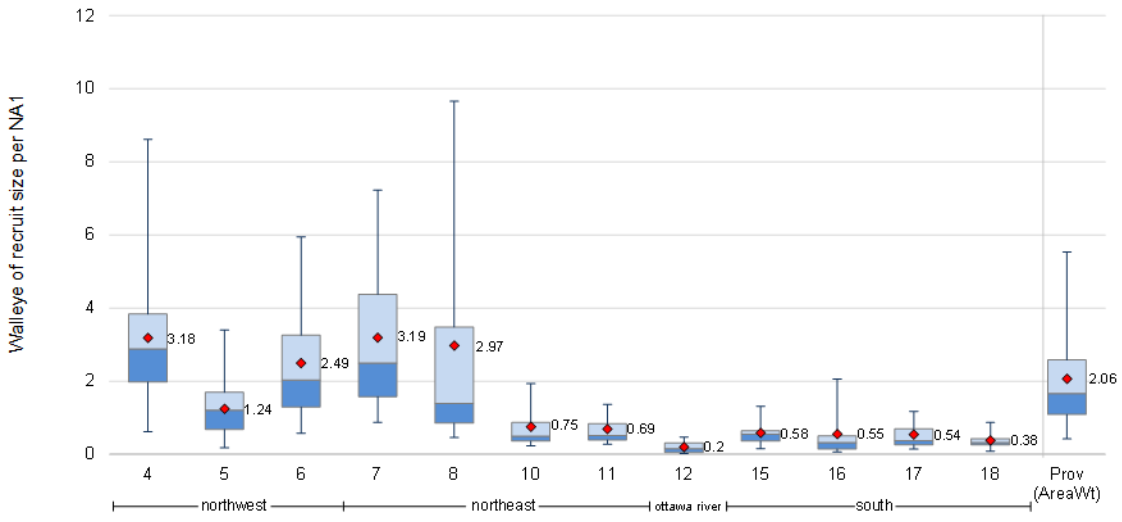


Figure A-3. Area weighted CUE of recruited walleye (number of walleye ≥ 350mm per net) for walleye trend lakes by FMZ as measured by BsM in Cycle 1 (2008-2012).

Number of Mature Size Walleye

In FMZ 10, as in most FMZ's there exists an interest in maintaining or increasing the abundance of mature walleye. Average length at maturity for female walleye in FMZ 10 was estimated by Kaufman and Houle (2008) as 477mm total length. This is supported by recent published estimates of walleye length at maturity across a much broader geographic area, suggesting that 450 mm total length is an appropriate length to use as representing mature walleye (Lester et al. 2014). We, thus use The AW CUE of walleye ≥ 450mm Total Length as measured by BSM as an index of abundance of mature walleye. We use Cycle 1 BsM as our baseline for , is 0.47 fish/net (Figure A-4).

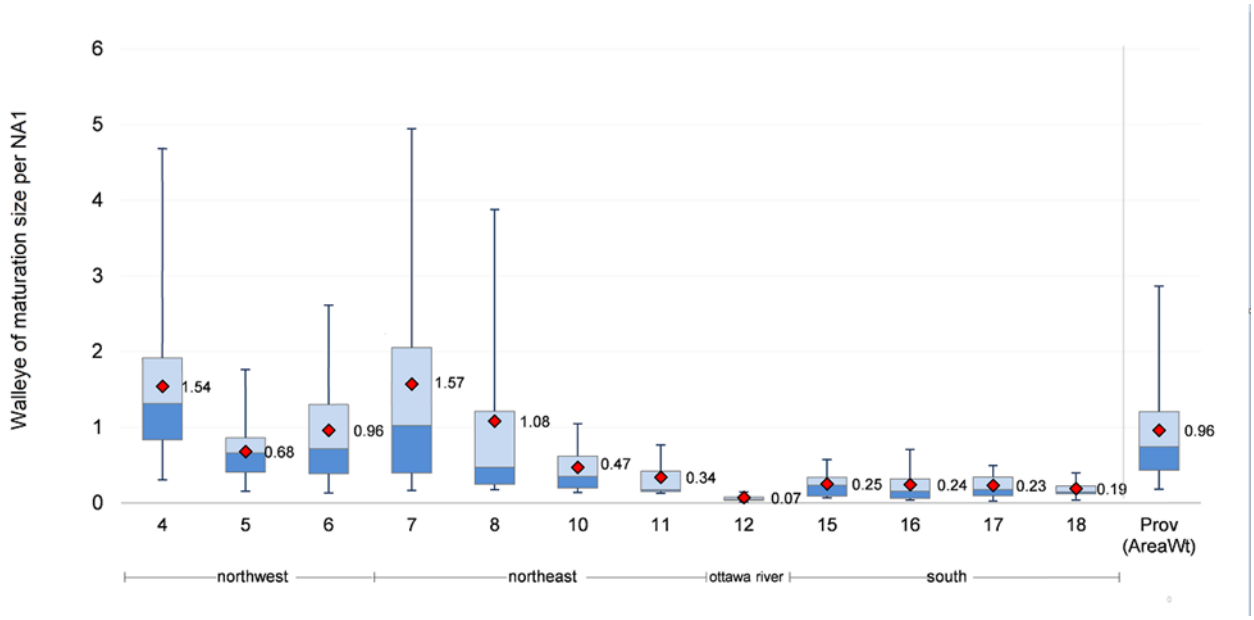


Figure A-4. Area weighted average CUE of mature walleye (number of walleye >450mm per NA1) for walleye trend lakes by FMZ as measured by BsM in Cycle 1.

Growth and Age Structure

Pre-Recruit Growth Rate

A well-documented relationship between walleye density and growth exists (Sass and Kitchell 2005, Venturelli et. al. 2010), where populations at low densities typically have faster growth because of less competition. Similarly, changes in juvenile growth rate is often a signal of changes in density of juvenile fish.

Provincial monitoring data from the BsM program demonstrates that walleye in FMZ 10 grow faster during the first few years of life than other northern populations, with a rate of 145 mm per year up to recruitment size (Figure A-5). These results from the BsM program are consistent with the results of regional monitoring efforts conducted between 1993 and 2003 (Kaufman and Houle (2008) and Morgan et al. (2002)), where FMZ 10 was shown to have high growth rates for juvenile walleye, when compared to other northern zones.

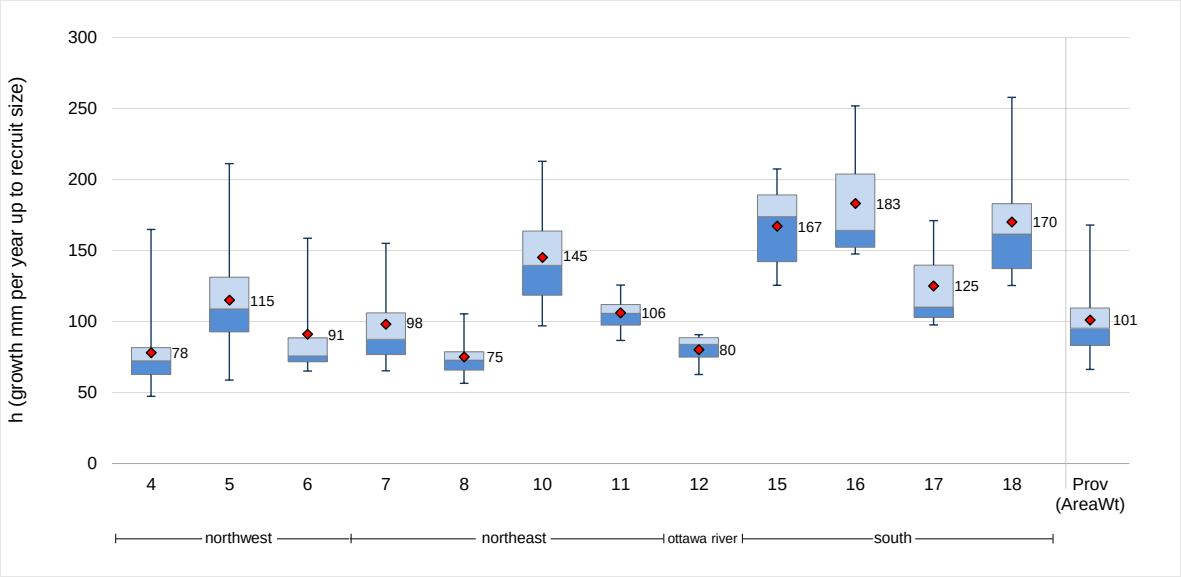


Figure A-5. Area weighted average walleye recruit h(growth in mm/yr. up to 350mm) for walleye trend lakes by FMZ as measured by BsM in Cycle 1.

Number of Walleye Age Classes

The age structure of FMZ 10 walleye populations appear to be stressed, with a cycle 1 BsM AW average number of 8.03 cohorts (range 1 – 12), lowest of all northern zones (Figure A-6). The relatively low number of cohorts observed in FMZ 10 during the BsM sampling is consistent with observations made during previous monitoring. The median (non-area weighted) number of cohorts among 60 lakes monitored by FWIN between 1993 and 2003 was 6, ranging from 1 to 14. These results suggest that, although stressed, the walleye population age structure has remained stable.

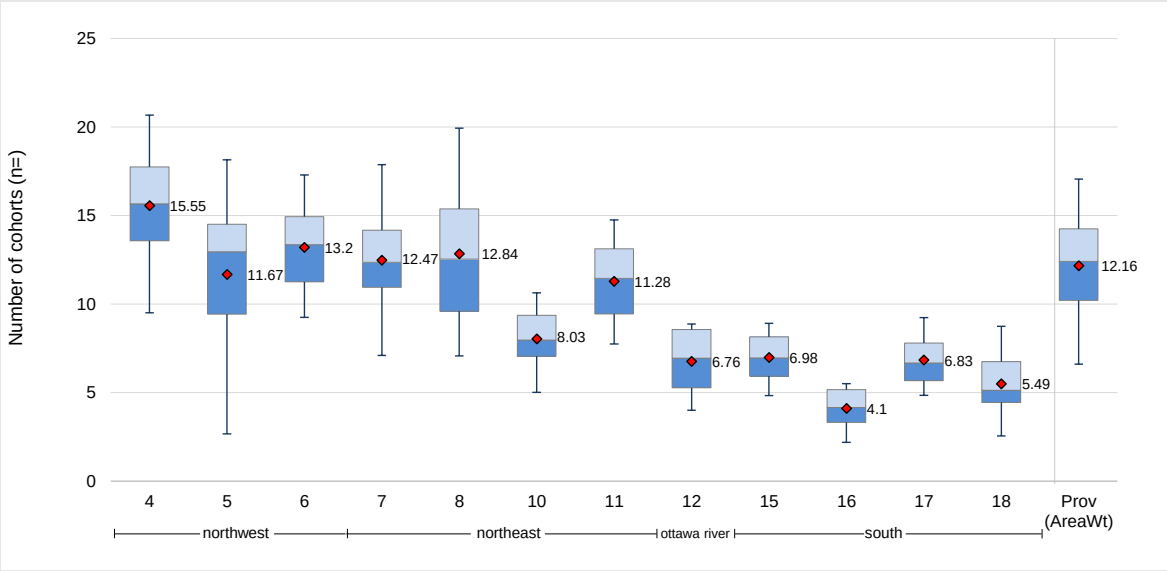


Figure A-6. Area weighted zone average number of walleye cohorts (age classes) observed during BsM cycle 1, by FMZ.

Mean Age of Recruited Size Walleye

Similar to the results for number of walleye cohorts, the mean age of recruited sized walleye in FMZ 10 indicates that populations are stressed, where FMZ 10 shows the lowest mean age among all northern zones (Figure A-7).

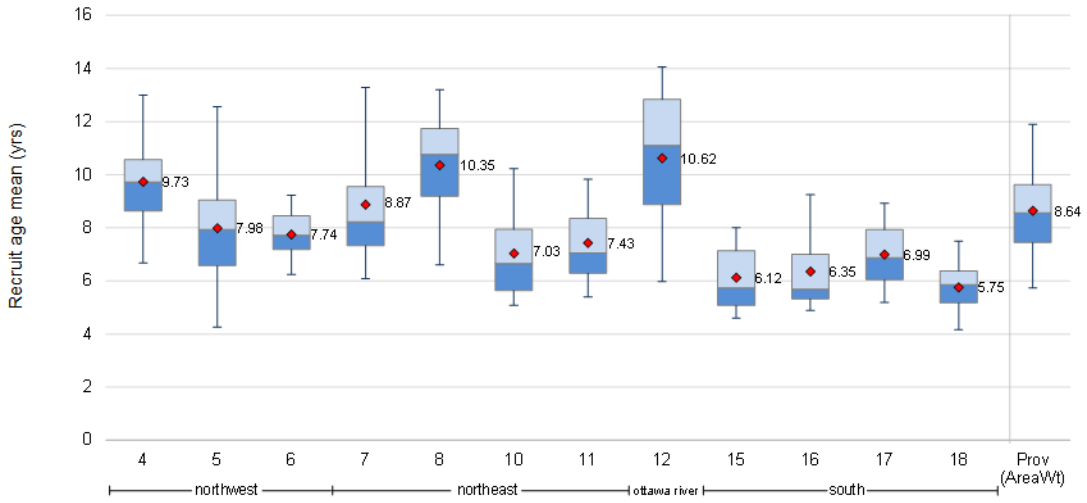


Figure A-7. Area weighted average mean observed age of Walleye of recruit size and larger by FMZ as measured by BsM in cycle 1.

Reference Points

Results from cycle 1 BsM indicates that FMZ 10 walleye fishing mortality exceeds the value considered safe for the zone (0.75xM) on 70% (10 of the 20 lakes monitored obtained sufficient age samples and were used to estimate individual lake level mortality) of the lakes monitored (Figure A-8). The estimated biomass (a measure of population health) is estimated to be below the level considered safe for the zone (1.3Bmsy) on 89% (19 of 20 lakes) of the lakes monitored (Figure A-9), where sufficient age samples were obtained to estimate individual lake level mortality. These results are similar to the results of the Fall Walleye Index Netting (FWIN) assessments conducted between 1993 and 2001 (Morgan et al. 2002) where the majority of surveyed lakes had biomass estimates below the level considered safe and where estimated fishing mortality exceeded the value considered safe on many lakes.

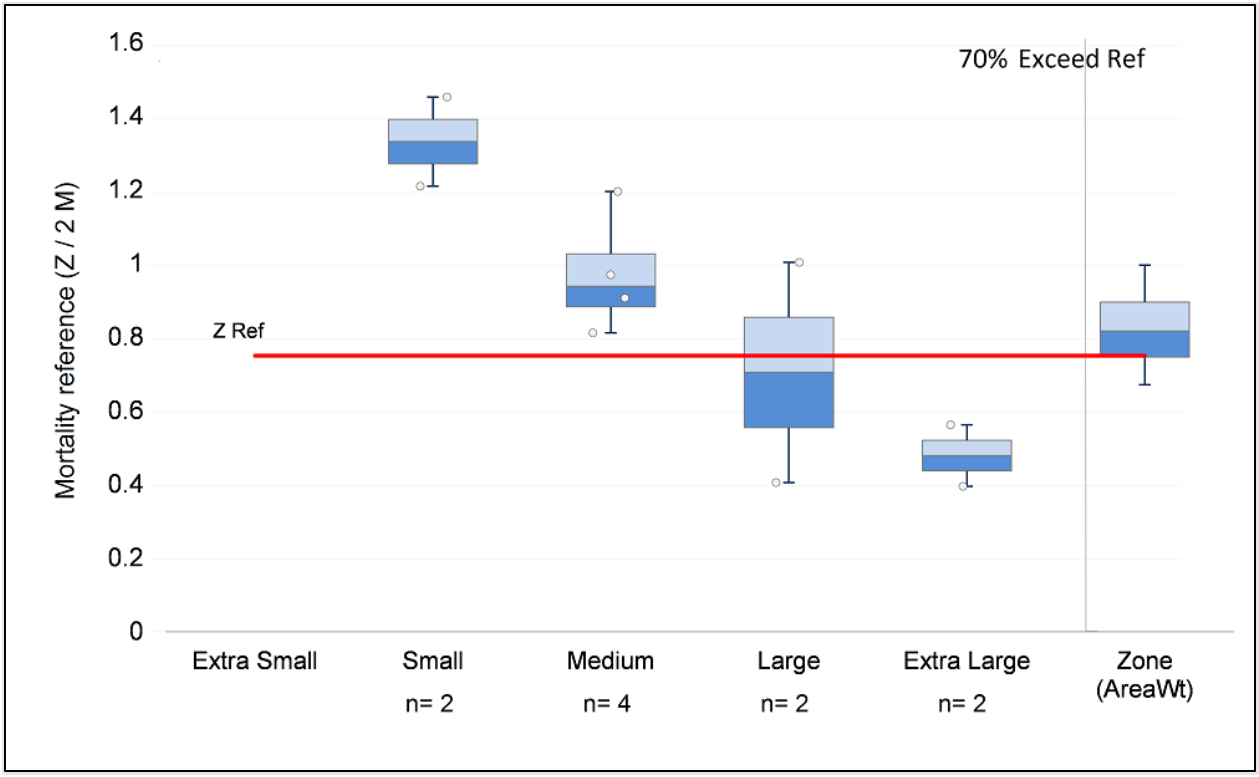


Figure A-8. Mortality reference point for walleye by lake size in FMZ 10. Red line denotes the safe mortality reference point of 0.75

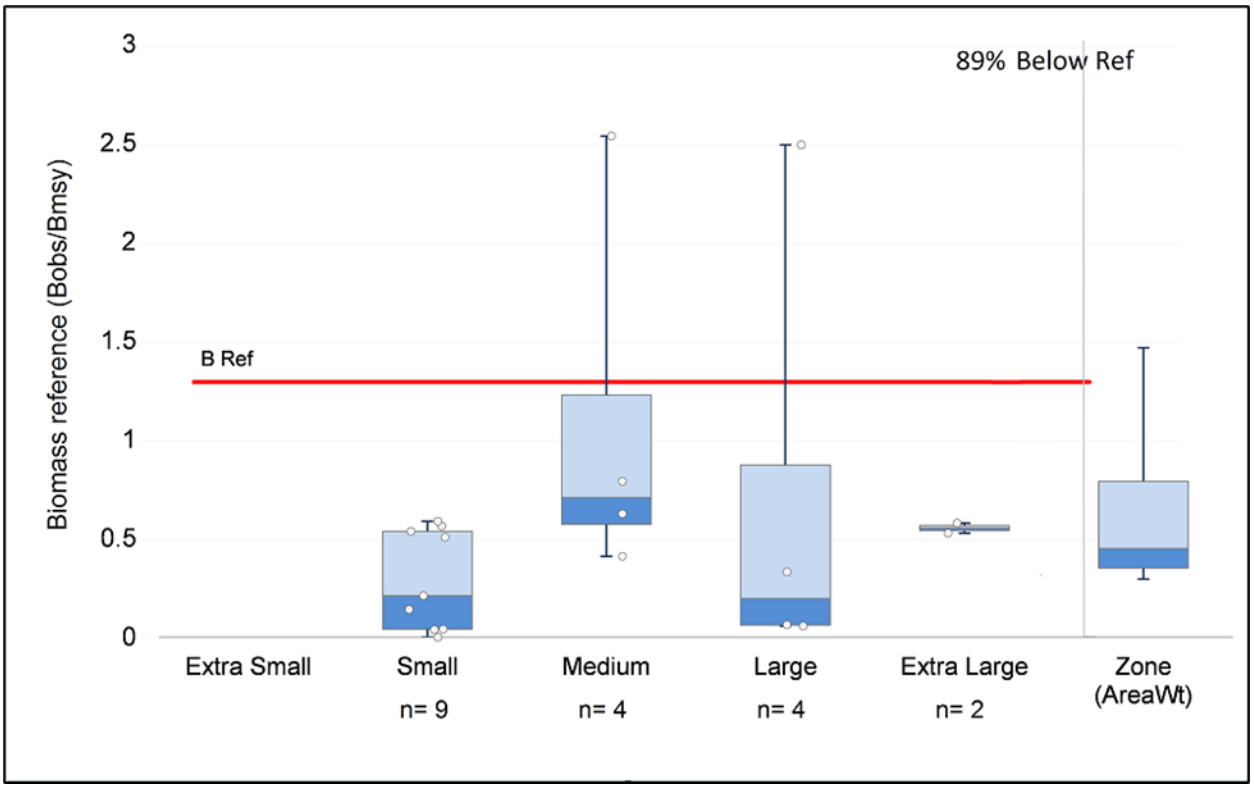
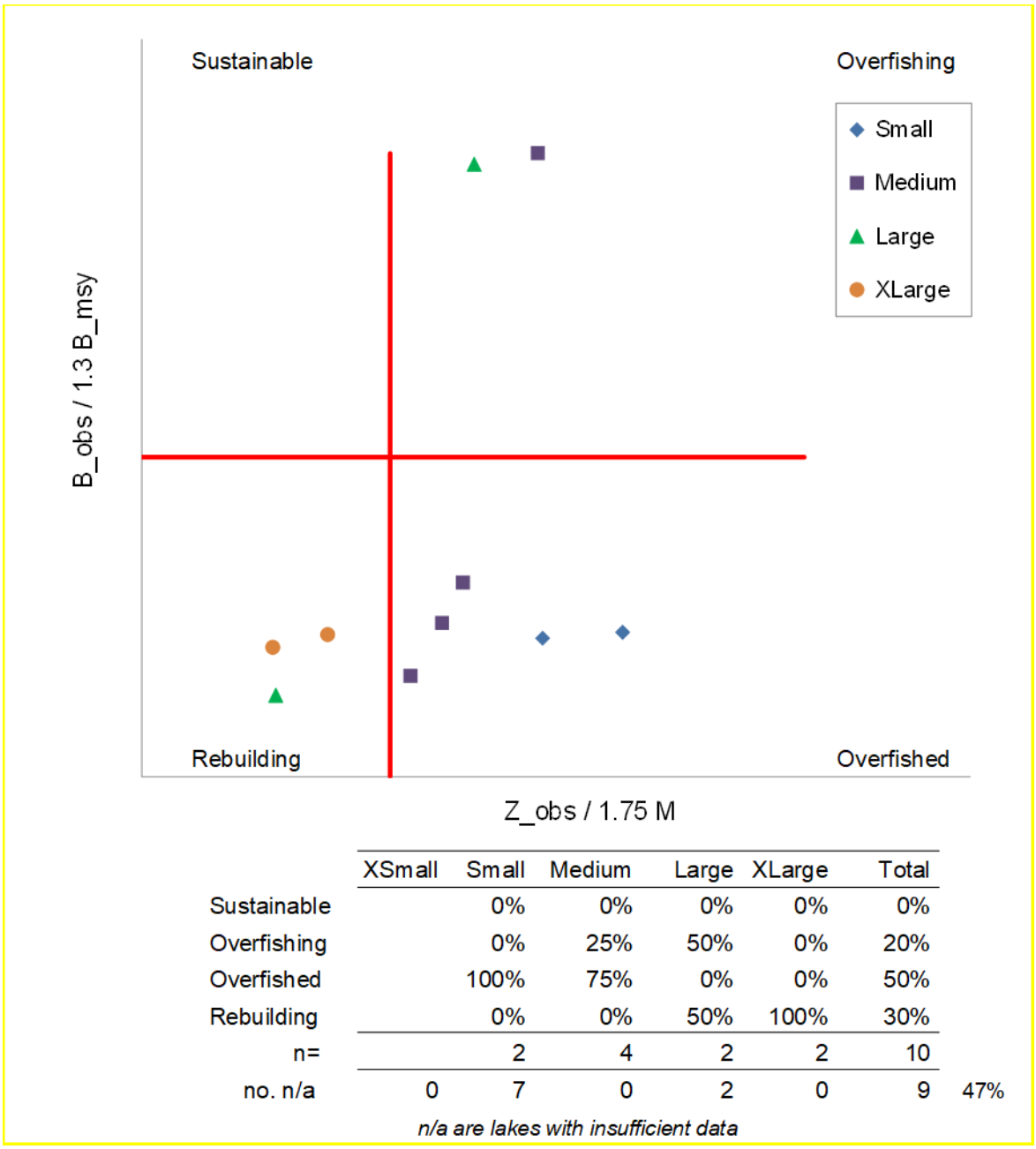


Figure A-9. Biomass reference point for walleye by lake size in FMZ 10. Red line denotes safe biomass reference point of 1.3.

Combining the 2 reference points together on the same plot is what is often referred to as Kobe plot or quadrant plot. The quadrant plot classifies a fish population into one of four status stages based on the relationship between biomass and mortality (Lester et al. 2003). In the 'Sustainable' stage, as many fish as would be expected, based on productivity, and fishing pressure is below the predicted safe level. Lakes in the 'Overfishing' stage are characterized by fishing pressure above the safe level for sustainability, but abundance of fish stays high. By comparison, the 'Overfished' stage is characterized by fishing pressure beyond safe levels and fish biomass has fallen below the productive capacity of the lake. Finally, the 'Rebuilding' stage is defined as degraded or recovering, with low biomass and, fishing mortality is also low, as anglers have generally abandoned fishing these lakes due to the poor quality of fishing.



	XSmall	Small	Medium	Large	XLarge	Total	
Sustainable		0%	0%	0%	0%	0%	
Overfishing		0%	25%	50%	0%	20%	
Overfished		100%	75%	0%	0%	50%	
Rebuilding		0%	0%	50%	100%	30%	
n=		2	4	2	2	10	
no. n/a	0	7	0	2	0	9	47%

n/a are lakes with insufficient data

Figure A-10. Quadrant (Q)-plot of walleye recruit biomass and walleye recruit mortality. The proportion of BsM lakes in each quadrant is listed in the table. There are nine lakes where insufficient fish were caught to generate a mortality estimate. The red vertical and horizontal lines represent our safe reference points, thus a lake falling to the right of the vertical line and below the horizontal line represents a lake where the estimated mortality rate is higher than the mortality reference point (safe mortality rate of 1.75 x M) and the observed biomass is less than the biomass reference point (sustainable biomass of 1.3 x Bmsy), respectively. Lakes where insufficient age samples were obtained to generate individual lake level mortality estimates would likely all have a negative biomass reference value (below the red line).

Northern Pike

Distribution of Northern Pike

Currently, there are 625 lakes known to support northern pike within FMZ 10, with 392 of those lakes greater than 50 ha (Section 2, Table 2.1). Northern pike have a wide distribution throughout FMZ 10 inhabiting most of the zone (Figure A-11).

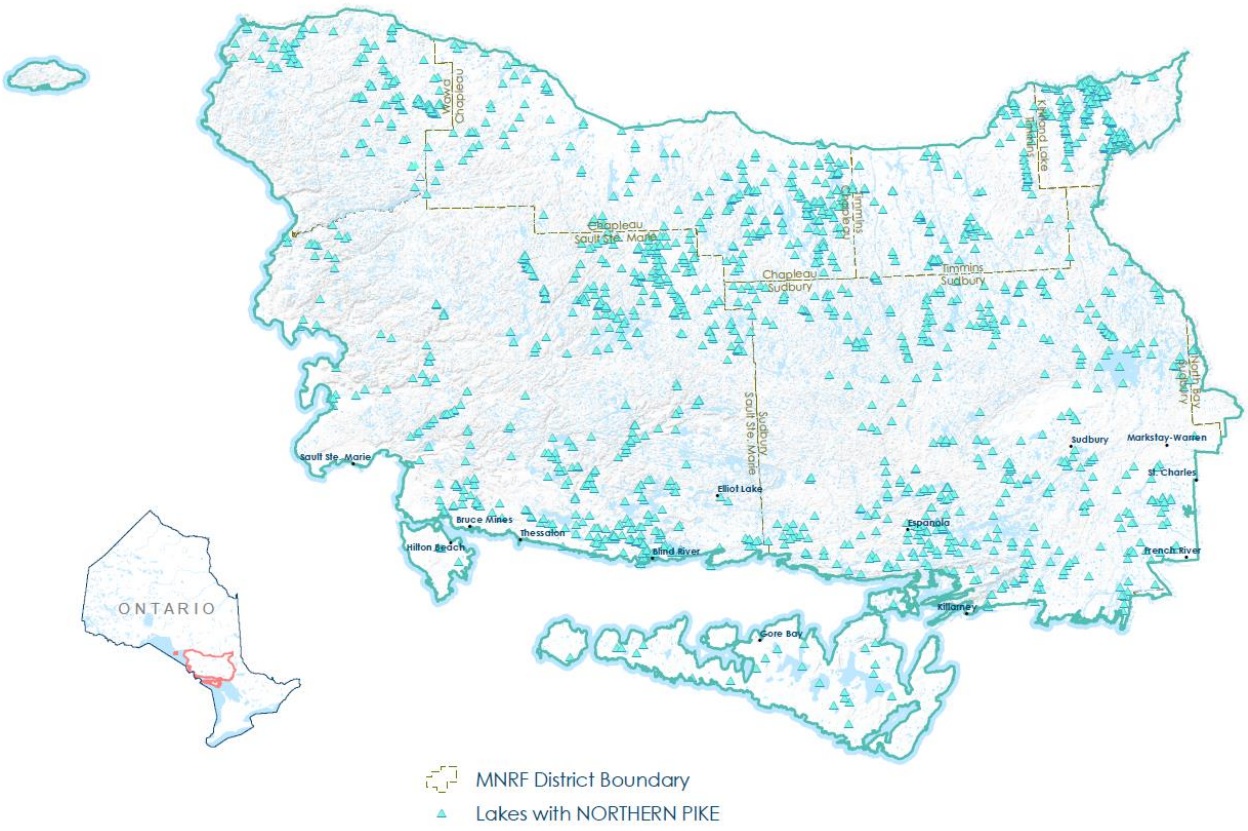


Figure A-11. Distribution of northern pike within FMZ 10. Data is captured from 2019 LIO's ARA_Water_Poly_Segment. Includes lakes, ponds and rivers throughout FMZ 10.

Habitat

Northern pike often inhabit vegetated, shallow waters that are moderately productive. Spawning may occur in streams, marshes and shallow bays, where eggs are deposited in submerged vegetation. Eggs are adhesive, keeping them from falling into the soft substrate where lack of oxygen could reduce survival of embryos (Casselman 2005). Northern pike are visual or ambush predators that prefer fish but are opportunistic and feed on a variety of prey including leeches, frogs, crayfish and small mammals (Chapman and Mackay 1990). Stressors on northern pike include exploitation and

habitat loss and they are susceptible to disease (bacterial and viral infections), parasites and bioaccumulation of toxins (Harvey 2009).

Northern pike can be found in most waters of FMZ 10, in both rivers and lakes. The wide range of lakes from clear, cold and deep to stained, shallow and warm provide a diversity of northern pike habitat and populations. In Canada, the preferred habitat of northern pike is usually clear, warm, slow moving and heavily vegetated rivers, or warm weedy bays of lakes. They do, however, occur in a wide range of habitats across their extensive distribution (Scott and Crossman 1973).

Northern pike in FMZ 10 are an underutilized species in many waters due primarily to their small size and low human consumption rates. Shallower lakes tend to be dominated by larger numbers of smaller sized fish while larger, deeper lakes tend to have fewer but larger sized pike (Pierce and Tomcko 2005).

Prior to the establishment of the provincial BsM program, FWIN provided the most comprehensive status of northern pike in Northeast Region. Malette and Morgan (2005) reported on the abundance of northern pike and the trophy potential for northern pike in the Northeast Region. The main conclusions from that work described how northern pike relative abundance is correlated with several water body characteristics (i.e. surface area, maximum depth and Secchi depth). Northern pike relative abundance was higher in waterbodies with large littoral zones and low transparency, and asymptotic (predicted maximum) length was higher in deeper water bodies.

The results of the BsM program from for FMZ 10 demonstrate that in FMZ 10 lakes are generally deep, cold, and clear, with small amounts of littoral habitat. These lake characteristics are not as favourable for northern pike as is found in other northern zones (see Figure 2.1 in Section 2 of plan).

Angling pressure

Northern pike were listed as the 4th most preferred species in 2005 and the third most preferred species in 2010 (MNRF 2015d). In 2010, northern pike were the third most commonly caught (13% of all fish caught) species, while they were the fourth most commonly harvested (12% of all fish harvested) species in the zone (MNRF, 2015d).

Northern Pike Indicators and Benchmarks

Abundance

In FMZ 10, as is the case in many FMZs, there exists an interest in maintaining or increasing the abundance of large northern pike. Here we make use of the equally weighted average CUE of recruit size northern pike as our abundance indicator. This

measure is very close to the size at which northern pike are mature. The equally weighted average CUE of recruit size northern pike from BsM trend lakes during the first cycle of the BsM program was 0.15 fish per gang (Figure A-12).

Comparing results from FMZ 10 to other FMZs with similar lake characteristics and productive capacity (i.e. FMZ 5 and 11) we see that observed abundance among these zones is similar and the lowest among northern zones (Figure A-12). The observed results in BsM data from FMZ 10 support the results of previous monitoring and assessment efforts (Morgan et al 2002), where abundance of FMZ 10 northern pike populations was lower than the Northeast regional benchmark and typically among the lowest in the province.

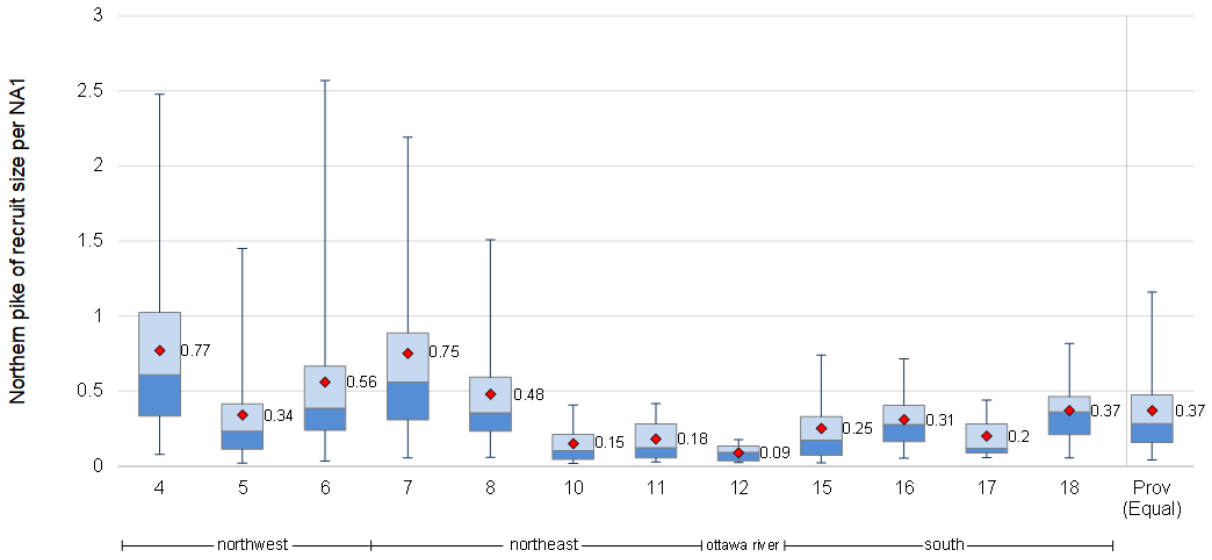


Figure A-12. Equally weighted average CUE of Recruited size (≥ 500mm) northern pike by FMZ from BsM, Cycle 1 (2008-2012).

Number of Mature Size Northern Pike

For our analysis, northern pike are classified as mature when equal to or greater than 525 mm. The Cycle 1 BsM baseline for equally weighted average CUE of northern pike ≥ 525mm Total Length, is 0.13 fish/net, being very similar to that observed in FMZ 11 and among the lowest in the province.

Growth and Age Structure

Pre-Recruit Growth Rate

Provincial monitoring data from the BsM program demonstrates that northern pike in FMZ 10 grow at a rate comparable to other northern zones (zone 7: 187mm; zone 8: 167mm), with a rate of 175 mm per year up to the size considered recruited to the fishery (Figure A-13).

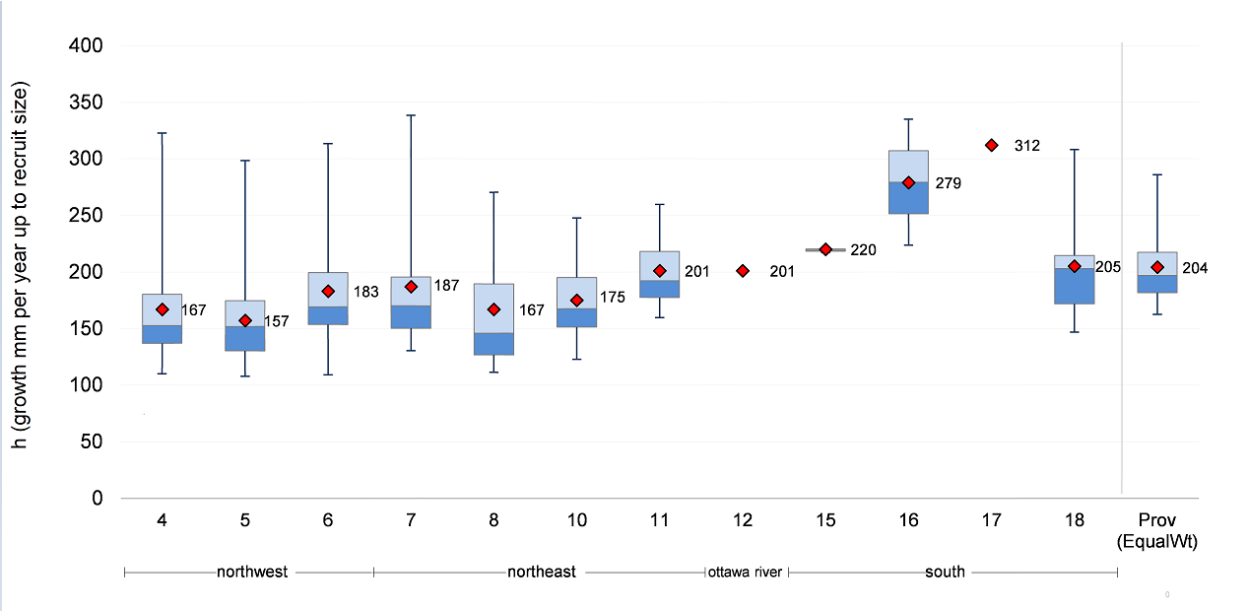


Figure A-13. Pre-maturation growth rate (mm/yr.) of northern pike by FMZ from BsM, Cycle 1.Lmax_25. (mean of largest 5% after removing the top 2% of lengths caught in large mesh nets)

Among northern pike sampled during the BsM program cycle 1 the mean length of pike that were in the top 5%, after removing the top 2% of lengths caught in large mesh nets was calculated, producing a Lmax_25 value. The Lmax_25 value for FMZ 10 was the lowest among the northern zones (Zones, 7, 8, 10, and 11) with a measure of 648 mm (Figure A-14).

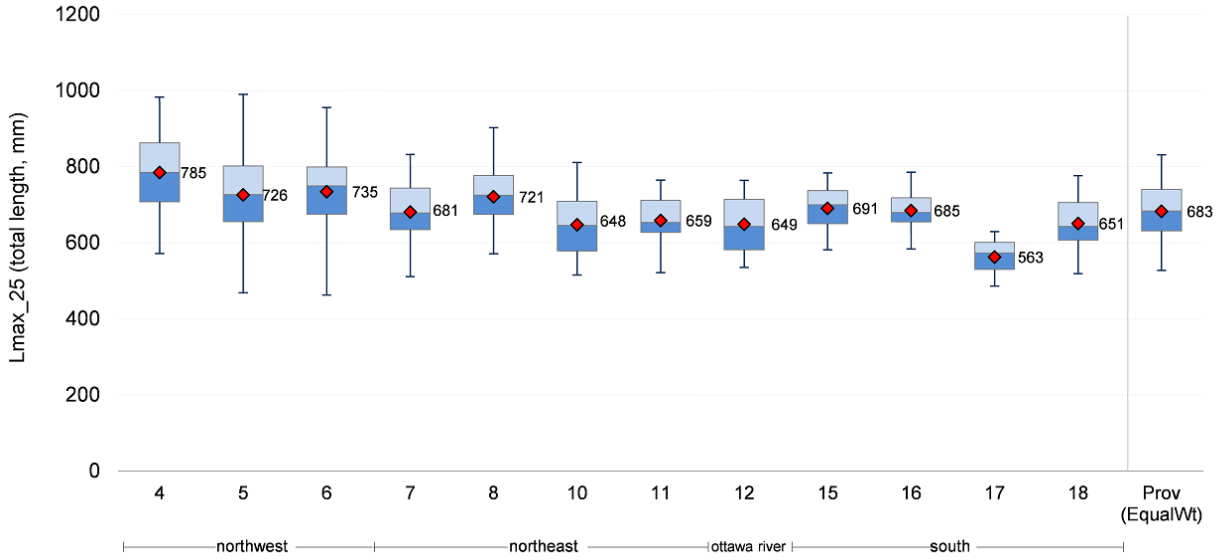


Figure A-14. Lmax_25. (mean of largest 5% after removing the top 2% of lengths caught in large mesh nets) of northern pike by FMZ from BsM, Cycle 1.

Number of Northern Pike Age Classes

The age structure of FMZ 10 northern pike populations appear to be stressed relative to other northern zones, with a cycle 1 BsM AW average number of 3.85 cohorts, which is comparable to Zone 11, but much lower than all other northern zones (Figure A-15).

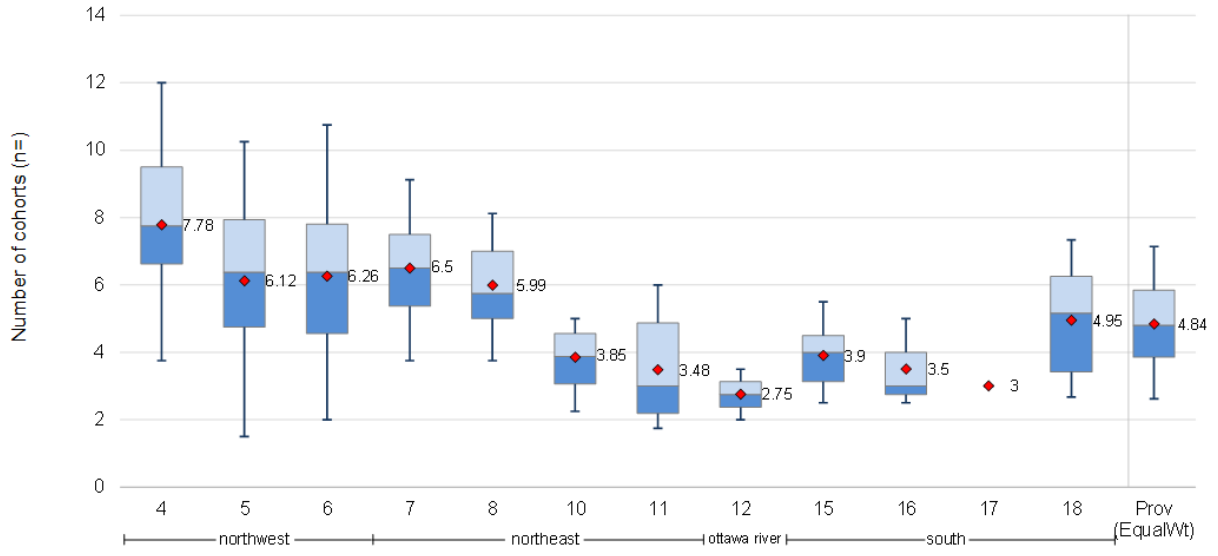


Figure A-15: Equally weighted mean number of age classes (cohorts) of northern pike by FMZ

Mean Age of Recruited Size Northern Pike

Similar to the results for number of northern pike cohorts, the mean age of recruited size northern pike in FMZ 10 indicates that populations are stressed, where FMZ 10 shows the second lowest mean age among all northern zones (Figure A-16).

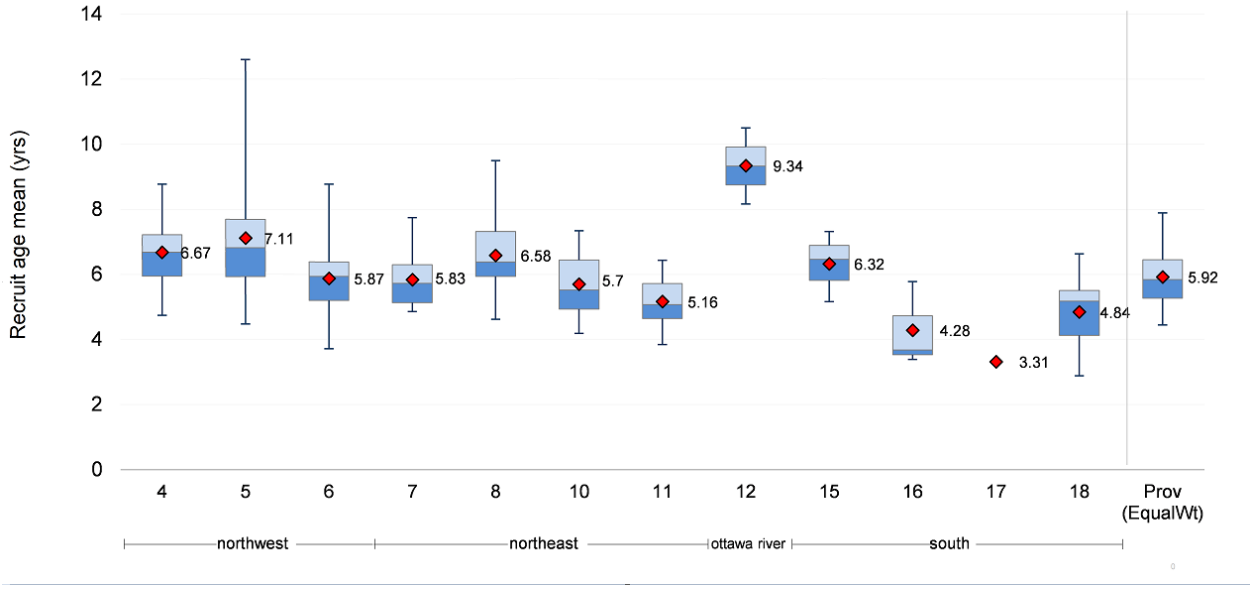


Figure A-16. Equally weighted average mean observed age of northern pike of recruit size and larger by FMZ as measured by BsM in cycle 1.

Smallmouth and Largemouth Bass

Distribution of Bass

Currently, there are 351 lakes known to support smallmouth bass within FMZ 10, with 253 of those lakes greater than 50 ha (Section 2, Table 2.1). Smallmouth bass are distributed across the zone; however, their distribution is greater in the southern portion of the zone (Figure A-17).

The original distribution of both largemouth and smallmouth bass was limited to the Great Lakes /St. Lawrence River and connected waters. While waters south of Highway 17 may have supported native bass populations, bass distribution is spreading northward across the zone, a result of ongoing unauthorized introductions and subsequent invasion of connected waters. This expansion poses significant risk to other valued native species.

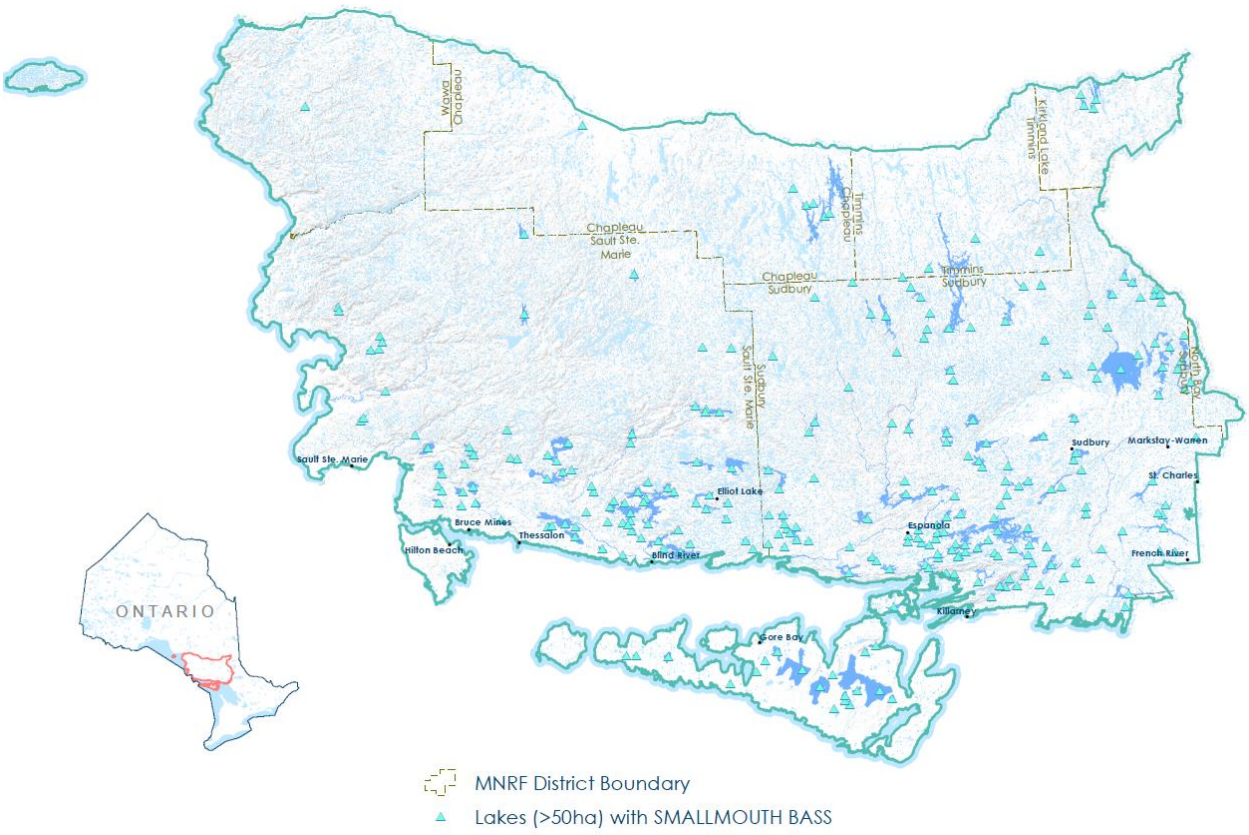


Figure A-17. Distribution of smallmouth bass within FMZ 10. Data is captured from 2019 LIO's ARA_Water_Poly_Segment. Includes lakes throughout FMZ 10 greater than 50 ha.

Smallmouth bass were detected in 40 of 122 lakes monitored by the BsM program during Cycle 1, in large mesh-NA1 nets, 29 of the 47 lake trout trend lakes, 8 of the 17 walleye trend lakes, and all 3 of the walleye/lake trout trend lakes, while none of the brook trout or lake trout/brook trout trend lakes had smallmouth bass detected.

Largemouth bass were captured in 3 lakes (Bright, Chiblow, Lang) by BsM during Cycle 1 (large mesh-NA1 and small mesh combined). Data are too sparse to extend results for largemouth bass to the FMZ level.

The distribution and reproductive success of smallmouth bass in northern Ontario appears related to summer water temperature and growth period relative to the length of the starvation period (Jackson and Mandrak 2002). In cooler areas, bass fry must reach an adequate size by the end of the first growing season if they are to survive the first winter. Shuter et al. (1980) noted that growth ceased and the "winter starvation period" began when temperatures dropped below 7-10 degrees °C.

Management Importance

While bass provide valued angling opportunities, they also can negatively impact other valued species, such as lake trout and brook trout. Bass, particularly juveniles, are aggressive littoral zone predators. Vander Zanden et al. (1999) demonstrated that a reduction in the availability of forage fish following bass introductions can have an adverse impact on native top predators which rely on littoral prey fish. Bass can significantly hamper lake trout productivity primarily by reducing the shallow-water forage upon which lake trout depend at certain times of the year (Selinger et al. 2006). Smallmouth bass, in multi-species fisheries which included walleye or lake trout are often targeted but harvested less frequently. In more urban settings, where few other game fish exist, more bass are expected to be harvested.

Habitat

In lakes, smallmouth and largemouth bass are found almost exclusively in the epilimnion (above thermocline) during summer stratification yet will frequent depths up to 12 m in all seasons (Scott and Crossman, 1973). Ideally smallmouth bass habitat contains protective cover such as shoal rocks, talus slopes, and submerged logs, while largemouth bass tend to prefer dense aquatic vegetation. The preferred water temperature for smallmouth bass is typically around 20 ^{o}C, while largemouth bass prefer slightly warmer water.

Climate change is expected to be favourable to bass over other species mainly by earlier and longer growing seasons (Suski and Ridgway 2007). For these reasons, we can expect that bass populations will expand in their present waters. The expansion in bass populations is predicted to be primarily comprised of juvenile fish due to improved spawning and young-of-the-year survival. The resulting reduced littoral zone forage in lakes where bass and lake trout directly compete will further challenge efforts to recover natural lake trout populations (Vander Zanden et al. 1999).

Angling pressure

Bass are a valued sportfish in FMZ 10; anglers ranked bass as the second most preferred species in FMZ 10, behind walleye (MNRF 2015d). Bass account for 23% of angler catch and 18% of the overall harvest in the zone. While bass provide valued angling opportunities, they are not native across much of the zone and introduced bass populations negatively impact other valued species including lake trout, brook trout and walleye.

Smallmouth Bass Indicators and Benchmarks

In FMZ 10, as is the case in several northern FMZs, there exists an interest in reducing abundance and distribution of bass populations where they are not native and constitute

a threat to sustainability of other species. However, maintaining or increasing the abundance of large bass is also a common objective. Here we make use of several indicators of bass population status in FMZ 10 and introduce an indicator (Proportional Stock Density) that is useful in describing the size structure of populations from an angling preference perspective.

Abundance

Recruited Size Smallmouth Bass

The equally weighted average CUE of recruit size (≥ 200mm) smallmouth bass from BsM trend lakes during the first cycle of the BsM program was 0.61 fish per gang (Figure A-18). Comparing results from FMZ 10 to other FMZs with similar climate, lake characteristics and productive capacity (i.e. FMZ 11) we see that observed abundance is similar to or higher than in other Northern zones.

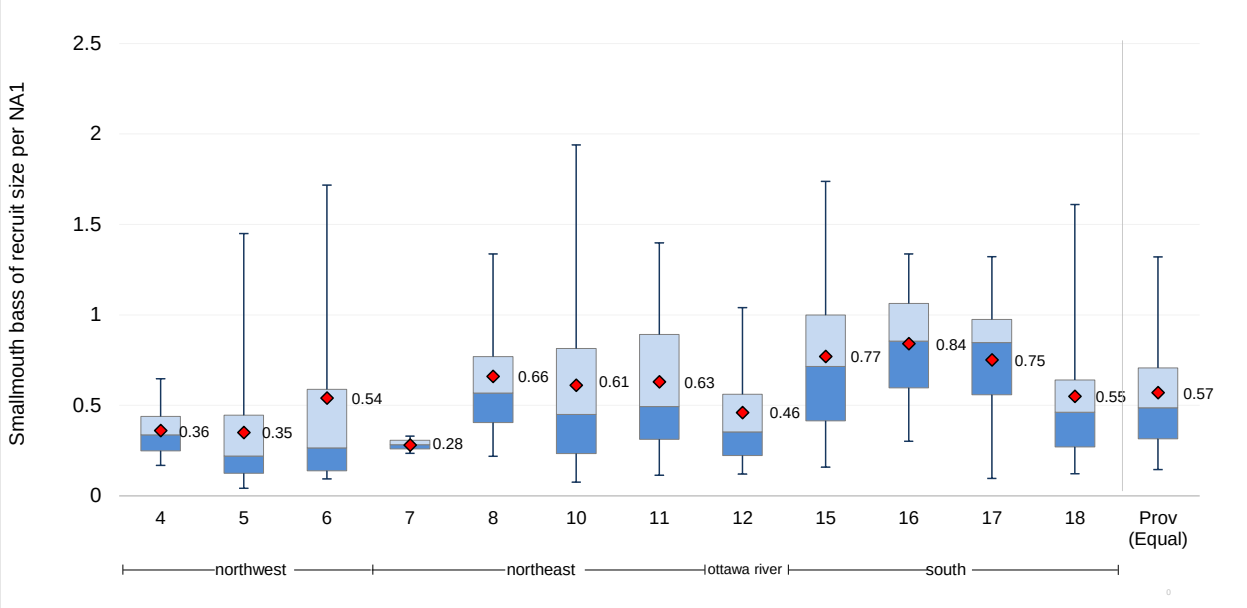


Figure A-18. Equally weighted average CUE of Recruited size (≥200mm) smallmouth bass by FMZ from BsM, Cycle 1 (2008-2012).

Proportional Stock Density

In FMZ 10, observations from the BsM program demonstrate that little changed in terms of size distribution of smallmouth bass between cycles. In both cycles, the greatest proportion of smallmouth bass were in the ‘Stock’ category (Figure A-19**Error! Reference source not found.**). The second most abundant was the ‘Quality’ category. A relatively small proportion of bass are in the ‘Preferred’ size category, and very few ‘Trophy’ sized fish were present.

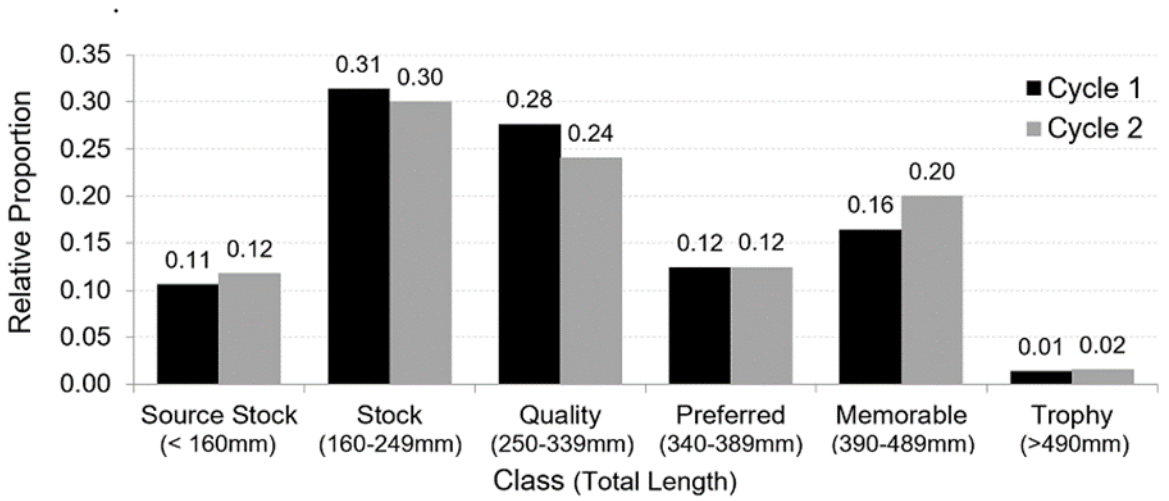


Figure A-19. Proportional Stock Density for bass in FMZ 10. Comparison of results from BsM cycle 1 and cycle 2.

Growth and Age Structure

Number of Smallmouth Bass Age Classes

Smallmouth bass populations in FMZ 10 are comprised of several different cohorts, having among the highest average number of cohorts in the province with a cycle 1 BsM EW average number of 7.01 cohorts (Figure A-20). This suggests that the population dynamics of smallmouth bass in FMZ 10 is highly resilient.

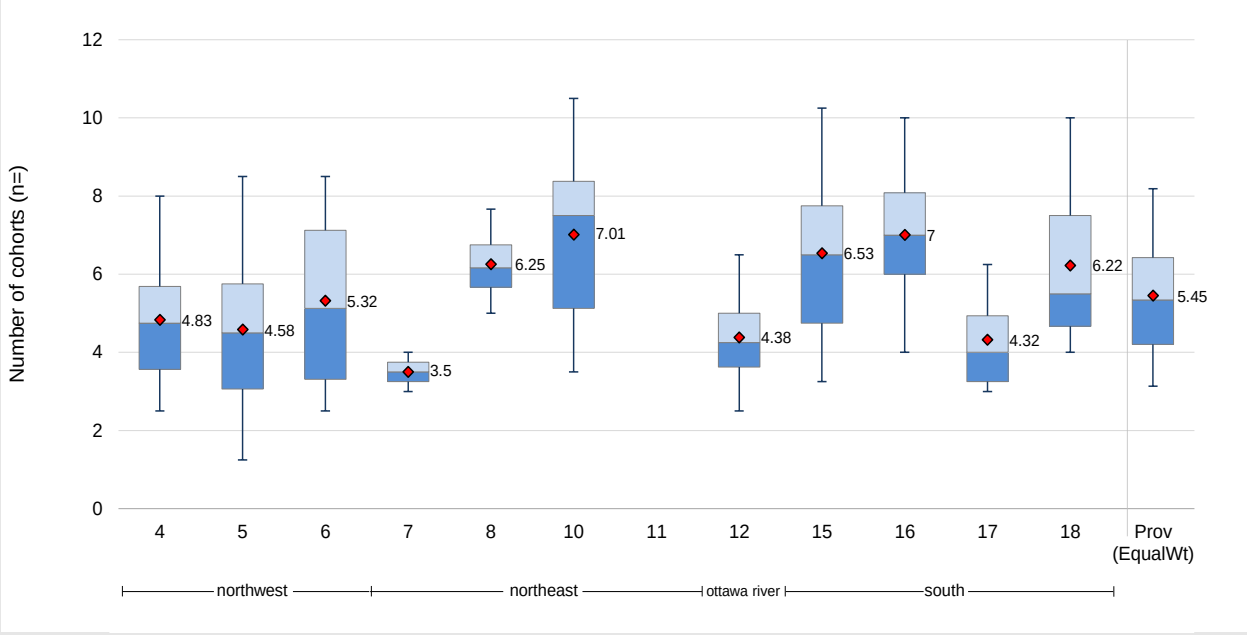


Figure A-20. Equal weighted average number of smallmouth bass cohorts (age classes) for all lakes by FMZ as measured by BsM in Cycle 1.

Mean Age of Recruited Size Smallmouth Bass

The mean age of recruited size (>200 mm) smallmouth bass in FMZ 10 as measured in cycle 1 of the BsM program was 6.23 years. Because ages of smallmouth bass were not consistently collected across FMZs in cycle 1, but were in cycle 2, we present cycle 2 results for comparing FMZ 10 smallmouth bass populations to other zones for age related indicators. Figure A-21 illustrates that the average age of recruited size smallmouth bass in FMZ 10 populations are similar to neighboring zones, but that they are lower than in Northwestern zones (i.e. FMZs 4, 5 & 6).

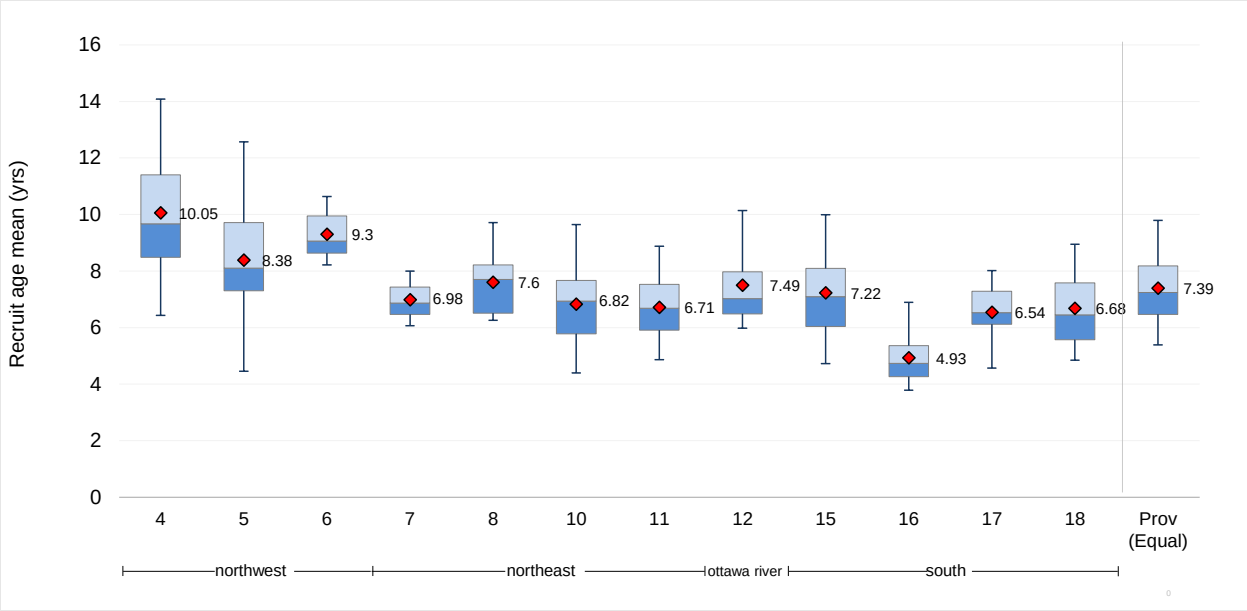


Figure A-21. Equal weighted average age of recruited size (> 200mm) smallmouth bass for all lakes by FMZ as measured by BsM in Cycle 2.

Smallmouth Bass Pre-Recruit Growth Rate

Provincial monitoring data from the BsM program demonstrates that smallmouth bass in FMZ 10 grow at a rate comparable to other northern zones (Zone 7: 104mm; Zone 8: 102mm), with a rate of 97 mm per year up to recruited size (Figure A-22).

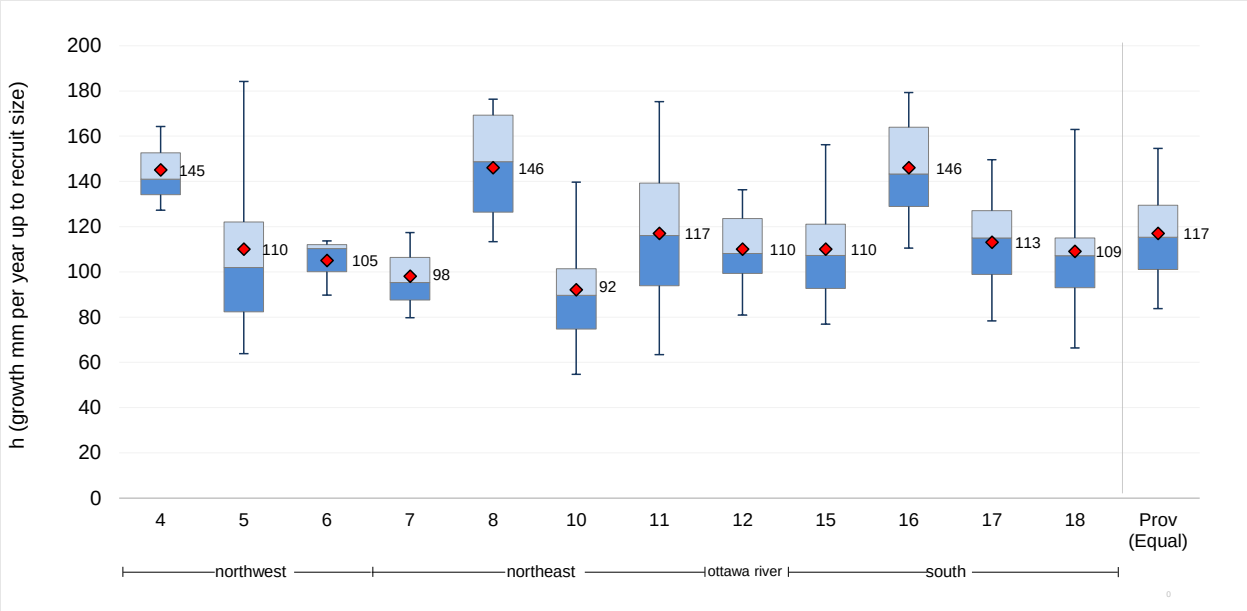


Figure A-22. Pre-maturation growth rate (mm/yr.) of smallmouth bass by FMZ from BsM, Cycle 1.

Lake Trout

Distribution

Ontario has 20 to 25% of the natural lake trout waters of the world and 2,098 of them are listed as naturally reproducing. Currently, there are 698 lakes known to support lake trout within FMZ 10, with 431 of those lakes greater than 50 ha (Section 2, Table 2.1). Lake trout are distributed across the zone (Figure A-23).

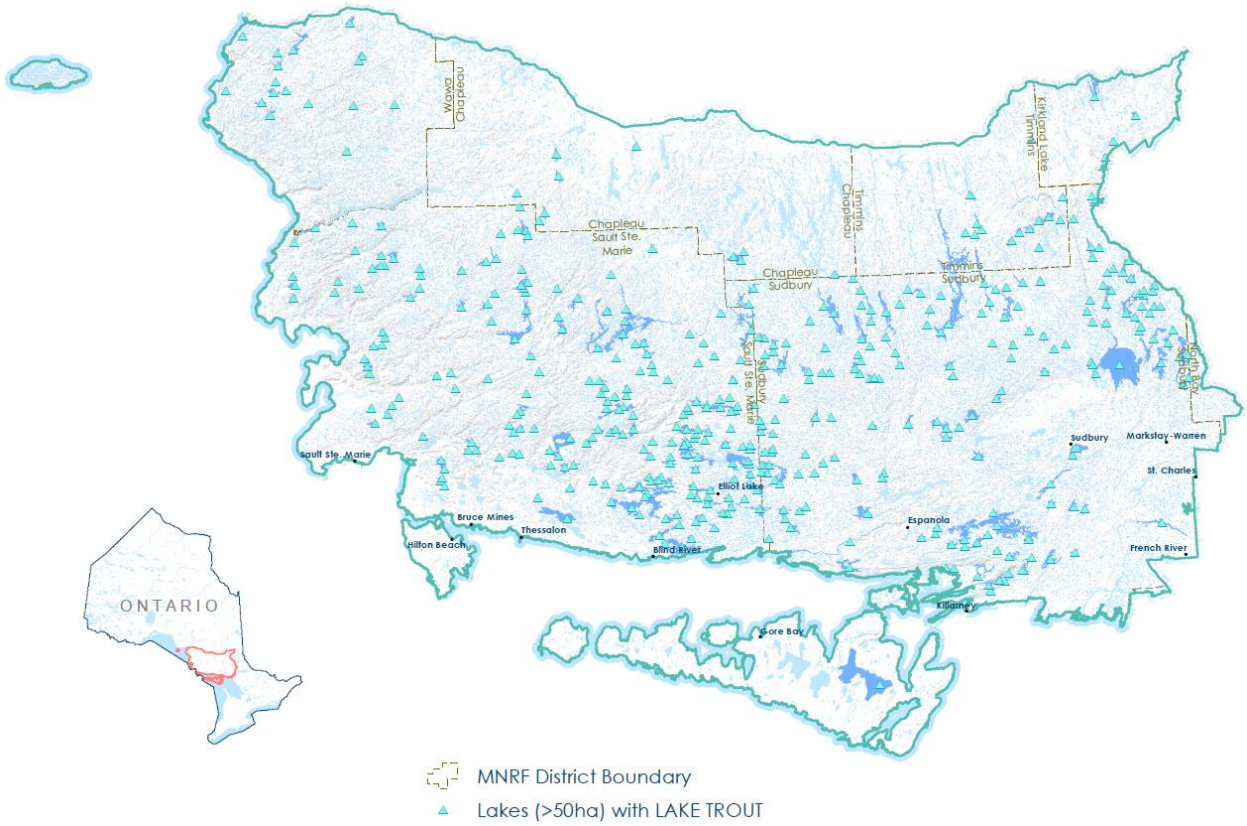


Figure A-23. Distribution of lake trout within FMZ 10. Data is captured from 2019 LIO's ARA_Water_Poly_Segment. Includes lakes throughout FMZ 10 greater than 50 ha.

Habitat

Lake trout habitat in FMZ 10 is abundant. FMZ 10 lake trout trend lakes are moderate in size, relatively deep, and provide adequate cold-water habitat (Figure A-24). However, FMZ 10 lake trout trend lakes have relatively high community complexity along with high abundance of smallmouth bass and Coregonids (i.e. lake whitefish and lake herring) (Figures A-25, A-26 & A-27). Smallmouth bass can significantly decrease lake trout productivity, primarily by reducing the shallow-water forage which lake trout require at certain times of the year (Vander Zanden 1999). Coregonids serve as an important forage species for adult lake trout but also compete for food with young lake trout. As adult lake trout are removed from a population, Coregonids become more abundant and can present a barrier to the survival of young lake trout. Depleted populations of lake trout may be very slow to recover given this potential barrier.

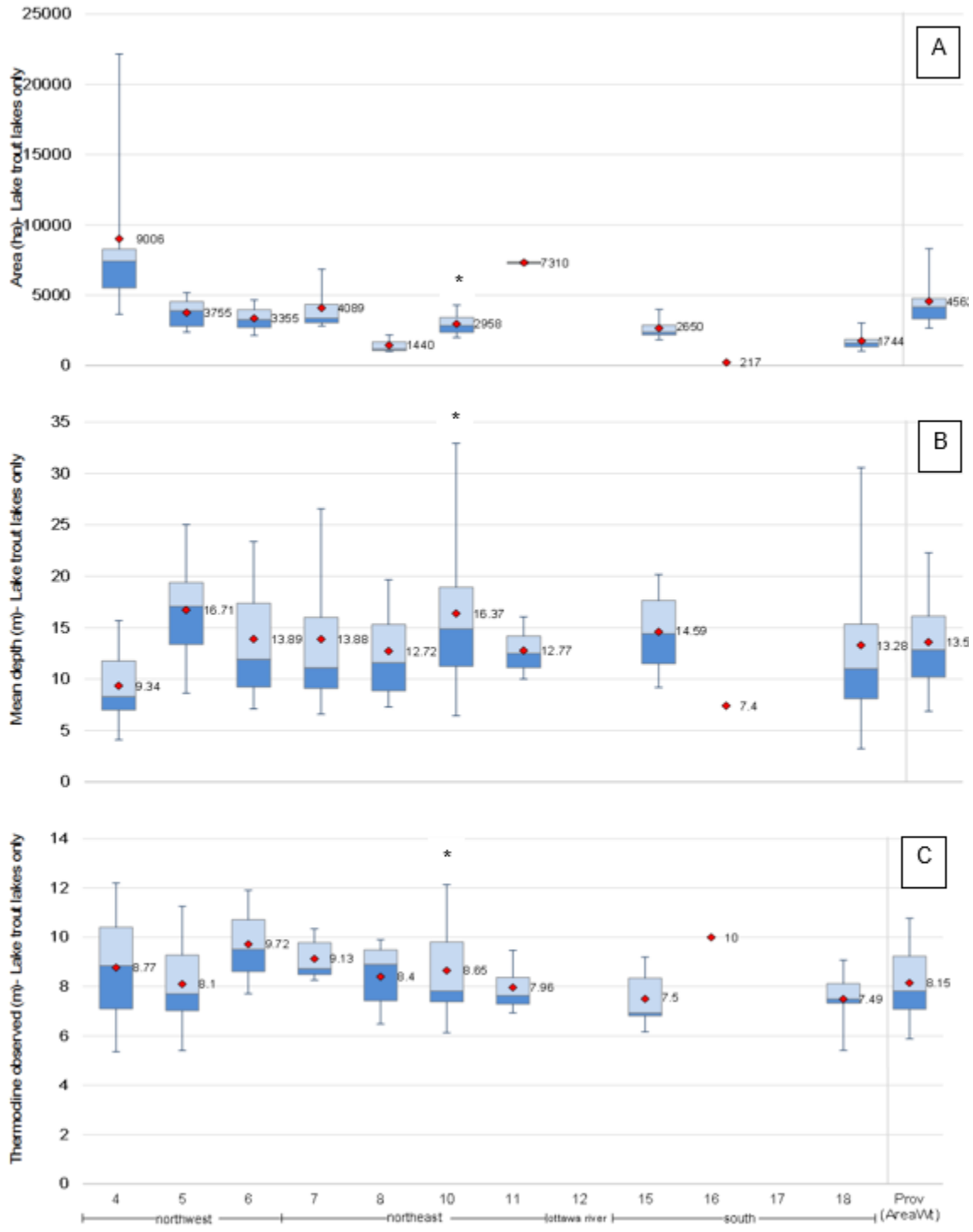


*Figure A-24. A: Area weighted average surface area (hectares), B: Area weighted average mean depth, C: Area weighted average thermocline depth (meters) of lake trout trend lakes by FMZ as measured by BsM in Cycle 1 (2008-2012). * denotes FMZ 10.*

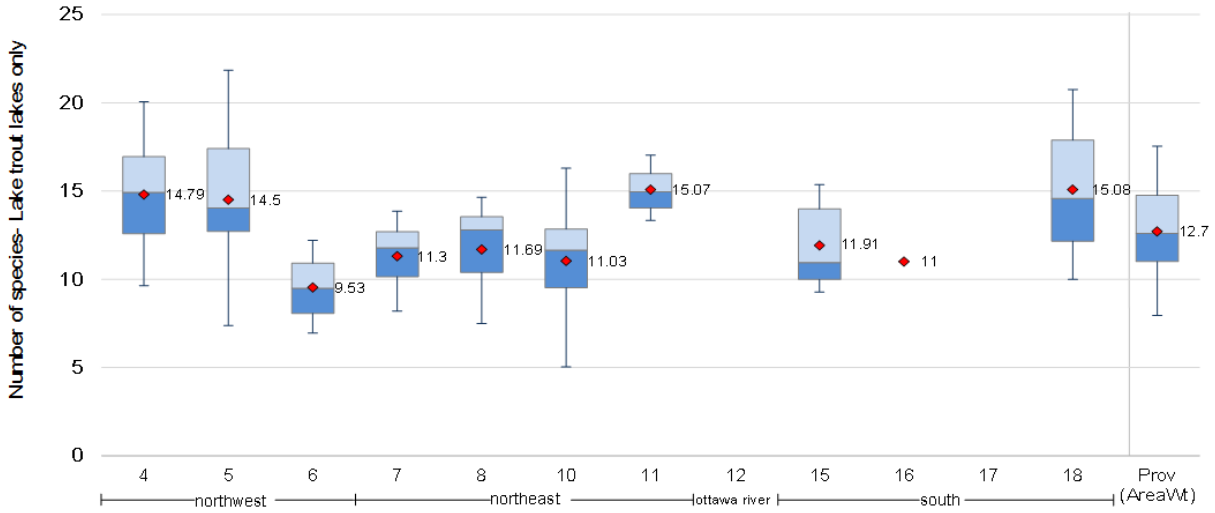


Figure A-25. Area weighted average number of fish species in lake trout trend lakes by FMZ as measured by BsM in Cycle 1 (2008-2012).

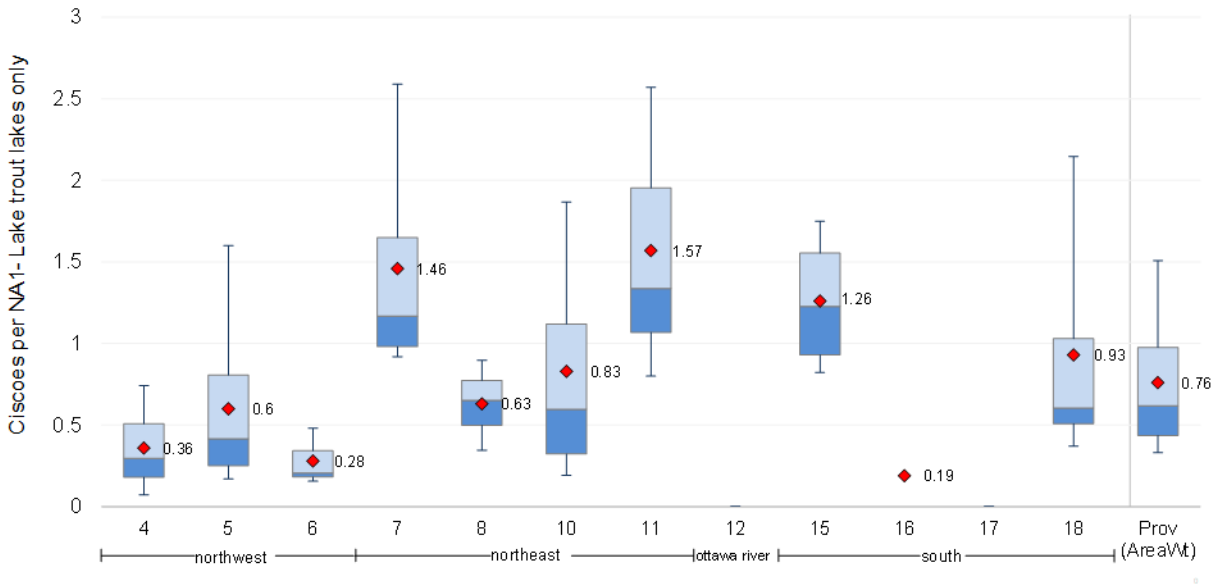


Figure A-26. *Area weighted average CUE of lake herring in lake trout trend lakes by FMZ as measured by BsM in Cycle 1 (2008-2012).*

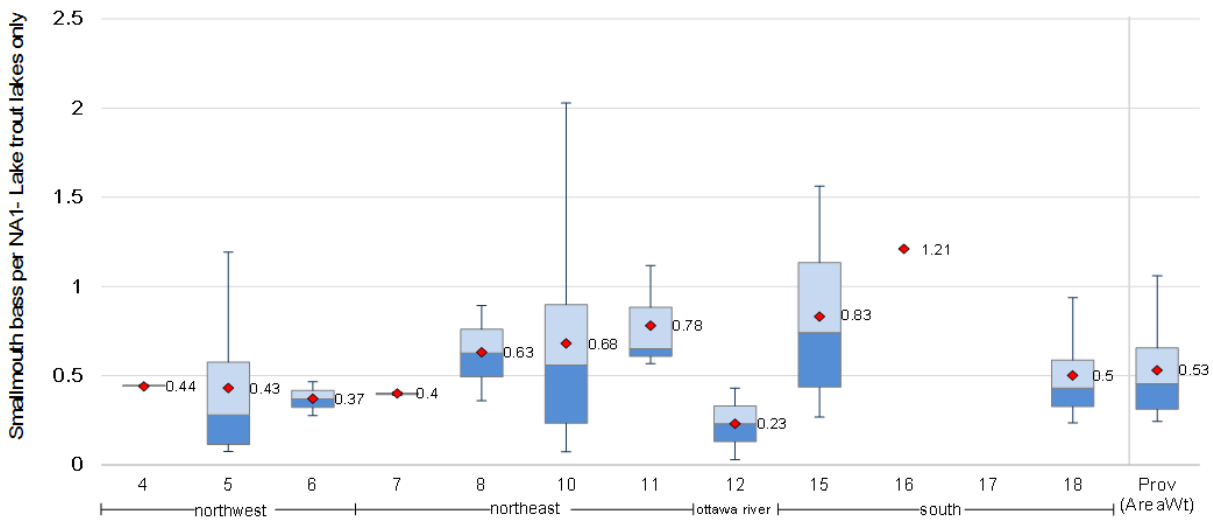


Figure A-27. Area weighted average CUE of smallmouth bass in lake trout trend lakes by FMZ as measured by BsM in Cycle 1 (2008-2012).

Angling pressure

The results of BsM aerial angler counts conducted during BsM cycle 1, indicate that the zone wide, area weighted average angling effort on FMZ 10 lake trout lakes is 2.96 angler hrs/ha (sum of winter (1.18) and summer (1.76) (Figure A-28). It should be noted that although these methods do supply reasonable estimates of total fishing effort, one cannot partition fishing effort to a species, thus it is unknown how much of this effort is directed towards lake trout, particularly on lakes which contain other sport fish species (i.e. walleye, northern pike, smallmouth bass).

Estimates of angling effort generated from results of the national survey of recreational fishing are available for 2005 and 2010 (MNRF 2015d). The estimated effort (all species) on lakes > 20 ha in FMZ 10 from 2005 and 2010 are 15 hrs/ha and 10 hrs/ha respectively. The percentage of anglers targeting lake trout was 13% in FMZ 10 (MNRF 2015d). Applying this estimate to the total angling effort results in walleye specific effort estimates of 1.95 hrs/ha and 1.3 hrs/ha for 2005 and 2010 respectively.

Selinger et al. (2006) showed the estimated regional benchmark for a sustainable level of fishing effort for 529 self-sustaining lake trout lakes in Northeast Region was 6.4 angler-hours per hectare (angler-hrs/ha). The observed mean annual angling intensity documented for the same self-sustaining lakes was 5.4 angler-hrs/ha, with many lakes exceeding safe levels. This result demonstrated that lake trout angling effort in the zone was at or very near its sustainable limit.

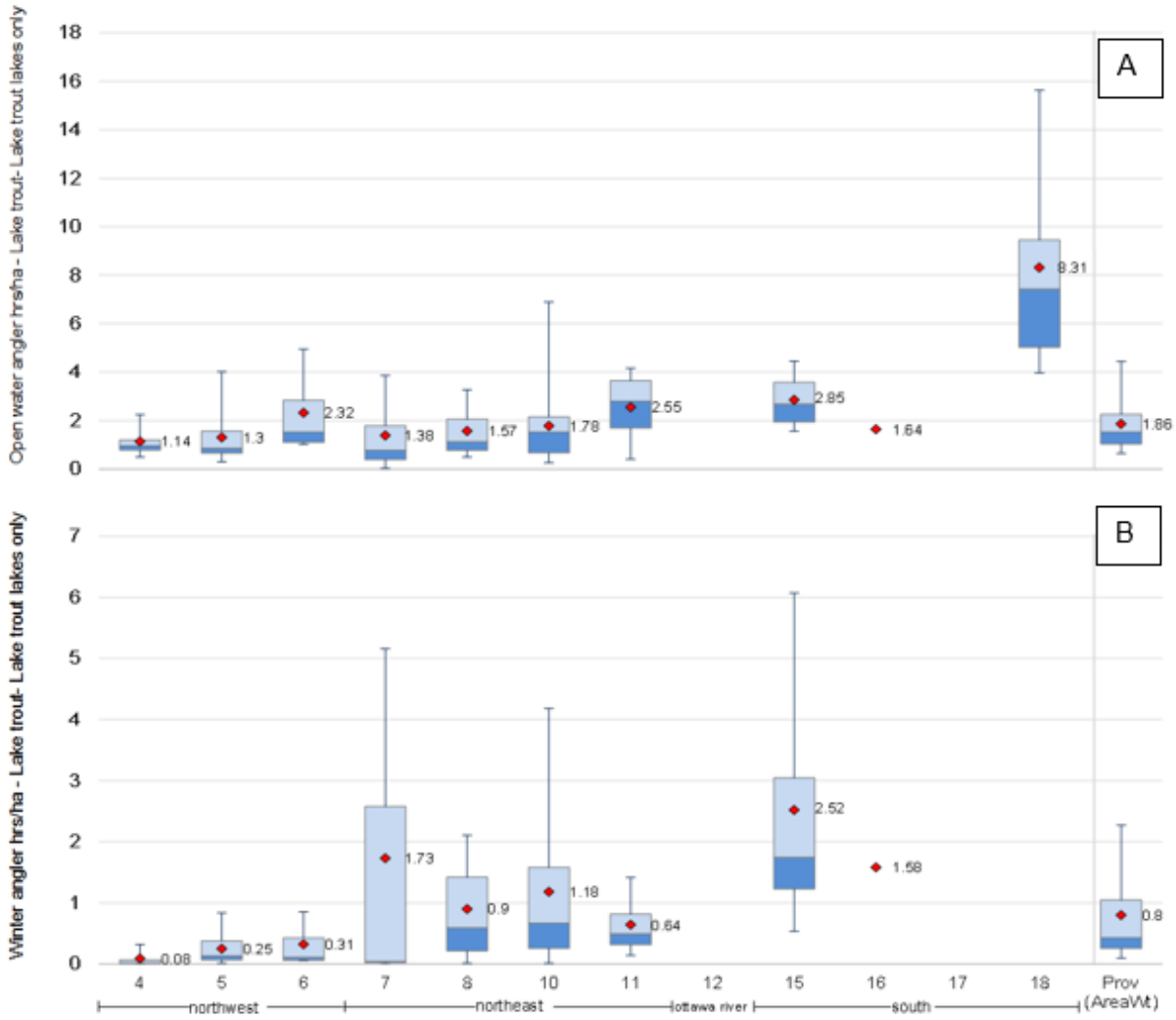


Figure A-28. Estimated angling intensity (hrs/ha) for summer (A) and winter (B) on lake trout trend lakes as measured by BsM Cycle 1 (2008-2012) for all zones were measured.

Lake Trout Indicators and Benchmarks

Abundance

Recruited Size Lake Trout

Abundance of lake trout, as a zone wide indicator of status, is assessed by making use of area weighted (AW) zone average catch per unit effort (CUE). The AW average CUE of recruit (≥ 350 mm) size lake trout from lake trout trend lakes In FMZ 10 during the

first cycle of the BsM program was 0.48 fish per gang (Figure A-29). Comparing results from FMZ 10 to FMZ 11, which has similar lake characteristics and productive capacity, we see that observed abundance among these zones is similar. However, we also see that abundance of lake trout in both FMZ 10 and FMZ 11 is much less than zones in the Northwest region. (Figure A-29).

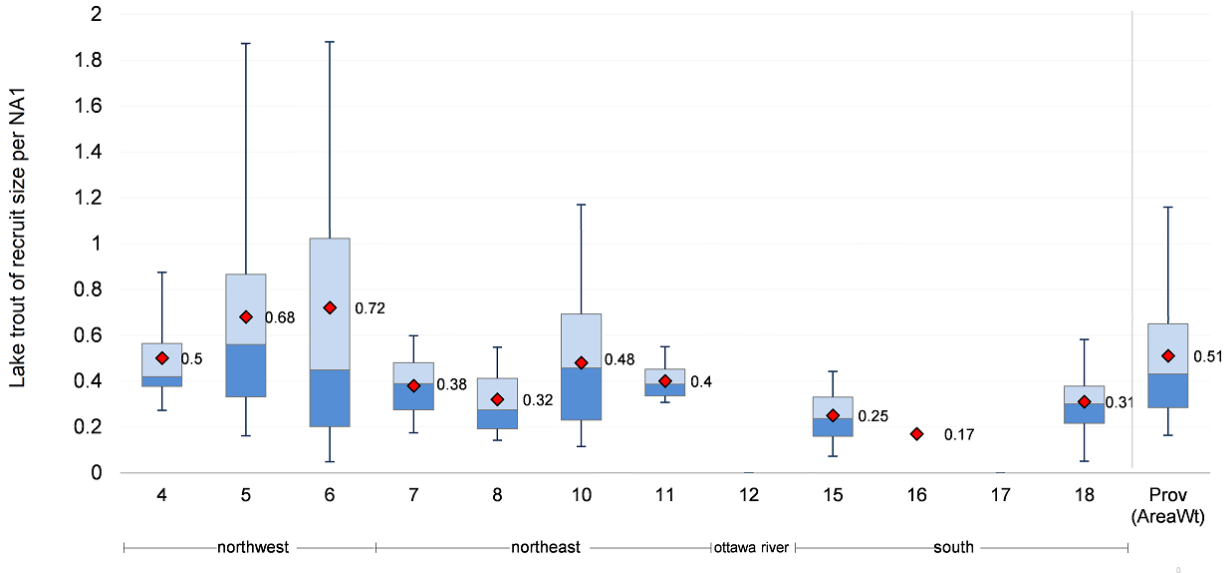


Figure A-29. Area weighted average CUE (fish per net) of recruited size (>350mm total length) lake trout from lakes monitored as lake trout trend lakes, by FMZ as measured in BsM Cycle 1.

A more widespread study of lake trout populations of the Northeast Region (Selinger et al. 2006) showed a similar result using a broader collection of lakes, indicating a widespread depletion of lake trout populations below expected abundance levels. The main drivers of the poor condition of the lake trout resource in the northeast region were identified as overfishing, introduced species, and increasing road access. This report made use of data collected from a number of index netting standards. Making a direct comparison of results from Selinger et al. (2006) with those from BsM is not appropriate, primarily because of major differences in the methods used to collect the information. However, general trends in resource status from historical studies and the current monitoring program (BsM) are consistent with each other and indicate a stressed resource.

As described in Selinger et al. (2006) and OMNR (2009), Northeast Region lake trout populations, when compared to unexploited reference lakes, show relatively low abundance of mature fish and may be suffering from reduced reproductive potential.

Number of Mature Lake Trout

The Cycle 1 BsM baseline for AW CUE of lake trout ≥ 400mm Total Length, is 0.39 fish/net (Figure A-30). Comparing results from FMZ 10 to other FMZs with similar lake characteristics and productive capacity (i.e. FMZ 5 and 11) we see that observed abundance of mature sized lake trout is similar to that in FMZ 11, but that both zones have considerably lower abundance of mature lake trout than in FMZ 5. (Figure A-30).

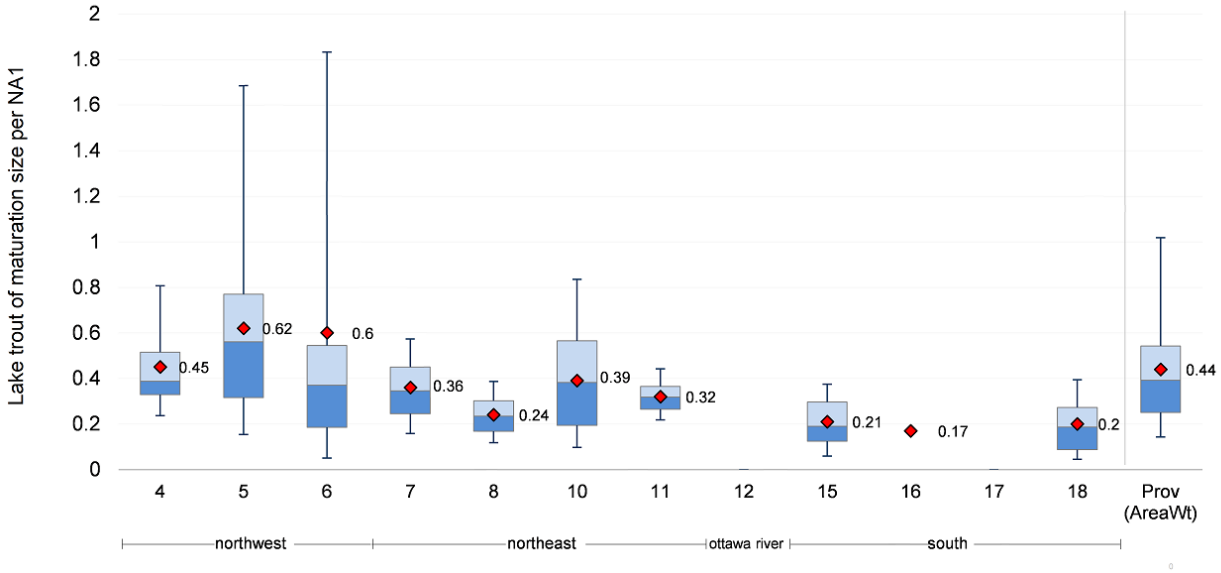


Figure A-30. Area weighted average CUE (fish per net) of mature size (>400mm total length) lake trout from lakes monitored as lake trout trend lakes, by FMZ as measured in BsM Cycle 1.

Growth and Age Structure

Pre-Recruit Growth Rate

Provincial monitoring data from the BsM program demonstrates that lake trout in FMZ 10 grow at a moderate rate during the first few years of life. With a rate of 83 mm per year up to recruitment size, the second lowest growth rate among northeastern zones (Zones; 7,8,11) (Figure A-31).

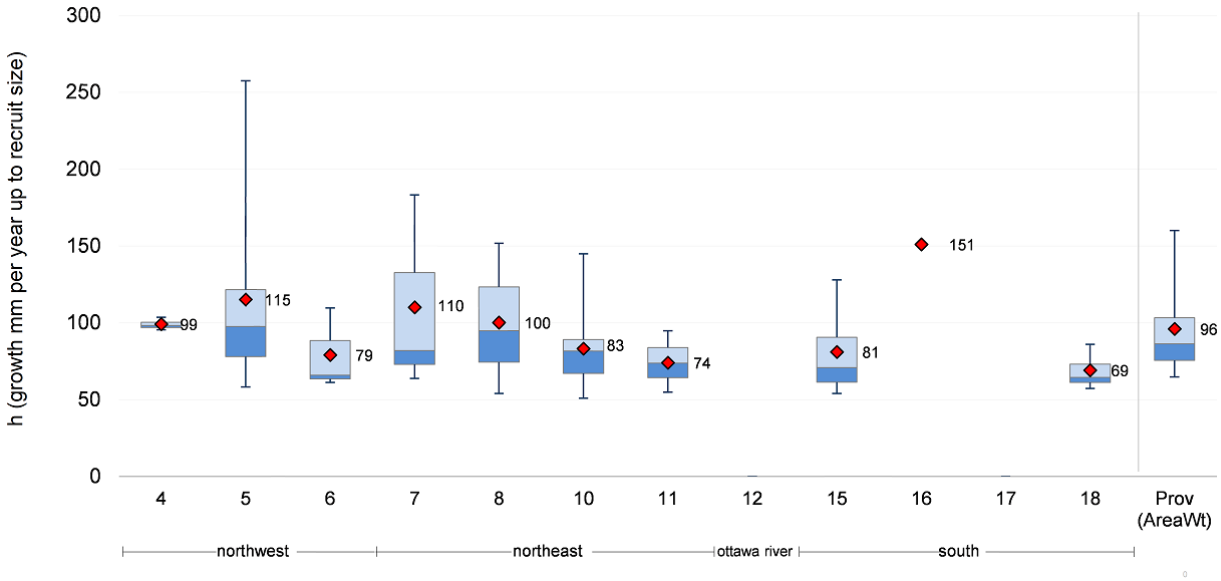


Figure A-31. Area weighted average lake trout recruit h(growth in mm/yr. up to 350mm) for lake trout trend lakes by FMZ as measured by BsM in Cycle 1.

Number of Lake Trout Age Classes

Provincial monitoring data from the BsM program found that lake trout in FMZ 10 average number of cohorts is 8.95, second highest among northeastern zones, but much less than observed in Northwest zones (FMZs 4, 5, 6) (Figure A-32).

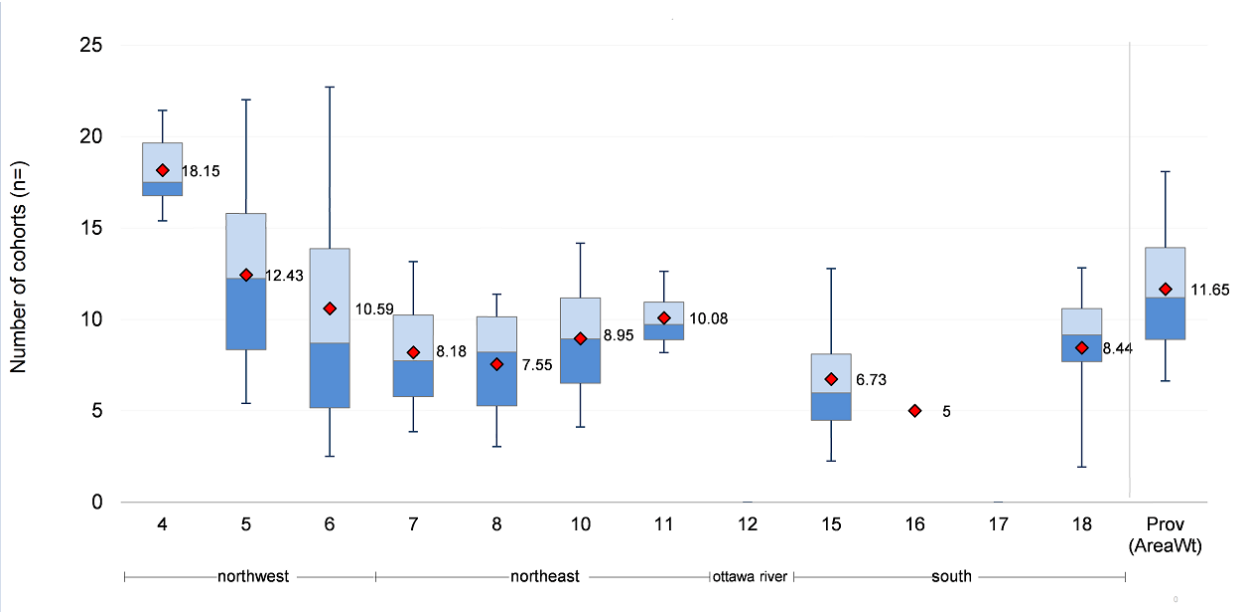


Figure A-32. Area weighted zone average number of lake trout cohorts (age classes) observed during BsM cycle 1, by FMZ.

Mean Age of Recruited Size Lake Trout

The mean age of recruitment size lake trout in FMZ 10 is the lowest mean age among all northern zones (Figure A-33).

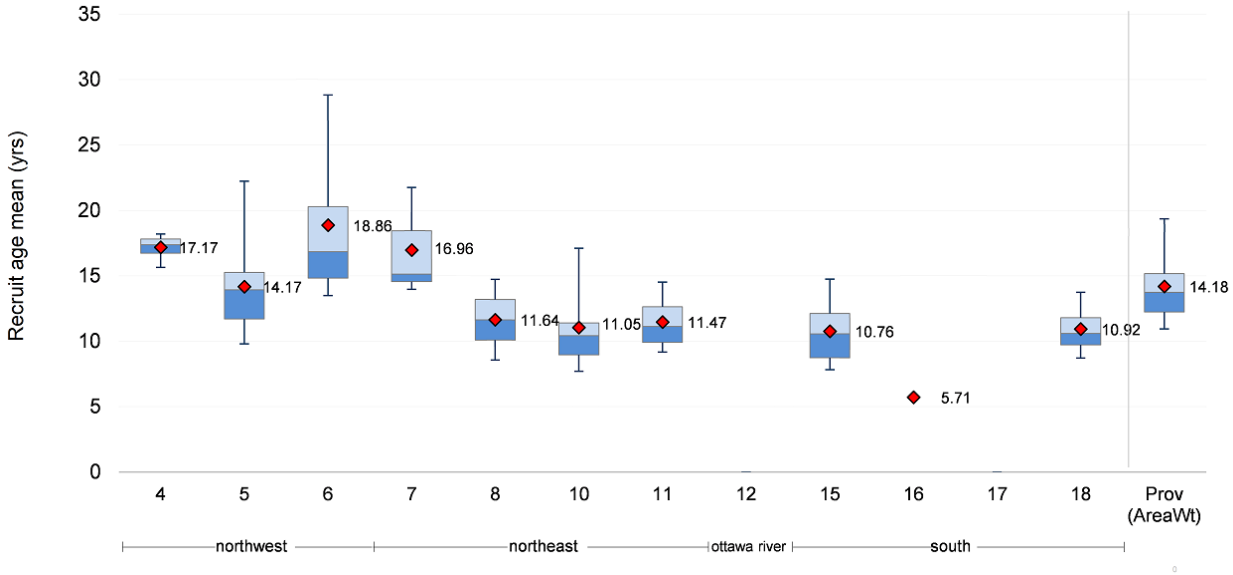


Figure A-33. Area weighted average mean observed age of lake trout of recruit size and larger by FMZ as measured by BsM in cycle 1.

Selinger et al. (2006) summarizes the breakdown of historically acid damaged lakes in the northeast. These are the baselines that the fisheries management plan will use as an indicator for recovery. Although this report includes some lakes outside of fisheries management zone 10, the majority of these lakes are within the zone and provides a published document that has summarized this information and is currently being studied by Laurentian University so this information will provide a good future comparison.

Table A-1: Breakdown of acid damaged lake trout lakes in northeastern region by pH category (Selinger et al. 2006).

Current pH Category	**# of Lakes**
Suitable (pH 5.5 or greater)	57 lakes
Marginal (pH 5.2 to 5.49)	20 lakes
Acidic (pH <5.2)	23 lakes

Table A-2: Breakdown of acid damaged lake trout lakes in northeastern region by stock status (Selinger et al. 2006).

Status Code	Descriptions	# of Lakes
N1	Self-sustaining native populations	25
I1	Introduced population, presently self-sustaining	1
R1	Re-introduced populations, presently self- sustaining	9
I2	introduced population, presently sustained by stocking	1
R2	introduced population, presently sustained by stocking	31
R	re-introduced population, present status unknown	2
E	re-introduced population, present status unknown	30
L	Lost population of unknown origin	1

Brook Trout

Distribution

Currently, there are 1,396 lakes known to support brook trout within FMZ 10 (Section 2, Table 2.1), with 698 of those lakes greater than 20 ha. 430 of those lakes are stocked for various reasons. Brook trout have a wide distribution throughout FMZ 10, inhabiting most of the zone but concentrated near the west central part of FMZ 10 (Figure A-34). Brook trout are found in the same general area as lake trout, although there are distinct

clusters of populations south of Wawa, and a distinct band of populations extending east to west through the middle of the zone. Houle and Vascotto (2012) examined characteristics of lakes in FMZ 10, with a focus on brook trout and found that brook trout lakes were the most unique in that they were the most frequent by number of lakes occupied, but the least amount by surface area in the zone. More than 80% of brook trout lakes were found to be smaller than 50 ha, and brook trout did not typically co-exist with other sportfish. Mean depth of these lakes ranged from 0.9 to 21.7 m (mean 6.51 m, n = 322), maximum depth ranged 1.8 to 73.2 m (mean 20.2 m, n = 323) and waters were moderately productive as described by measurements of total dissolved solids (mean 28.0, range 3 to 84 mg/L, n = 311).

No systematic categorization has recently been undertaken to determine the status of brook trout streams in FMZ 10. In 2007, 128 streams and 61 rivers were identified as containing reproducing populations of brook trout in the zone (OMNR 2007). This information was based on a variety of sources including OMNR archives, District staff input and holdings of the Royal Ontario Museum. As there has been no systematic effort to characterize communities in streams and rivers within the zone, this number is likely an under-representation of the true resource.

The number of lost, natural lake-dwelling populations in FMZ 10 over the last several decades is assumed to have been considerable, although documentation of original distribution and losses of brook trout populations is limited.

Natural brook trout lakes in FMZ 10 persist in large part due to their remote (roadless) location. Landscape change including deforestation, fragmentation, climate change, acid rain and nutrient loading have been demonstrated to impact brook trout populations references). The introduction of exotic species including white sucker, creek chub, yellow perch, and smallmouth bass has been linked to declines in brook trout populations, and in some cases extirpation of local populations (Lachance and Magnan 1990, Magnan 1988, Flick and Webster 1992). Results from the BsM program provide additional evidence for the relationship between brook trout decline with increasing number of species present (Figure A-35). Houle and Vascotto (2012), in their comparison of information collected from surveys conducted over that last five decades in FMZ 10, found that lakes where brook trout populations have been lost or have seen significant declines in abundance, nearly all have seen introductions of deleterious species (primarily spiny-rayed species).

Brook trout are stocked in both former natural brook trout waters as well as introduced into waters within FMZ 10. Stocked brook trout lakes are found in most portions of the zone where lake features and fish community types allow the species to survive.

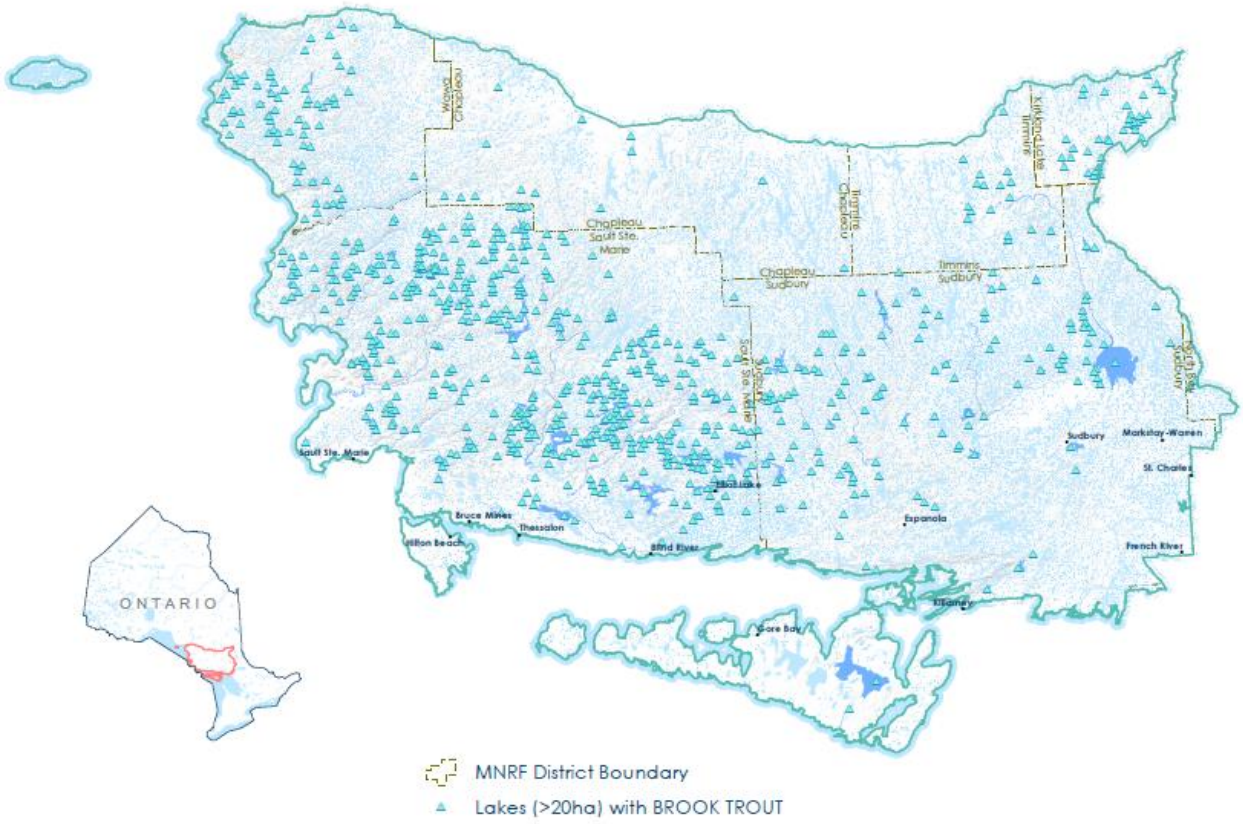


Figure A-34. Distribution of brook trout within FMZ 10. Data is captured from 2019 LIO's ARA_Water_Poly_Segment. Includes lakes greater than 20 ha throughout FMZ 10.

Habitat

Brook trout exist almost exclusively in simple fish communities as they are very sensitive to competition and predation. They have the inability to compete with introduced species and their dependence on up-welling, cold-water springs have made them very susceptible to decline as the effects of cumulative stressors such as anthropogenic development and climate change make suitable habitat increasingly rare. Brook trout generally inhabit water temperatures below 20°C and when temperatures rise above that they seek cooler water by shifting their depth distribution or by inhabiting areas associated with groundwater springs.

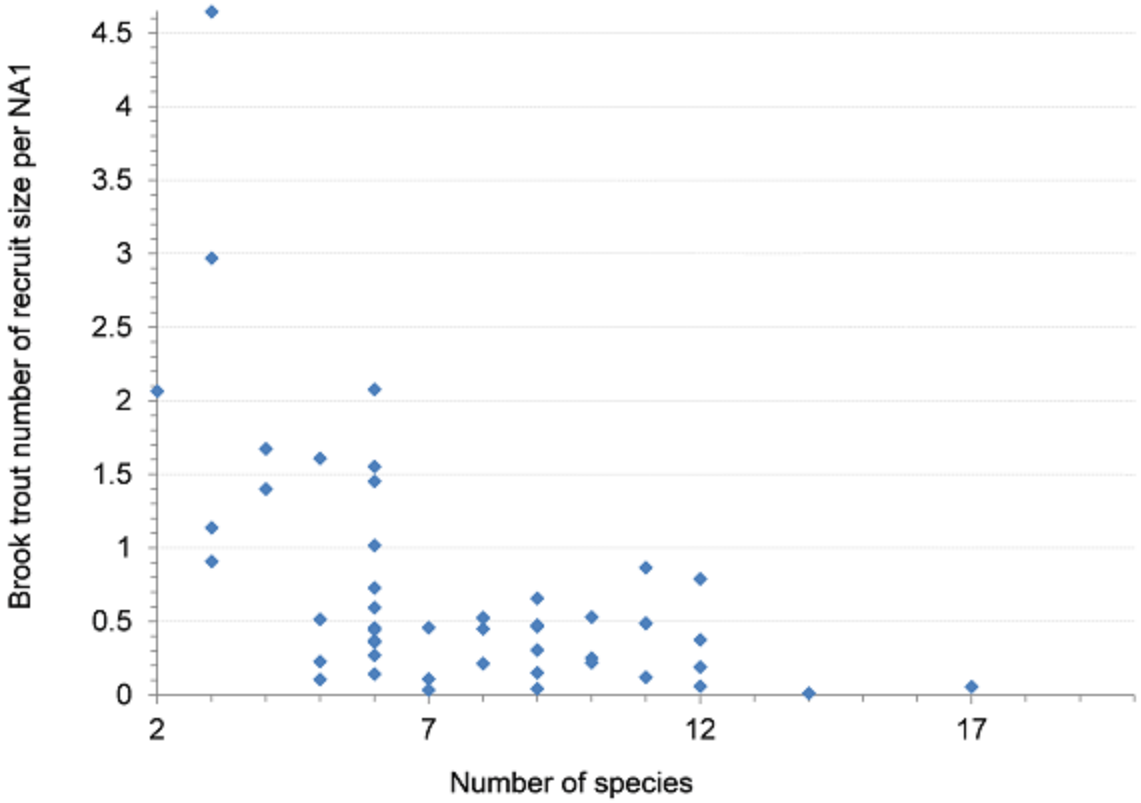


Figure A-35. Correlation between CUE of recruited size brook trout (number of brook trout ≥ 250mm Total Length per net) and number of co-occurring species for brook trout trend lakes measured by BsM in Cycle 1 across all zones (2008-2012).

Angling Pressure

The results of BsM aerial angler counts conducted during BsM cycle 1, indicate that the zone wide, area weighted average angling effort on FMZ 10 brook trout lakes is 3.65 angler hrs/ha (sum of winter (2.09) and summer (1.56) (Figure A-36). However, angling effort on a few individual lakes can exceed 20 hrs/ha.

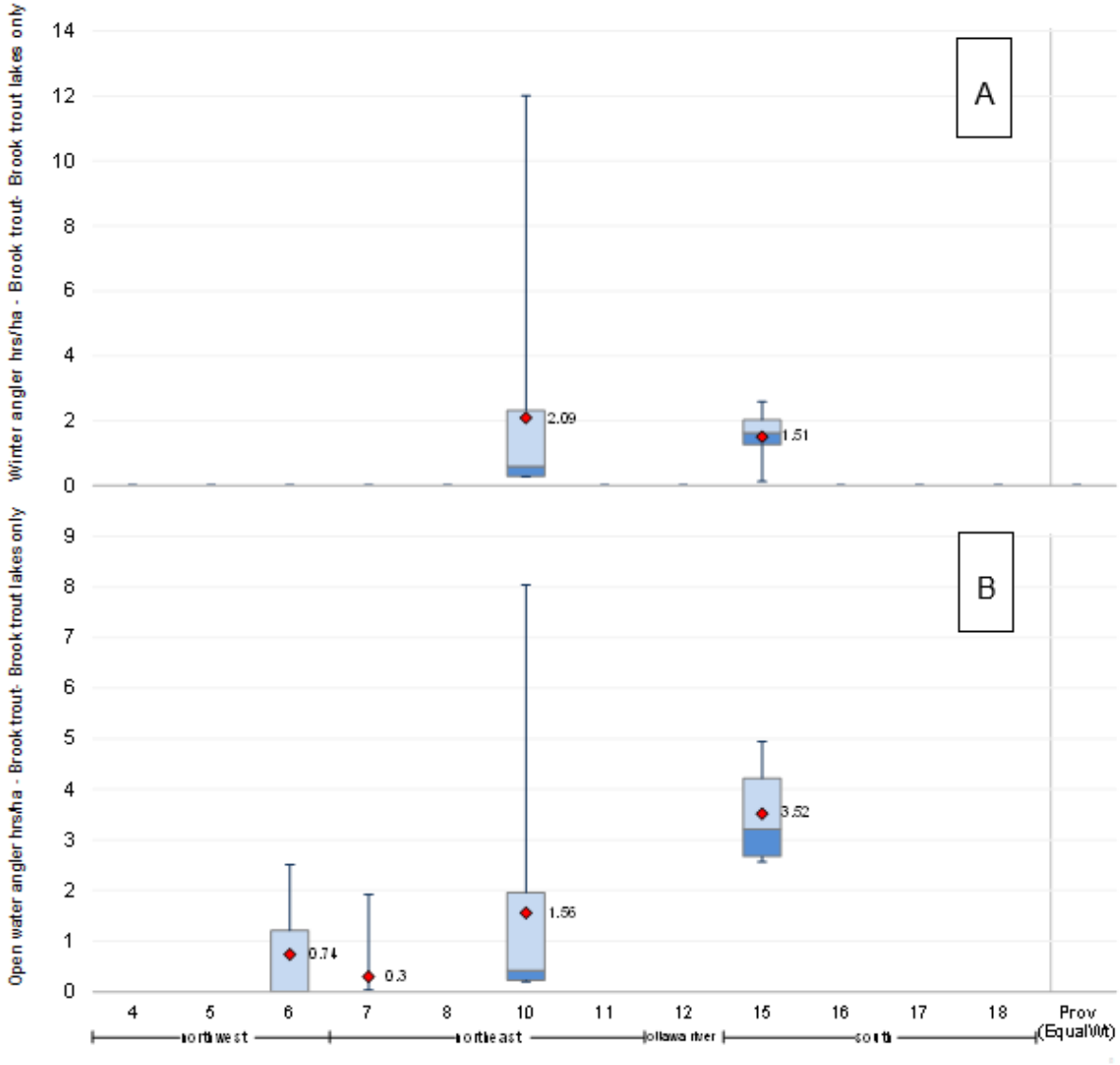


Figure A-36. Estimated angling intensity (hrs/ha) for winter (A) and summer (B) on FMZ 10 brook trout trend lakes as measured by BsM Cycle 1 (2008-2012).

Estimates of angling effort generated from results of the national survey of recreational fishing 2005 and 2010. The survey indicates that in both 2005 and 2010 brook trout were ranked the 5th most preferred species within FMZ 10 (MNRF 2015d). The survey identified that harvest of brook trout is approximately one third of that for lake trout across the zone. The percentage of anglers targeting brook trout was 5% in FMZ 10 (MNRF 2015d). The survey also identifies that brook trout are kept at a higher rate than other species (~54% caught and retained), and results suggest that approximately 1/3 of brook trout anglers are focusing on streams/rivers while the remainder focus on lake populations.

Brook Trout Indicators and Benchmarks

Here we present a number of indicators of health of FMZ 10 brook trout populations. However, it should be recognised that sustainability of brook trout populations is primarily driven by habitat alterations, including introduction of new species.

Unlike most other species described throughout this document, the life history strategy of brook trout results in populations that are fast growing, with high mortality rates, and thus changes in typical indicators can be naturally eratic. An example of this is demonstrated by observations from the BsM program where, of the 55 lakes thought to have brook trout present, and randomly selected as brook trout trend lakes for cycle 1 in 2008, brook trout were only detected in 46. Although confirmation of historical brook trout presence in all these lakes is not possible, this initially suggested that perhaps as much as 10% of historical populations have been lost. However, results from the 2nd cycle of BsM (2013 – 2017) re-confirmed the presence of brook trout in 5 of these lakes, suggesting that populations can recover quickly from levels of low abundance.

Literature has demonstrated the resiliency of brook trout populations to harvest provided other factors remain static. Yields of brook trout fisheries are generally quite high, ranging on the order of 0.78 kg/ha (Quinn et al. 1994) to 7.43 kg/ha (Magnan et al. 2005). Recognizing all of this, we will continue to track changes in all of the indicators presented here, but special attention should be paid to the community complexity indicator.

Abundance

Recruited Size Brook Trout

Abundance of brook trout, as a zone wide indicator of status, is assessed by making use of the EW average CUE of recruit (≥ 250 mm) size brook trout from brook trout trend lakes. In FMZ 10 during the first cycle of the BsM program the EW average CUE of recruit sized brook trout was 0.81 fish per gang (Figure A-37). Comparing results from FMZ 10 to FMZ 7 we see that abundance observed in FMZ 10 is lower than in other northern zones, but higher than observed in southern zones.

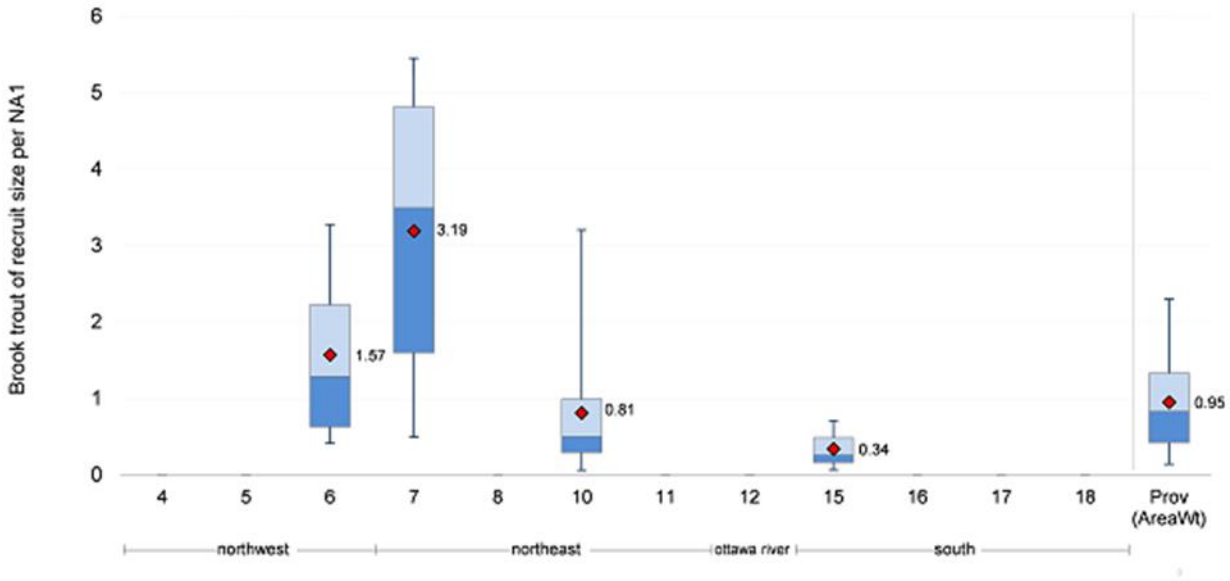


Figure A-37. Equally weighted CUE of recruited brook trout (number of brook trout ≥ 250mm per net) for brook trout trend lakes by FMZ as measured by BsM in Cycle 1 (2008-2012).

Growth and Age Structure

Number of Brook Trout Age Classes

Provincial monitoring data from the BsM program cycle 1 demonstrated that brook trout in FMZ 10 had an EW average number of 3.67 cohorts (Figure A-38).

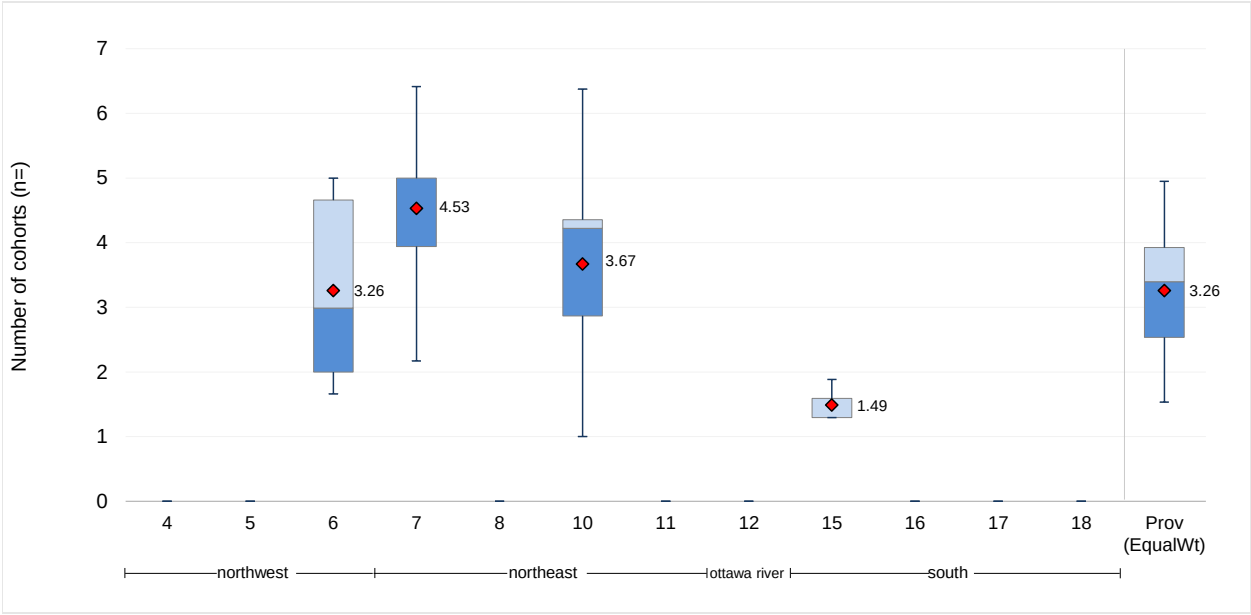


Figure A-38. Equally weighted zone average number of brook trout cohorts (age classes) for brook trout trend lakes in FMZ 10 by lake size as measured by BsM in Cycle 1 and Cycle 2.

Mean Age of Recruited Brook Trout

Provincial monitoring data from the BsM program cycle 1 demonstrated that brook trout in FMZ 10 had an EW average recruitment age of 3.46 years (Figure A-39).

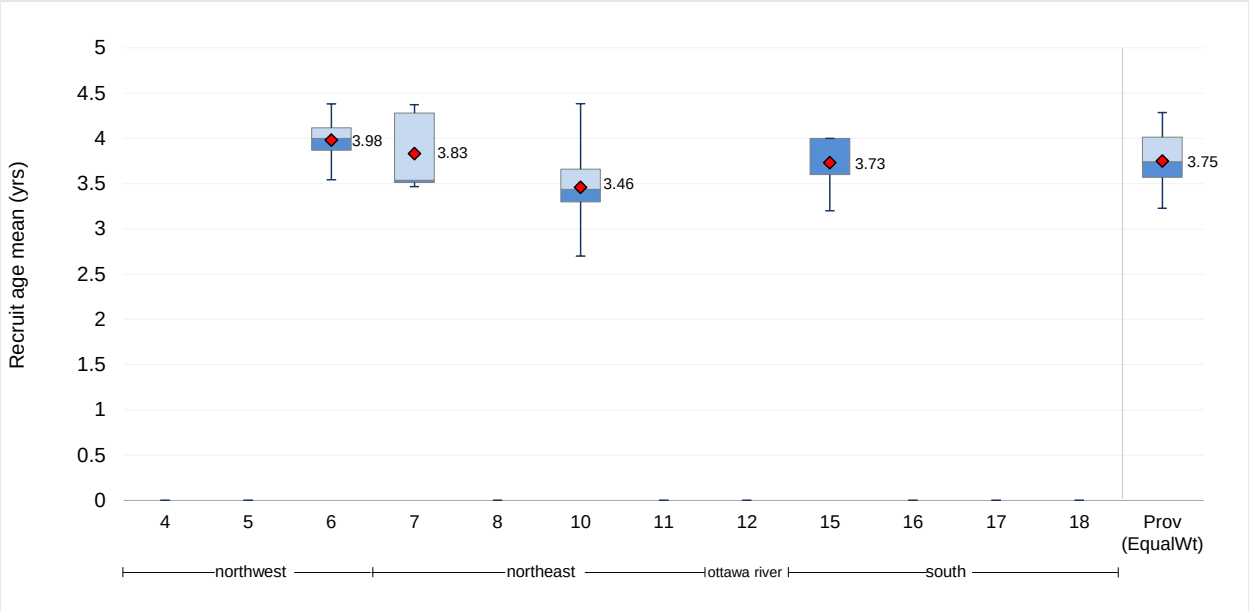


Figure A-39. Area weighted average mean age of brook trout of recruit size and larger for brook trout trend lakes in FMZ 10 as measured by BsM in Cycle 1.

Pre-Recruit Growth Rate

Provincial monitoring data from the BsM program cycle 1 demonstrates that brook trout in FMZ 10 had a growth rate of 145 mm per year up to recruitment size (Figure A-40).

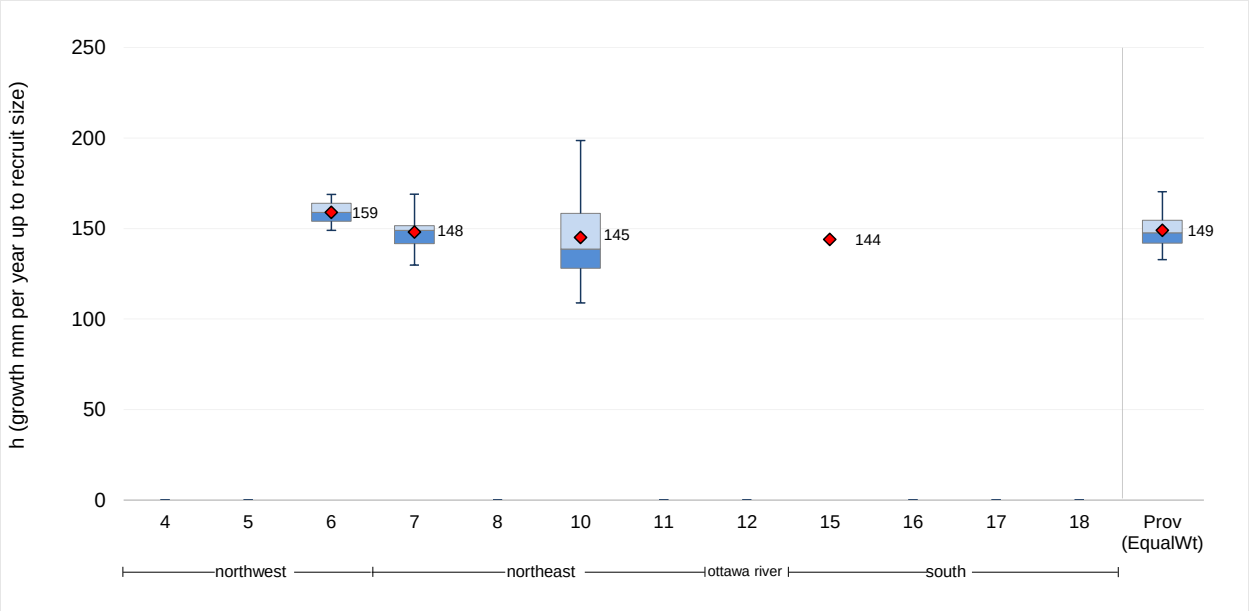


Figure A-40. Equally weighted average brook trout recruit h(growth in mm/yr. up to 250mm) for brook trout trend lakes in FMZ 10 as measured by BsM in Cycle 1.

Community Complexity of Brook Trout

Mean Number of Species in Brook Trout Lakes

Provincial monitoring data from the BsM program cycle 1 demonstrated that in brook trout lakes in FMZ 10 there was an EW average of 8.13 fish species per lake (Figure A-41). Analysis of FMZ 10 data by Houle and Vascotto (2012) demonstrated that aquatic communities in FMZ 10 brook trout lakes have become more complex over last 20-30 years. It is safe to say that the simple and most productive brook trout communities in Zone 10 are in danger of being lost because of incidental introductions.

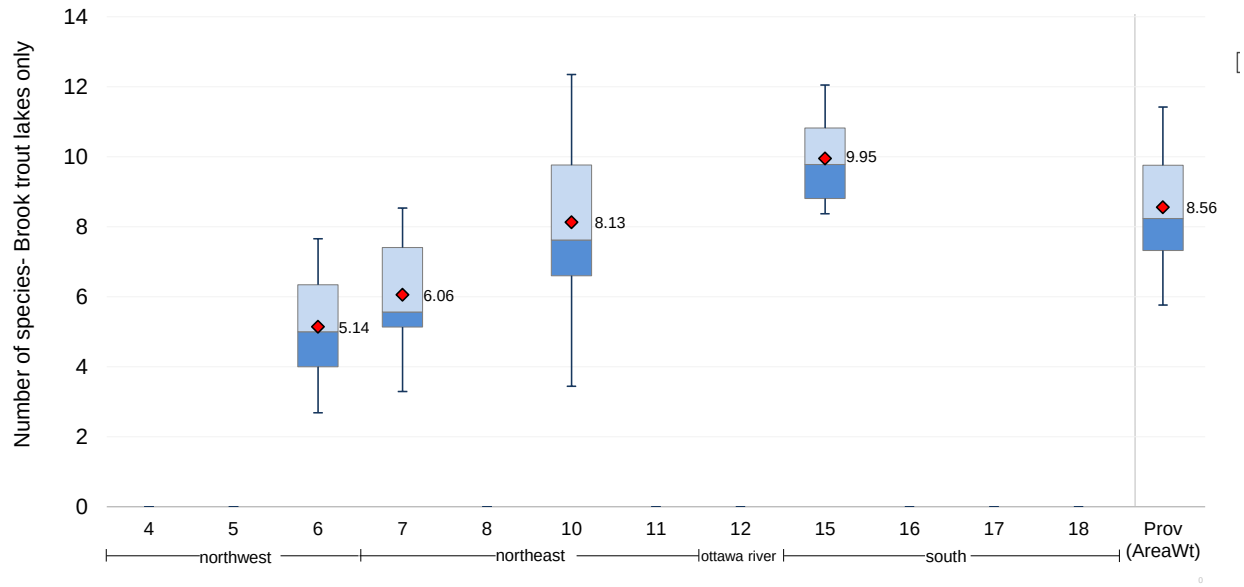


Figure A-41. Equally weighted average number of fish species present in brook trout Lakes in FMZ 10 as measured by BsM in Cycle 1.

Muskellunge

Distribution

In Ontario, muskellunge reside in over 300 lakes and 100 rivers. These populations account for more than 25% of known muskellunge populations in North America and over one-third of native, naturally reproducing populations (Kerr, 2011). In FMZ 10, several populations reside in large river systems and some lakes. Muskellunge management in Ontario is grounded in a science-based management system that evolved from the Cleithrum Project. Ontario's muskellunge populations show a range in growth potential (Casselman et al., 1999) which is influenced by a combination of habitat, forage, climate and genetics. This growth potential was used to categorize Ontario's muskellunge populations to one of three catagories: (1) high-density populations, (2) enhanced size fisheries, and (3) record class fisheries. To achieve these objectives, a series of standard 'Minimum Size Limits' (MSL) were implemented, with the appropriate size limits for each population determined primarily by the growth potential.

Muskellunge (Muskie) are known to be present in 20 lakes in FMZ 10, generally distributed along the southern border of FMZ 10 (Figure A-42). Muskellunge populations are also present in several rivers within FMZ 10 such as the Goulais River, Mississagi River, Serpent River, Spanish River, and the French River. Of the 122 lakes sampled by

the BsM program in both cycles 1 and 2, muskellunge were only detected in one lake (Lake Lauzon), although they are known to be present in several other lakes.

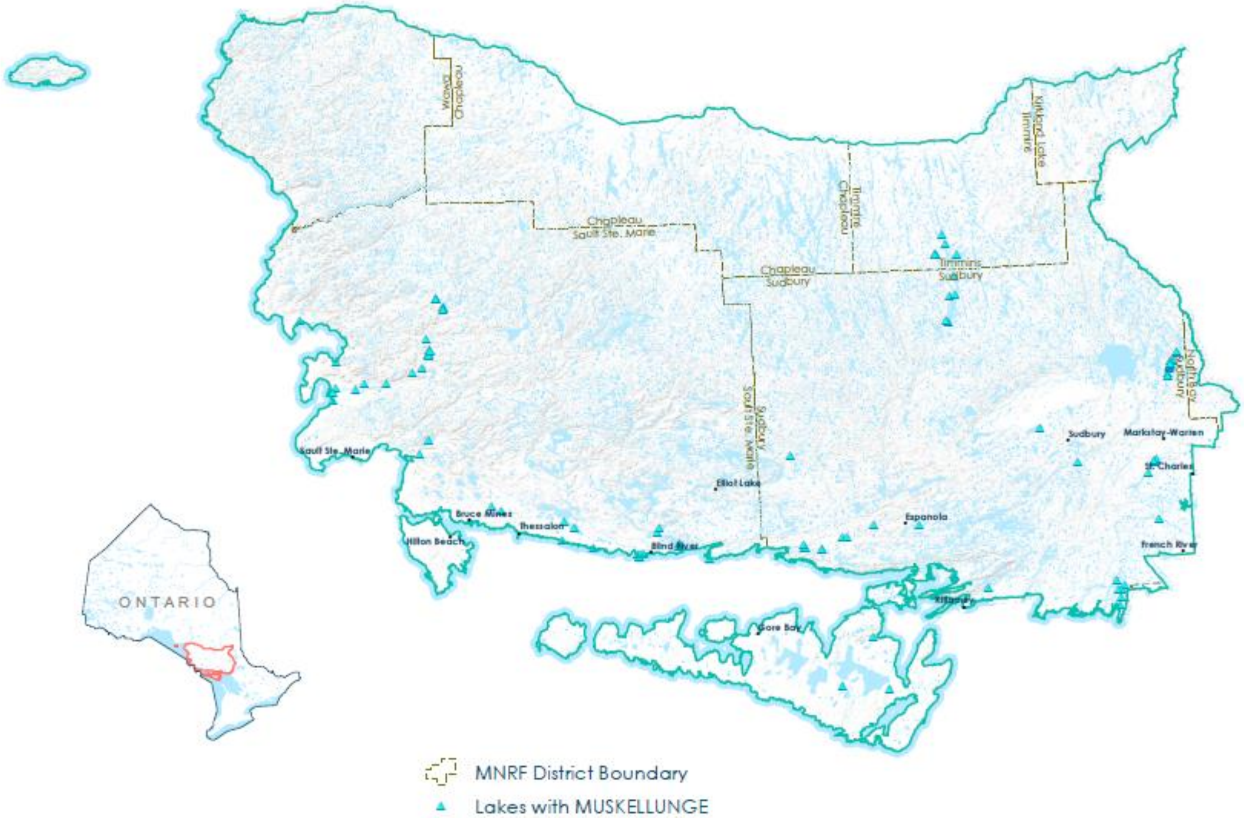


Figure A-42. Distribution of muskellunge within FMZ 10. Data is captured from 2019 LIO's ARA_Water_Poly_Segment. Includes lakes of all sizes throughout FMZ 10.

Angling pressure

Angling for muskellunge in Ontario is fundamentally different than that for most other species as harvest limits are exceptionally restrictive, usually one adult fish per day (in FMZ 10, must be greater than 122 cm in length), which anglers rarely harvest. This management approach results in high average size and optimization of sustainability through 100% release of mature females between their age at first maturity and 122 cm. Muskellunge angling is the model of socio-economic benefit with extremely low impact on the sustainability of the resource.

Estimates of angling effort generated from results of the national survey of recreational fishing are available for 2005 and 2010 (MNRF 2015d). The estimated effort (all species) on lakes > 20 ha in FMZ 10 from 2005 and 2010 was 15 hrs/ha and 10 hrs/ha respectively. The percentage of anglers targeting muskellunge was 1% in FMZ 10

(MNRF 2015d). Applying this estimate to the total angling effort results in muskellunge specific effort estimates of 0.15 hrs/ha and 0.1 hrs/ha for 2005 and 2010 respectively.

Muskellunge Indicators and Benchmarks

Assessment of muskellunge populations in FMZ 10 is limited by availability of relevant data and, as such, the abundance and size distribution of the populations are not well known but generally are thought to be healthy.

Muskies Canada Inc. is a strong advocate for the resource and a valuable partner in the management of muskellunge populations. Members typically participate in an angler diary program which, initiated in 1978, has provided useful information to support management decisions and which may address shortcomings in muskellunge information in FMZ 10 including fish health, catch information and, potentially, spawning habitat information.

The most significant threat is the transport of Viral hemorrhagic septicemia (VHS) infected baitfish by anglers moving bait from the provincial VHS zone to FMZ 10. The primary threat from VHS transmission has not to date resulted in the visible loss of muskellunge as has occurred in some portions of southern and southeastern Ontario.

Growth

Assessment of muskellunge growth variability conducted during the 1990s revealed that growth varies widely across the range of the species, and that some populations have potential to reach very large maximum sizes, while others do not (Casseleman 2007). It is based on this growth potential and ultimate size that Ontario primarily bases its management approach. A Provincial standard, 91 cm minimum size limit (MSL) exists and 4 additional MSLs (102, 112, 122 and 137 cm) are used, based on evaluation of specific population growth potential.

In FMZ 10, available information suggests that few muskellunge populations exhibit the growth potential to justify the largest of the minimum size limit options and thus the zone-wide minimum size limit remains at 122 cm. However, a few populations in FMZ 10 do demonstrate growth potential to justify the highest minimum size limit and these populations are all associated with large rivers flowing into Lakes Huron and Superior.

Yellow Perch

Distribution

Yellow perch belong to the Percidae Family (as does walleye) and are considered a cool water fish that typically prefers shallow water with moderate vegetation. Yellow perch spawn later than walleye, typically on sand or vegetation in shallow waters. They are invertebrate feeders initially (water fleas, copepods etc.), then move onto insects and small fish. Generally, at age 3 males are mature and females at age 4 (Scott and Crossman 1998).

Although a widespread, native species within FMZ 10, yellow perch has been introduced into numerous lakes within FMZ 10, likely through bait bucket introductions. This has resulted in the loss of some sensitive, high-value fisheries including many historical brook trout waters.

Yellow perch have strong schooling behaviours and are important prey for species such as northern pike, walleye and to lesser extent adult lake trout (Scott and Crossman 1998). However, yellow perch are also competitive with trout species, particularly those that prey primarily on invertebrates (e.g. insects). Competition for food during vulnerable life stages can reduce the number of juveniles recruited into adult populations, particularly in trout species who also feed during the day. Perch can deplete a brook trout fishery within a few years of introduction unless the brook trout fishery has enough adult fish (>30cm) that can prey on the perch at the time of introduction before they begin to reproduce. Introductions of perch to brook trout lakes most often result in brook trout population decline and establishment of a stunted perch population. Splake, however, can coexist and thrive on them under specific circumstances depending on the lake type.

Currently, there are 640 lakes known to support yellow perch within FMZ 10, with 414 of those lakes greater than 50 ha (Section 2, Table 2.1). Yellow perch have a wide distribution throughout FMZ 10 inhabiting most of the zone (Figure A-43).

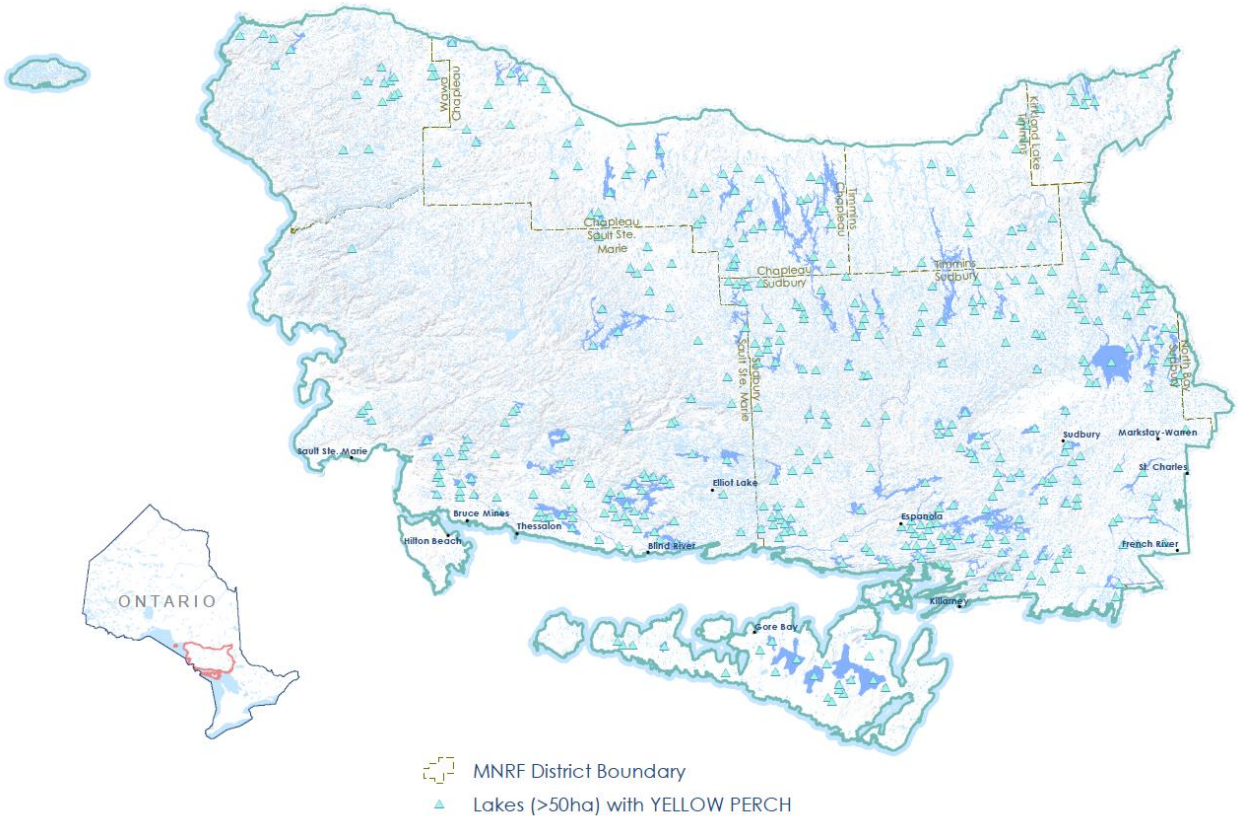


Figure A-43. Distribution of yellow perch within FMZ 10. Data is captured from 2019 LIO's ARA_Water_Poly_Segment. Includes lakes, ponds and rivers throughout FMZ 10 greater than 50 ha.

Habitat

Yellow perch habitat is similar to walleye and northern pike habitat, where preference is cool to warm water with sufficient littoral area and moderate vegetation.

Angling pressure

Estimates of angling effort generated from results of the national survey of recreational fishing are available for 2005 and 2010 (MNRF 2015d). The estimated effort (all species) on lakes > 20 ha in FMZ 10 from 2005 and 2010 are 15 hrs/ha and 10 hrs/ha respectively. The percentage of anglers targeting yellow perch was 3% in FMZ 10 (MNRF 2015d). Applying this estimate to the total angling effort results in yellow perch specific effort estimates of 0.45 hrs/ha and 0.3 hrs/ha for 2005 and 2010 respectively. This suggests that there is relatively little angling pressure on yellow perch populations in FMZ 10.

Yellow Perch Status in FMZ 10

Abundance

Abundance of yellow perch, as a zone wide indicator of status, is assessed by making use of equally weighted (EW) zone average catch per unit effort (CUE). The EW average CUE of yellow perch based on the catch rate in large (NA1) mesh nets in FMZ 10 during the first cycle of the BsM program was 1.12 fish per gang (Figure A-44). Comparing results from FMZ 10 to other northern zones (i.e. FMZ 7, 8, and 11) observed abundance among these zones is similar, with FMZ 10 being the second lowest. Similar results were observed when catch rates from small mesh nets (ON2) were used to assess abundance of yellow perch in FMZ 10, with 9.78 fish per gang, second lowest among northern zones (Figure A-45).

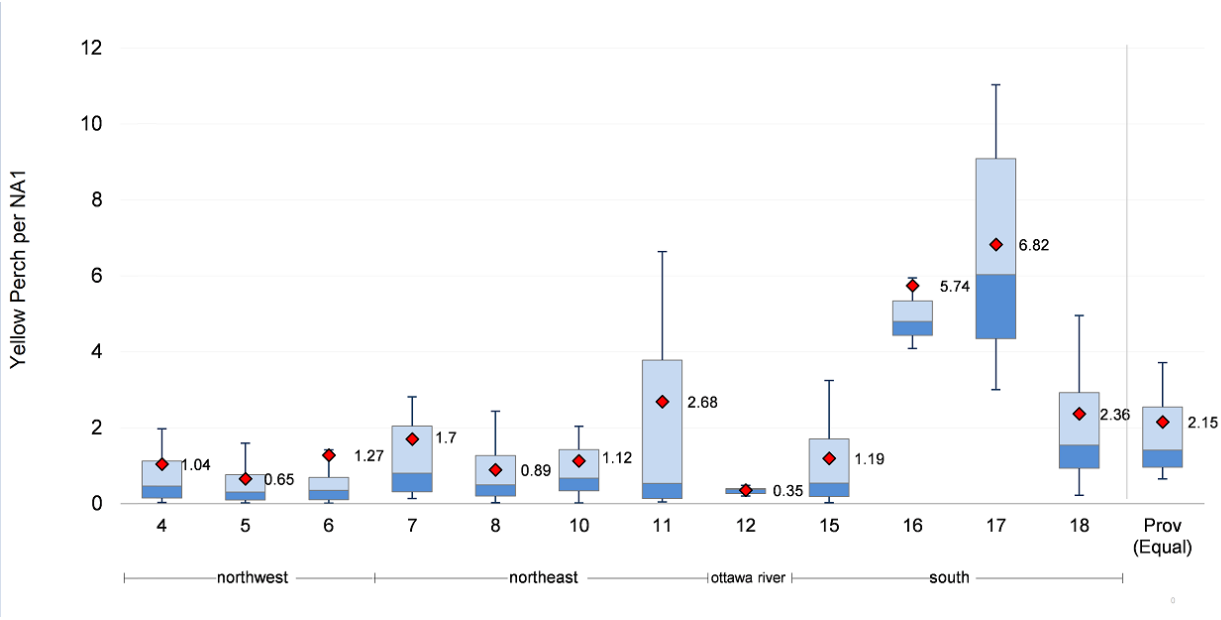


Figure A-44: Equally weighted average catch per unit effort of yellow perch by FMZ for large (NA1) mesh nets. Data from BsM Cycle 1.

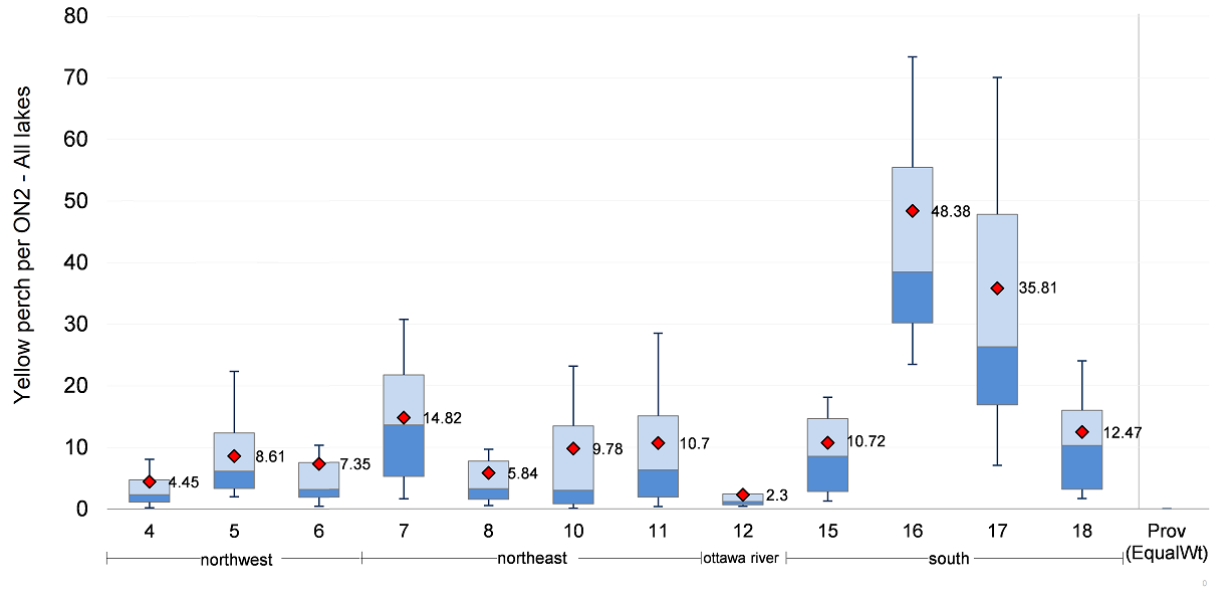


Figure A-45: Equally weighted average catch per unit effort of yellow perch by FMZ for small (ON2) mesh nets. Data from BsM Cycle 1

Growth and Age Structure

Yellow Perch Length

Based on the BsM data from Cycle 1, provincially, where yellow perch were detected, the average total length is lowest in FMZ 10 and 11, based on catch in large (NA1) mesh nets (Figure A-46). The relatively small size of perch in FMZ 10 is consistent with known density dependent relationship with growth, where populations are known to become stunted at high densities, primarily as a result of competition for food, and in the case of FMZ 10 where habitat is limited because of the general characteristics of FMZ 10 lakes being deep and cold with relatively small amounts of littoral habitat (Scott and Crossman 1973).

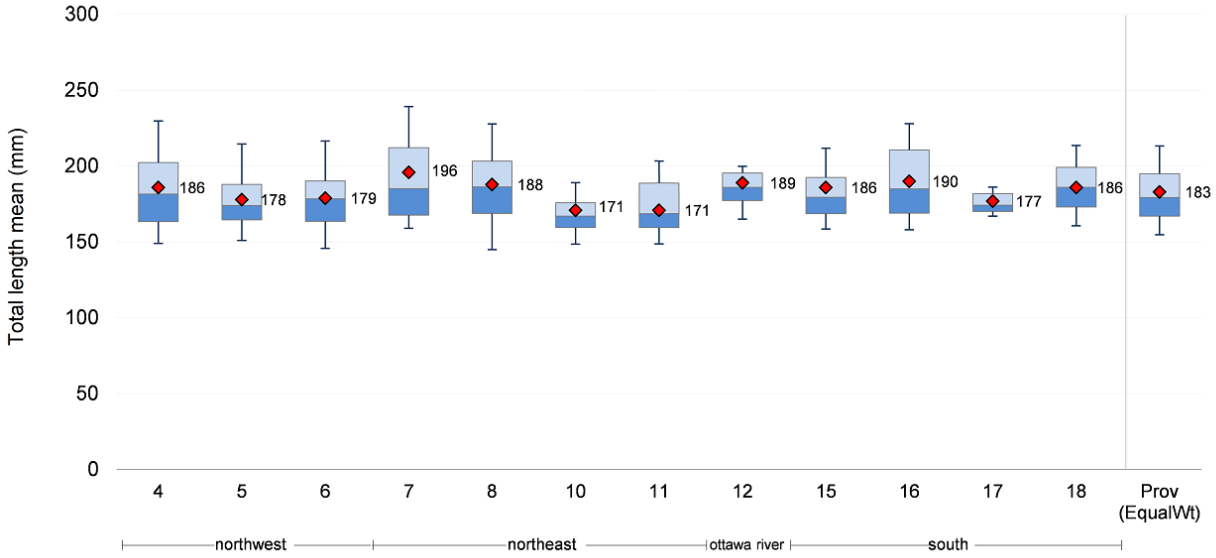


Figure A-46: Equally weighted average total length (mm) for yellow perch by FMZ for large (NA1) mesh nets. Data from BsM Cycle 1.

Coregonid

Distribution

Currently, there are 551 lakes, greater than 50 ha in size, known to support Coregonid species within FMZ 10, with 238 lakes known to support lake whitefish (Figure A-47 A) and 193 known to support lake herring (Cisco) (Figure A-47 B) . Coregonids have a wide distribution throughout FMZ 10 inhabiting most of the zone. Additionally, several lakes have been confirmed to have round whitefish present.

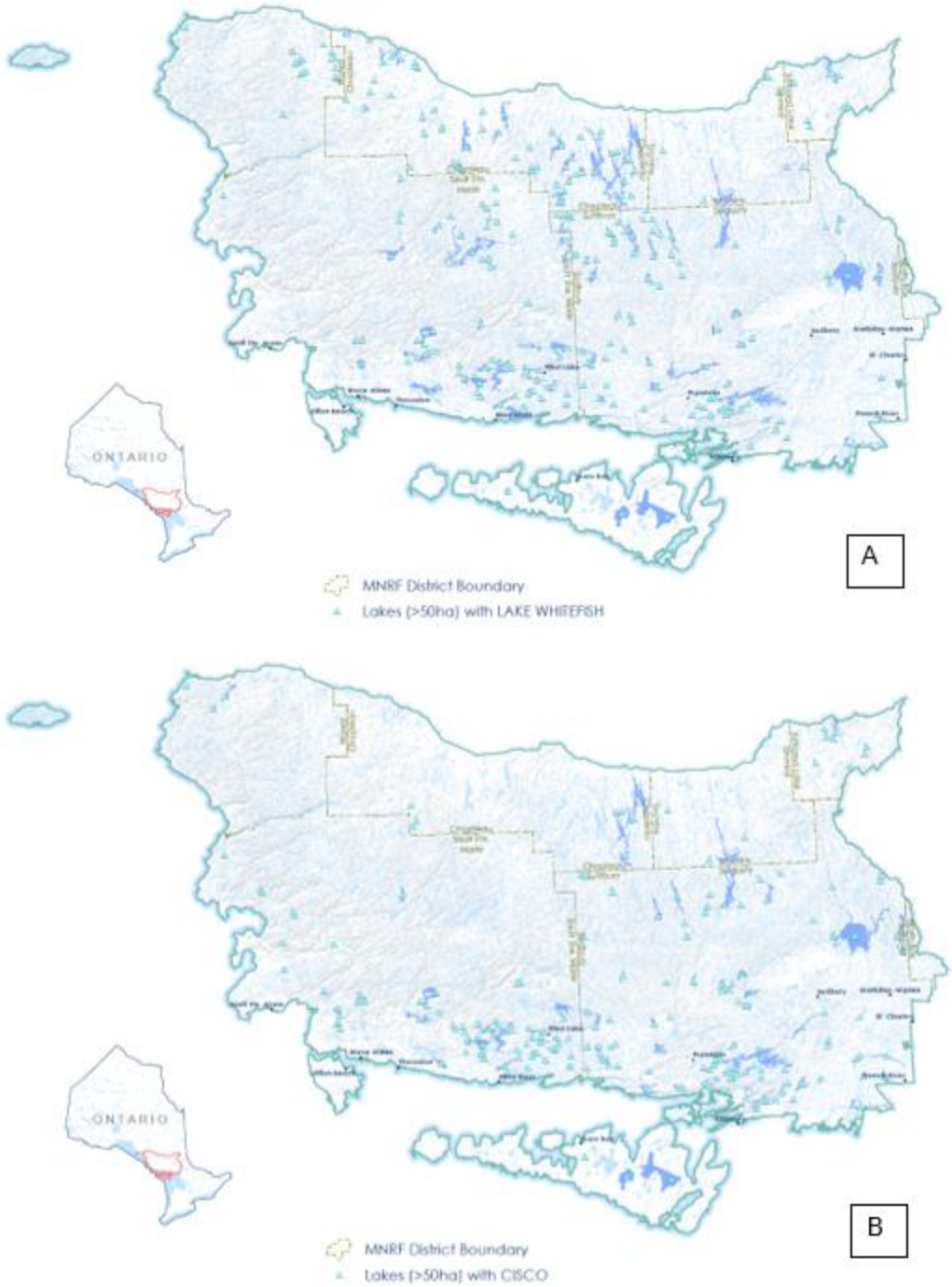


Figure A-47. Distribution of Coregonids within FMZ 10; A: Lake whitefish, B: Lake herring (Cisco). Data is captured from 2019 LIO's ARA_Water_Poly_Segment. Includes lakes, ponds and rivers throughout FMZ 10 greater than 50 ha.

Habitat

Lake herring (Cisco) and lake whitefish are the two most common Coregonid species and are found throughout FMZ 10 in both cold-water and cool-water fish communities. Lake whitefish are normally associated with the lake bottom since they consume primarily benthic (bottom-dwelling) organisms. Lake herring are pelagic (living suspended over deep water), and primarily consume invertebrates from the water column including zooplankton and emerging insects.

Lake herring function as an integral component of typically complex fish communities, primarily as a forage base for a variety of fish-eating predators such as lake trout, walleye, northern pike, muskellunge and smallmouth bass. Anglers rarely fish for lake herring in the zone although the fall dip-net season from October 1 to December 15 is popular for some. Lake herring are also considered a baitfish under the *Fish and Wildlife Conservation Act* (FWCA).

Lake whitefish, unlike lake herring, are targeted by anglers in some waters, particularly in winter. Lake whitefish may comprise a significant component of cold-water fish communities and function as both competitor and prey, particularly where they exist with healthy lake trout populations.

Lake herring or lake whitefish have also been found to dominate lake trout waters where the population of adult lake trout has been substantially depleted through over-harvest. In such cases, juvenile lake trout survival is suppressed through competition with lake herring or lake whitefish (Carl 1997) (See lake trout section).

Lake whitefish are fewer and larger in the presence of lake herring than in their absence. Lake whitefish shift from feeding on both plankton and benthic prey when lake herring are absent to a primarily benthic feeding niche in the presence of lake herring. Predation on the pelagic larvae of burbot and lake whitefish by planktivorous lake herring alters the size and age structure of these populations. As life history theory predicts, those species with poor larval survival appear to adopt a bet-hedging life history strategy of long-lived individuals as a reproductive reserve (Carl and McGuiness 2006).

Angling pressure

Lake whitefish are not a frequently targeted sport fish within FMZ 10, only accounting for 1 percent of species targeted by anglers in the zone (MNRF, 2015d).

Coregonid Status in FMZ 10

Abundance

The abundance of lake whitefish in FMZ 10 trend lakes is second highest among northern zones (FMZs 7,8, 10, and 11) and higher than the provincial average (Figure A-48). The abundance of lake herring (Cisco) in FMZ 10 is similar to other northern zones, being slightly less than observed in neighboring FMZ 11 (Figure A-49).

However, when examining abundance of lake herring (Cisco) in lake trout trend lakes alone (Figure A-50), the abundance within FMZ 10 decreases to nearly half that observed in FMZ 11. This is important to recognize because of the known negative impact that high density lake herring populations can have on lake trout recruitment, through increased competition for food resources (Powell et al. 1986).

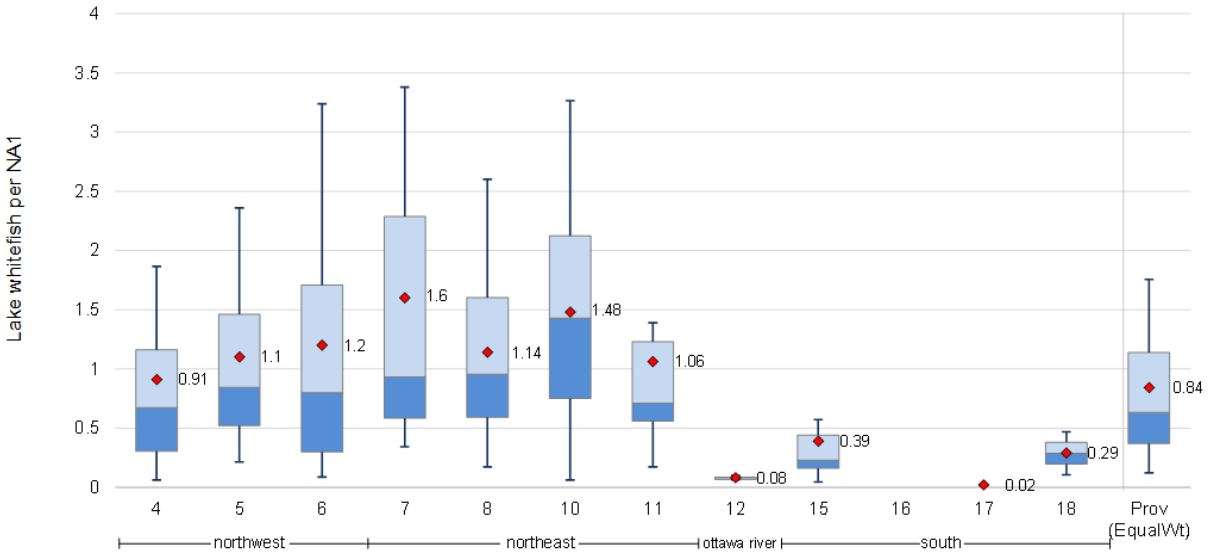


Figure A-48: Equally weighted mean CUE of lake whitefish by FMZ. Data from BsM Cycle 1.

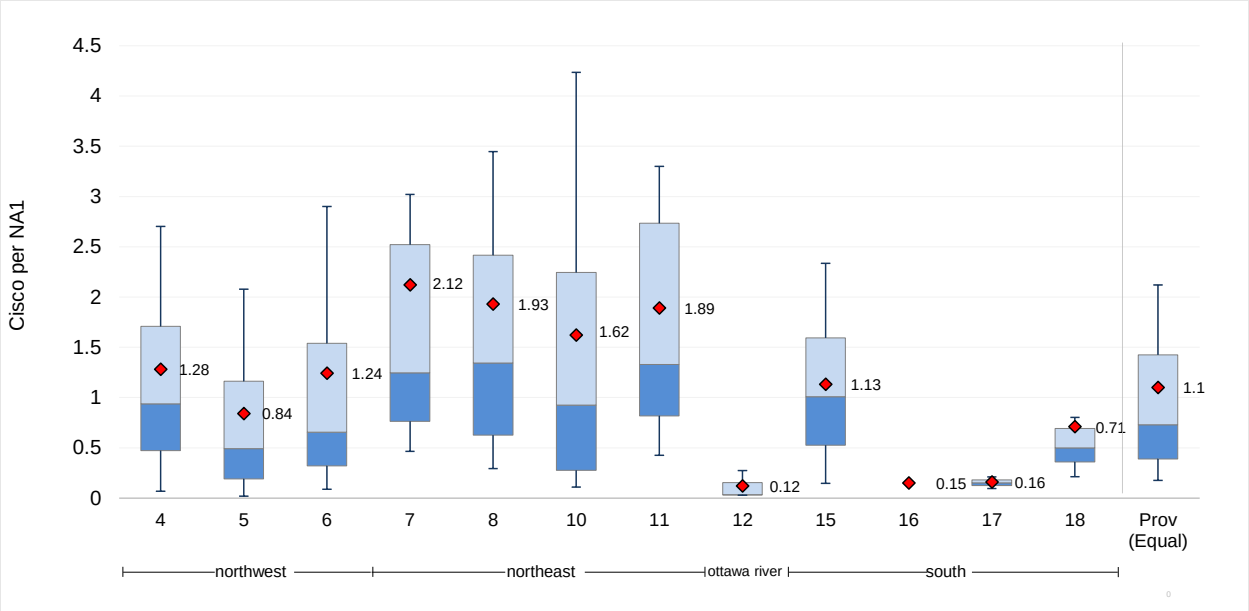


Figure A-49. Equally weighted mean CUE of lake herring by FMZ. Data from BsM Cycle 1

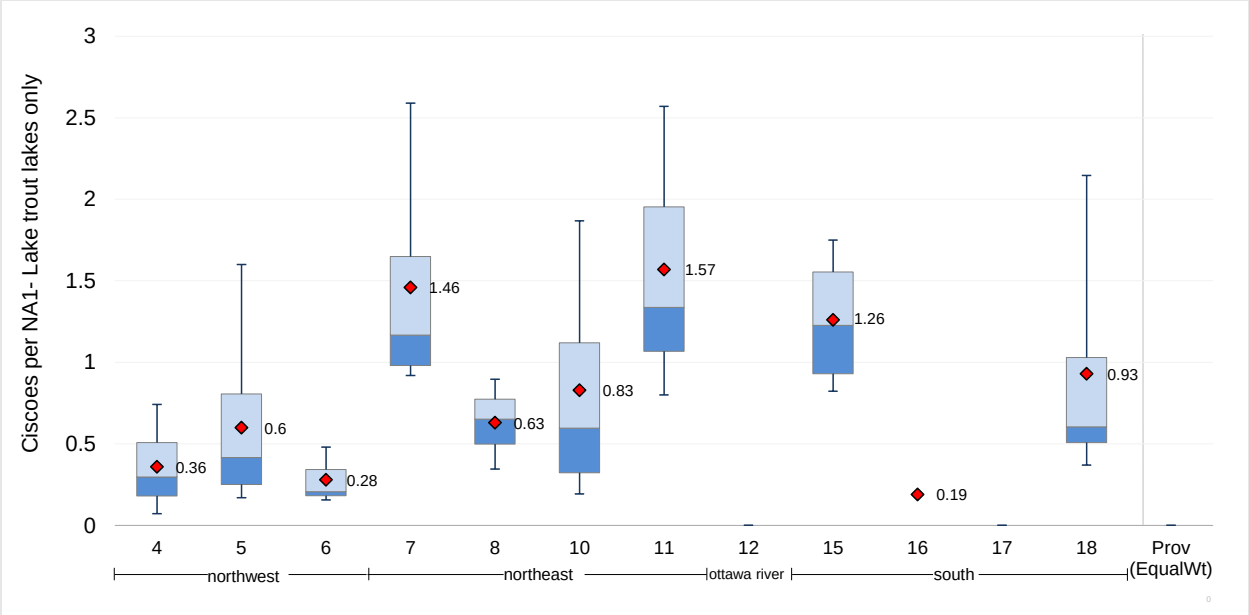


Figure A-50. Equally weighted mean CUE of lake herring (Cisco) by FMZ form lake trout trend lakes. Data from BsM Cycle 1.

Growth and Population Age Structure

Lake Herring (Cisco) Length

Based on the BsM data from Cycle 1, provincially, where lake herring were detected, the average total length was 250 mm, similar to other northern zones.

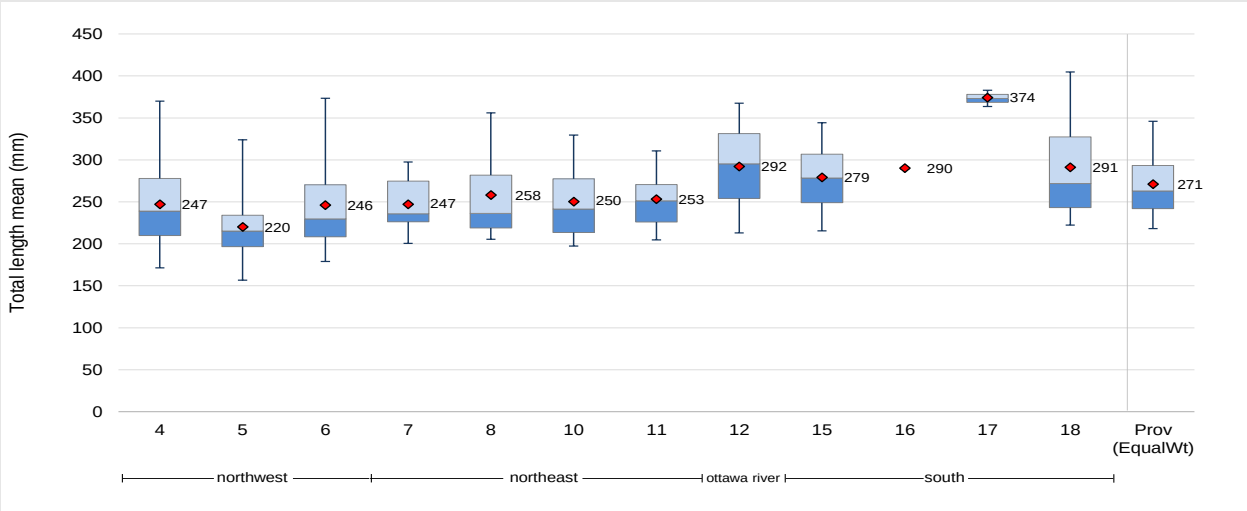


Figure A-51. Equally weighted average total length (mm) for Cisco by FMZ for large (NA1) mesh nets. Data from BsM Cycle 1.

Lake Whitefish Length

Based on the BsM data from Cycle 1, provincially, where lake whitefish were detected, the average total length was 440 mm, similar to other northern zones.

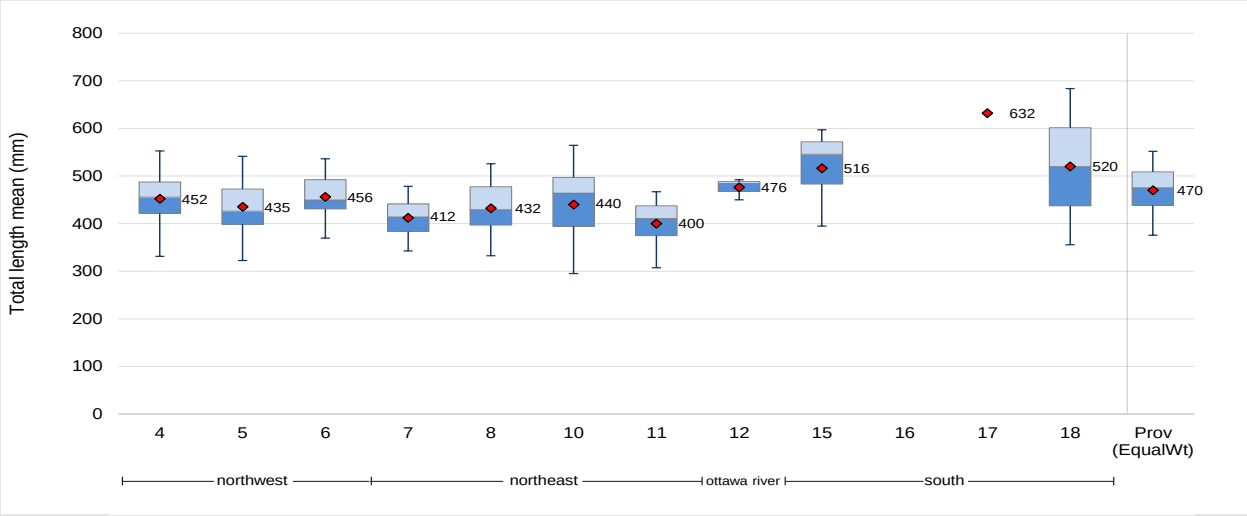


Figure A-52. Equally weighted average total length (mm) for lake whitefish by FMZ for large (NA1) mesh nets. Data from BsM Cycle 1.

Fish Stocking Program in FMZ 10

One of the objectives in the Ontario's Provincial Fish Strategy (OMNRF 2015b) is to increase economic, social and cultural benefits derived from fish resources. Recognizing that stocking is an important management tool to create fishing opportunities where they do not exist, or where native fish populations cannot support existing fishing pressure. The ministry's strategic direction Naturally Resourceful (OMNRF 2020c) also identifies there are two fundamental reasons for stocking fish 1) to establish or enhance natural reproduction, where stocking occurs for a finite period and stopped when the objectives of rehabilitation and introduction has been successful, or 2) provide hatchery dependent fisheries, where stocking is aimed at providing artificial fisheries for public use and generally stocking is continued on an ongoing basis if waters stay suitable to create opportunities. In general, stocking effort in FMZ 10 is mainly focused on creating Put-Grow-Take (PGT) fisheries; where sub-catchable-sized fish (i.e. fingerlings, yearlings) are stocked, allowed to grow, and ultimately provide angling opportunities however there are Put-Take opportunities as well. These have been summarized from a five year period from the stocking database.

In FMZ 10, over the past few decades stocking efforts have also been employed to recover species populations. In particular, stocking has been used to recover populations in acid damaged lakes. Lakes in the Sudbury region have been recovering from acidification from smelter emissions that have declined from a peak of 2.5 M tonnes of sulphur dioxide in 1960 to less than 5% of that total today (Gunn *et al*. 2002)). At the height of the damage in the 1960s, an estimated 100 lake trout (*Salvelinus namaycush*) lakes were acidified (pH < 5.5) within the Sudbury Sulphur deposition zone, extirpating many of its lake trout populations and making lake trout the most widely and severely impacted of all the sportfish in the area. Hatchery stocking initiated by the ministry to recover these acidified lakes have shown promising results.

Applied restoration strategies include lake trout stocking and a range of harvest control measures. Surplus adult broodstock and 2 year old hatchery products are being used as alternatives to regular yearling stocking in the face of complex fish communities. Nearly 250,000 lake trout were stocked between 2001 and 2005 (Selinger et al 2006). Additional stocking has continued to present day. Although reproducing populations are more readily established where angler harvest is curtailed, substantive harvest resulting from a pulse of angler interest can be expected when a closed fishery is opened. For the majority of the lakes being restored, stocking is ongoing with regular 9 month open seasons recognizing that angling pressure will build concurrent with lake trout biomass. For the remaining lakes, harvest control strategies have been applied, ranging from reduced winter lake trout seasons to full year round sanctuaries. In addition to potential harvest control measures, the value of stocked put-grow-take trout fisheries (splake,

brook trout, and lake trout) in absorbing / deflecting angling pressure is essential. In this fisheries management plan a target is to maintain or expand such stocking programs especially where suitable recipient water bodies exist in proximity to self-sustaining lake trout lakes which was an action item in Selinger et al (2006). Other research that corroborates this finding is the community restoration of acid damaged lakes (CRADL) project run by Laurentian University's freshwater ecology unit, has shown the recovery status of the fish population within the historically affected area (Keller.,W. et al (2018)).The study's findings shows a recovery in pH and evidence of natural reproduction of lake trout. Concluding the benefits of both the pollution control program and hatchery stocking.

Another species that was impacted by acid damage was the Aurora trout (*Salvelinus fontinalis timagamiensis)* population. Original populations of Aurora trout were discovered in 1923 in two small lakes (Whitepine and Whirligig) north of Sudbury within what is now Lady Evelyn-Smoothwater Provincial Park. Aurora trout is a colour variant of brook trout (*Salvelinus fontinalis)* and was extirpated from its original range by 1967 (COSEWIC, 2011). The disappearance was mainly due to anthropogenic acidification. Aurora trout genetics were preserved through the establishment of a captive breeding population in 1958 using brood stock. Improvements in air quality over time and rehabilitation efforts have improved water quality and successful re-introduction of Aurora trout into their native waters. In FMZ 10, stocking Aurora trout help meet management objective 3 from the Northeast region Aurora trout management strategy 2013 –to enhanced quality of Put, Grow and Take (PGT) Aurora trout fisheries in a limited selection of waters outside the original sub-watershed but within the geographic extent of the Northeast Region (Durant et al 2013*)*. In FMZ 10, Carol Lake in Beulah Township and Lake 21 in Tyrell township are stocked with Aurora trout to provide unique angling opportunities. Stocking in Lake 21 began in 1974 to provide an additional source of brood stock and continues today, once every three years. Carol Lake is open for fishing once every three years from August 1st October 15th to provide for a rare trophy fishing opportunity. The use and possession of live bait is prohibited.

The planning, production and distribution of fish, communication to anglers and monitoring of fish stocking are undertaken in an annual cycle that involves a diverse range of staff in several MNDNRF organizational units. The District stocking coordinator prepares a stocking plan that is informed from the FMZ plan, the stocking guidelines, results of monitoring, angler feedback and local knowledge/expert opinion. The stocking plan lists waterbody, species, life stage, genetic strain, number and marking requirements. This is coordinated with the Fish Culture Section to meet production and distribution. The Provincial Fish Strategy highlights the importance of monitoring as part of an effective fish stocking program. Where the stocking program should be informed by good, up-to-date data to assess risk, and to effectively plan and implement actions

such as fish stocking and harvesting regulations (OMNRF 2015b). Concurrent with the planning, production and distribution cycle, District prepare annual Work Plans which may include activities to monitor aspects of the stocking program, including angling activity, fish community and population assessments. Periodically, assessment and EA processes are undertaken to consider new waters for stocking. Stocking lists for individual lakes for districts are available through Fish Online as well as local District offices.

Appendix B: Monitoring and Assessment

Monitoring

Monitoring is critical to managing fisheries under an adaptive framework. Monitoring supports fisheries management and evaluates the success of fisheries management by: estimating current status and trends, including the effect of management actions, seeking associations between natural and anthropogenic stresses and helping the ministry anticipate the future needs of the organization. Monitoring is essential for determining if current management actions require adjustment and for informing policy development and implementation decisions.

The Broad-scale Monitoring (BsM) program which began in 2008, is the primary fisheries monitoring program for the province. The purpose of the BsM program is to improve information about the health of Ontario's inland lakes and recreational fish species, specifically at the new broader FMZ scale. The BsM program is designed to support fisheries management decision making and to evaluate success in meeting fisheries objectives by providing relevant information for selected lakes on a five-year cycle. Specifically, the objectives of the BsM program are to:

- Describe the geographic distribution, extent and characteristics of aquatic resources in Ontario;
- Estimate, with known confidence, the current status and trends in selected indicators of Ontario's fishery resources;
- Identify natural and anthropogenic stresses affecting the condition of aquatic resources; and
- Provide periodic reports on the state of aquatic resources in Ontario.

In FMZ 10, the first cycle of BsM lake surveys were completed between 2008 and 2012, and the second cycle of surveys were completed between 2013 and 2018. In most cases, the cycle 1 data are considered the baseline to which we can measure progress towards achieving the stated objectives.

The lake selection process for BsM is a stratified random design where lakes were randomly selected in proportion to the total number of lakes known within each FMZ at the time of lake selection. Identified trend lakes were sampled once within each 5-year monitoring cycle.

In FMZ 10, there were a total of 122 lakes randomly selected to be surveyed by the BsM program in cycle 1 (2008-2012). In the walleye section of this document 20 trend lakes were used in reporting on the status; in the lake trout section, 53 lakes were used

for reporting on the status; in the brook trout section of this document, 55 lakes were used in reporting on the status. Of the total 122 lakes, three lakes were classified as both walleye and lake trout trend lakes, and three lakes were selected for both lake trout and brook trout trend lakes. For all other species that are reported on in this document, all lakes where the species was captured are used in analyses (i.e. N ≤ 122). Although the BsM program is monitoring 122 lakes in FMZ 10, representing approximately 1% of all lakes (> 5 Ha), these 122 lakes represent approximately 22% of lake surface area (>5 ha) in the zone.

Currently, the BsM program provides information for non-target species (northern pike, bass, yellow perch, lake whitefish, lake herring) within the zone for management purposes and Cycle 1 results are considered the baseline from which progress is measured. Therefore, there is the potential to have missing coverage of non-targets species lakes that do not have lake trout, walleye, or brook trout. We recognize that the status measures reported here are from populations that coexist with other key sportfish species and that characteristics of non-target species in waters free of walleye and/or lake trout may be different.

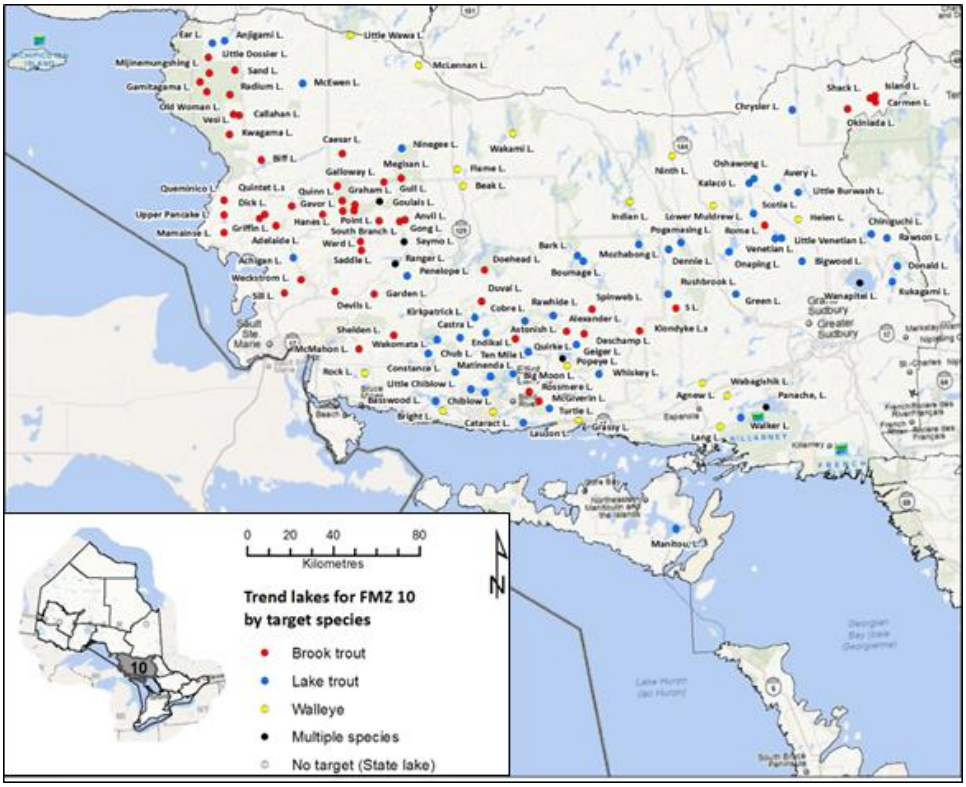


Figure B-1. FMZ 10 lakes selected for trend monitoring by Provincial BsM program. Lake are displayed by target species.

A more detailed description of the BsM monitoring program can be found at:

https://www.ontario.ca/page/broad-scale-monitoring-program

Other Data Sources

In order to successfully assess the achievement of some of the management objectives or carry out management actions included within the plan, local targeted monitoring (monitoring over and above BsM) by either the district or in conjunction with partners as determined by the outcome of the management actions herein may be required (e.g. stocking assessments and spawning assessments).

An additional source of monitoring data used in the current assessment is the national survey of recreational fishing (DFO 2012). In Canada, a mail survey method has been used since 1975 to monitor recreational fisheries. The survey is conducted at 5-year intervals and provides useful statistics for measuring the size of the fisheries in each province and tracking changes through time. These statistics include fishing effort, as well as the catch and harvest by species. In the province of Ontario, the mail survey data have been used since 2005 to estimate fishery statistics in each of 20 fisheries management zones to provide general trend information (Hogg et al. 2010).

Results from the national survey of recreational fishing are available for most FMZs across Ontario from years 2005 and 2010 (MNRF 2015d, Hogg et al. 2010). Results include estimates of fishing effort, catch, and harvest in each zone, as well as reports on angler demographics, general fishing activities, expenditures and angler opinions. A study by Hogg et al. 2010 attempted to measure the bias that exists in fishing effort estimates in the 2005 mail survey. It compared mail survey estimates on individual waterbodies to creel survey estimates. This study found that mail survey estimates of effort and harvest exceeded creel survey estimates by approximately 2-fold.However, the mail survey remains an important source of trends in recreational fishing effort in FMZ 10.

Assessment

Assessment, in the context of fisheries management, can be generally thought of as turning data into advice. It typically involves describing, as accurately as possible, the status of fish stocks via indicators (e.g. abundance, age structure, mortality). The

assessment and description of status, as measured through time can then be used to measure progress toward achieving the stated objectives. For most species where we describe our assessment of status and trends, we make use of several indicators of status and we provide a brief description of each below. Additionally, we make use of a reference point framework for walleye which is also described below. Finally, we describe how lake level data collected through the BsM program are rolled-up to provide a zone level measure of the indicators.

Abundance

Abundance is a measure of the size of a fish population. Abundance is an important measure of the status of a fish population. It can be expressed by the number or biomass of fish in absolute terms (total for a waterbody) or relative terms (number or weight/unit area). The latter is most commonly used to allow comparison of abundance across lakes. Index netting, such as is done in the BsM program, produces a measure of relative abundance (e.g., catch-per-unit-effort (number of fish per net)) rather than absolute abundance.

Size, Age, Growth, Maturity

Although abundance measures are good indicators of population status, it is also important to track changes in other useful indicators. Measures of the size, age, growth rate and size or age of maturity of fish in a population are supporting indicators of population status. They are highly inter-related and influenced by multiple factors, many of which are independent of the fishery. A healthy fishery is typically supported by many age classes, whereas populations made up of fewer age classes typically indicate a stressed population. Looking at the number of cohorts (age classes) or average age of that portion of the population recruited to the fishery typically gives a good indication of the health of the population, where fewer cohorts and/or declining average age typically results from high levels of mortality for those older age classes. Changes in growth rates may be a signal of changes in fish density, mortality, and responses in the fish population to management actions.

Proportional Stock Density

The size composition of a fish population can be expressed as the Proportional Size Distribution (PSD) (Gabelhouse 1984). Changes in the size composition of a population can be tracked and management goals developed by categorizing the length distribution into length classes that are meaningful to fishers. This approach will make conversations with council meaningful and objective setting easier. For the purposes of zone planning, the size categories chosen to determine the PSD are based on the Ontario Angling Record for each species (Table B-1).

Table B-1. Total length (mm) ranges used for calculation of proportional size density for selected species, FMZ 10.

Size Class	Brook Trout	Lake Trout	Northern Pike	Smallmouth Bass	Walleye
Source	<210	<340	<320	<160	<240
Stock	210-329	340-539	320-499	160-249	240-379
Quality	330-439	540-719	500-679	250-339	380-509
Preferred	440-509	720-839	680-789	340-389	510-589
Memorable	510-639	840-1049	790-979	390-489	590-739
Trophy	>640	>1050	>980	>490	>740

In developing the PSD, the 'Stock' category is the minimum size at which a fish has a recreational value to an angler. 'Quality' length is characterized as the inflection point, where fish growth rate increases rapidly and is the minimum size anglers like to harvest. Gabelhouse (1984) suggested that although anglers may enjoy catching a fish of "Quality" length, they would prefer a larger-sized 'Preferred' fish. 'Memorable' is defined as a size of fish the majority of anglers remember catching, and 'Trophy' was considered worthy of acknowledgement.

Calculating Zone-level metrics

Most data presented throughout this document to describe status are from Cycle 1 (2008 – 2012) of the BsM program and are presented as box plots. For all box plots the mean, median, quartiles, and range are presented (Figure B-2). The number of lakes is not constant for all displays within a zone and species combination as not all metrics could be calculated for every lake (i.e. because of small sample size and or missing information).

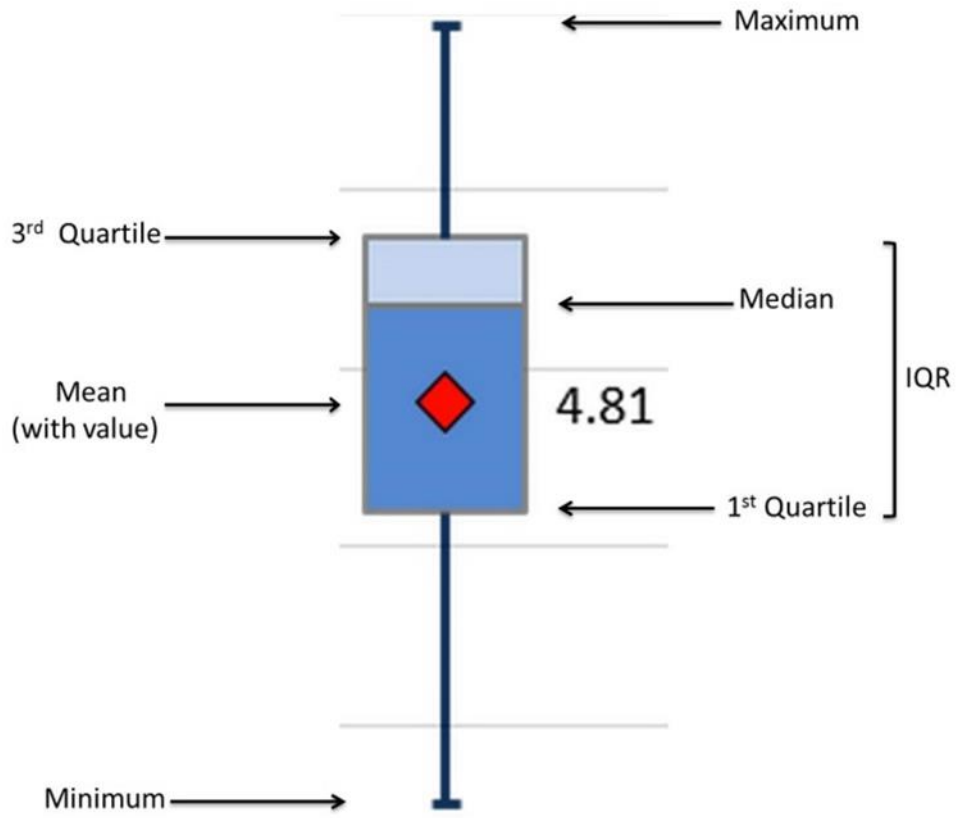


Figure B-2: Components of Box Plots.

All zone level box plots presented for walleye and lake trout are based on species specific trend lakes, and therefore are area-weighted based on zone specific lake size class proportions. This is done by first calculating a measure of interest (e.g. mean length of walleye) for each of the walleye trend lakes, then rolling-up the individual lake measures to calculate the average of each lake size bin category, and then applying an area weighting based on area of all known walleye lakes by size bin within FMZ 10 to arrive at an area weighted average mean length of walleye.

In the following sections, area-weighted zone averages are only calculated for walleye, and lake trout, where we are confident in the size of the population of lakes containing those species in the zone. For all other species, measures presented as a zone average are based on all lakes where the species was detected and are calculated using an equal weighting by lake size bin (each size bin contributes equally to the zone average).

An important distinction exists between the description of status of the two major sport fish species (walleye and lake trout) and of all other species. The description of status of walleye and lake trout can be taken to be a description of status of that species across

the FMZ because of the random lake selection process described above and the application of the area weighting method. However, the description of status of all other species should only be interpreted as a description of that species' status where they coexist with either lake trout or walleye, because of the random lake selection process described above.

Except where noted, the data presented here are based on catch from the North American (NA1) gillnet (also known as 'large mesh'; Bonar et al. 2009). Some displays also use data from the Ontario small mesh gear (ON2) described by Sandstrom et al. (2013). The assortment of mesh sizes used in the NA1 net were chosen to survey primarily fish in the size range where the recreational fishery operates, and thus, cannot provide a description of the whole population (i.e. does not include very small fish). In addition, fish of different sizes are not equally vulnerable to the gear (e.g. smaller fish may only be caught in one or two panels of the smaller mesh, while larger fish may be caught in both the larger meshes as well as entangling in the smaller meshes). Recent studies have described these differences, or retention selectivity characteristics, associated with the NA1 net for several species (Walker et al. 2013 and Smith et al. 2017). However, to maintain consistency among various measures of status, and because typically the selectivity of our sampling gear peaks very near the size at which species are recruited to the recreational fishery, unless otherwise noted, retention selectivity adjusted measures are not used.

Selected BsM indicators were assessed using cycle 1 data to develop a benchmark. Data collected from cycle 2 of the BsM was used to assess if there was movement towards the desired target for the specific indicator. The intent is that as cycle 3 BsM information is collected the indicators will be reassessed to determine target achievement. A paired t-test was conducted on the un-weighted means and assessed against a p value of 0.1 which is relevant to field collected data.

Analysis of provincial creel data provide size ranges of fish of various species typically retained by recreational anglers and therefore considered to be recruited to the fishery (MNRF Unpublished data). In the context of fisheries management, to be most informative, descriptions of the status or trends of different populations is presented here for fish greater than or equal to the sizes at which they are recruited into the fishery. Table B-2 provides species specific definitions of recruit size used in our analyses.

Table B-2. Species specific sizes at which they are considered recruited into the recreational fishery

Species	Total Length (mm)	Fork Length (mm)
Walleye	350	328
Lake Trout	350	316
Brook Trout	250	238
Lake Whitefish	400	358
Northern Pike	500	470
Smallmouth Bass	200	237
Rock Bass, Pumpkinseed, Bluegill	150	142

Reference Points

Models relating abundance and sustainable fish yield (reference points) to lake productivity measures (e.g. Secchi depth) have been used for management purposes in Ontario since the 1960s (Ryder 1965, Schlesinger and Regier 1982, Lester et al. 2014). Reference points offer a means of assessing the extent to which ecosystems have been altered by manmade changes. In the case of exploitation, they offer an assessment of whether current levels of harvesting are sustainable. The ministry has developed reference points to evaluate the status of walleye in inland lakes (Lester et al. 2004, Lester et al. 2014). Development of reference points for other species (i.e. lake trout, northern pike) is not currently available.

These recommended limit reference points are meant to be a limit that should not be exceeded. The biomass limit reference value is calculated by dividing the retention selectivity adjusted biomass (Kg/ha) estimate of fish >350mm total length (size when recruited to recreational fishery) by the expected biomass at MSY. The mortality limit reference value is the retention selectivity adjusted total mortality rate (Z) divided by the predicted natural mortality rate (M). In this document, as part of our assessment of walleye status we present results in the context of safe reference points, which are

more precautionary than the limit reference points. Here we use a safe biomass reference point of 1.3 times the expected biomass at MSY, and a safe mortality reference point of 0.75 times the predicted natural mortality rate (M). Reference points are determined for each trend lake and the observed biomass and mortality compared to the reference values is displayed for each lake, by size class.

Lester and Dunlop 2004 recommend a plot of observed biomass / expected biomass at Maximum Sustainable Yield on one axis, against observed mortality / sustainable mortality on the other axis, to characterize four stages of fishery status or health (quadrant plot, kobe plot).

An important point during interpretation of the reference point framework is that although individual lakes are classified, it has been recommended that this approach is only appropriate when applied to a large group of lakes on a landscape scale (Lester et al. 2014). Model predictions may not be very accurate on a small scale (e.g. individual lakes), but precision improves when individual estimates are aggregated on a larger scale. This is because there is a large amount of statistical uncertainty associated with estimating sustainable abundance and fishing benchmarks to which the observed levels are compared. Therefore, using a collection of lakes provides a more precise ‘picture’ of the state of the resource, essentially “averaging out” individual lake uncertainty. The reader should not focus on placement of individual lakes, but rather consider the collection of lakes.

Appendix C: First Nation and Métis Community Engagement

Ontario, as the Crown, has a legal obligation to consult with Aboriginal peoples where it contemplates decisions or actions that may adversely impact asserted or established Aboriginal or treaty rights. Ontario is committed to meeting its duty to consult with First Nations and Métis communities.

The duty to consult, and where appropriate accommodate, is rooted in:

- the Honour of the Crown (a legal principle that commits government to act with integrity)

- the protection of Aboriginal and treaty rights under section 35 of the Constitution Act, 1982

Initial outreach to Indigenous communities occurred in 2007 with an invitation to identify a community representative to join the FMZ 10 Advisory Council, which was in the process of being established. As a result of these communications, the North Shore Tribal Council identified a representative to sit on the FMZ 10 Advisory Council. The North Shore Tribal Council was represented on the FMZ 10 Advisory Council until 2009 at which time the Tribal Council decided to no longer have a representative on the Advisor Council.

In 2018, the Advisory Council started to focus primarily on the development of FMZ 10 Management Plan. Prior to that, in November 2017, to support the management planning process, the following First Nation and Métis communities were invited to participate in an Information Centre to share information on the fisheries in FMZ 10 and on the fisheries management planning process:

- Atikameksheng Anishnawbek
- Aundeck Omni Kaning First Nation
- Bar River Métis Community
- Batchewana First Nation
- Brunswick House First Nation
- Chapleau Cree First Nation
- Chapleau Objibwe First Nation
- Dokis First Nation
- Flying Post First Nation
- Garden River First Nation
- Henvey Inlet First Nation
- Matachewan First Nation
- Mattagami First Nation
- Métis Nation of Ontario Region 3
- Métis Nation of Ontario Region 4

- Métis Nation of Ontario Region 5
- M’Chigeeng First Nation
- Michipicoten First Nation
- Missanabie Cree First Nation
- Mississauga First Nation
- Sagamok Anishnawbek
- Serpent River First Nation
- Sheguiandah First Nation
- Sheshegwaning First Nation
- Taykwa Tagmou First Nation
- Temagami First Nation
- Thessalon First Nation
- Wahnapitae First Nation
- Whitefish River First Nation
- Wikwemikong Unceded Territory
- Zhibaahaasing First Nation

Information Centers where hosted in the following locations:

- Garden River – November 28, 2017
- Sudbury – December 12, 2017
- Timmins – December 6, 2017

Representative(s) from Aundeck Omni Kaning First Nation, Brunswick House First Nation, Garden River First Nation, Matachewan First Nation, Mississauga First Nation, Michipicoten First Nation, Thessalon First Nation, Wahnapitae First Nation, Mattagami First Nation and Whitefish River First Nation participated in one of the Information Centers.

A separate information centre was held for representatives from the Métis Nation of Ontario’s (MNO) Regions 3, 4, and 5 in Blind River in 2019.

The following is a summary of information shared by First Nation and Métis representatives during the First Nation and Métis Information Centers in 2017 and 2019 and the intital First Nation and Métis Task Team subcommittee meeting, in response to a number of specific questions:

How have you traditionally used fisheries?

- Fisheries were and are a food resource.
- The focus is on sustainable fishing, taking only what is needed.
- First Nation and Métis people used waterbodies as their travel routes and fished in different areas depending on the seasons.
- Water and fish are sacred to the First Nation and Métis culture and way of life

- Fishing was an opportunity for community members and communities to gather together. It was social and a networking opportunity. It was a time for everyone to come together and give appreciation to the fish and the water.
- Fish and water are medicine.
- Indigenous people honored fisheries far before European control. It is only recently that areas like wetlands are required to be protected.
- First Nation and Métis people traditionally managed fisheries with spawning beds.
- Fish were viewed as an economic source for bartering. Similar to trapping, different fish were worth different amounts of money. Communities would barter with nearby communities for other types of fish, fur, medicines, wild rice etc.
- The Hudson Bay Company created a long history of impact on fisheries.
- First Nation and Métis people have always honored and appreciated fisheries and it is not until lately that government and industry want to work with First Nation and Métis people to protect them.
- Traditional Ecological Knowledge of fisheries has been lost over time as many settlers did not appreciate the important knowledge the Indigenous people had.
- Fisheries are a true natural resource.

How would you describe a healthy fishery?

- Sustainable for at least seven generations; this is different than industry's perception of sustainability.
- Should have a youth and Elder perspective at the Advisory Council and First Nation and Métis Task Team.
- Elders teach community members how to fish sustainably.
- Elders teach how to fertilize the eggs to stock the lakes at community hatcheries and micro hatcheries.
- You can fish in a tailings pond that is stocked. Even though you keep catching fish, it does not mean it is a healthy fishery.
- Feed community with healthy fish consistently.
- For certain fish species where there are slot size regulations, if you keep fishing and ca not catch anything within a slot size, you should stop fishing as it is not sustainable to continuously fish where you know the fish will not survive when you have to release them.
- There is not enough enforcement to regulate non-Indigenous fish harvesters.
- In the Anishnawbe culture everything supports one another.
- Sustainability is not about numbers. Everything is connected. The approach to determine sustainability should be a holistic approach, rather than scientific.
- Indigenous communities don't think about the fisheries, they feel the fisheries
- There is a disconnect from books and numbers.
- Traditionally when the sturgeon lily came up every year, the Elders would know that is time to catch sturgeon.
- Sustainability is when nothing is wasted.

- Elders are finding it harder to know the timing of fish based on impacts of climate change.
- Other land uses impact the sustainability of fisheries.
- A sustainable fishery has healthy fish.
- Sustainable fisheries involve respecting the land.
- In order to have sustainable fisheries, there needs to be education on how First Nation and Métis people use the land traditionally.
- Industries like mining and forestry need to be educated on how Indigenous people use fisheries.
- Cumulative impacts are an important item to consider.
- There is a Spiritual connection to the fisheries; it is a way of life connected to the Elders.
- There should be studies on the impact of spraying on fisheries.
- Communities should be involved in the co-management of the resource.
- Healthy fish is sustainable.

What goals or objectives are missing from the intital draft of plan?

- Use traditional knowledge as a foundation to assess ecosystem health and population status.
- Need to increase public and industry education on fisheries pre and post contact and traditional fishing practices.
- Identifying Economic benefit opportunities for First Nations and Métis communities.
- Better collaboration and information sharing between the ministry and First Nation and Métis communities in the management of FMZ 10.
- Shift towards co-management of the fisheries resource.

First Nation and Métis Community Representation on the FMZ 10 Advisory Council and First Nation and Métis Task Team Subcommittee

The First Nation communities that attended or expressed interest in attending one of the Information Centres were invited to identify a representative to the join the FMZ 10 Advisory Council.

The following communities identified representatives to participate in the FMZ 10 Advisory Council and the associated First Nation and Métis Task Team subcommittee:

- Aundeck Omni Kaning First Nation
- Brunswick House First Nation
- Garden River First Nation
- Matachewan First Nation
- Mattagami First Nation
- Métis Nation of Ontario - Region 3
- Métis Nation of Ontario - Region 4

- Métis Nation of Ontario - Region 5
- Mississauga First Nation
- Serpent River First Nation
- Wahnapitae First Nation
- Whitefish River First Nation

The MNO also designated a Lands and Resources staff member to participate in the Advisory Council and Task Team.

The First Nation and Métis representatives on the FMZ 10 Advisory Council participated in discussions to highlighted community concerns and interest related to various fisheries management topics.

The First Nation and Métis Task Team subcommittee allowed for more in-depth discussion of fisheries management planning and space to discuss specific to First Nation and Métis interests in the FMZ 10 plan. The Task Team also provided a first point of contact to work collaboratively on the development and review of applicable sections of the plan.

First Nation and Métis communities will receive direct written notification of the Environmental Registry posting and will be provided with information on social media posts and communication products.

Appendix D: Fisheries Management Plan Development Team

To develop this Fisheries Management Plan expertise was required from the FMZ 10 Advisory Council, and from the Technical Project Team, with support from the Steering committee. The Advisory Council provided a link to stakeholders, First Nations and Métis Communities, and users of the land base of FMZ 10, while the technical project team provided an understanding of the monitoring and status of the fisheries of FMZ 10. The activities of both the FMZ 10 Advisory Council and the Technical Project Team was supported by the Steering Committee throughout the development of the Fisheries Management Plan for FMZ 10.

FMZ 10 Advisory Council

With the creation of Fisheries Management Zones (FMZs) in 2008, the ministry made a commitment to increase the involvement of the public in recreational fisheries management decision making. FMZ Advisory Councils were established to meet that commitment. Councils are involved throughout the fisheries management planning process from the development of fisheries objectives to the determination of appropriate management actions. At key stages in the planning process, broader public input is sought, which informs FMZ Advisory Council advice, and ultimately the ministry decision making. The end results are fisheries management plans that are built upon a foundation of public support that reflect a shared vision for fisheries management.

The purpose of the FMZ 10 Advisory Council is to provide advice to the the ministry to assist with the development of management objectives and strategies . A Terms of Reference (TOR) was developed and further describes the purpose, principles, organizational details, roles, responsibilities and operating costs for the Council.

Through the various stages of plan preparation, the Advisory Council provided critical input that shaped the plan to reflect local interests and concerns. Their active and purely voluntary participation in the plan development process is very much appreciated. See Section 7.1 for a listing of Advisory Council affilations.

Technical Project Team

The Technical Project Team, led by the Regional Planning Biologist, is comprised of the ministry’s district Management Biologists from each administrative District located within the zone, an enforcement representative, a representative from the Northeast Regional Indigenous Relations Team, a Regional Fisheries Specialist and a Regional Aquatics

Science Specialist. Other technical advisors and subject matter experts were consulted during planning as required.

Steering Committee

The Steering Committee is comprised of the ministry's District Managers at each administrative District located within the zone as well as the Northeast Regional Resources Planning Supervisor. The Steering committee was consulted during key planning and decision points within the planning process.

Ministry Offices:

- Northeast Regional Office
- Timmins District
- Chapleau District
- Sault Ste. Marie District
- Sudbury District
- Wawa District
- Kirkland Lake

Glossary

Abundance – A measure of how many fish are in a population or a fishing ground.

Adaptive management – A systematic process for continually improving management policies and practices by learning from the outcomes of previously employed policies and practices.

Aquatic biodiversity Habitat Inventory (AHI) – A database of lake survey information for lakes surveyed from the sixties to the late eighties including physical data, water chemistry and species information.

Biodiversity – The variation of life forms within an area. In the context of fisheries, the number and variety of organisms found within a fishery.

Biomass – The total weight of a fish species in a given area. Can be measured as the total weight in kilograms or tonnes of a stock in a fishery or can be measured by area (e.g. per hectare).

Catch per unit Effort (CUE) – CUE is an indirect measure of the relative abundance of a target species. Changes in the catch per unit effort are inferred to signify changes to the target species' true abundance. A decreasing CPUE indicates a declining population, while an unchanging CPUE indicates a sustained abundance.

Climate Change – Any change in climate over time due to natural variability or as a result of human activity.

Cohort – Group of fish born in the same year within a population or stock.

Commercial Fishery – An umbrella term covering the process of catching and marketing fish. It includes the fishermen and their boats, and all activities and resources involved in harvesting, processing, and selling.

Creel Surveys – The term creel survey is applied to sampling surveys that target recreational anglers. Traditionally, the survey is conducted on-site at access points along the water and the angler is asked about the fish species that have been targeted, the numbers of each species caught and released, and the time spent fishing. These data are used to estimate the total catch and effort for that recreational fishery in order to manage its harvest. Additionally, other measures such as catch per unit effort are used to assess qualities of the fishery that lead to angler satisfaction with his/her recreational experience. Anglers can also be contacted by other means, such as by

telephone or mail, and may also be asked other questions, such as those related to economic expenditures.

Crown Forest Sustainability Act (CFSA) – Sustainable forest resource management legislation mandated by the Ministry of Natural Resources and Forestry.

Depletion – Reducing the abundance of a fish stock through fishing.

Ecological Framework for Fisheries Management (EFFM) – Operational framework that provides the building blocks for improving the way in which recreational fisheries are managed in Ontario.

Endangered species – A species is classified as endangered if it lives in the wild in Ontario but is facing imminent extinction or extirpation.

Endangered Species Act (ESA) – Endangered species legislation mandated by the Ministry of Environment, Conservation and Parks

Environmental Assessment Act (EA Act) – Environmental assessment legislation mandated by the Ministry of Environment Conservation and Parks.

Environmental Registry (ER) – The Environmental Registry contains "public notices" about environmental matters being proposed by all government ministries covered by the Environmental Bill of Rights. The public notices may contain information about proposed new laws, regulations, policies and programs or about proposals to change or eliminate existing ones.

Fall Walleye Index Netting (FWIN) – Standardized method for the collection of biological information to support management of a percid fishery dominated by walleye. This is a fisheries independent data collection survey that captures data including: estimates of relative abundance (# and kg), size distribution, age distribution, mortality, growth and condition, sex ratio, maturity and reproductive characteristics (# eggs, gonadosomatic index)

Fish – Any of various cold-blooded, aquatic vertebrates, having gills, commonly fins, and typically an elongated body covered with scales; the term "fish" can refer to more than one fish, particularly when the fish are from the same species; the term "fishes" refers to more than one species of fish.

Fish and Wildlife Conservation Act (FWCA) – Fish and wildlife legislation mandated by the Ministry of Natural Resources and Forestry.

Fish stocking – The practice of raising fish in a hatchery and releasing them into a waterbody to supplement existing populations, or to create a population where none exists. Stocking may be done for the benefit of fishing and to restore or increase a population of threatened or endangered fish in a body of water.

Fisheries Act (FA) – Fisheries legislation mandated by Fisheries and Oceans Canada

Fishery – Activities leading to and resulting in the harvesting of fish. It may involve capture of wild fish or raising of fish through aquaculture. A fishery is characterized by the people fishing, the species caught, the fishing gear used, and the area of operation.

Fishery Management Zone (FMZ) – The designated geographic unit for fisheries assessment, monitoring, planning and management in Ontario.

Fork length – In fishes with forked tails, this standard measure is from the tip of the snout to the fork of the tail. It is used in fishes when is difficult to tell where the vertebral column ends.

Gillnet – Fishing nets constructed so that fish are entangled or enmeshed, usually in the gills, by the netting. According to their design, ballasting and buoyancy, these nets can be used to fish on the surface, in mid-water or on the bottom. The mesh size of the net determines the size of fish caught, since smaller fish can swim through the mesh.

Habitat – The place where an organism lives.

Harvest – The number or weight of fish caught and retained from a given area over a given period of time.

Hatchery – The process of cultivating and breeding a large number of fish in an enclosed environment. The fish are then released into lakes, rivers or fish farm enclosures.

Impact – In climate change; the effects of existing and projected changes in climate in natural, built, and human systems.

Incidental catch – The catch of non-fish species, caught in the course of commercial fishing practices. Examples of non-fish species are birds, and mammals and reptiles, such as turtles. Incidental mortality can be contrasted with bycatch, which is a general term for the catch of all fish and non-fish species other than the targeted species.

Introduced species – Species brought into an area where it does not naturally occur but is able to survive and reproduce there.

Invertebrates – Animals without a backbone, such as insects. See also vertebrates.

Juvenile – A young fish or animal that has not reached sexual maturity.

Lakes and Rivers Improvement Act (LRIA) – Lakes and rivers sustainable development and use legislation mandated by the Ministry of Natural Resources and Forestry.

Littoral – The shallow water region around the lake where significant light penetrates to the bottom. Typically occupied by rooted plants.

Mark and recapture – Marking or attaching a tag to a fish so that it can be identified on recapture. Used for the study of fish growth, movement, migration, and stock structure and size.

Maximum sustainable yield (MSY) – The maximum harvest that can be taken from a species' stock over an indefinite period. Under the assumption of logistic growth, the MSY will be exactly at half the carrying capacity of a species, as this is the stage at when population growth is highest. The maximum sustainable yield is usually higher than the optimum sustainable yield. Studies have shown that fishing at the level of MSY is often not sustainable.

Mitigation – Actions to reduce or minimize risk; in fisheries management: Application of fishing regulations, restoring or enhancing fish habitat, etc.; in climate change: Actions to reduce the sources or enhance the sinks of greenhouse gases.

Model (population) – A hypothesis of how a fish population function. It often uses mathematical descriptions of growth, recruitment and mortality.

Mortality – Mortality is a death rate from various causes, such as the proportion of a fish stock dying annually.

NA1 – North American net gear described by Bonar et al. (2009). Also called “Large mesh” gillnet that target fish larger than 20 cm in length (the size range of interest to anglers).

Naturally Resourceful – Ministry of Natural Resoruces and Forestry strategic direction document.

Nursery – Habitat that supports congregations of larval and/or juvenile fish.

ON2 – Ontario small mesh gear described in Sandstrom et al. (2013). Also called “Small mesh” gillnet that target smaller fish (size range of interest to large fish).

Ontario Biodiversity Strategy (OBS) – Ministry of Natural Resources and Forestry strategic direction document.

Overfishing – Occurs when fishing activities reduce fish stocks below an acceptable level. This can occur in any body of water from a pond to the oceans.

Phosphate – A chemical compound containing phosphorus and oxygen, naturally occurring in the ecosystem but also commonly found in agricultural fertilizers and land runoff. A nutrient in the aquatic ecosystem that limits productivity.

Plankton – Consist of any drifting organisms (animals or plants) that inhabit the open water or pelagic zones, particularly the surface areas of bodies of water.

Population – A specific portion of the fish population being studied (e.g. spawning adult portion of a walleye population may be referred to as “spawning stock”). Often referred to as a fish stock.

Precautionary principle – A moral and political principle which states that if an action or policy might cause severe or irreversible harm to the public or to the environment, in the absence of a scientific consensus that harm would not ensue, the burden of proof falls on those who would advocate taking the action.

Public Lands Act (PLA) – Crown land resource use legislation mandated by the Ministry of Natural Resources and Forestry.

Put-Grow-Take (PGT) – A form of fish stocking where small fish (either fry or yearlings) are stocked into a lake or stream with the intent that they grow to larger size and are caught by anglers. There is no intent to create a self-sustaining population with this approach.

Recruitment – The number of new young fish that enter a population in a given year. More pragmatically, it can be defined as the number of young fish that attain a size where they can be legally caught or become susceptible to being caught by a given fishing gear.

Recreational fishery – Fishing for sport or competition; fishing that does not constitute the individual’s primary resource to meet nutritional needs and are not generally sold or otherwise traded on export or domestic markets.

Remote – Situated far from the main centers of population.

Relative abundance – An index of fish population abundance used to compare fish populations from year to year. This does not measure the actual numbers of fish but shows changes in the population over time.

Sample – A portion of a fish stock which is removed for study, and which ideally is representative of the whole. The greater the number and size of the samples, the greater the confidence that the information obtained accurately reflects the status (such as abundance by number or weight, or age composition) of the stock.

Secchi disk – Used to gauge the transparency of water by measuring the depth at which the disk (black and white) ceases to be visible from the surface. As a general guideline, typical Secchi depth readings for low productivity lakes are greater than 5m, medium-productivity lakes range between 2m and 5m depths, and highly productive lakes are generally less than 2m in depth.

Selectivity – Ability of a type of fishing tackle or gear to catch a certain size or kind of fish, compared with its ability to catch other sizes or kinds.

Sensitivity – The degree to which a system is affected when exposed to a stress.

Shoal – A somewhat linear landform within or extending into a body of water, typically composed of sand, silt or small pebbles.

Spawning – The act of reproduction by fish. The deposition and fertilization of eggs in water.

Species – A group of organisms capable of interbreeding and producing fertile offspring.

Stakeholder – Anyone who has a stake or interest in the outcome of the project, as well as anyone one who is affected by the project.

Statement of Environmental Values (SEVs) – The Ministry's statement of environmental values and guiding principles to be considered as part of the resource management decision making process.

Stock – A specific portion of the fish population being studied (e.g. spawning adult portion of a walleye population may be referred to as "spawning stock"); Often referred to as population.

Sustainable yield – Sustainable yield is the catch that can be removed over an indefinite period without causing the stock to be depleted. This could be either a

constant yield from year to year, or a yield which is allowed to fluctuate in response to changes in abundance.

Thermocline – The narrow zone of rapid temperature change that separates the warm surface layer of water from the cold, deeper layer. During the summer, this separates the cool water habitat of the lake (known as the epilimnion) from the cold-water habitat (known as the hypolimnion).

Threatened species – A species is classified as a threatened species if it lives in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address factors threatening to lead to its extinction or extirpation.

Viral Hemorrhagic Septicemia (VHS) – VHS is an infectious disease of fish. The Great Lakes strain of the virus affects or is carried by many species of fish including: game fish and baitfish (i.e. walleye, emerald shiners,yellow perch, bluntnose minnows, muskellunge, spottail shiners, smallmouth bass, rock bass, along with other species such as Chinook salmon, freshwater drum, black crappie, round goby, white bass, and gizzard shad.

Wild fish – Are fish which live free, not penned in, in lakes or rivers. They can be contrasted with farmed/hatchery-raised fish.

Year Class – The production from a fishery in terms of numbers or weight