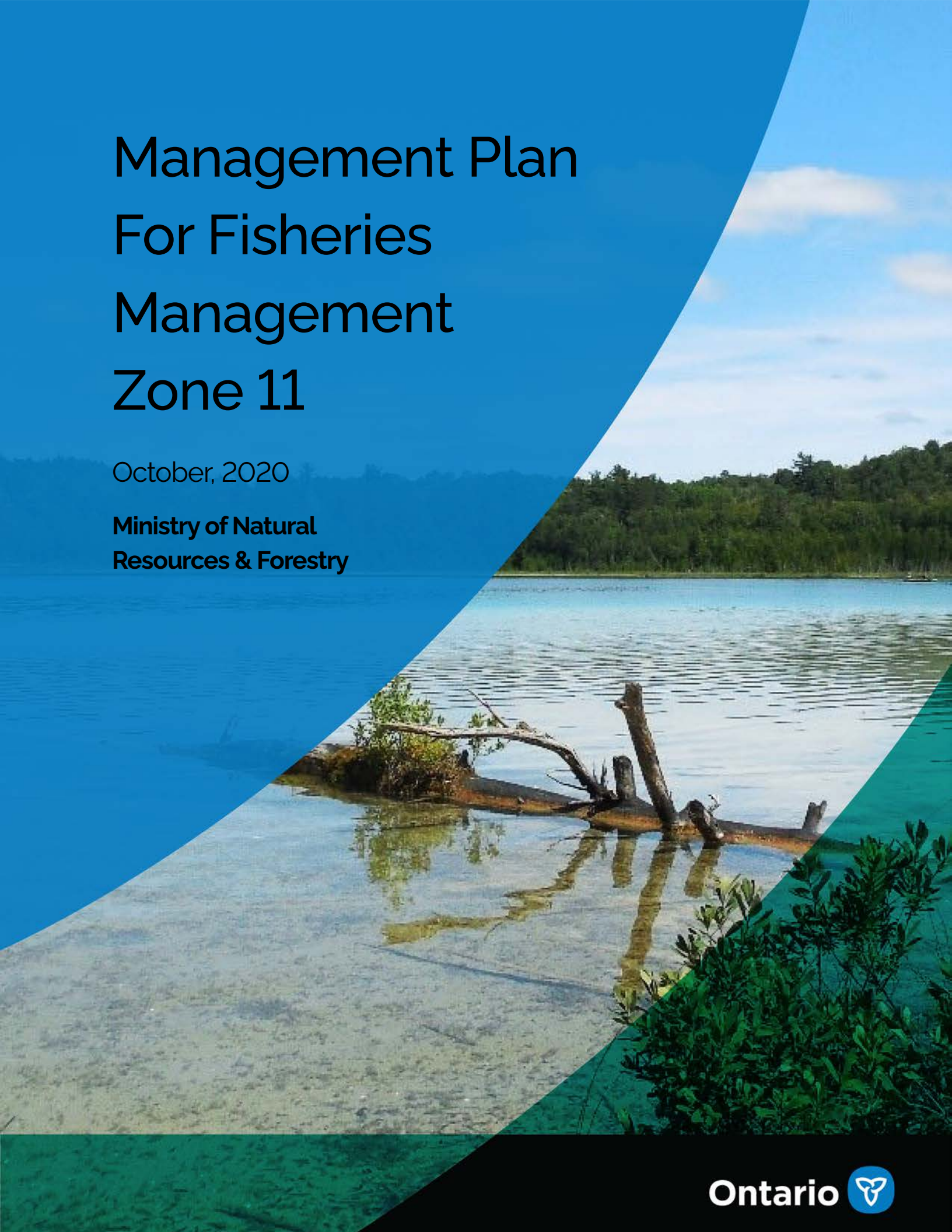
Management Plan For Fisheries Management Zone 11

October, 2020

Ministry of Natural Resources & Forestry



Ontario

Management Plan for Fisheries Management Zone 11

Encompassing portions of the Ontario Ministry of natural Resources and Forestry Administrative districts of North Bay, Kirkland Lake, Sudbury, Parry Sound and Pembroke.

I certify that this plan has been prepared using the best available science and is consistent with accepted fisheries management principles. I further certify that this plan is consistent with the Ontario Ministry of Natural resources and Forestry strategic direction, the Ontario Ministry of natural resources and Forestry Statement of Environmental Values and direction from other sources. Thus, I recommend this fisheries management plan be approved for Implementation.

Prepared and submitted by:

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We would like to thank all members of the Advisory Council for the many hours they spent informing this plan in order to support fisheries sustainability within Fisheries Management Zone 11. We would also like to acknowledge the significant contributions from former Ministry of Natural Resources and Forestry staff who pioneered both the supporting science and the management plan. Particularly the biologists and technicians from the North Bay district - we thank you for your professional expertise and commitment to excellence in natural resource management.

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Executive summary

The management plan for Fisheries Management Zone 11 (FMZ 11) is intended to outline the status of the fisheries in the zone, describe management objectives and provide direction for management actions.

Fisheries management planning is a key component of recreational fisheries management in Ontario. This operational framework provides the building blocks for improving the way recreational fisheries are managed in Ontario. Fisheries management planning is consistent with the Ministry of Natural Resources and Forestry's (MNRF) current five-year strategic plan, Naturally Resourceful, and the goals and objectives of the Ontario Biodiversity Strategy. It is also aligned with the fisheries policy principles stated in Ontario's current Provincial Fish Strategy– Fish for the Future.

The plan identifies monitoring that will take place to ensure that progress is being made towards meeting the management objectives and targets. The plan is a dynamic document designed to be flexible and adaptable to a wide range of future conditions and will be amended as required, with assistance from the Advisory Council and Indigenous Communities.

Purpose and scope of the plan

The FMZ 11 Management Plan was developed by MNRF with input and advice from the FMZ 11 Advisory Council, which is made up of a group of anglers, stakeholders, researchers, and interested community members. Input and advice were also sought from Indigenous communities whose traditional territories fall within the zone landscape. The planning area extends from Temiskaming Shores in the north to Trout Creek and the northern boundary of Algonquin Park in the south. The eastern boundary is the Ottawa River south of Mattawa and extends west to Highway 69, south of the French River (Figure 1).

The fisheries management plan identifies management strategies and proposes actions to meet the stated goals and objectives. The plan also documents and describes recreational fishing regulation changes that were implemented January 1st, 2020, based on advice from the FMZ advisory council and following broad

consultation during 2018/19. The intent of the plan is to assist MNRF in balancing the demands placed on the resource with the biological capacity of the supporting ecosystems. This balance is based on analysis of fisheries data and collaborative discussions with members of the public, government and partner agencies, Indigenous communities and non-governmental agencies.

Goal statements:

- Fish Populations: Manage for the improvement of fisheries, including healthy natural fish populations, beyond a minimally sustainable condition; enhance harvest and recreational usage while providing a safe food source.
- Aquatic Ecosystems: While minimizing the risk of invasive species, maintain healthy aquatic ecosystems and restore damaged aquatic ecosystems.
- 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.
- Socio-Economic: Provide diverse ways for users to experience and interact with resources and support a fair valuation of the resources in order to promote socio-economic benefits from resource usage.

Management objectives:

The management plan is comprised of a series of broad management strategies that reflect management priorities within the zone. Each strategy identifies management issues, challenges, present status, and associated objectives and management actions for the following:

- Management of Walleye, Lake Trout, Smallmouth and Largemouth Bass, Brook Trout, Northern Pike and Muskellunge
- Fish stocking
- Ecosystem changes
- Fish habitat
- Water levels

These strategies, although target-specific, are largely consistent with the following objectives:

- To increase or maintain fish abundance

- To develop a habitat protection and restoration strategy

To increase public awareness of fisheries management

- To work with partners to provide sustainable fishing opportunities
- To prevent the arrival, establishment and/or spread of non-native and invasive species

Walleye management

The current Walleye regulations (four fish, none between 43cm and 60cm, not more than one over 60cm) initiated in 2008 were implemented in order to support population stability and an increase of fish of preferred sizes. After careful review, the decision was made to retain the current recreational angling Walleye regulations, but also to commit to ongoing review of Walleye monitoring data as it becomes available to inform future management actions.

Lake trout management

The status of natural Lake Trout waters in the zone is poor and has been characterized as unhealthy for decades. The Plan objectives for Lake Trout are thus to increase overall abundance, and specifically, to increase the abundance of adult Lake Trout within the zone. The plan describes actions implemented to achieve these objectives through modification of Lake Trout seasons and limits. The regulation change also included a size restriction on natural and diversionary lakes, with the restriction determined by the known growth rates of Lake Trout within a waterbody. Lake Temagami will also have a catch and release season during the month of September. Listed below are the former regulations and regulation changes implemented January 1st, 2020 for Lake Trout:

Items	Former regulations	Regulation change
Season	February 15 to third Sunday in March and third Saturday in May to September 30.	February 15 to third Sunday in March and third Saturday in May to Labour Day.
Limits	S-2 and C-1	S-2; not more than 1 greater than 40 cm, and C-1
Limit exception – Cross Lake, Kokoko Lake, Diamond Lake and Makobe Lake	S-2 and C-1	S-2; not more than 1 greater than 50 cm, and C-1
Season and limit exception – Lake Temagami	Limits: S-2 and C-1 Season: February 15 to third Sunday in March and third Saturday in May to September 30.	Limits: S-2; not more than 1 greater than 50 cm, and C-1 Regular season: February 15 to third Sunday in March and third Saturday in May to labour day. Catch and release season: Day after Labour day to September 30.Limits: S-0 and C-0
Obabika Lake	Fish sanctuary – closed all year	Remove fish sanctuary. Season: same as zone Limit: S-1 and C-0
Cut and McConnell Lakes	Fish sanctuary – no fishing from January 1 to April 30 and October 1 to December 31. Live fish may not be used as bait.	Fish sanctuary – no fishing from January 1 to Friday before the third Saturday in May and day after Labour day to December 31. Live fish may not be used as bait.

(S) – sports licence; (C) – conservation licence

Brook trout

The losses of natural and stocked Brook Trout lakes in the zone and regionally 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 inability to compete with introduced species, as well as a dependence on up-welling, cold-water springs for spawning, have made natural populations of Brook Trout very susceptible to decline and even local extirpation. The proposed regulations retain the present season, and catch limits on natural Brook Trout lakes, but will prohibit the use of live baitfish in these waterbodies. The proposed baitfish restrictions on natural brook trout lakes in FMZ 11 is anticipated to take effect in 2022 – 2024 and is consistant with the 2020 release of Ontario's Sustainable Bait Management Strategy. The former size restriction was removed from lakes identified as "Additional Opportunities" in order to enhance opportunities for anglers in these waterbodies. Listed below are the current regulations and recommended regulation changes for Brook Trout:

Items	**Former regulation** natural & diversionary Lakes	**Anticipated regulation change** natural & diversionary Lakes	**Former regulation** additional opportunities	**Regulation change** additional opportunities
Season	February 15 to September 30	No change	Open all year	Open all year
Catch	S-5 and C-2	No change	S-5 and C-2	S-5 and C-2
Size	1>31cm (S); 0-over 31cm (C)	No change	1>31cm (S); 0-over 31cm (C)	No size restriction
Bait	No restrictions	No live baitfish	No restrictions	No restrictions

Largemouth and smallmouth bass management

Populations of Largemouth and Smallmouth Bass are considered healthy and stable within the zone, and projected to continue their growth into the future, creating additional resource competition with other sportfish within the zone. Thus, the

regulatory change to the angling season now aligns with the Walleye and Northern Pike seasons, to simplify existing regulations, as well as to permit additional harvest opportunities. Listed below are the former regulations and the regulation changes for Smallmouth and Largemouth Bass:

Items	Former regulation	Regulation change
Season	Fourth Saturday in June to December 31.	January 1 to third Sunday in March third Saturday in May to December 31.
Catch	S-6 and C-2	S-6 and C-2
Size	None	None
Obabika Lake	S-2 and C-1	Consistent with zone wide regualtions

Northern pike management

Although limited information was available for an in-depth review of Northern Pike status within FMZ 11, the Advisory Council and MNRF recommended that present regulations are suitable to meet the plan objectives. Listed below are the former regulations and the regulation changes for Northern Pike on Obabika Lake:

Items	Former regulation	Regulation change
Obabika Lake	S-2; only 1 >86cm, and C-1; must be < 86 cm	Consistent with zone wide regulations.

Muskellunge management

Muskellunge (muskie) regulations are to remain largely unchanged across FMZ 11, however, the season exception on the French River was removed in order to provide protection during spawning for these populations and to align the season across the zone. Enhanced information-gathering is also being promoted within the Plan, along with water management reviews that may benefit fish habitat for muskie. The change to the French River season is described below:

Items	Former regulation	Regulation change
French River	Open first Saturday in June to December 15	Open third Saturday in June to December 15 (consistent with zone wide season).

Fish stocking

The appropriate use of fish stocking as a management tool is directed by the Guidelines for the Stocking of Inland Lakes (2002). The Plan summarizes these guidelines and supports the practice that natural reproduction of fish populations will remain the primary strategy for management within FMZ 11, with enhancements via Put-Grow-Take (PGT) stocking to create fisheries exclusively for public enjoyment. The use of salmonid PGT lakes creates diversionary fisheries which reduce the harvest pressure on naturally reproducing populations. However, there are limited opportunities to expand PGT salmonid stocking in the zone, due to the finite availability of suitable habitat and compatible aquatic community structure, and the plan is realistic about these limitations. Supplemental stocking, or stocking on top of natural populations, has been found to be ineffective to support population recruitment and is discouraged.

Ecosystem changes

This section identifies and addresses species at risk, invasive species concerns, and human-induced habitat change within the zone. 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. Acid precipitation effects are addressed as well.

Fish habitat

Fish habitat protection is a necessity where proponents of development projects are working in water or along the shoreline. The plan outlines objectives and strategies to ensure habitat protection through avoidance and mitigation of potential impacts during the review and approvals of these proposals, in accordance with the Fisheries Act (R.S.C. 1985).

Water levels

There are several managed watercourses within FMZ 11, that are regulated by water control structures set at varying temporal flow and level compliance points. The plan recognizes that these structures range from direct power production to flood control, and maintenance of recreational water levels that benefit the public.

Sustaining water resources and their hydrological function, as well as maintaining water quality and quantity to sustain aquatic life, is the most socio-economically effective approach to long-term resource management and to mitigate or prevent cumulative impacts.

Review and amendment

The FMZ 11 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. Results of the review will be reported back to the FMZ 11 Advisory Council and the public. Amendment of the plan can occur prior to or because of a comprehensive review following the adaptive management approach. It is anticipated that amendments to the plan will only occur if there is a significant management issue (i.e. stemming from monitoring and assessment results or other empirical data which suggest that action is required).

Résumé de direction

Le Plan de gestion de la zone de gestion des pêches 11 (ZGP 11) a été établi pour décrire l'état des pêches dans la zone, décrire les objectifs de gestion et donner une orientation aux mesures de gestion.

La planification de la gestion des pêches est une composante essentielle de la gestion de la pêche sportive en Ontario. Ce cadre opérationnel fournit les assises nécessaires à l'amélioration de la gestion de la pêche sportive en Ontario. La planification de la gestion des pêches est conforme au plan stratégique quinquennal actuel du ministère des Richesses naturelles et des Forêts (MRNF), Naturally Resourceful. Elle est aussi conforme aux objectifs de la Stratégie de la biodiversité de l'Ontario. Cette planification s'aligne sur les principes de la politique des pêches énoncés dans le document à jour Politique stratégique provinciale relative à la pêche pour l'Ontario : assurer la pérennité des ressources halieutiques.

Le plan détermine le type de surveillance qui sera utilisé pour s'assurer que des progrès vers la concrétisation des objectifs et des cibles de gestion sont réalisés. Le plan est un document dynamique. Il est conçu pour être flexible et s'adapter à un grand ensemble de conditions pouvant survenir dans le futur. Il sera modifié au besoin avec l'aide du conseil consultatif et des communautés autochtones.

Utilité et portée du Plan

Le plan de gestion de la ZGP 11 a été développé par le MRNF et le conseil consultatif du ZGP 11 y a apporté sa contribution. Ce conseil se compose d'un groupe de pêcheurs, d'intervenants, de chercheurs et de membres de la communauté qui s'intéressent à ces questions. Des avis et des conseils ont aussi été demandés aux communautés autochtones dont certains territoires traditionnels touchent la zone. La zone de planification s'étend, au nord, des berges de Temiskaming à Trout Creek, et à la frontière nord du parc Algonquin, au sud. À l'est, la limite se situe à la rivière des Outaouais au sud de Mattawa, et elle s'étend vers l'ouest jusqu'à la route 69, au sud de la rivière des Français (Figure 1).

Le plan de gestion des pêches établit les stratégies de gestion et propose des mesures permettant de concrétiser les objectifs énoncés. Le plan documente et décrit également les modifications apportées à la réglementation de la pêche sportive qui ont été mises en œuvre le 1er janvier 2020 en fonction des options proposées dans la version provisoire de ce plan et des consultations menées sur ce plan provisoire en 2018-2019. L'objectif du plan est d'aider le MRNF à équilibrer la demande sur les ressources avec la capacité biologique des écosystèmes dans lesquels ces ressources vivent. Cet équilibre est fondé sur l'analyse des données portant sur les pêches et sur des discussions avec la population, des organismes gouvernementaux et partenaires, des communautés autochtones et des organismes non gouvernementaux.

Énoncé des objectifs :

- Populations de poissons : Faire une gestion qui favorise l'amélioration des pêches – y compris le maintien de populations naturelles de poissons qui sont sains – en les amenant au-delà d'une condition durable (au minimum), améliorer la récolte et l'utilisation récréative tout en fournissant une source de nourriture salubre.
- Écosystèmes aquatiques : Tout en réduisant les risques d'apparition d'espèces envahissantes au minimum, maintenir des écosystèmes aquatiques sains et restaurer les écosystèmes aquatiques endommagés.
- Éducation : Améliorer le respect du grand public pour les ressources naturelles, sa sensibilisation aux pratiques éthiques touchant les écosystèmes aquatiques et sa connaissance des principes et pratiques réglementaires.
- Socio-économique : Fournir aux utilisateurs différents moyens pour approcher, utiliser et interagir avec les ressources, et soutenir une évaluation

équitable des ressources afin de faire la promotion des avantages socio-économiques de l'utilisation des ressources.

Objectifs de gestion :

Le plan de gestion comprend un ensemble de grandes stratégies de gestion qui mettent en relief les priorités de gestion au sein de la zone. Chaque stratégie établit les problèmes de gestion, les défis, la situation actuelle ainsi que les objectifs et mesures de gestion associés pour les éléments suivants :

- Gestion du doré, de la truite grise, de l'achigan à petite bouche et à grande bouche, de l'omble de fontaine, du grand brochet et du maskinongé.
- Ensemencement de poissons.
- Modification des écosystèmes.
- Habitat du poisson.
- Niveau de l'eau.

Ces stratégies, bien qu'elles ciblent un objectif en particulier, sont conformes aux objectifs suivants :

- Augmenter ou maintenir l'abondance des poissons.
- Développer une stratégie de protection et de restauration de l'habitat.
- Augmenter la sensibilisation de la population à la gestion des pêches.
- Collaborer avec des partenaires pour offrir des possibilités de pêche durables.
- Empêcher l'arrivée, l'établissement et/ou la propagation d'espèces étrangères envahissantes.

Gestion du doré

Le règlement actuel sur le doré (quatre poissons; aucun entre 43 cm et 60 cm; pas plus d'un [1] de plus de 60 cm) a été mis en place en 2008 afin de soutenir la stabilité de la population et augmenter la quantité de poissons de taille voulue. Après un examen détaillé, les règlements actuels de la pêche récréative du doré seront conservés pour le moment, mais un examen permanent des données de surveillance du doré devra être réalisé à mesure que ces données deviennent disponibles afin d'éclairer les futures mesures de gestion.

Gestion de la truite grise

L'état des eaux naturelles de la truite grise dans la zone est médiocre et ces eaux sont considérées comme insalubres depuis des décennies. Les objectifs du Plan

pour la truite grise sont donc d'augmenter l'abondance globale, et plus particulièrement d'augmenter l'abondance des truites grises adultes dans la zone. Le plan décrit les mesures mises en œuvre pour concrétiser ces objectifs par la modification de la saison de pêche et des limites relatives à la truite grise. La modification du règlement était accompagnée par une restriction portant sur la taille dans les lacs naturels et de dérivation – la restriction sera déterminée par le taux de croissance connu de la truite grise dans un plan d'eau. Le lac Temagami profitera d'une saison de capture et de remise à l'eau pendant le mois de septembre. Voici la liste des anciens règlements pour la truite grise et les modifications mises en œuvre le 1er janvier 2020 :

Article	**Anciens règlements**	**Modification du règlement**
Saison	Du 15 février au 3e dimanche de mars et du 3e samedi de mai au 30 septembre.	Du 15 février au 3e dimanche de mars et du 3e samedi de mai jusqu'à la fête du Travail.
Limites	S-2 et C-1.	S-2; pas plus d'une (1) prise dont la taille dépasse 40 cm, et C-1.
Exceptions aux limites – lac Cross, lac Kokoko, lac Diamond et lac Makobe	S-2 et C-1.	S-2; pas plus d'une (1) prise dont la taille dépasse 50 cm, et C-1.
Exception pour la saison et les limites – Lac Temagami	Limites : S-2 et C-1. Saison : Du 15 février au 3e dimanche de mars et du 3e samedi de mai au 30 septembre.	Limites : S-2; pas plus d'une (1) prise dont la taille dépasse 50 cm, et C-1. Saison normale : du 15 février au 3e dimanche de mars et du 3e samedi de mai à la fête du Travail.

		Saison de capture et de remise à l'eau : du jour suivant la fête du Travail au 30 septembre. Limites : S-0 et C-0.
Lac Obabika	Refuge ichtyologique – Fermé toute l'année	Retrait du refuge ichtyologique. Saison : similaire à celle de la zone. Limite : S-1 et C-0.
Lacs Cut et McConnell	Refuge ichtyologique – aucune pêche permise du 1er janvier au 30 avril et du 1er octobre au 31 décembre. Les poissons vivants ne peuvent pas être utilisés comme appâts.	Refuge ichtyologique – aucune pêche permise du 1er janvier au vendredi précédant le troisième samedi de mai et du lendemain de la fête du Travail au 31 décembre. Les poissons vivants ne peuvent pas être utilisés comme appâts.

(S) – permis de sport; (C) – permis de conservation

Omble de fontaine

Les pertes d'ombles de fontaine dans les lacs naturels et ensemencés de la zone, et à l'échelle régionale, sont importantes. Dans plusieurs cas, on pense qu'elles sont dues à la propagation de nouvelles espèces par différents moyens, mais plus particulièrement par l'utilisation de poissons vivants comme appâts. L'incapacité de concurrencer les espèces étrangères et la dépendance à l'égard des sources d'eau froide pour le frai ont rendu les populations naturelles d'omble de fontaine très vulnérable au déclin, voire à la disparition locale. Les règlements actuels ont été conçus pour soutenir la résilience des populations et améliorer la qualité de la pêche. Le règlement proposé maintient la même saison et les mêmes limites de prises sur les lacs naturels à ombles de fontaine, mais interdira l'utilisation des poissons vivants comme appâts dans ces plans d'eau. Les restrictions proposées concernant l'utilisation de poissons comme appâts dans les lacs naturels à ombles de fontaine dans la ZGP 11 sont conformes à la Stratégie ontarienne de gestion durable des appâts (2020). Ce règlement devrait entrer en vigueur en 2022-2023. L'ancienne restriction de taille a été supprimée (janvier 2020) des lacs

désignés comme « possibilités supplémentaires » afin d'améliorer les possibilités pour les pêcheurs sportifs dans ces plans d'eau. Voici des règlements actuels et les modifications réglementaires recommandées pour l'omble de fontaine :

Article	**Ancien règlement** Lacs naturels et de dérivation	**Modification du règlement** Lacs naturels et de dérivation	**Ancien règlement** Possibilités supplémentaires	**Modification du règlement** Possibilités supplémentaires
Saison	Du 15 février au 30 septembre	Aucun changement	Ouvert à l'année	Ouvert à l'année
Prises	S-5 et C-2	Aucun changement	S-5 et C-2	S-5 et C-2
Taille	1 > 31 cm (S); 0 de plus de 31 cm (C)	Aucun changement	1 > 31 cm (S); 0 de plus de 31 cm (C)	Aucune restriction de taille
Appâts	Aucune restriction	Aucun poisson vivant comme appât	Aucune restriction	Aucune restriction

Gestion des achigans à grande bouche et à petite bouche

Les populations d'achigans à grande bouche et d'achigans à petite bouche sont considérées comme saines et stables dans la zone. Elles devraient poursuivre leur croissance dans le futur, ce qui créera une concurrence supplémentaire avec les autres poissons de pêche sportive dans la zone. Ainsi, le changement réglementaire touchant la saison de pêche s'aligne maintenant sur la saison du doré et du grand brochet. Il vient en outre simplifier les règlements en place et permettre des possibilités de récolte supplémentaires. Voici la liste des anciens règlements pour les achigans à petite bouche et à grande bouche, et les modifications :

Article	**Ancien règlement**	**Modification du règlement**
Saison	4e samedi de juin au 31 décembre.	Du 1er janvier au 3e dimanche de mars et du 3e samedi de mai au 31 décembre.

Prises	S-6 et C-2	S-6 et C-2
Taille	Aucun	Aucun
Lac Obabika	S-2 et C-1.	Cohérent avec les règlements en place pour l'ensemble de la zone.

Gestion du grand brochet

Les informations dont nous disposons pour mener un examen approfondi de l'état du grand brochet dans la ZGP 11 sont limitées, mais le Conseil consultatif et le MRNF ont recommandé que les règlements en place soient adaptés de manière à s'harmoniser avec les objectifs du plan. Voici la liste des anciens règlements pour le grand brochet du lac Obabika et les modifications :

Article	**Ancien règlement**	**Modification du règlement**
Lac Obabika	S-2; maximum de 1 > 86 cm, et C-1; doivent être < 86 cm.	Cohérent avec les règlements en place pour l'ensemble de la zone.

Gestion du maskinongé

Les règlements encadrant la gestion du maskinongé resteront en grande partie inchangés dans la ZGP 11, toutefois, les exceptions qui étaient en vigueur dans la rivière des Français ont été supprimées afin d'assurer la protection de cette population pendant le frai et d'aligner les saisons dans la zone. Le Plan favorise d'ailleurs la mise en place d'une meilleure collecte d'information ainsi que des examens de la gestion de l'eau qui pourraient être profitables pour l'habitat du maskinongé. Voici les changements pour la saison dans la rivière des Français :

Article	**Ancien règlement**	**Modification du règlement**
Rivière des Français	Ouvre le 1er samedi de juin et va jusqu'au 15 décembre.	Ouvre le 3e samedi de juin et va jusqu'au 15 décembre (cohérent avec la saison en place pour l'ensemble de la zone).

Ensemencement de poissons

L'utilisation appropriée de l'ensemencement de poissons comme outil de gestion est soumise aux Lignes directrices pour l'ensemencement des lacs intérieurs

(2002). Le plan résume ces lignes directrices et soutient une approche de reproduction naturelle pour les populations de poissons comme principale stratégie de gestion au sein de la ZGP 11. Il soutient toutefois l'intégration de certaines améliorations provenant d'une approche « empoissonnement-croissance-prise » (ECP) pour créer des pêcheries exclusivement destinées au public. L'utilisation de l'ECP dans les lacs de salmonidés permet de créer des pêcheries de diversion qui réduisent la pression des récoltes sur les populations qui se reproduisent de manière naturelle. Toutefois, les possibilités d'augmenter la présence de salmonidés par l'ECP dans la zone sont limitées en raison de la disponibilité limitée d'un habitat convenable et d'une structure de communauté aquatique compatible; le plan est d'ailleurs réaliste au sujet de ces limites. L'ensemencement supplémentaire – ensemencement qui se fait en surplus des populations naturelles – s'est révélé inefficace pour soutenir le recrutement de la population et il est déconseillé.

Changements dans l'écosystème

Cette section établit quelles sont les espèces en péril, et traite des préoccupations relatives aux espèces envahissantes et des changements induits par l'homme dans les habitats de la zone. La surveillance de l'écosystème aquatique se fait par la mesure et la surveillance des indicateurs biologiques de changement. Ces indicateurs fournissent aux gestionnaires des ressources des renseignements portant sur les changements climatiques, les habitats et la qualité de l'eau. Ils réagissent en outre à l'évolution de l'utilisation des ressources qui est faite au fil du temps. Les effets des précipitations acides sont également mesurés.

Habitat du poisson

La protection de l'habitat du poisson devient une nécessité lorsque les promoteurs de projets de développement travaillent dans l'eau ou le long des berges. Le plan énonce les objectifs et les stratégies permettant d'assurer une protection de l'habitat par l'évitement ou l'atténuation des possibles conséquences lors de l'examen et de l'approbation de ces propositions, conformément à la *Loi sur les pêches (L.R.C. 1985).*

Niveau de l'eau

Il existe un certain nombre de cours d'eau gérés dans la ZGP 11, qui sont réglementés par des structures de contrôle de l'eau établies à des points de contrôle de conformité de la variation du débit et du niveau au fil du temps variables. Le plan reconnaît que ces structures vont de la production d'électricité

directe, au contrôle des inondations et au maintien de niveaux des plans d'eau récréatifs qui sont utilisés par la population. Le maintien des ressources en eau et de leur fonction hydrologique tout en maintenant la qualité de l'eau et la quantité nécessaires pour soutenir la vie aquatique représente l'approche socioéconomique la plus efficace pour une gestion des ressources à long terme et pour l'atténuation ou la prévention des effets cumulatifs.

Examen et modification

Le plan de la ZGP 11 sera réexaminé périodiquement afin d'évaluer l'avancement de la réalisation des objectifs de gestion et d'établir quelles sont les sections du plan de gestion qui exigent des mises à jour. Les résultats de l'examen seront transmis au Conseil consultatif du ZGP 11 et à la population. Une modification du plan peut intervenir avant un examen approfondi des effets d'une approche de gestion adaptative, ou comme conséquence d'un tel examen. Des modifications au plan ne seront apportées que s'il y a des problèmes de gestion importants (mis en relief par des résultats de surveillance et d'évaluation, ou autre).

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1.0 Introduction

In April 2015, the Ministry of Natural Resources and Forestry (MNRF) 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 (MNRF, 2015a). 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

MNRF manages natural 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 approaches for many species and their habitats, in the context of varied human activities and multiple stressors.

An ecosystem-based approach to management has long been advocated as the best way to address the complex resource management challenges associated with diverse and complex landscapes, whether terrestrial or aquatic. Moving toward this approach to managing Ontario's fisheries resources will mean shifting management to broader spatial scales, over longer time periods. It also requires acknowledgement of uncertainty. One of the greatest challenges of natural resources management is the absence of complete knowledge of natural systems. Decisions must therefore be based on the best available science and knowledge and reviewed periodically as the knowledge base improves. The Precautionary Principle guides this process, confirming 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.

Risk assessment is a tool that is used to help MNRF set priorities when addressing threats and identifying vulnerable species and communities. Vulnerability assessment supports risk assessment by evaluating the ecological or biological

mechanisms that prevent organisms, habitats and/or processes from coping with stress (ex. warming climate) beyond a certain tolerance range. It can help fisheries managers identify ways to reduce risks and impacts to fisheries resources and the people that depend on them.

Risk assessment must consider the cumulative effects of past, present and future developments. 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 may be additive (ex. impact of repeated activities in the same area over a period of time) or synergistic (ex. 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.

The planning process

Fisheries management planning is a risk-based tool that the ministry uses to plan for sustainable fisheries management. Fisheries management planning provides guidance for managing fisheries at multiple spatial and temporal scales. Planning is focused on ensuring the sustainability of fisheries and informs the allocation of fisheries resources within the planning area to provide a range of social, cultural and economic benefits.

This plan provides direction for the management of fisheries resources within Fisheries Management Zone 11 (FMZ 11). Management objectives and actions are presented to address specific fisheries management issues and challenges identified by the FMZ11 Advisory Council (AC) and MNRF during plan development.

The FMZ 11 AC provided invaluable advice to MNRF during the development of objectives, strategies, management options and selection of proposed management actions for the draft management plan.

In addition to receiving input from the FMZ 11 AC, where and when appropriate, the planning team connected with and sought input from adjacent fisheries management zone resource managers in order to ensure planning decisions were consistent with regional sustainable fisheries objectives.

The planning process provides the opportunity for Indigenous communities, stakeholders, local anglers, the tourism sector, environmental non-government organizations, municipalities, local business representatives, cottagers and the general public to:

- be apprised of the current status of key fish species and management challenges/issues associated with the management of FMZ 11;
- provide input into the development of the objectives and management actions contained within the plan; and
- provide input into the development of the objectives and management actions contained within the plan.

The intention of the planning process is to develop objectives that are measurable, achievable and support the long-term sustainability of the aquatic ecosystems and fisheries of the FMZ. This is achieved by compiling and analyzing relevant data, reviewing the available science, referencing provincial policies, guidelines and direction, and gathering input from stakeholders and Indigenous communities.

In addition to regular monitoring and reporting, there will be periodic reviews of the plan in order to track the state of the resource relative to the targets and objectives described herein. This plan is considered a living document that can be amended on an as-needed basis.

2.0 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 MNRF.

The protection of fish and fish habitat is a responsibility of the federal government. DFO uses the federal Fisheries Act to protect fish and fish habitat against harmful alteration, disruption or destruction. DFO has created a Fish and Fish Habitat

Protection Policy Statement that outlines how DFO and its regulatory partners (including MNRF) will apply the Fish and Fish Habitat Protection and Pollution Prevention Provisions of the Fisheries Act, guide the development of regulations, standards and directives, and provide guidance to proponents of projects.

MNRF 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, MNRF 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.

Other federal and provincial laws and national and international agreements also touch on the management of fish, fisheries and their supporting ecosystems in Ontario. Examples include *Ontario's Lakes and Rivers Improvement Act, Crown Forest Sustainability Act, Public Lands Act, Provincial Parks and Conservation Reserves Act, Environmental Assessment Act* and *Planning Act*. For example, under the *Crown Forest Sustainability Act*, forestry operations must follow Forest Management Plans and adhere to site-specific environmental protection requirements in and around water to protect fish and fish habitat. Another example is land use planning for Crown lands, a process that is led by MNRF under the authority of the *Public Lands Act* and guided by the Crown Land Use Policy Atlas. This planning includes establishment of broad direction for resource-related activities and road access, both of which may impact fisheries and aquatic ecosystems. A last example is the Provincial Policy Statement (PPS), issued under the Planning Act, which integrates all provincial ministries' land use interests related to municipal planning and development. While the Ministry of Municipal Affairs (MMA) has overall responsibility for the PPS, MNRF has the lead for policies and the provision of technical advice

regarding the protection of fish habitat, as outlined in the Natural Heritage Reference Manual (OMNR 2010).

MNRF'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. MNRF is committed to the conservation of biodiversity and the use of natural resources in a sustainable manner.

Risk-based approach to compliance

For sound and effective governance, policies, and practices to be effective in achieving their intended objectives, it is important to achieve compliance by resource users. 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.

Enforcement following the development of the fisheries management plan and its associated regulations is extremely important. Without enforcement there is serious risk that unregulated fishing activities could compromise the effectiveness of the management plan and its objectives.

The role of enforcement within the ministry is to safeguard the public interest by leading and delivering professional regulatory protection of Ontario's natural resources. Priorities are set at the provincial, regional/great lakes and district/lake levels. These regional/great lakes and district/lake priorities are a result of unique local attributes of the local landscape, industry or communities.

- The compliance framework is based on risk assessment principles that will enable MNRF to focus its work and response to incidents on the risk posed to:
  - human health and safety;
  - natural resources;
  - the economy; and
  - social and cultural values.

- The risk-based compliance framework will enable the ministry to focus enforcement resources on the area of greatest risk. These will include:
  - focusing proactive work on areas of highest risk;
  - prioritizing incident/complaint response based on risk; and

    - prioritizing resources for special investigations based on risk.

- MNRF's Enforcement Branch leads the coordination of MNRF's Risk Based Compliance Framework. The implementation of the framework into the day to day operation of the enforcement program is accomplished through the Enforcement Branch Operational Plan (EBOP). This plan is developed on an annual basis by the Provincial Enforcement Operations Section by reviewing and revising enforcement branch commitments as appropriate to ensure they reflect the operational needs of the organization.
- The enforcement continuum is based on four main principles: promotion and education of sustainable natural resource use and applicable laws, violation reporting, monitoring compliance and taking appropriate enforcement action.

3.0 Broad fisheries management goals

As stewards of Ontario's fisheries resources, MNRF 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 that reflect ideal future conditions:

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 (MNRF 2015a).

As part of the FMZ 11 Management Planning process the Advisory Council prepared four goal statements that were intended to guide the development of more detailed objectives, strategies and tactics.

Goal statement – fish populations

Manage for the improvement of fisheries, including healthy natural fish populations, beyond a minimally sustainable condition; enhance harvest and recreational usage while providing a safe food source.

Goal statement – aquatic ecosystems

While minimizing the risk of invasive species, 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 support a fair valuation of the resources in order to promote socio-economic benefits from resource usage.

4.0 Guiding principles

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

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 first 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.

Principles of conduct

Aboriginal and treaty rights: Aboriginal rights and interests in fisheries resources will be recognized and will help guide MNRF's plans and activities. MNRF is committed to meeting the province's constitutional and other obligations in respect of Indigenous Peoples, including the duty to consult.

Informed and 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 MNRF 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 2015a).

5.0 Description of Fisheries Management Zone

Fisheries Management Zone 11 (Figure 1) is within the MNRF's Northeast Region, predominantly within the administrative boundaries of the North Bay district. It shares waters with FMZ 12 to the east, FMZ 10 to the west, FMZ 15 to the south, and FMZ 8 to the north. The zone's southern border follows the northern boundary of Algonquin Provincial Park and the Pickerel River. To the west, the zone is bounded by Highways 69, 64, 535 and 539, and the Sturgeon River. The northern boundary of the zone is the northern border of Lady Evelyn Smoothwater Provincial Park and Highway 65. To the east of FMZ 11 lie Lake Temiskaming and the Ottawa River (FMZ 12). The total area of FMZ 11 is 2,245,000 ha.

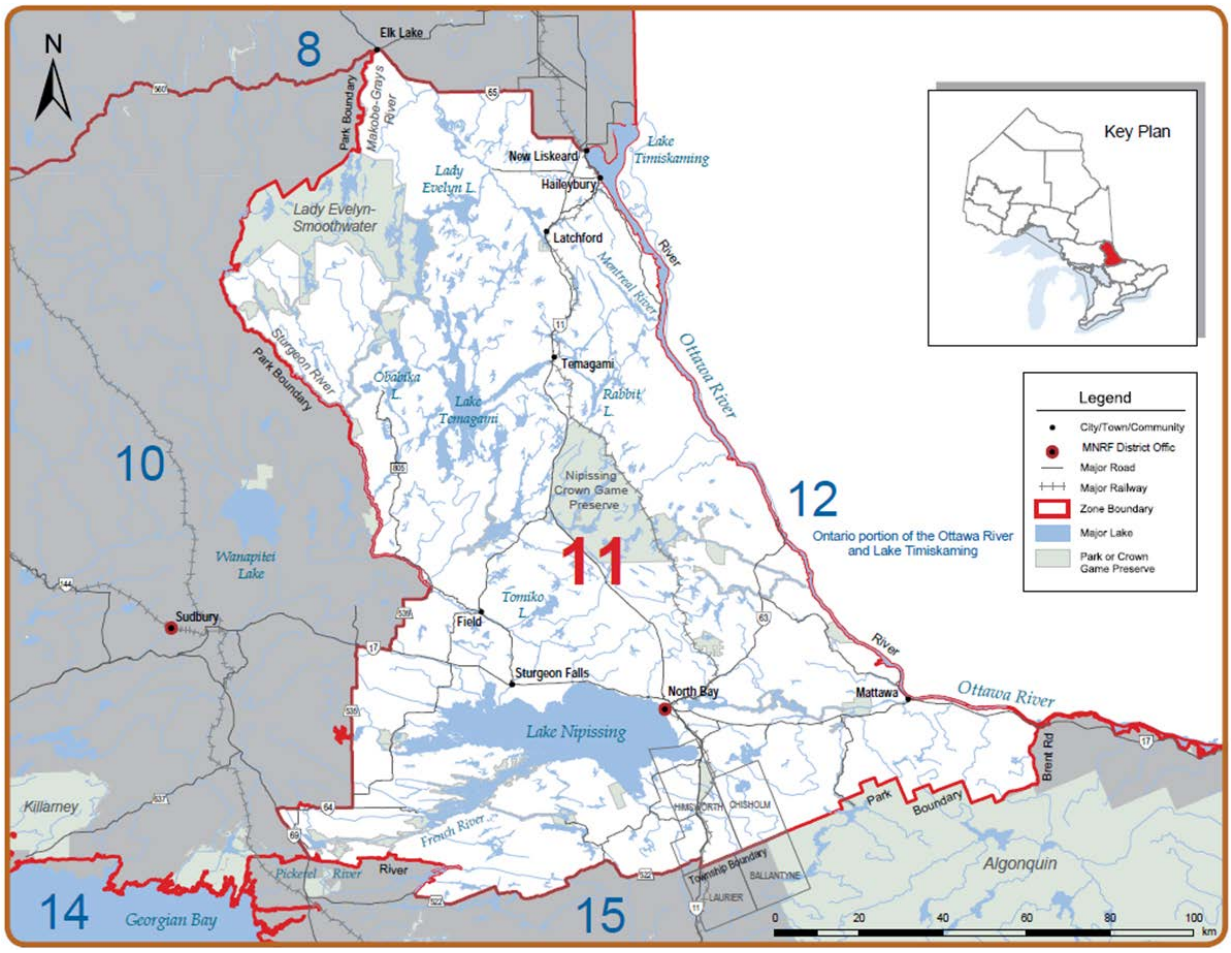


Figure 1. *Fisheries Management Zone 11.*

The major population centers in the zone are North Bay (population 54,000), West Nipissing (13,000), Temiskaming Shores (11,000), Mattawa (2,000) and Temagami (900).

Major roads that access the zone are Highway 11 (north and south), Highway 17 (east and west), Highway 64 (southwest) and Highway 63 in Quebec. The largest density of roads is in the southern half of the zone. There is also a concentration of roads at the northern edge of the zone in proximity to Temiskaming Shores. FMZ 11 is approximately 350 kilometers north of Toronto, the largest population centre in Canada.

There is one large wilderness class provincial park in the zone; 72,400 ha Lady Evelyn Smoothwater Wilderness Provincial Park (LESWPP) located in the northwest portion of the zone. In addition, there are seven waterway Provincial Parks and eight recreation class Provincial Parks along with over 30 conservation reserves. There are also several Enhanced Management Areas within the zone that are managed to protect recreational values, including remote fishing opportunities.

The Nipissing, Dokis, Temagami, Matachewan and Henvey Inlet First Nations have traditional territories within the boundaries of FMZ 11. Several other First Nations and Métis have asserted or are negotiating treaty rights within the zone. The fisheries within the zone have a long history of human use, beginning with First Nation's historical use for food, social and ceremonial purposes, and later for commercial purposes which continue today.

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 recreational fishery is an important economic and social driver within FMZ 11, contributing to a significant local tourism industry.

Fish communities within all three thermal guilds (coldwater, coolwater, and warmwater) are found within Zone 11. The zone is dominated by Walleye (*Sander vitreus*) and trout fisheries (Lake Trout (*Salvelinus namaycush*) and Brook Trout (*Salvelinus fontinalis*)), with Smallmouth Bass (*Micropterus dolomieu*), Largemouth Bass (*Micropterus salmoides*), Northern Pike (*Esox lucius*), Muskellunge (*Esox masquinongy*), Yellow Perch (*Perca flavescens*), Lake Whitefish (*Coregonus clupeaformis*), Lake Herring (*Coregonus artedi*) and White Sucker (*Catostomus*

commersoni) providing alternative angling opportunities. The American Eel (*Anguilla rostrata*) (endangered), Lake Sturgeon (*Acipenser fulvescens*) (endangered), Northern Brook Lamprey (*Ichthyomyzon fossor*) (special concern), Silver Lamprey (*Ichthyomyzon unicuspis*) (special concern) and the Shortjaw Cisco (*Coregonus zenithicus*) (threatened) are the five fish species at risk in the zone. FMZ11 also has introduced species found within the zone: Rainbow Smelt (*Osmerus mordax*), Common Carp (*Cyprinus carpio*), and Black Crappie (*Pomoxis nigromaculatus*). Aquatic pathogens remain uncommon, and Viral Hemorrhagic Septicemia (VHS) has not been detected in the zone, however, one significant invasive invertebrate species, Spiny Water Flea (*Bythotrephes longimanus*), has been confirmed in several lakes.

The northern lakes in FMZ 11 are typical boreal shield, oligotrophic lakes, characterized by relatively deep, cold, clear, nutrient poor water, and with a small littoral area. Figures 2, 3, 4 and 5 compare FMZ 11 lakes to other FMZs in relation to these key lake characteristics (see figure 6 for interpretation of boxplots). The littoral area of a lake is the proportion of lake area shallower than 4.6 m (Figure 3). It is often used as a predictor of available habitat important to species such as Walleye and Brook Trout. Water clarity is measured by collecting a Secchi depth reading using a black and white metal disc known as a Secchi disc (Figure 4). It is a simple and inexpensive way to gather data that reflects the productive capacity of a lake. 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.

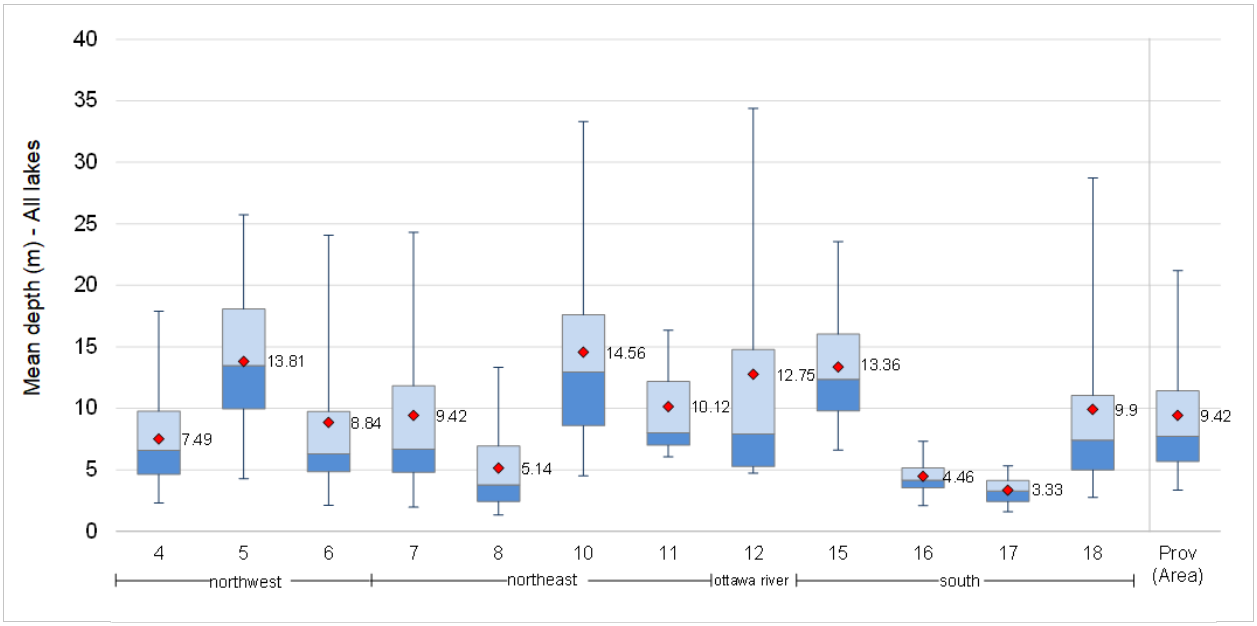


Figure 2. *Area weighted average mean depth of all lakes monitored by the Broad-scale Monitoring (BsM) program in Cycle 1 (2008 – 2012) by FMZ. Provincial area weighted average is presented at far right.*

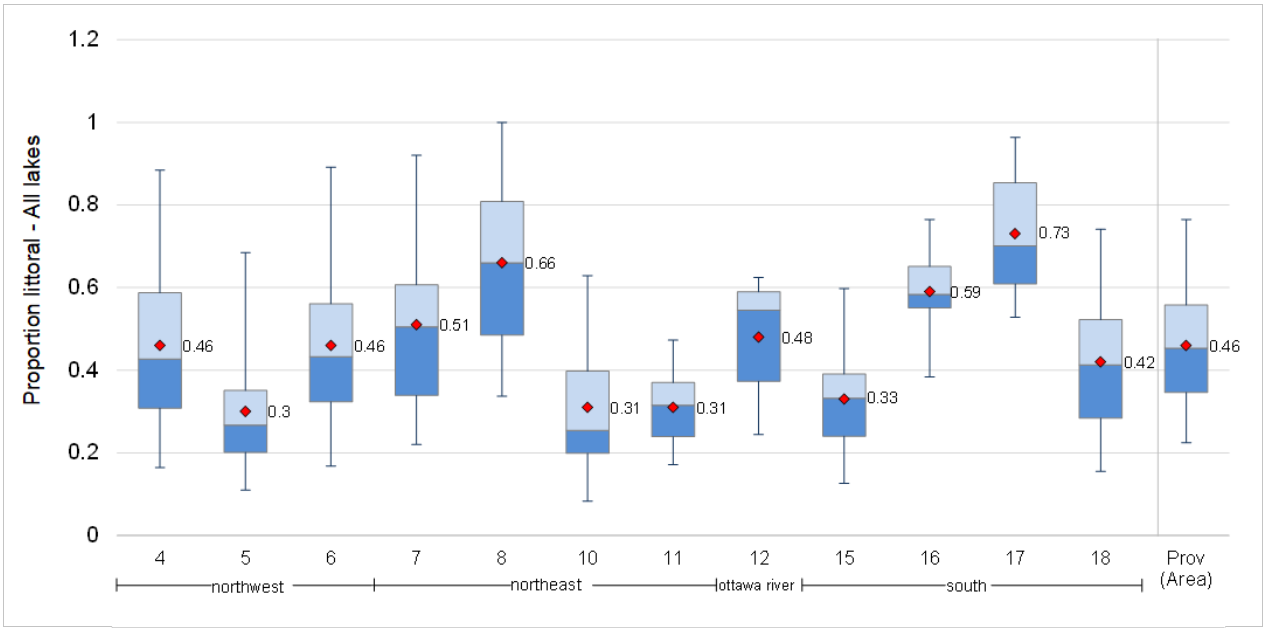


Figure 3. *Area weighted average proportion of lake area that is littoral for all lakes monitored by BsM program in Cycle 1(2008 – 2012) by FMZ. Provincial area weighted average is presented at far right.*

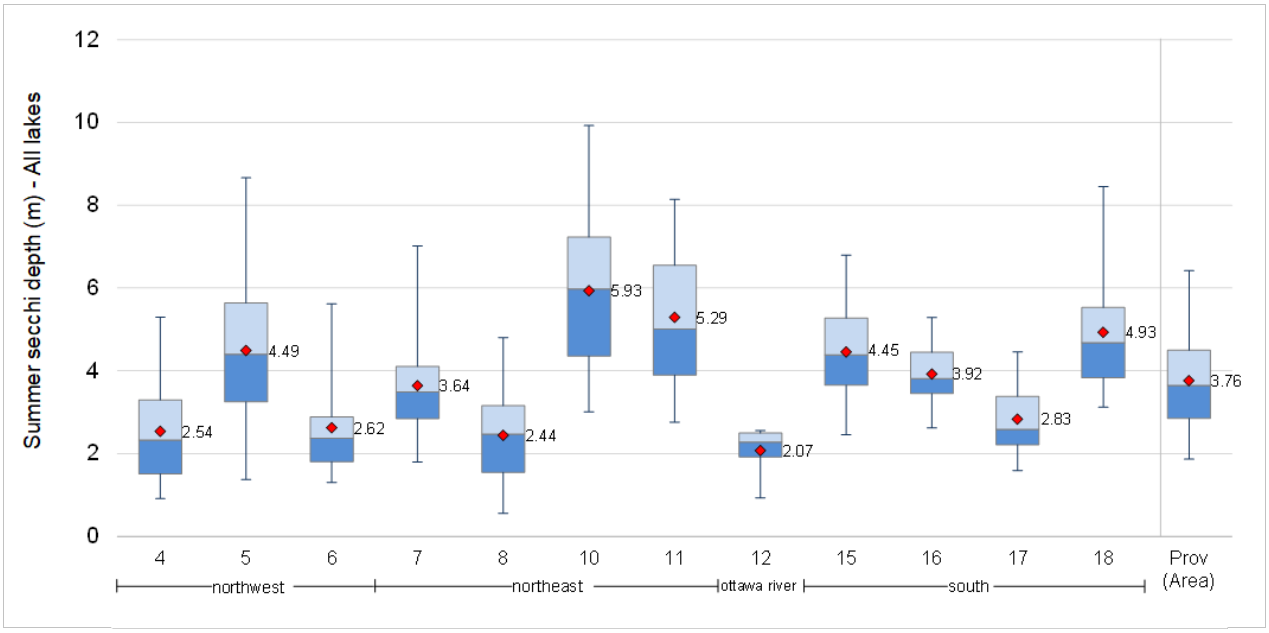


Figure 4. *Area weighted average summer Secchi depth for all lakes monitored by BsM program in Cycle 1 (2008 – 2012) by FMZ. Provincial area weighted average is presented at far right.*

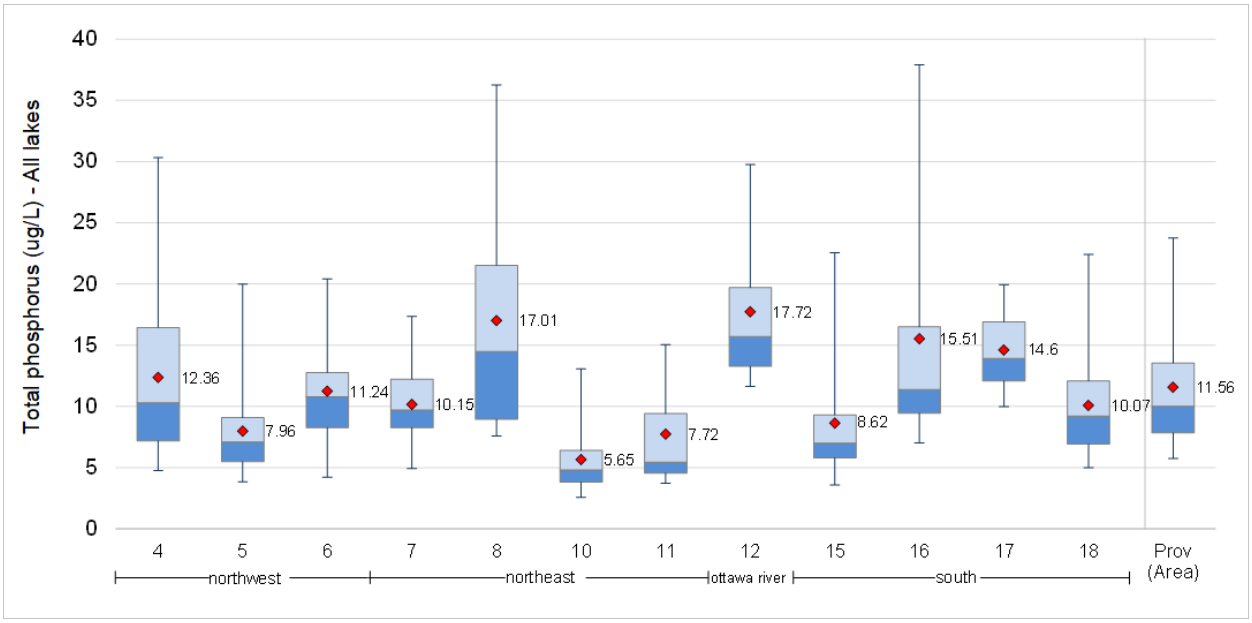


Figure 5. *Ice-free-mean, mixed layer total phosphorus concentrations all lakes monitored by BsM program in Cycle 1 (2008 – 2012) by FMZ. Provincial area weighted average is presented at far right.*

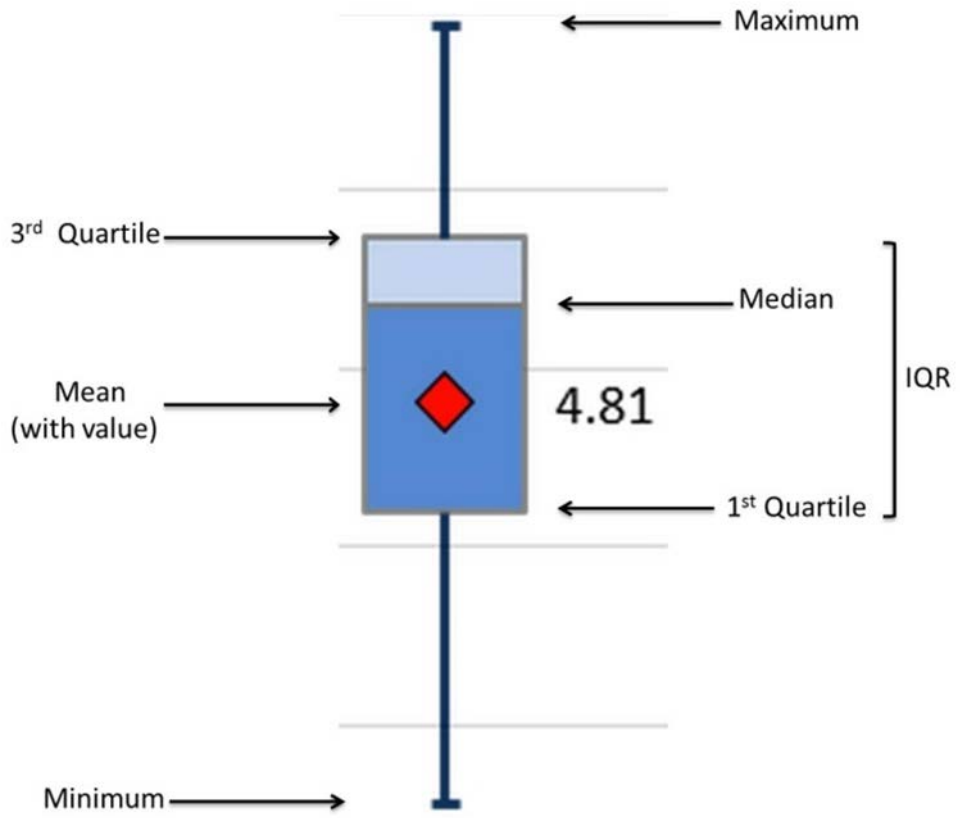


***Figure 6**. Components of Box Plot*

Table 1 provides the number of lakes known to have Walleye and Lake Trout, two of the key sport fish species in FMZ 11. FMZ 11 contains numerous flowing waters (lakes 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, 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 identified for enhanced management through land use planning activities.

Lake size classes (hectares)	**5 – 50**	**50 – 500**	**500 – 1,500**	**1,500 – 5,000**	**5,000 – 250,000**	**Total**
Number of lakes (All)	2,480	358	26	12	3	2,879

Lake size classes (hectares)	5 – 50	50 – 500	500 – 1,500	1,500 – 5,000	5,000 – 250,000	Total
Surface area (ha) lakes (All)	34,492	44,399	21,918	25,075	113,432	239,316
Number of known lakes containing walleye	76	116	19	9	3	223
Number of known lakes containing lake trout	25	86	18	7	1	137

Table 1. *Description of FMZ 11 lakes resource.*

5.1 Areas of special interest within Fisheries Management Zone

Several waters within FMZ 11 retain regulations that differ from the base regulations for the zone. Exception regulations are normally employed to ensure sustainability of a specific population or to protect vulnerable fish during a certain time period (e.g. spawning time). FMZ 11 also contains several waters that require individual and enhanced management attention due to their size, socio-economic importance, influence on angling patterns across the landscape and unique biological and physical properties.

The most significant individual socio-economic drivers of fisheries within FMZ 11 are lakes Nipissing and Temagami and the French River, due to their size, the nature of their resources and the level of tourism infrastructure they support.

Lake Nipissing

Lake Nipissing is a very large inland lake, in excess of 87,000 hectares and has historically contained productive Walleye and premier Yellow Perch fisheries in northeast Ontario.

Lake Nipissing is classified as a provincially Significant Inland Fishery (PSIF) within FMZ 11. PSIF's are designated to recognize the importance of specific water bodies to the Province of Ontario. These waters may have unique challenges requiring more intensive monitoring and planning separate from that of the broader FMZ. Lake Nipissing has its own fisheries management plan, management objectives and

strategies which were initially implemented in 2014 (MNRF 2014). A separate Lake Nipissing Advisory Council was made up of a variety of stakeholders including FMZ 11 Advisory Council members who were instrumental in the plan development.

Lake Nipissing is also currently monitored as part of the landscape by the BsM program and is therefore included in the figures and tables which summarize BsM results throughout this document, but some exceptions exists (see section 6.2.3).

Lake Temagami

Lake Temagami is one of Ontario's largest (20,971 ha) natural inland Lake Trout lakes and is a significant destination tourist fishery for Lake Trout, Walleye and Lake Whitefish. Separate exception fishing regulations have been in place for Lake Temagami since 1974. Lake Temagami is also monitored as part of the landscape by the BsM program and is therefore included in the figures and tables which summarize BsM results throughout this document.

French River

The French River Management Recovery Plan was instituted in 1993. The goals of the plan are to improve the yield from the fishery, reduce fishing mortality on maturing and mature walleye to increase spawning stock, and to ensure overfishing does not occur.

Enhanced fisheries management lakes

Trout Lake is an urban fishery found within the City of North Bay. It supports the only self-sustaining inland Atlantic Salmon population and a recovering Lake Trout population both of which have received enhanced management efforts in the past. Trout Lake provides drinking water to the City of North Bay, and has garnered a substantial amount of public interest, including its own conservation association. At this time, with the inception of the BsM program, a review of the historical and current status of the management decisions and actions for Trout Lake is required in order to determine future management requirements.

The Highway 805 Lake Trout Lakes and the McConnell Lake Recreational Area were two areas within FMZ 11 that were historically extensively monitored and managed in order to enhance and protect fisheries resources in these special

management areas. The last series of assessments were carried out in 2003 and were incorporated into Status of Lake Trout Populations in Northeastern Ontario (Selinger et al. 2006). These lakes currently fall under the broader landscape BsM monitoring and assessment program.

Remote and semi-remote waterbodies exist within some portions of FMZ 11 providing higher than average quality angling, which often benefits remote and semi-remote tourist operators. Remote experiences are most commonly available in Lady Evelyn Smoothwater Wilderness Provincial Park, in the northwest portion of the zone. Many of the tourism businesses in FMZ 11 are drive-to operations that primarily cater to open water anglers while others provide winter and remote fly-in experiences. The extent to which the tourism businesses rely on the state of the fisheries resource varies amongst operators depending upon location and the focus of their business.

6.0 Fisheries management planning

A variety of fisheries management tools are available to structure the delivery of MNRFs mandate. Fisheries management planning is one of these tools and follows the following cycle of:

- planning (setting objectives and strategies);
- implementing strategies;
- monitoring and reporting; and
- evaluating success.

6.1 Planning considerations

The purpose of the planning process was 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). Specific targets and timelines were identified that will assist with and guide the management of the recreational fisheries in an open and transparent way that solicits input from the general public and stakeholders. The end-result is a plan that is comprehensive, provides clear direction with measurable and achievable goals 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.

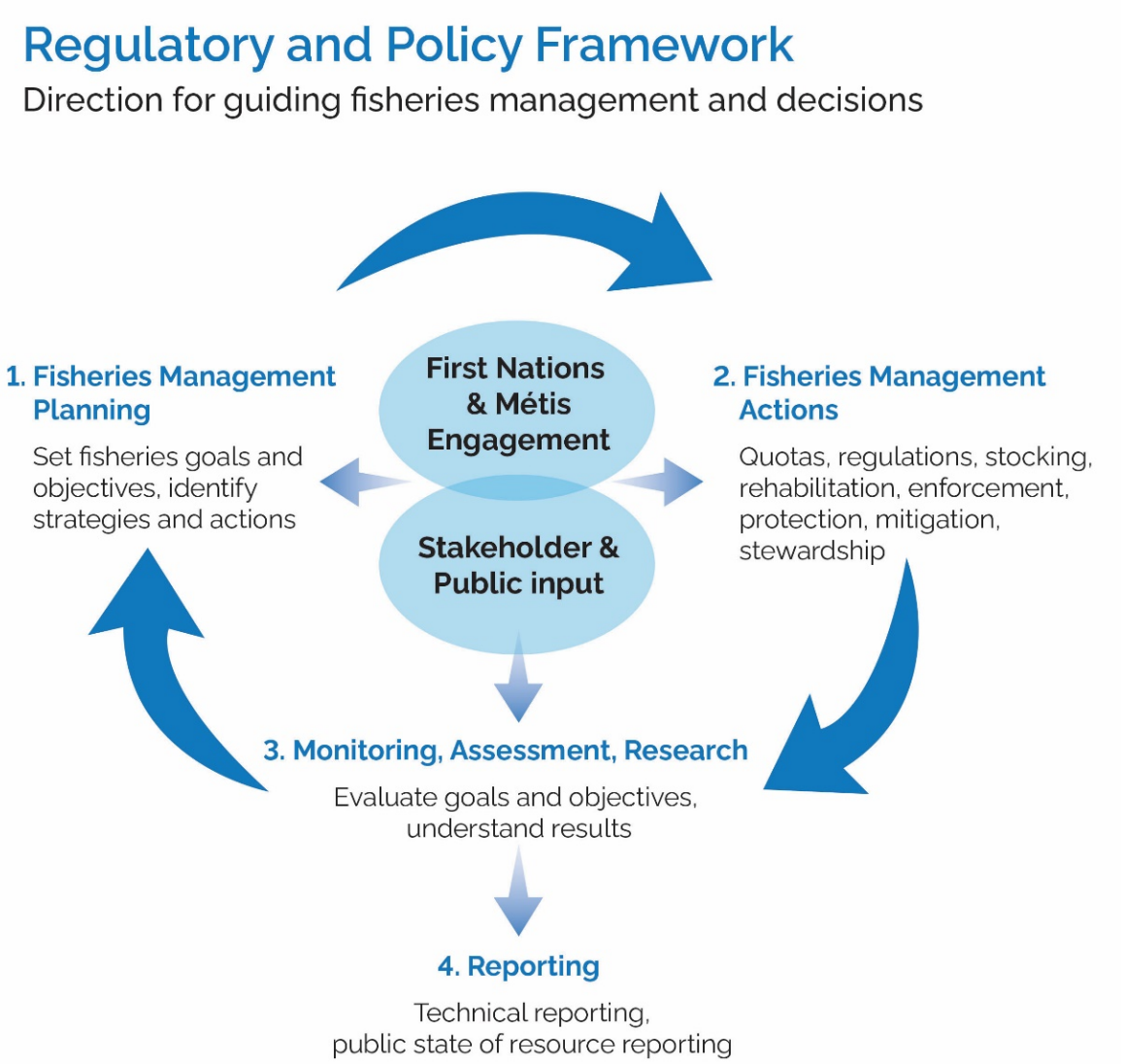


***Figure 7**. Fisheries management framework within an adaptive management cycle. Adapted from Ontario's provincial fish strategy (2015a).*

Management issues, challenges and opportunities

The FMZ 11 Advisory Council and MNRF staff undertook an extensive discussion of the management issues and challenges facing the fisheries resources of FMZ 11. Analysis of the management issues and challenges suggest they can be grouped into four broad categories: exploitation, ecosystem and habitat, invasive/introduced species, and education.

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.

The following sections describe the management objectives, indicators, benchmarks, actions and targets that are associated with the various management issues and challenges.

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

In most cases, four objectives were identified to reflect the goals set out in the plan. In all cases, upon completion of a species status report, the question asked of the FMZ 11 Advisory Council was "What is the desired future condition of the resource?" Posing this question was most helpful in the objective development.

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 that must be completed to meet management objectives.

For each of the following issues, the objectives, indicators, benchmarks and targets have been summarized in a table in section 6.3. In some cases, the indicators or targets have not been completely defined as the science is still in development (e.g. use of Broad-scale monitoring data to define ecosystem status and health). As they are developed, these tables will be updated for inclusion in successive plan review or amendments as required.

6.2 Monitoring and assessment

6.2.1 Monitoring

Monitoring is critical to managing fisheries under an adaptive framework. Monitoring supports fisheries management by estimating current status and trends and evaluates the success of fisheries management actions. 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, introduced in 2008 is the primary fisheries monitoring program for the province. The BsM program is designed to support fisheries management by providing information for Ontario's inland lakes and recreational fish species, at the FMZ scale. 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.

The lake selection process for BsM is a stratified random design where lakes are randomly selected in proportion to the total number of lakes in each FMZ. Lakes are randomly selected for the program and identified as either a trend lake or a state lake. A trend lake is sampled once in each 5-year monitoring cycle, whereasstate

lakes are sampled once in a 5-year cycle and may or may not be sampled again in future sampling cycles. However, at the time of writing this document a review of the BsM program was underway to assess its effectiveness, and changes to the frequency of sampling and the number of lakes sampled in each FMZ is anticipated.

A more detailed description of the BsM program can be found at: Broad Scale Monitoring Program (https://www.ontario.ca/page/broad-scale-monitoring-program).

In FMZ 11, 30 trend lakes were randomly selected to be surveyed by the BsM program (Figure 7), no additional state lakes were sampled. Sixteen lakes were selected as Walleye trend lakes and ten lakes were selected as Lake Trout trend lakes. Additionally, four lakes were selected for both Walleye and Lake Trout trend. Therefore, in the sections that follow, the 20 Walleye trend lakes are used in reporting on the status of Walleye in the zone, and the 14 Lake Trout trend lakes are used for reporting on the status of Lake Trout in the zone. For all other species that are reported in this document, all lakes where the species were captured are used in analyses (i.e. $N \leqslant 30$). Although the BsM program is only monitoring 30 lakes in FMZ 11, these 30 lakes represent approximately 55% of lake surface area in the zone.

In FMZ 11, the first cycle (2008 to 2012) of BsM lake surveys were completed in 2009, the second cycle of surveys were completed in 2014/15 and the third cycle in 2018/2019. In most cases the 2009 data is considered the baseline from which we will measure progress towards achieving the stated objectives.

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 will be necessary such as stocking assessments, spawning assessments and in cases where lake-specific data are required that are not within the scope of BsM).

An additional source of monitoring data to be used in reporting is the national survey of recreational fishing (DFO 2015). 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).

6.2.2 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 (once every 5 years) can then be used to measure progress toward achieving the stated objectives.

The majority of data presented throughout this document to describe status are from Cycle 1 (2008 – 2012) of the BsM program and are presented as box plots (see Figure 8). For all box plots the mean, median, quartiles, and range are presented. 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). It is important to note that at the time of writing this document, the second (2013 – 2017) and third cycles (2018-2019) of BsM surveys and data quality review were still ongoing. Comparisons between Cycle 1 and Cycle 2 data are included where possible and can be considered the most current description of status and to show emerging trends as rationale for management actions in this plan.

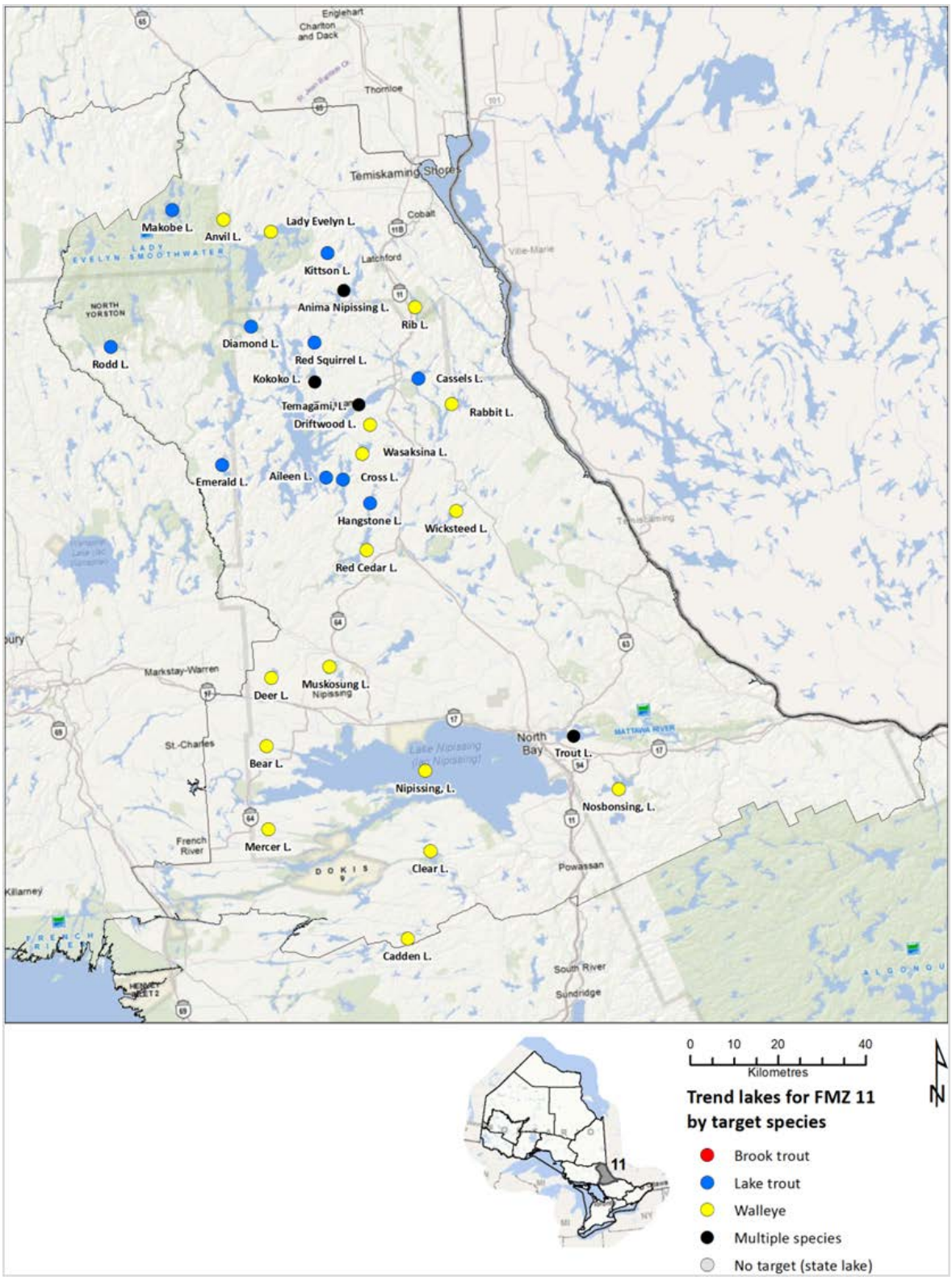


***Figure 8**. Lakes selected for monitoring in FMZ 11 for the BsM program.*

6.2.3 Calculating zone metrics

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 (see Table 1). 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. Once that is complete, an area weighting based on area of all known Walleye lakes by size bin within FMZ 11 is applied to arrive at an area weighted average mean length of Walleye. 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 & 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.

A unique situation exists within FMZ 11 that requires an additional level of assessment. The three largest lakes in FMZ 11 (Nipissing, Temagami and Lady Evelyn) which make up the extra-large size bin (Table 1), represent 68% of the surface area of all lakes containing Walleye in the zone. This means the results from these lakes combined contributes 68% to the area weighted zone average for Walleye metrics. Making use of an area weighted zone average is appropriate, since these three lakes are such a significant part of the Walleye resource in the zone and attract most of the angling effort targeting Walleye in the zone. However, Lake Nipissing has its own management plan, regulations, and monitoring program. Large changes to the Walleye population in Lake Nipissing, which may be attributed to lake specific management actions, will skew the area weighted zone metrics in a

way that may not reflect changes that are happening across the rest of the zone. It is therefore most informative to characterize the Walleye resource in FMZ 11 with Lake Nipissing included and excluded.

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. (2015). 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, in an effort 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 (Table 2), unless otherwise noted, retention selectivity adjusted measures are not used.

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 2 provides species specific definitions of recruit size used in our analyses.

Species	**Total length (mm)**	**Fork length**
Walleye	350	328
Lake Trout	350	316
Brook Trout	250	238
Lake Whitefish	400	358
Northern Pike	500	470

Species	Total length (mm)	Fork length
Smallmouth Bass	200	237
Rock Bass, Pumpkinseed, Bluegill	150	142

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

6.3 Recreational fisheries

6.3.1 Walleye

Management issues, challenges and opportunities

In FMZ 11, the single biggest challenge in managing Walleye is human exploitation (harvest). The vast majority of fishing pressure specifically targets Walleye for consumption.

Management issues:

- Catch rates can remain high and don't necessarily reflect the true state of the resource;
- Current FMZ 11 Walleye regulations are more complex and more restrictive than those in adjacent zones due to a number of zone-specific factors, which is viewed negatively by some resource-users;
- The unknown level of pressure being exerted on the zone as a result of the more restrictive fishing regulations (both recreational and Indigenous) that have been implemented on Lake Nipissing; and
- Lack of understanding of the intensity and geographic distribution of various forms of harvest (Recreational, commercial and Indigenous) across the zone.

Challenges:

- Unrealistically high expectations by anglers about the zone's ability to produce Walleye;
- 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;

- Unrealistic perceptions regarding the availability of "simple fixes", such as supplemental stocking, to address perceived declines in catchable sized fish.
- Challenges in compliance and enforcement of Walleye regulations;
- Invasive species (Spiny Water Flea) and other potential species such as Rusty Crayfish (*Orconectes rusticus*), and transmission of diseases (i.e. Viral Hemorrhagic Septicemia);
- Habitat loss, unfavorable water level manipulation and other unforeseen circumstances which the fisheries may face in the future; and
- Potential gaps in knowledge of Walleye harvest during sensitive periods/locations (e.g. pre-spawning staging areas and migration routes).

Opportunities:

- BsM program that will serve to standardize fisheries monitoring parameters and allow for sound comparisons of data within and between fisheries management zones.
- Ongoing collaboration with local Indigenous communities to better incorporate traditional ecological knowledge into natural resource management planning;
- Increased public awareness of the actual productive capacity of Walleye within the zone;
- Increase the transparency of monitoring results to foster greater public understanding and acceptance of management actions; and
- Utilize partnership opportunities to enhance social awareness of Walleye management and ecosystem health.

Status of walleye

Like most fish species, the most important factor determining Walleye abundance and life history characteristics in FMZ 11 is the quality and quantity of available habitat. It has been well documented that Walleye populations do best in dark (low Secchi depth, <3m), nutrient rich (high Total Dissolved Solids) water with sufficient epi-benthic (above thermocline) habitat (Lester et al. 2004). It is also well documented (Colby and Nepszy 1981, Venturelli et al. 2010) that climate (Growing Degree Days) 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).

In FMZ 11, in relation to other FMZs in Ontario, the climate is moderate and Walleye lakes are relatively clear with a moderate amount of epi-benthic area. This means that on average, most lakes in FMZ 11 have less productive capacity to support abundant walleye populations than in other FMZ's (Figures 9 to 11). Obvious exceptions exist within FMZ 11 (e.g. Lake Nipissing), but when considering the FMZ as a whole, Walleye habitat is a limiting factor. The limited walleye habitat in FMZ 11, combined with the presence of other competing species (i.e. Lake Trout, Northern Pike and bass) results in Walleye populations that persist at lower densities than those found in other FMZ's. This assessment is consistent with results from previous monitoring activities (Morgan et al. 2002).

Currently, there are 147 lakes in FMZ 11 which are greater than 50 ha and are known to support self-sustaining populations of Walleye (Table 1). A random selection of 20 lakes from this subset are identified as Walleye trend lakes within the BsM program and are used to assess the status of Walleye within the zone.

Of the 20 lakes in FMZ 11 selected as Walleye trend lakes and surveyed in Cycle 1 of BsM in 2009, three lakes detected 0 Walleye, indicating extremely low abundance. However, consultation with the FMZ 11 Advisory Council confirmed that Walleye do still exist in these waterbodies, and therefore will continue to be monitored as Walleye trend lakes, and monitoring results from these lakes will be used to describe the status of Walleye in the zone.

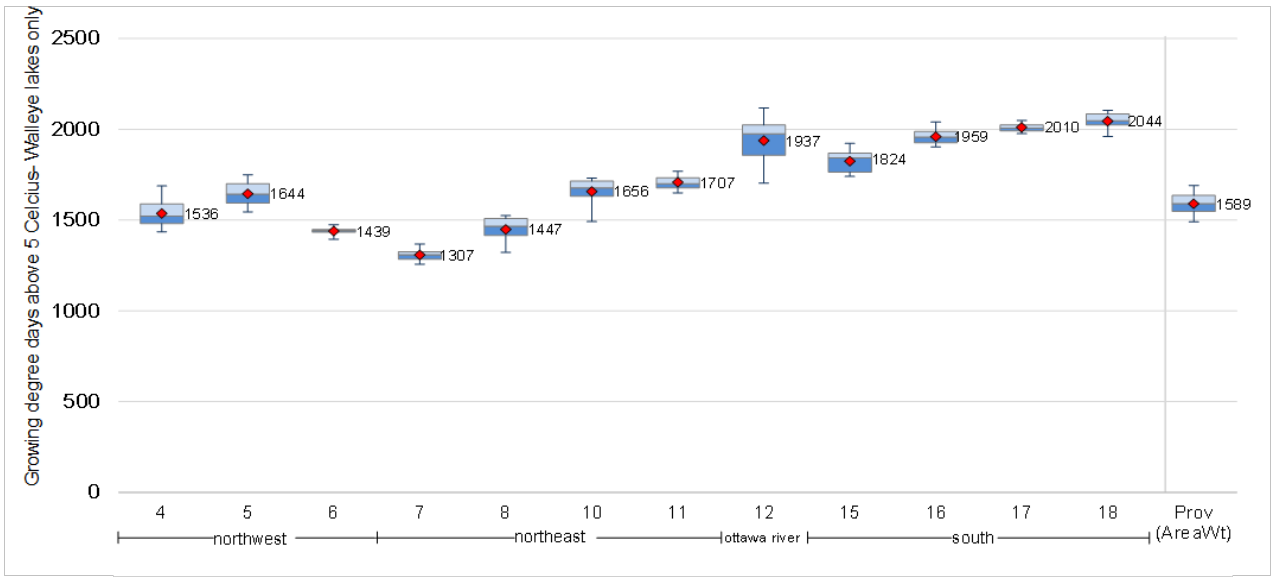


Figure 9. *Area-weighted average of Growing Degree Days (GDD) above 5 degrees Celsius for the period 1981-2010 for Walleye trend lakes by FMZ.*

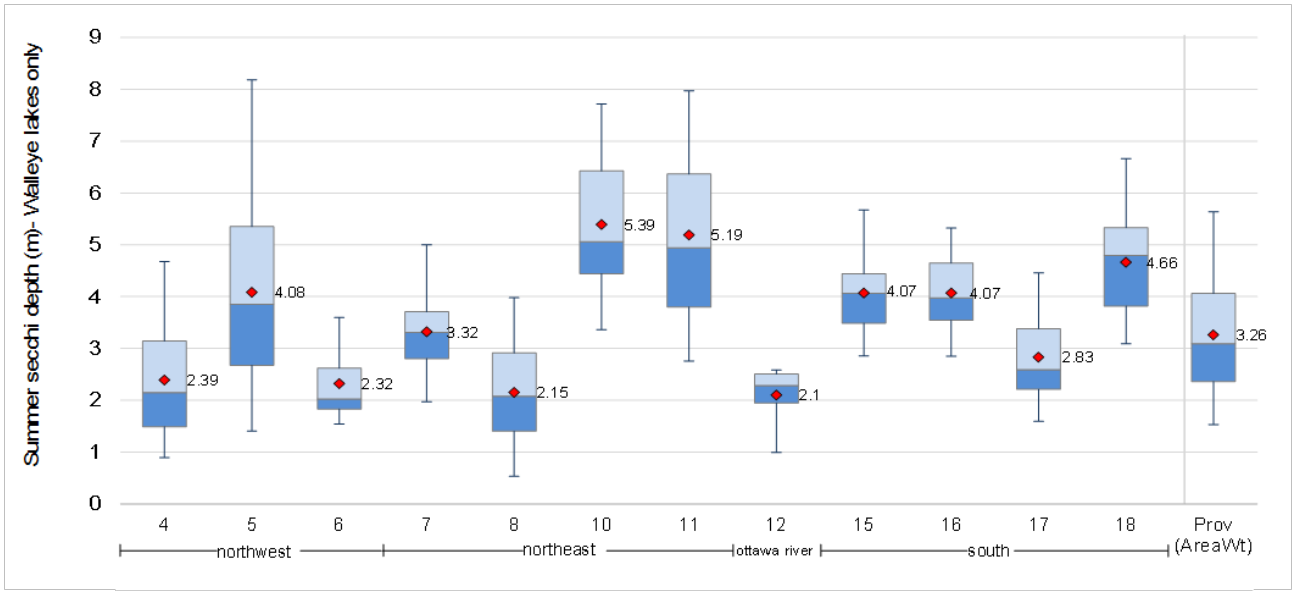


Figure 10*. Area weighted average summer Secchi depth (water clarity measure) for Walleye trend lakes by FMZ, from BsM program Cycle 1 (2008-2012).*

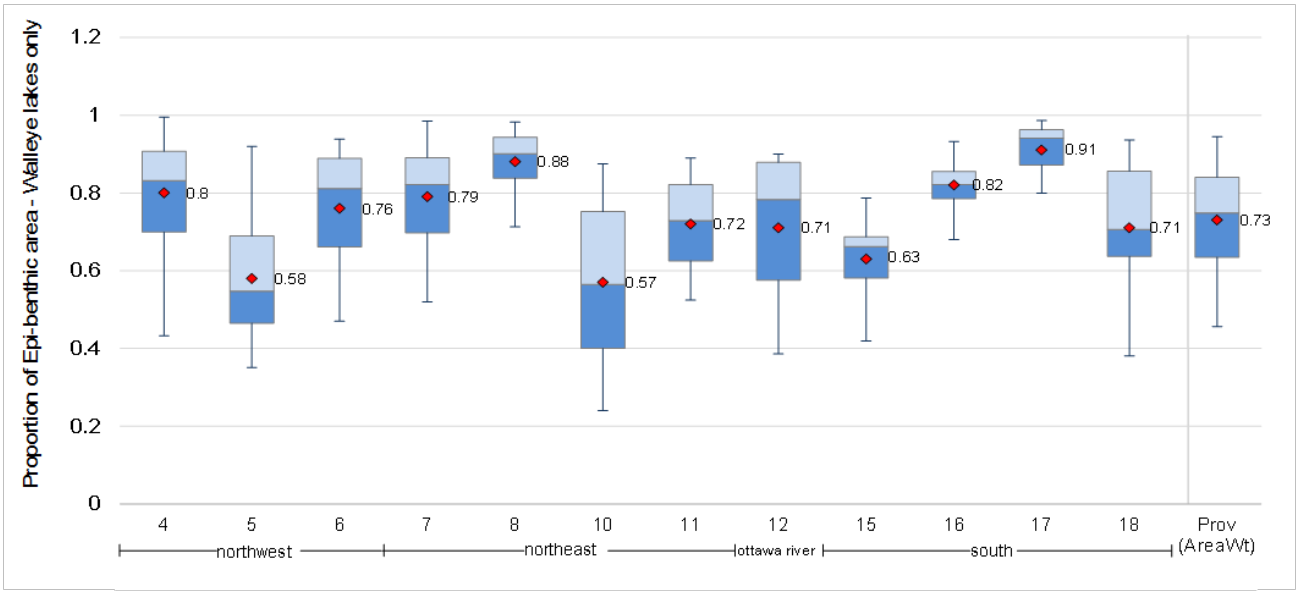


***Figure 11**. Area weighted average proportion of total lake area that is epi-benthic for Walleye trend lakes by FMZ from BsM program Cycle 1 (2008-2012).*

Abundance

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), as described in section 6.2. The AW CUE of recruited size Walleye from 20 Walleye trend lakes in FMZ 11 during the first cycle of the BsM program was 0.65 fish per gang (Figure 12). Comparing results from FMZ 11 to other FMZs with similar lake characteristics and productive capacity (i.e. FMZ 5 and 10) we see that observed abundance among these zones is similar and the lowest among northern zones.

The observed trends in BsM data from FMZ 11 support the results of previous monitoring and assessment efforts (Kaufman 2007, Morgan et al. 2002), where abundance of FMZ 11 Walleye populations was lower than the Northeast regional benchmark and typically among the lowest in the province.

As described in section 6.2.3, characterizing Walleye abundance in FMZ 11 with results from Lake Nipissing removed is helpful, as it will provide a zone-wide measure that can be assessed in the future, independent of large changes in Lake Nipissing. The area weighted Walleye recruit CUE when results from lake Nipissing were removed was 0.70 fish/net.

In FMZ 11, as in most FMZ's, there exists an interest in maintaining or increasing the abundance of mature Walleye. Recent published estimates of Walleye length at maturity (sexes combined) across a broad geographic area, suggest that 450 mm total length is an appropriate length to use as representing mature Walleye (Lester et al. 2014). The Cycle 1 BsM baseline in FMZ 11, for AW CUE of Walleye ⩾ 450mm Total Length, is 0.34 fish/net (Figure 13), and the same measure with Lake Nipissing results excluded is 0.41 fish/net.

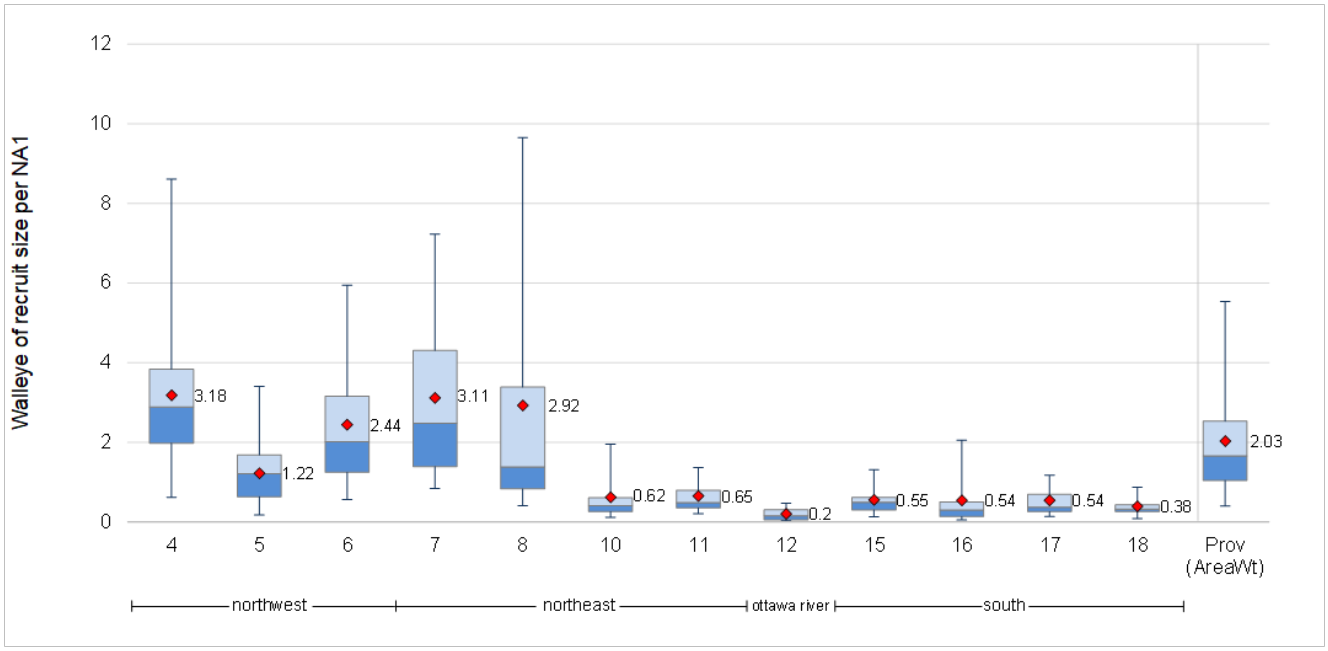


Figure 12. *Area weighted CUE of recruited Walleye (number of Walleye >350mm per net) for Walleye trend lakes by FMZ as measured by the BsM program in Cycle 1 (2008-2012).*

Growth

Although abundance is a good indicator of population status, it is also important to track changes in growth rates and in population age structure. Changes in growth and or age structure may be signals of changes in fish density, mortality, and responses in the fish population to management actions. For example, 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. Therefore, changes in juvenile growth rate are often a signal of changes in density of juvenile fish and a good indicator of recruitment levels. Additionally, the presence of a broad range of prey

species and sizes available to Walleye typically results in increased growth rates and ultimately maximum size.

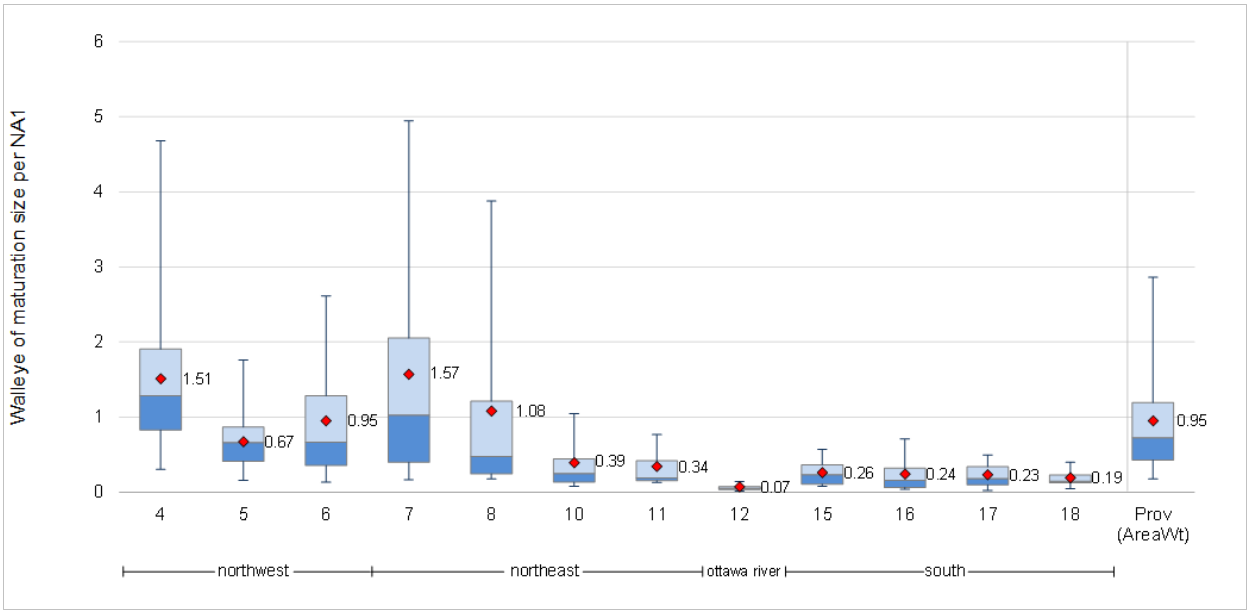


Figure 13. *Area weighted average CUE of mature Walleye (number of Walleye >450mm per NA1) for Walleye trend lakes by FMZ as measured by BsM in Cycle 1 (2008-2012).*

Walleye in FMZ 11 grow relatively fast during the first few years of life, having the third highest pre-recruit growth rate among northern FMZ's. Figure 14 presents the pre-recruit growth rate (h) as (mm/year) of juvenile Walleye up to recruit size (350mm). These values are calculated at the lake level and then displayed as an area weighted zone average.

Adult growth rate of Walleye in FMZ 11 is also high, relative to other northern zones. In Figure 15 we present a useful indicator (Lmax25) of maximum size, where the average of the largest 5% after removing the largest 2% of lengths is used. We use this rather than the maximum observed length because it reduces the variability that may be observed through time as a result of the random chance of observing a single very large individual. The Lmax25 of Walleye in FMZ 11 (observed in Cycle 1 of BsM) is the highest in the province.

The growth characteristics of Walleye in FMZ 11 are likely a result of the combination of relatively low Walleye densities, the presence and abundance of

preferred prey species (i.e. Rainbow Smelt, Ciscoes), and other lake characteristics. The results from the BsM program are consistent with the results of regional monitoring efforts conducted between 1993 and 2001 (Morgan et al. 2002).

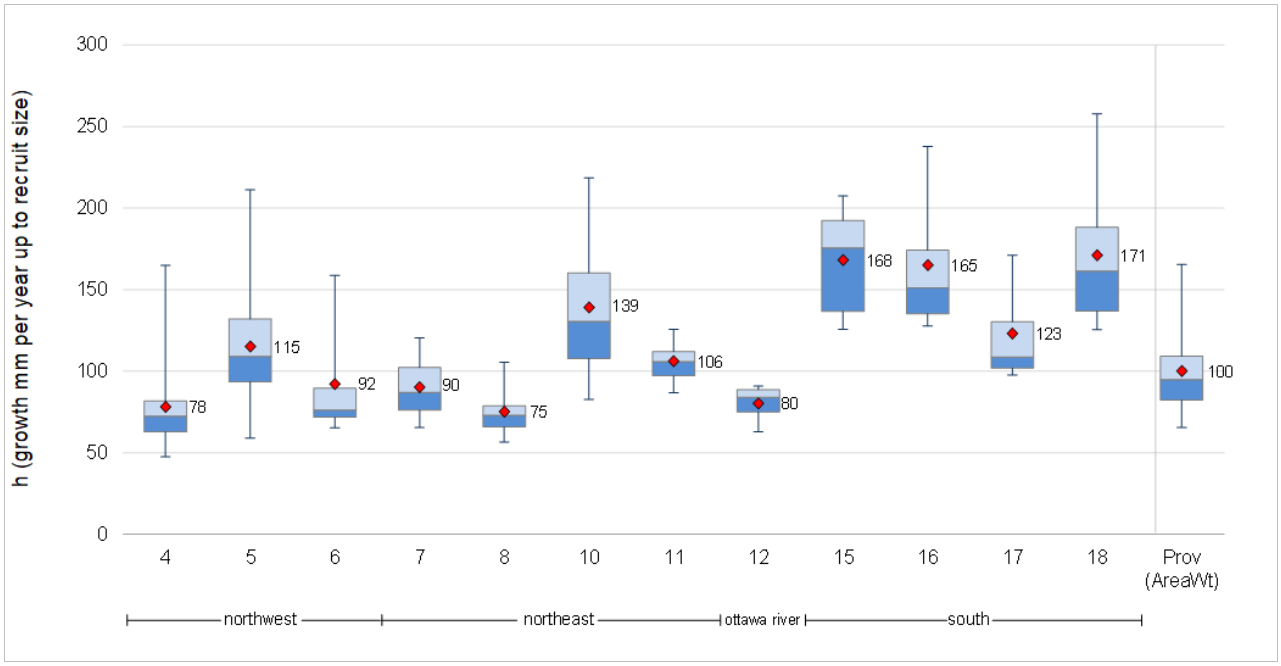


Figure 14. *Area weighted average Walleye growth in mm/yr up to 350mm total length for Walleye trend lakes by FMZ as measured by the BsM program in Cycle 1 (2008-2012).*

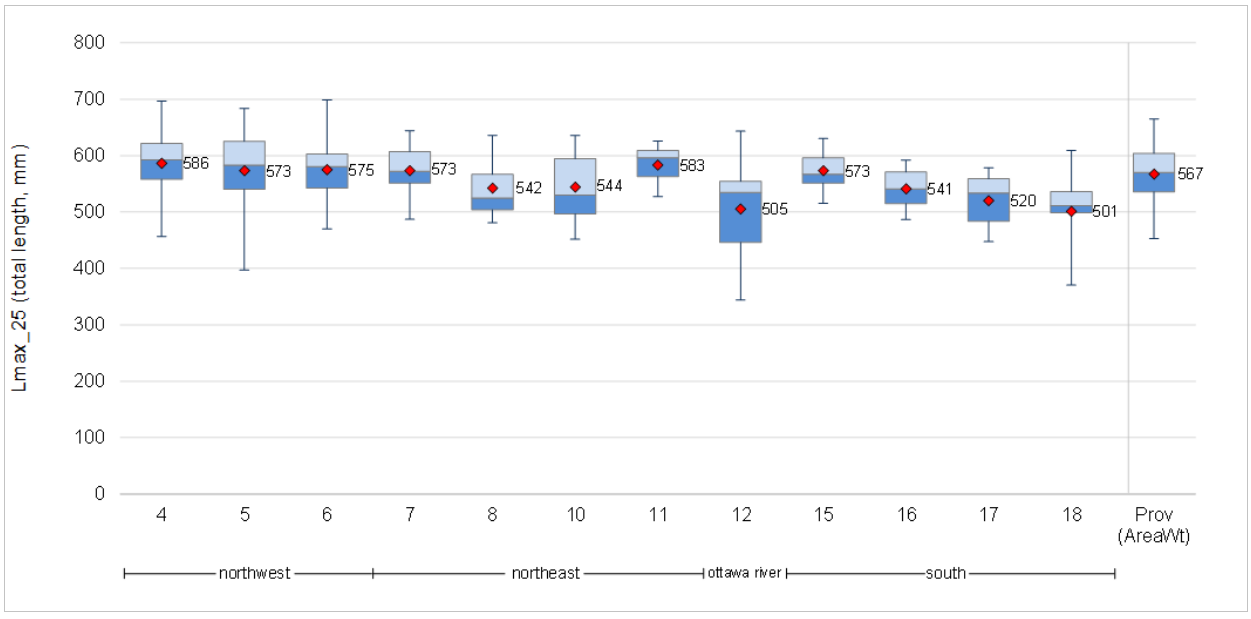


Figure 15. *Area weighted average Lmax 25 (average of the largest 5% after removing the largest 2% of lengths) for Walleye trend lakes by FMZ as measured by the BsM program in Cycle 1.*

Age Structure

A healthy fishery is typically supported by many age classes (cohorts), whereas populations made up of fewer age classes can indicate a stressed population. Looking at the number of cohorts or average age of recruitment to the fishery, typically gives an indication of the health of the population. Fewer cohorts and/or declining average age typically results from high levels of mortality for those older age classes. Here we define a cohort as any age class where 3 or more individuals of that age were detected in NA nets.

The age structure of FMZ 11 Walleye populations is relatively healthy and is comparable to other northern zones (Figure 16). The Cycle 1 AW average number of cohorts from Walleye trend lakes was 11.31, representing the baseline from which we will measure future progress. Removing Lake Nipissing from the calculations results in an AW zone average number of cohorts of 12.57.

Looking at the average age of the recruited portion of the population (Figure 17), we see that the Cycle 1 AW zone average is 7.42, being slightly better than FMZ 10, but less than other northern zones. This represents the baseline from which we will measure future progress. Removing Lake Nipissing from the calculations results in an AW zone average of 8.09.

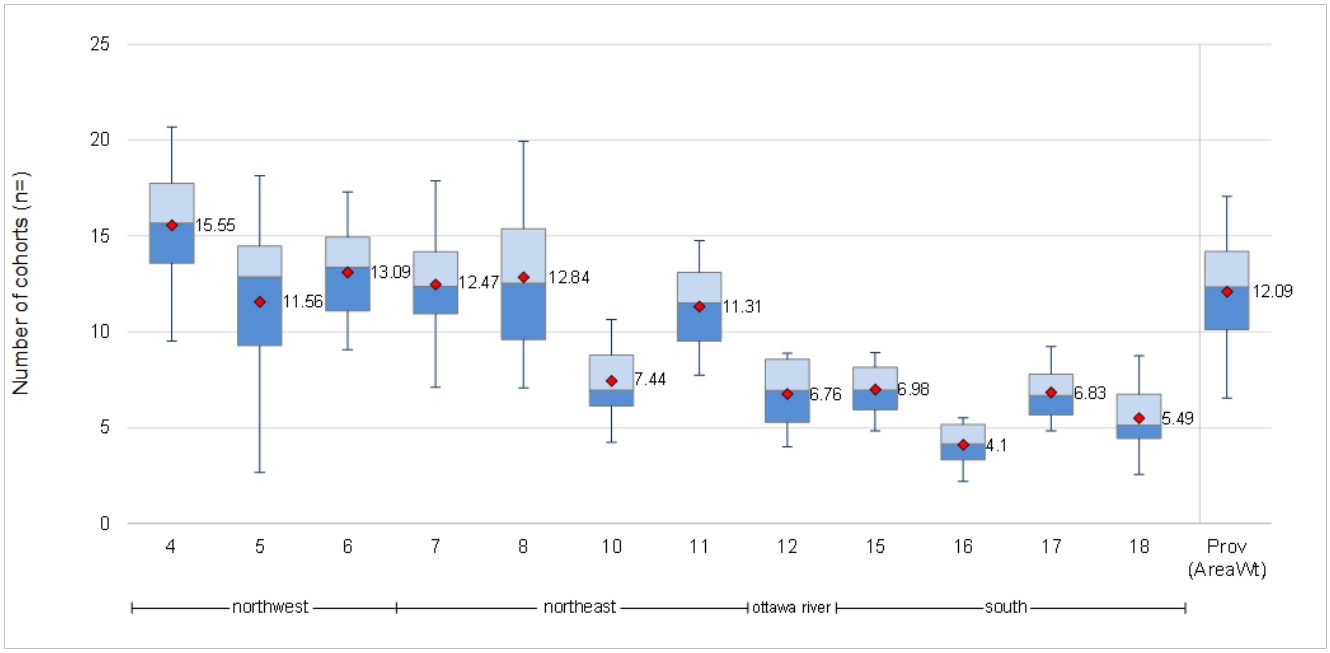


Figure 16. *Area weighted average number of Walleye cohorts (age classes) observed during BsM Cycle 1, by FMZ.*

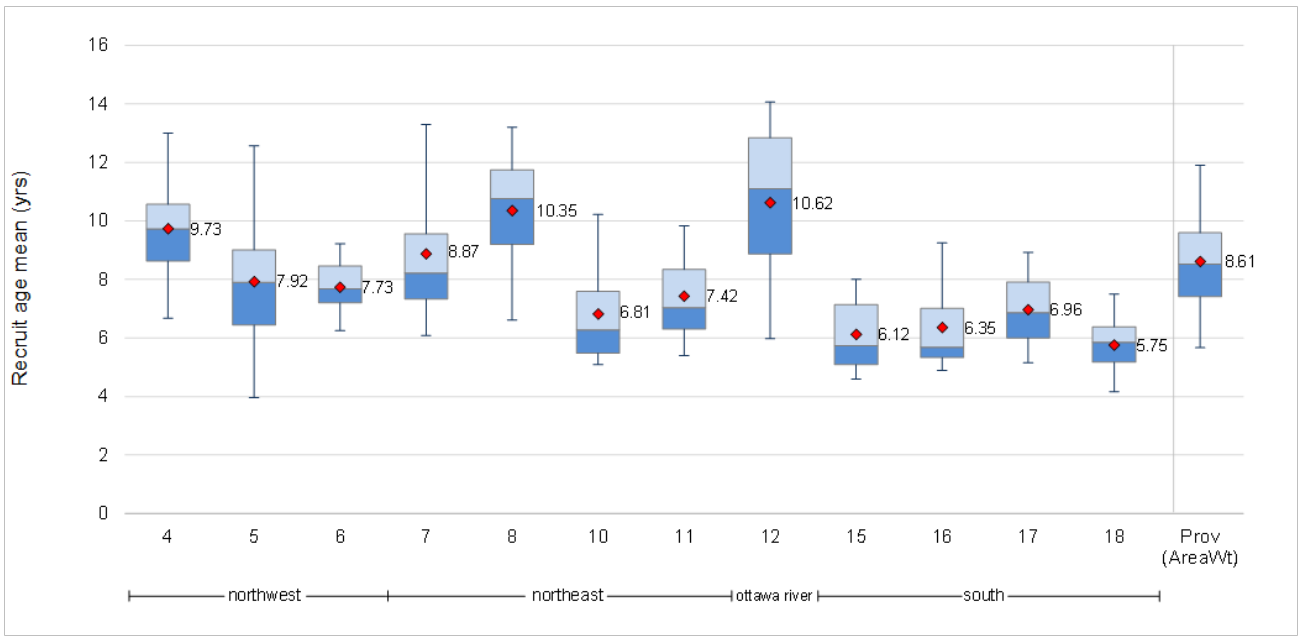


Figure 17. *Area weighted average mean observed age of recruit size Walleye from Walleye trend lakes by FMZ as measured by BsM in Cycle 1.*

Angling pressure

In 2003, 52 Walleye lakes in FMZ 11 (Nipissing and Temagami not included) were assessed for angling effort. The assessment indicated that 12 rod

hours/hectare/year were exerted on Walleye waters (OMNR 2009). The 2003 assessment indicated that Walleye fishing in the zone was approaching its sustainable limits. When examined in the context of sustainability, 41% of the Walleye lakes surveyed were being fished beyond sustainable levels. This is very similar to estimated proportion of lakes being overfished using current reference points and BsM data (Figure 18).

The results of BsM 2009/10 aerial angler counts indicate that on average, angling effort on lakes containing Walleye in FMZ 11 is approximately 7 angler hrs/ha (sum of winter and summer). However, angling effort on a few individual lakes exceeds 30 hrs/ha. The counts conducted by the BsM program in FMZ 11 did not include lakes Nipissing and Temagami, and therefore represent an underestimate of zone-wide angling pressure. Figure 18 and 19 illustrate that angling effort as measured by BsM in Cycle 1 is highest on small (50-500 ha) lakes in both summer 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. Figure 20 provides a visual illustration of how angling effort on Walleye trend lakes is distributed across the zone, where an obvious south to north gradient exists, with effort being highest in the south and lowest in the north.

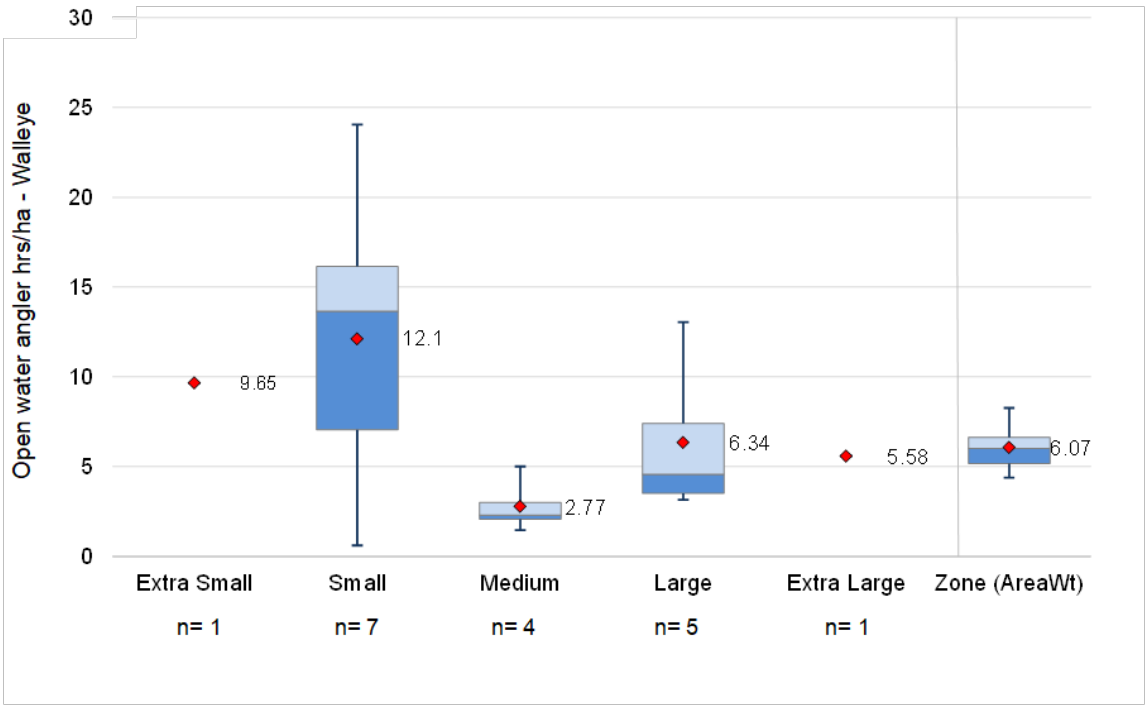


Figure 18. *Open water angling activity (angler hours per hectare) on Walleye trend lakes in FMZ 11, BsM Cycle 1. Angler counts on lakes Nipissing and Temagami were not conducted and therefore are not included here.*

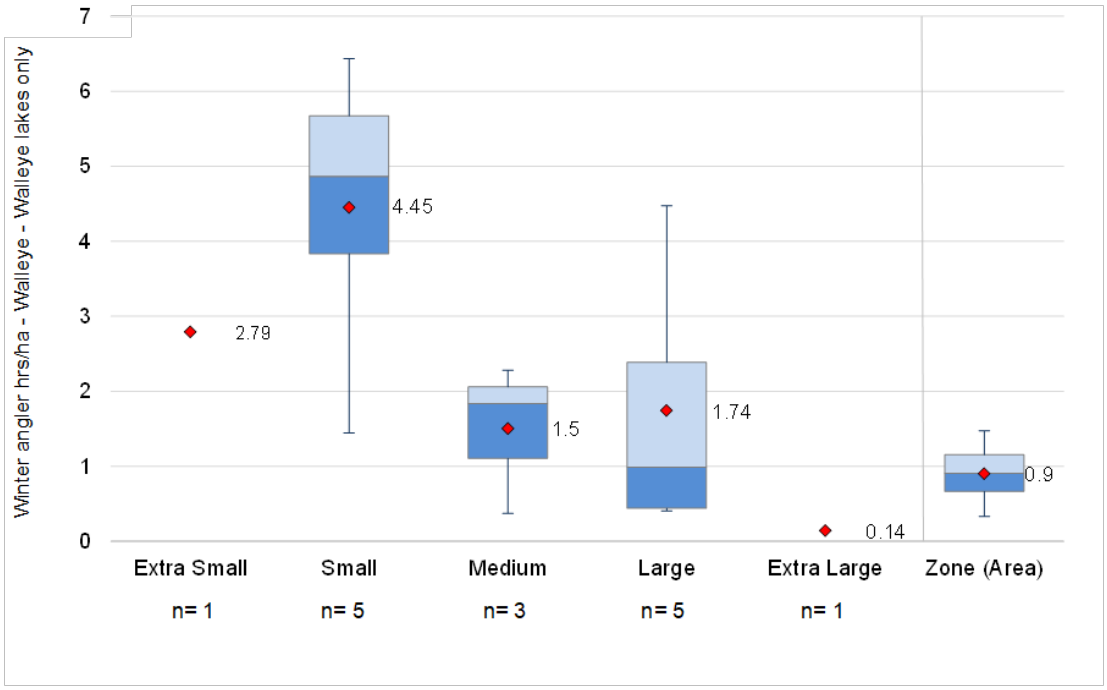


Figure 19. *Winter water angling activity (angler hours per hectare) on Walleye trend lakes in FMZ 11, BsM Cycle 1. Angler counts on lakes Nipissing and Temagami were not conducted and therefore are not included here.*

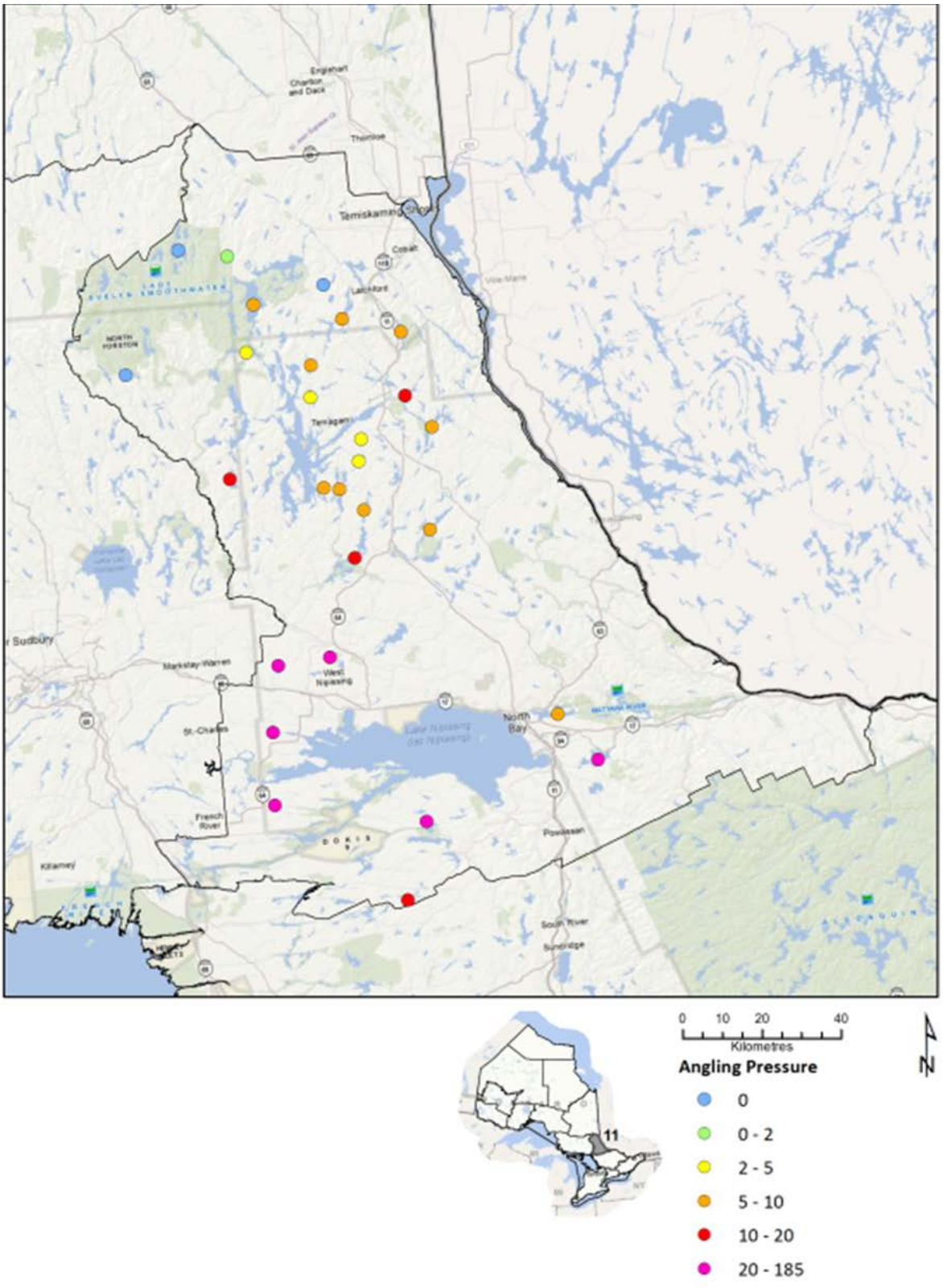


Figure 20. *Distribution of angling pressure (angler hrs/ha) in FMZ 11 as measured by BsM Cycle 1. Angling pressure displayed is the sum of summer and winter combined.*

Reference points

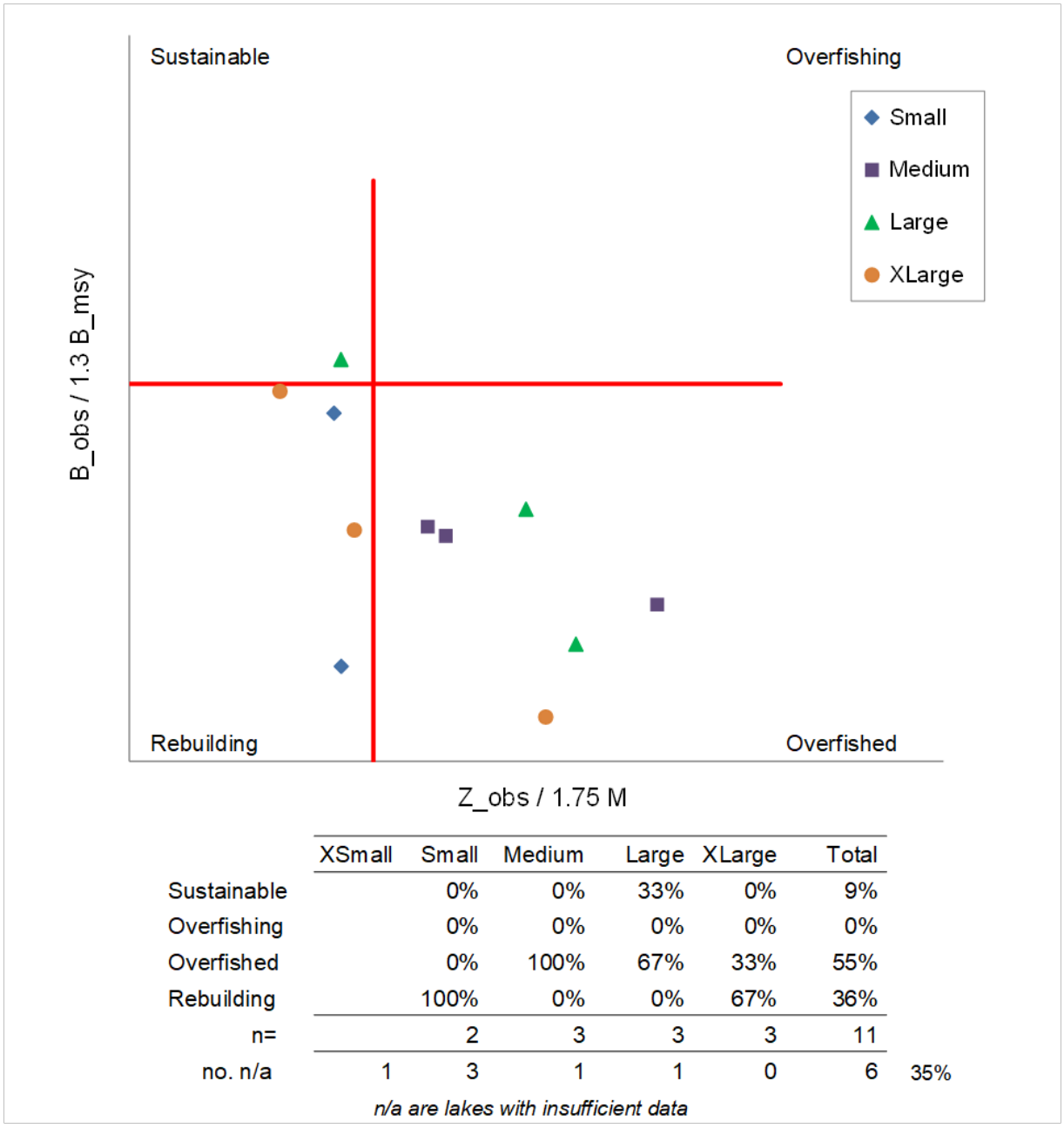
Models relating abundance and sustainable fish yield (reference points) to lake productivity measures (e.g. Secchi depth) have been used for management purposes in Ontario since the 1960s (Ryder 1965, Schlesinger and Regier 1982, Lester et al. 2014). Reference points offer a means of assessing the extent 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. MNRF has developed reference points to evaluate the status of Walleye in inland lakes (Lester et al. 2004, Lester et al. 2014). 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 (kobe plot).

In this document, we use limit reference points for Walleye recommended by Lester et al. (2014). 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 (Figure 21). The mortality limit reference value is the retention selectivity adjusted total mortality rate (Z) divided by the predicted natural mortality rate (M). In addition to the limit reference points we also present results in the context of recommended 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). As shown in Figure 21, 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.

Making use of the 2009 BsM data, in a reference point framework (Figure 21), indicates that at the time when these data were collected, the FMZ 11 Walleye fishing mortality rate exceeded the value considered safe (0.75xM) in 50% of the lakes (6 of 12 lakes monitored had sufficient age samples to obtain an estimate of individual lake level mortality). Additionally, the estimated biomass was below the level considered safe (1.3Bmsy) on 92% (11 of 12) of the lakes monitored.

The poor status of the Walleye resource in FMZ 11 is not a new phenomenon and has been consistent for several years, as indicated by other, independent monitoring data. For example, analyses conducted on the results of various Fall Walleye Index Netting assessments conducted between 1993 and 2001 (Morgan et al. 2002) suggests that the majority of surveyed lakes had biomass estimates below the level considered safe and where estimated fishing mortality exceeded the value considered safe.

An important point to remember 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 mortality 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.



	XSmall	Small	Medium	Large	XLarge	Total	
Sustainable		0%	0%	33%	0%	9%	
Overfishing		0%	0%	0%	0%	0%	
Overfished		0%	100%	67%	33%	55%	
Rebuilding		100%	0%	0%	67%	36%	
n=		2	3	3	3	11	
no. n/a	1	3	1	1	0	6	35%

n/a are lakes with insufficient data

Figure 21. *Quadrant (kobe)-plot of Walleye recruit biomass and Walleye recruit mortality. The proportion of BsM lakes in each quadrant is listed in the table. There are six lakes where insufficient fish were caught to generate a mortality estimate. The red vertical and horizontal lines represent a value of 1, 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). 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).

In an effort to apply a "landscape scale" approach, we make use of the area weighting methodology employed for other indicators throughout this section. Figure 22 shows the range of observed biomass estimates for each lake size bin and ultimately (far right of figure) an area weighted zone level range in Walleye biomass, relative to the previously discussed safe limit reference point (1.3xBmsy). Rather than characterizing the zone as number of lakes above and below the reference point, this method allows for the characterization of the zone as a percentage of water containing Walleye in the zone, above and below the reference point. Figure 22 demonstrates that 93% of Zone 11 Walleye waters are below the safe biomass reference point, and this is the baseline which we will measure progress against. Removing Lake Nipissing from the calculations results in slight increase in status, where 92% of Zone 11 Walleye waters are below the safe biomass reference point. Applying the same logic to the mortality reference point, based on results from lakes where sufficient samples were collected to estimate mortality, we see in Figure 23 that 46% of Zone 11 Walleye waters exceeded the safe mortality reference point. Removing Lake Nipissing from the calculations results in slight increase in status, where 42% of Zone 11 Walleye waters exceed the safe mortality reference point.

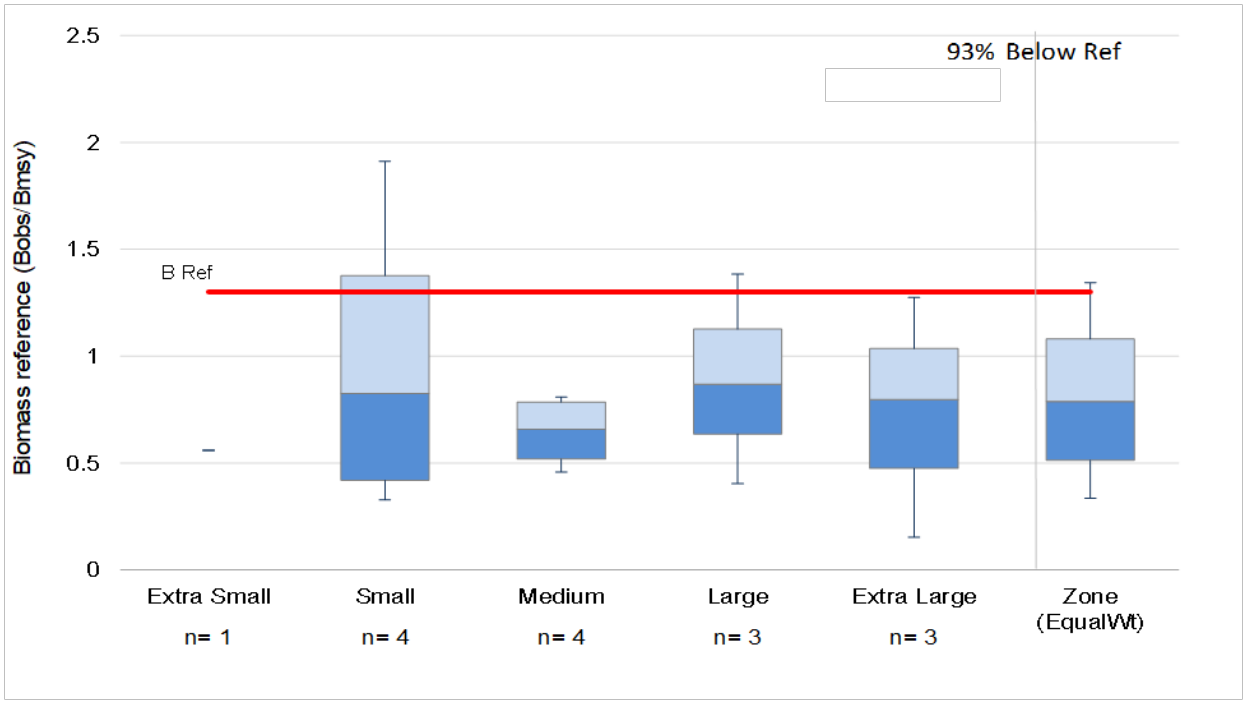


Figure 22. *Biomass reference point for Walleye by lake size. Red line denotes safe biomass reference point of 1.3.*

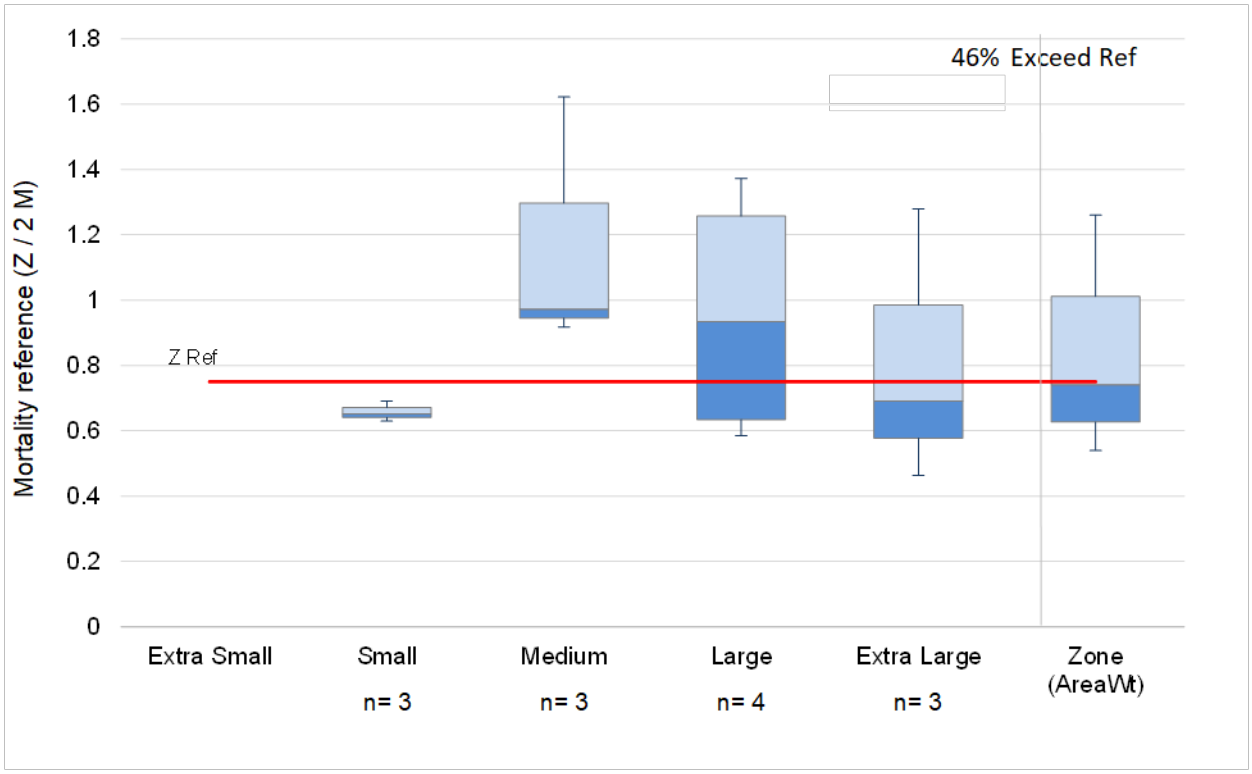


Figure 23. *Mortality reference point for Walleye. Red line denotes the safe mortality reference point of 0.75.*

Walleye Management Plan

Objectives for Walleye within FMZ 11, include improving the overall abundance of Walleye, and in particular, the abundance of reproductively mature fish, to ensure self- sustaining Walleye populations with the Zone. Primary measures of success in this objective would be to increase the percentage of Walleye lakes where both the fishing mortality and biomass (as measured by the Area Weighted Catch per unit Effort, CUE) meet sustainability benchmarks, by 2025. Secondary indicators of success in this objective would be an observed increase, per BsM gang in: the number of fish above 350 mm in length, the number of fish above 450 mm in length, the observed number of age classes (cohorts), the average age of fish being recruited into the adult population. These secondary indicators will be monitored to support the overall weight of evidence to help support management decisions.

The following summarizes the management plan for Walleye outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 3).

Table 3. *Summary of Walleye Management Plan for FMZ 11.*

Objective	**Indicator**	**Benchmark**	**Target**
Increase the percentage of Walleye lakes within FMZ 11 where both fishing mortality and biomass meet sustainability benchmarks.	Percentage of Zone 11 Walleye lakes where fishing mortality is at or below 75% of natural mortality ($F \leqslant 0.75$ M).	Baseline Cycle 1 BsM = 46% of Zone 11 Walleye waters, were at or below the mortality reference point.	Mortality target – increase the % of Zone 11 Walleye waters below the mortality reference point.
	Percentage of Zone 11 Walleye lakes where Biomass is 30%	Baseline Cycle 1 BsM = 7% of Zone 11 Walleye waters, were at or	Increase % of Zone 11 Walleye waters above the Biomass reference point.

	above Biomass at Maximum Sustainable Yield (Biomass ⩾1.3 BMSY).	above the biomass reference point.	
	Number of Walleye (Average AW CUE) ⩾ 350mm in length per BsM gang.	BsM Cycle 1 = 0.65 Walleye per gang (0.7 with Lake Nipissing excluded).	Number of Walleye (Average AW CUE) ⩾ 350mm in length per BsM gang ⩾ 0.65.
	Number of Walleye (Average AW CUE) ⩾ 450mm in length per BsM gang.	BsM Cycle 1 = 0.34 Walleye per BsM gang (0.41 with Lake Nipissing excluded).	Number of Walleye (length ⩾450mm) ⩾ 0.34 Walleye per gang.
	AW Mean age (Years) of recruit size (length >350mm) Walleye.	Cycle 1 BsM value of 7.42 (8.09 with Lake Nipissing excluded).	AW Mean age of recruit size (length >350mm) Walleye ⩾ 7.42.
	Average number of Walleye cohorts (age classes) from BsM.	Average number of Walleye cohorts from BsM Cycle 1 = 11.31 (12.57 with Lake Nipissing excluded).	AW zone average number of Walleye cohorts ⩾11.31.

	AW zone average angler hours per hectare on FMZ 11 Walleye trend lakes.	Area-weighted zone average angler hours/ha on BsM. Walleye trend lakes = 6.97 (does not include Lakes Nipissing or Temagami).	Walleye angling effort to remain stable.
To develop a management strategy to protect and improve Walleye fish habitat within the zone.	Number and frequency of updates to available information on walleye spawning habitat within the North Bay district.	Plan start status. Inclusion of fish (Walleye) habitat considerations in FMZ 11 within other processes, such as: Class Environmental Assessments, shoreline development permitting, and water management planning.	As per the management strategy, assess, prepare and implement remediation plans for impacted spawning as required (district or with partners). Provide input on 100% of the EA (or other streamlined) screenings submitted under the *Public Lands* Act, Water Management Plans and amendments, *Lakes and Rivers Improvement Act* permits where required.
To promote awareness of the principles of	Number of public presentations regarding	Educational tools to be prepared for FMZ 11.	Conduct outreach activities on FMZ 11 fisheries including

Walleye management and to foster a respect for their life history.	education and compliance.		education/compliance events, tradeshows, etc.
	Number of resource reports, status updates and/or peer-reviewed summaries produced and distributed via websites, social media, stakeholder distribution networks and hard copy.		Publish compliance-oriented FMZ 11 literature and share zone-wide Broad-scale monitoring document upon receipt of results.

Management actions to meet walleye management objectives

The management actions are presented below along with an indication of the level of support from the FMZ 11 Advisory Council (Table 4).

Table 4. *Management Actions to Meet Walleye Objectives.*

Walleye management actions	**Advisory Council Advice**
Maintain current angling regulation. Season: January 1 to third Sunday in March and third Saturday in May to December 31. Limits: Sport – 4 fish; Conservation – 2 fish; none between 43-60cm, not more than 1 greater than 60cm.	Council considered the following when discussing regulation change: Comparison between Cycles 1 and 2 of BsM have not been able to show that Walleye populations have improved or declined. Current estimation is that the status of Walleye may not improve under current regulations. If the recreational angling season dates are changed at this time however, it will be extremely difficult to discern whether a future observed decrease or improvement was due to the regulation change in 2008. Leaving the seasons unchanged at this time, until an appropriate analysis of all 3 cycles of BsM data is complete would allow a proper evaluation of the regulation that has been in place since 2008 with relatively low risk. If the BsM program results show signs of improvement or decline to the Walleye fishery, MNRF, with advice from the advisory council, can then consider the need for regulatory change.
Maintain current fish sanctuaries within FMZ 11, unless an apparent change is required, such as with theFountain Falls fish	Walleye sanctuaries have been established based on known vulnerabilities of pre-spawn,

sanctuary, where the sanctuary boundaries and legal description will be amended to reflect the new spawning location. Likewise, streamlining some fish sanctuary dates across the zone to reduce inconsistencies could be considered in the future, but would require a thorough review of all existing sanctuaries and their needs.	spawning and post-spawn Walleye in proximity to specific spawning sites. Most of the existing sanctuaries have been in existence for over 40 years. In the absence of any apparent challenges, problems or issues with the existing fish sanctuaries, the FMZ 11 Advisory Council advised against undertaking an exhaustive review at this time, except in circumstances where revisions are necessary to reflect changes in the seasonal timing or location of the spawn (such as with the Fountain Falls sanctuary)
Continue to address information gaps and improve involvement of Indigenous communities in fisheries management planning process to better inform fisheries management decisions.	None
Continue to integrate FMZ 11 Fisheries Management Plan (FMP) 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.	None

5) Water management planning and operations approvals. 6) Activities reviewed under MNRF's Class EA for Resource Stewardship and Facility Development 7) Aquaculture and Community Hatchery Program permitting and approvals.	
Education about Walleye biology and management to have increased buy-in from users about management actions.	None
Monitor VHS presence in FMZ 11 by: 1) BsM submissions to the national surveillance program administered by CFIA, when requested. 2) investigating reports of fish kills and submitting Walleye which die of unknown causes.	None
Continue to work with enforcement to identify threats to fisheries within the zone such as illegal harvest and unauthorized habitat alteration, disturbance or destruction, introduced species (i.e. Smallmouth Bass, Yellow Perch, and Rainbow Smelt), invasive species (Spiny Water Flea) and transmission of diseases (VHS).	None
Completion of a district habitat management strategy that reviews, assesses and prioritizes risk to known significant Walleye habitat with the	None

intention to protect and improve Walleye fish habitat within the zone. As directed by the district habitat management strategy, conduct assessments at known and suspected walleye spawning sites where flows and levels are regulated, in order to ensure that water management regimes are consistent with Walleye management objectives in the Zone.	

Rationale for the maintenance of current walleye regulations

As discussed above, the 2009 BsM results have been established as the baseline condition to which we will measure the success of management actions. This aligns well with the regulation change of 2008 as a point to assess future results against. In FMZ 11, Cycle 2 BsM data collection was undertaken in 2014/15 and Cycle 3 in 2018/2019 (zone-level data not yet available). These results are helpful because they provide an idea of current trends on the landscape and provide valuable information when considering potential regulation changes. Table 5 presents Cycle 2 results for the selected indicators, and results of paired-sample t-tests for FMZ 11 Cycle 1 vs Cycle 2.

Table 5. *Summary of Walleye Indicator comparisons (using paired sample t-tests) of Cycle 1 and Cycle 2 BsM data for FMZ 11 to determine if there is a statistical difference between cycles.*

Indicator	**Cycle 1**	**Cycle 2**	**Statistical Difference**
CUE (fish per NA1) of recruited size Walleye (≥ 350mm Total Length)	Mean = 0.72 (SD 0.62)	Mean = 0.80 (SD 0.82)	No (P = 0.46)
CUE (fish per NA1) of mature size Walleye (≥ 450mm Total Length)	Mean = 0.30 (SD 0.29)	Mean = 0.41 (SD 0.45)	Yes (P = 0.04)

Indicator	Cycle 1	Cycle 2	Statistical Difference
Number of Walleye cohorts (age classes)	Mean = 9.05 (SD 3.44)	Mean = 9.11 (SD 3.36)	No (P = 0.94)
Mean age of recruited size (≥ 350mm Total Length) Walleye	Mean = 6.9 (SD = 1.6)	Mean = 7.6 (SD = 1.9)	No (P = 0.15)

A full consideration of the above results from Table 5 suggests that Walleye populations in Zone 11 are showing small signs of improvement based on the described indicators. However, since there was no meaningful change, positive or negative, based on the comparison between BsM cycles, and also given the relatively limited opportunity to observe any effects of the 2008 regulation change, we will retain the current regulation and will re-evaluate status post BsM Cycle 3 results (Table 4).

6.3.2 Lake Trout

Management issues, challenges and opportunities

Ontario has 20 to 25% of the natural Lake Trout waters of the world. In FMZ 11, 137 lakes are known to support self-sustaining populations of Lake Trout (Table 1). The Status of Lake Trout Populations in Northeastern Ontario (Selinger et al. 2006) details the health of Lake Trout lakes in the Northeast Region. The report indicated that the status of natural Lake Trout waters in the region was fundamentally unhealthy due to overharvest, unauthorized species introductions and acid damage. Road access was implicated in both the overharvest and the unauthorized species introductions.

In 2006, Lake Trout catch, and possession limits were reduced from three to two and the winter season was reduced to five weeks in an effort to arrest the decline in resource status. This regulation change came into effect in January 2008. To further support population recovery, a zone-wide size limit for Lake Trout was implemented on January 1 2020 for both conservation and sport recreational fishing licenses, whereby anglers can only retain 1 fish over 40 cm. Additionally, the open-

water season for Lake Trout was reduced, closing on Labour Day rather than September 30.

Challenges:

- Status of the Lake Trout fishery as identified in The Status of Lake Trout Populations in Northeastern Ontario (Selinger et al. 2006) suggests only 28% of natural Lake Trout lakes meet benchmark considered healthy for abundance. In addition, adult female abundance (proportion of adult female Lake Trout in the population) was identified as 19% (well below the 32% in reference lakes);
- Past impairment or losses of Lake Trout populations due to acidification of waterbodies and challenges with recovery;
- Poorly timed water level variations in regulated systems, for example, impairing or exposing overwintering embryos. Among FMZ 11 Lake Trout lakes considered degraded, greater than 90% have winter drawdowns from water level control/water power operations;
- Increased nutrient loading due to poor shoreline practices and lakeside developments;
- Inability to precisely control the magnitude of recreational harvest in an open-access fishery;
- Uncertainty about the effects of climate change and its direct effects, specifically, on coldwater species through changing conditions that benefit competitors (e.g. bass); and

Opportunities:

- Ability to implement regulations which simultaneously protect reproductive output (spawning adults), while providing consumptive and trophy fisheries in the zone;
- Continue to work with partners to assess the status of acid damaged lakes and to recover Lake Trout populations in acid damaged waters through restorative stocking and protection;
- To work with partners to update values and protect and enhance spawning habitat;

- Increase public awareness of the productive capacity of Lake Trout lakes, their sensitivity to introductions and how complex fish communities reduce a water body's ability to produce Lake Trout;
- Consider and review water level management regimes to ensure that facility operations do not affect Lake Trout recruitment and do not conflict with the Lake Trout recovery efforts;
- Increase the transparency and visibility of monitoring results to foster greater public awareness and acceptance of management actions.
- Utilize effective educational materials that explain Lake Trout life history and the challenges of harvest control and management; and
- Maintain Lake Trout stocking program in the zone with 19 currently stocked waterbodies on the 2019 North Bay District stocking list.

Status of Lake Trout

The FMZ 11 Lake Trout fishery is an important and sensitive fishery that represents a unique indicator of one of the coldwater fish communities and ecosystems in the zone. Once these fisheries and their ecosystems are severely altered, it is very difficult for resource managers to return them to their natural state.

It is important to recognize that Lake Trout lakes in FMZ 11 are, in some cases, limited in their productive capacity because of habitat alterations, potential interactions with introduced species (e.g. Smallmouth Bass), and acidification. In the following sections we primarily present results from the current monitoring program (BsM), using data from lakes which are monitored as Lake Trout trend lakes. These data represent our best understanding of the current status of Lake Trout in the zone. It is important to note that many of the results from previous studies of Lake Trout in FMZ 11 show similar patterns as the current monitoring program, and we refer to historical measures where appropriate.

The following figures (24 to 29) provide comparisons of some key Lake Trout habitat characteristics, and fish community complexity from lakes in FMZ 11 to those in other FMZ's. Some of these will play a significant role in how these populations respond to management actions. As seen in Figures 24 to 26, FMZ 11 Lake Trout trend lakes are relatively large, moderately deep, and provide adequate coldwater habitat (area below thermocline). However, FMZ 11 Lake Trout trend lakes have

relatively high community complexity (Figure 27) along with high abundance of Smallmouth Bass (Figure 28) and Coregonids (Figure 29). Smallmouth 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 (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.

Local and regional reports indicate that the FMZ 11 Lake Trout resource has been in a state of poor condition for decades (OMNR 2009). Lake Trout populations in the Highway 805 area were reported to be over-fished and degraded (Rowe and Ingwersen 2003). This local resource assessment also examined historical data and found that the resource was also in poor condition in the 1970's and 1980's.

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 from across Northeast region, indicating a widespread depletion of Lake Trout populations below expected abundance levels. Lake Trout populations in FMZ 11 were found to be in a similar condition to those in adjacent FMZ 10. The main drivers of the poor condition of the Lake Trout resource in the northeast region were identified as overfishing and introduced species. This report made use of data collected from several 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 continuing decline of the resource in FMZ 11.

In 2006 North Bay district MNRF, recognizing the poor condition of the Lake Trout resource in FMZ 11 developed and consulted on an interim Lake Trout regulation to stop the decline. A new set of Lake Trout regulations was implemented in 2008. Beginning in late 2010 the FMZ 11 Advisory Council and the MNRF project team developed a set of objectives and evaluated alternative angling regulations utilizing

a computer simulation model based on general Lake Trout life history information. Modelling forecasts of the relative performance of alternative regulations were compared to the current regulation at that time and the recovery objectives set by council were evaluated. The 10-year and 20-year targets set by council were to manage the Lake Trout fisheries to realize an increase in abundance of 20% and 40% respectively. A random selection of 14 lakes, larger than 50 ha, identified as known to support self-sustaining populations of Lake Trout, are identified as Lake Trout trend lakes in the BsM program and are used to determine current and future status of Lake Trout in the zone.

Of the 14 lakes in FMZ 11 selected as Lake Trout trend lakes and surveyed in Cycle 1 (2009), 1 lake had no Lake Trout captured, indicating extremely low abundance. However, consultation with the FMZ 11 Advisory Council confirmed that Lake Trout do still exist in this waterbody, and therefore will continue to be monitored as a Lake Trout trend lake. Recent (2010) regulatory changes for Lake Trout in neighboring FMZ 10, which were established to recover Lake Trout populations in that zone, provide an opportunity to further evaluate the performance of the 2008 FMZ 11 Lake Trout regulation changes. In the following sections we provide comparisons between FMZ 10 and FMZ 11 for several indicators of population health. Most of the critical comparisons that demonstrate the effectiveness of the FMZ 10 regulations, compared to FMZ 11 regulations, only become apparent when looking at results of the second cycle (2012 – 2017) of BsM. This is consistent with the general life history of Lake Trout populations which make them slow to respond to recovery efforts.

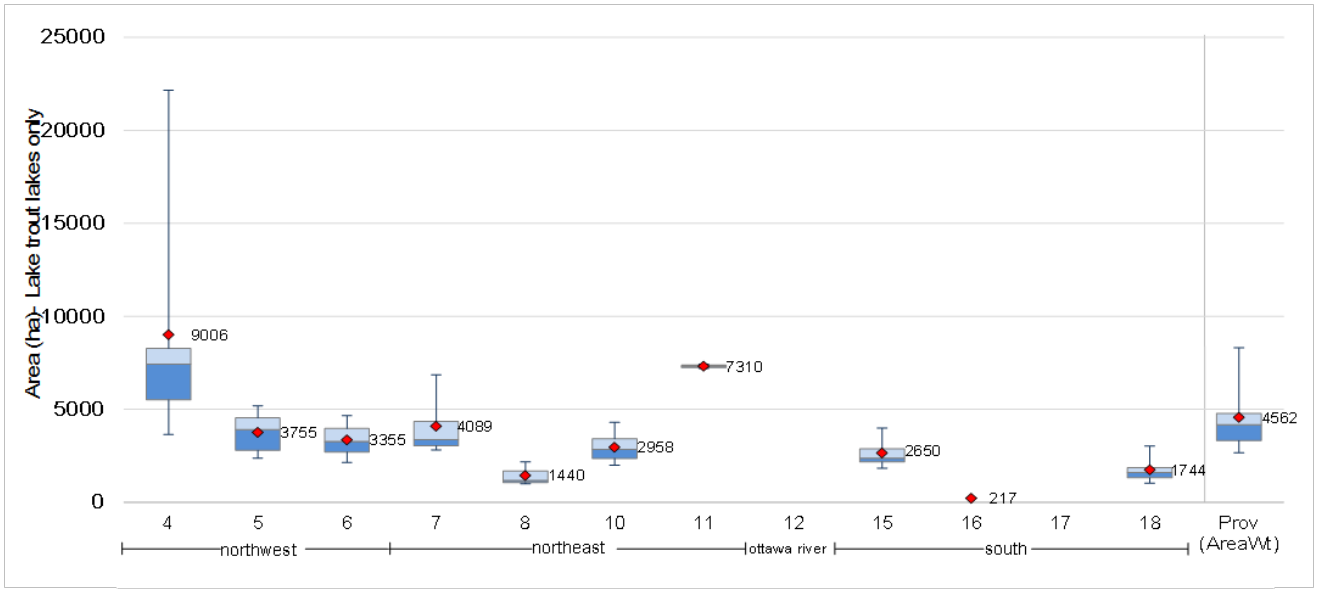


Figure 24. *Area weighted average surface area (hectares) of Lake Trout trend lakes by FMZ as measured by BsM in Cycle 1 (2008-2012).*

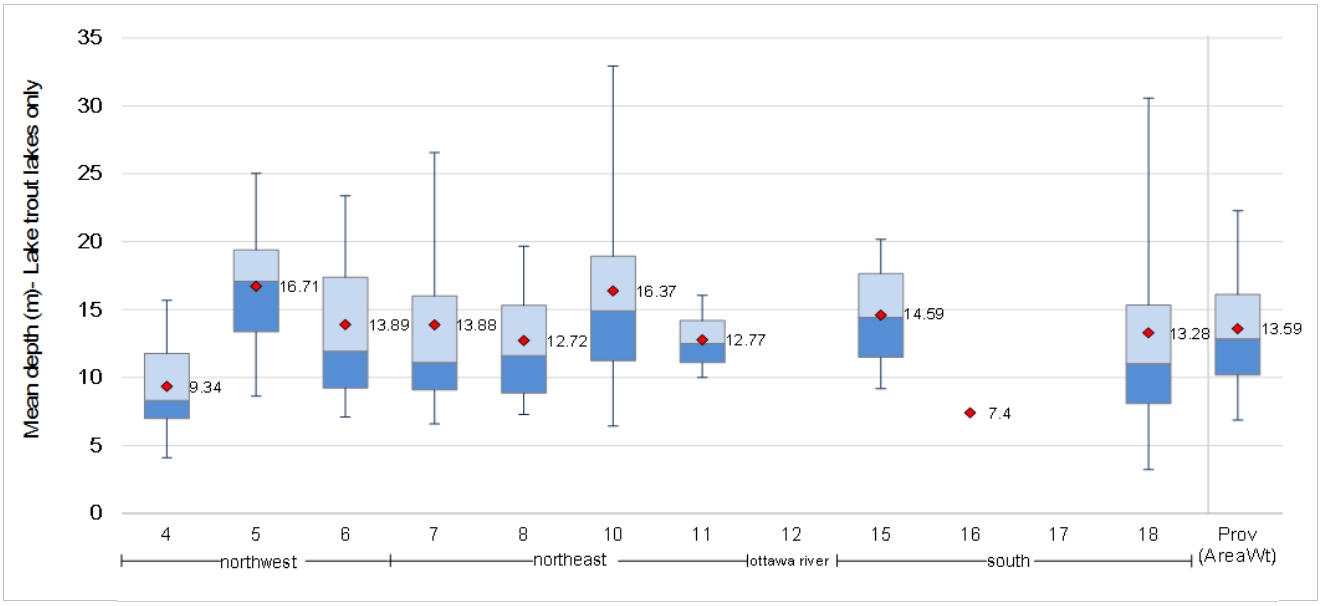


Figure 25. *Area weighted average mean depth of Lake Trout trend lakes by FMZ as measured by BsM in Cycle 1 (2008-2012).*

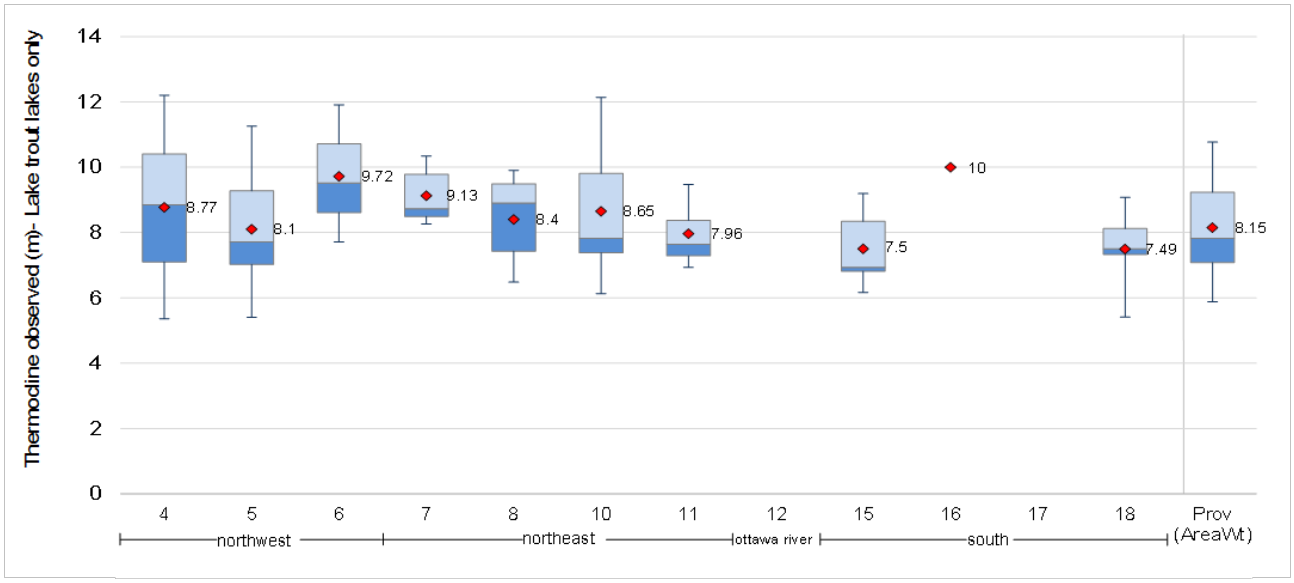


Figure 26. *Area weighted average thermocline depth (meters) of Lake Trout trend lakes by FMZ as measured by BsM in Cycle 1 (2008-2012).*

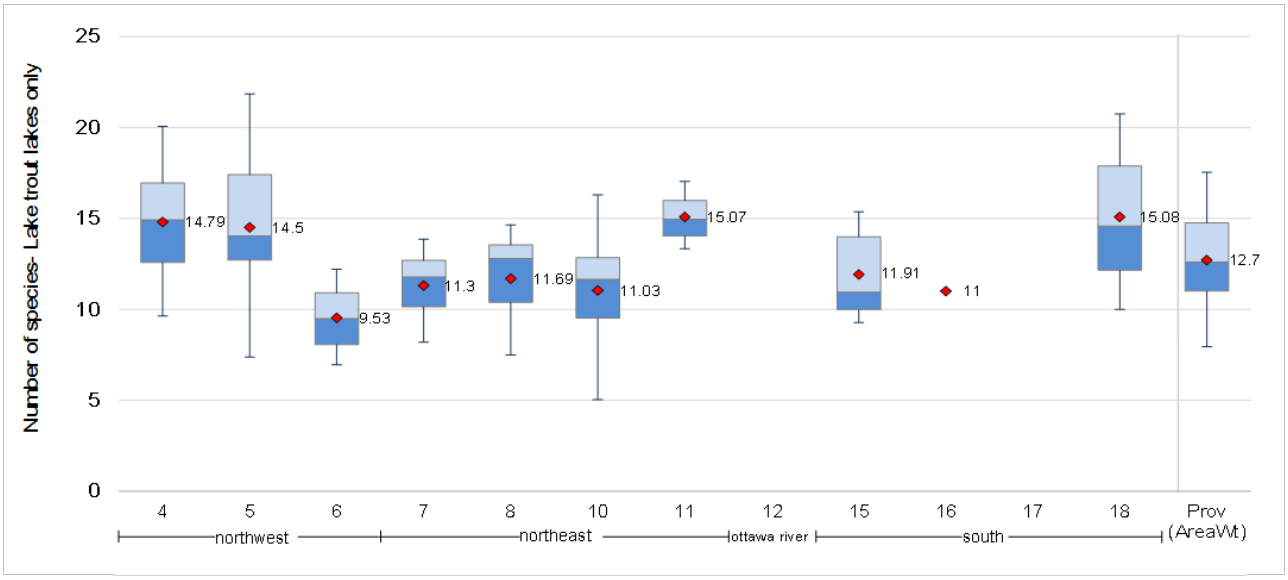


Figure 27. *Area weighted average number of fish species in Lake Trout trend lakes by FMZ as measured by BsM in Cycle 1 (2008-2012).*

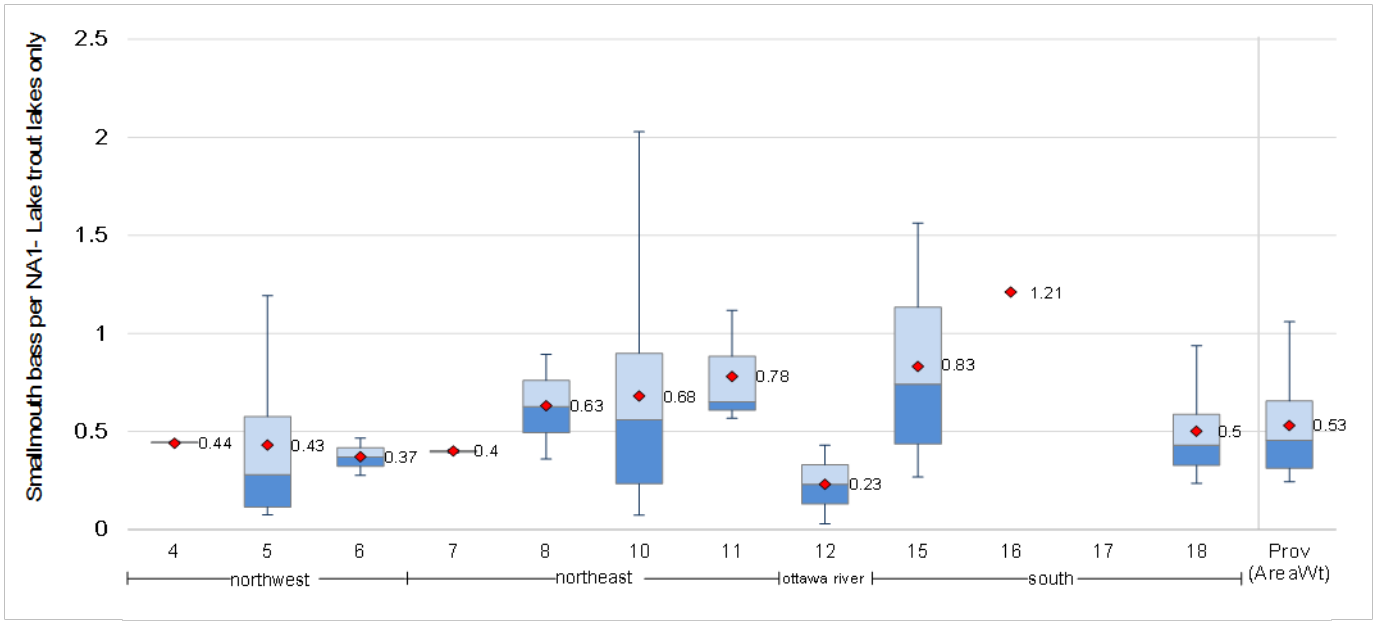


Figure 28. *Area weighted average CUE of Smallmouth Bass in Lake Trout trend lakes by FMZ as measured by BsM in Cycle 1 (2008-2012).*

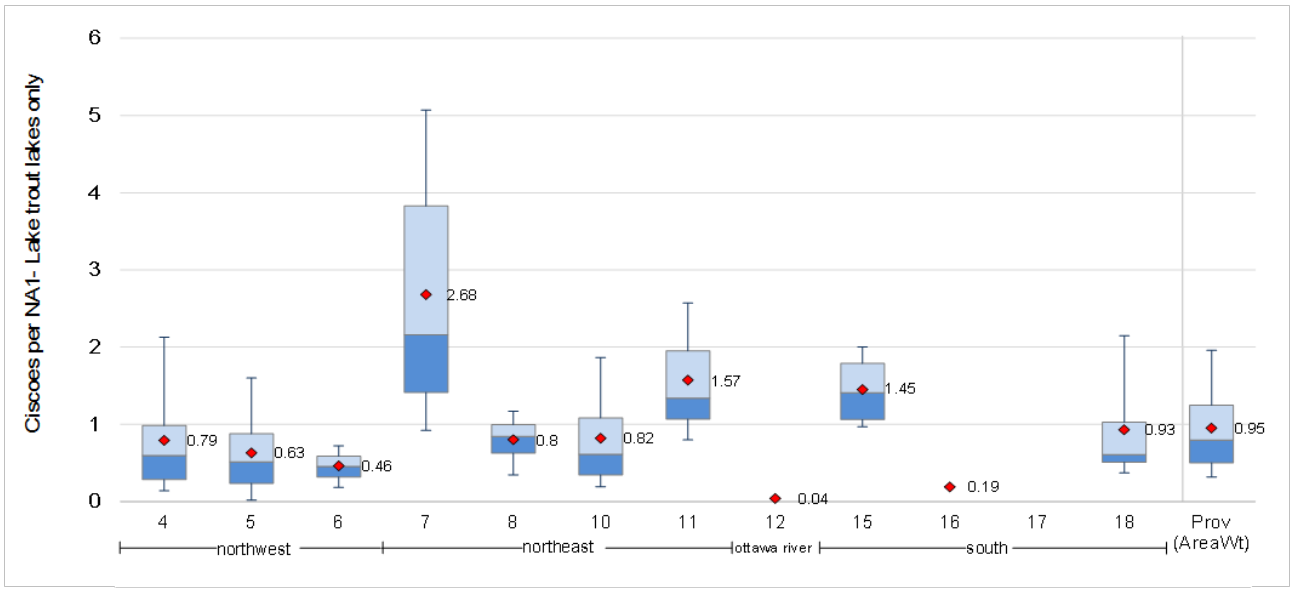


Figure 29. *Area weighted average CUE of Lake Herring in Lake Trout trend lakes by FMZ as measured by BsM in Cycle 1 (2008-2012).*

Abundance

Abundance of Lake Trout, as a zone-wide indicator of status, is assessed by making use of an AW CUE, as described in section 6.2. The AW average CUE of recruited size Lake Trout from 14 Lake Trout trend lakes in FMZ 11 during the first cycle of the

BsM program was 0.39 fish per gang (Figure 30). Comparing results from FMZ 11 to other FMZs with similar lake characteristics and productive capacity (i.e. FMZ 5 and 10) we see that observed abundance in FMZ 11 is lowest, but similar to observations in neighboring FMZ 10. However, making use of BsM results from Cycle 2 (Figure 31), it becomes apparent that FMZ 10 Lake Trout populations appear to be responding positively, with increases in abundance, to the restrictive regulations implemented in 2010, whereas FMZ 11 Lake Trout abundance appears to be declining..

In FMZ 11, as in most FMZ's there exists an interest in maintaining or increasing the abundance of mature Lake Trout. 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. It is therefore important to track the abundance of mature lake trout. We pooled all Lake Trout data collected in BsM Cycle 1 and Cycle 2 from FMZ 11 to provide an estimate of length at 50% maturity for the zone. The estimated length at 50% maturity for FMZ 11 Lake Trout (sexes combined) is 401mm total length (Figure 32).

The Cycle 1 BsM baseline in FMZ 11, for AW CUE of Lake Trout $\geqslant$ 400mm Total Length, is 0.31 fish/net. (Figure 33). Here, it is again helpful to compare results from FMZ 11 to other FMZs (i.e. FMZ 5 and 10). We see in Figure 33 that observed abundance in FMZ 11 is lowest among these three zones, but similar to observations in neighboring FMZ 10. Making use of BsM results from Cycle 2 (Figure 34), it becomes apparent, again, that FMZ 10 Lake Trout populations appear to be responding positively, in recent years, whereas FMZ 11 Lake Trout appear to be declining in abundance.

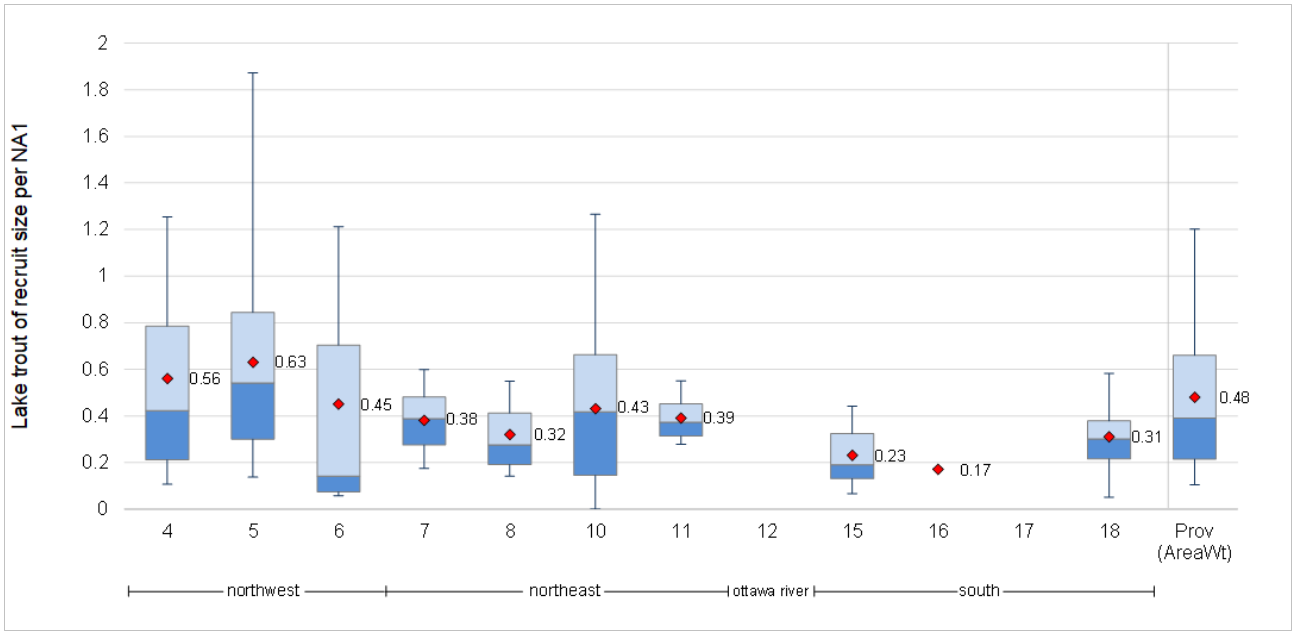


Figure 30. *Area weighted average CUE (fish per net) of recruited size (>350mm total length) Lake Trout from lakes monitored as Lake Trout trend lakes, by FMZ as measured in BsM Cycle 1.*

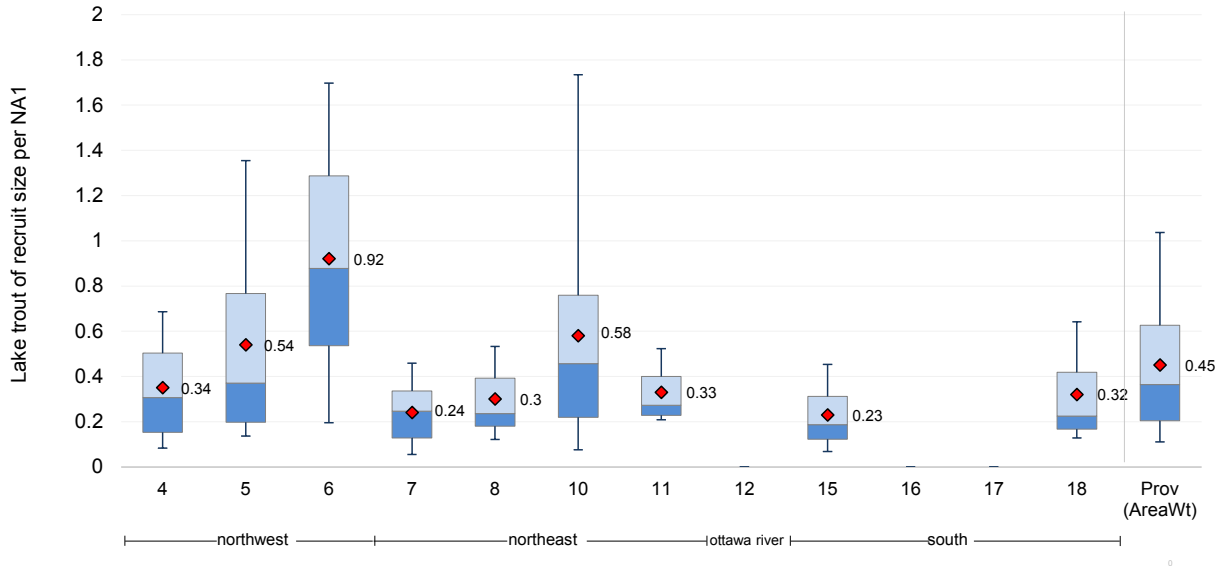


Figure 31. *Area weighted average CUE (fish per net) of recruited size (>350mm total length) Lake Trout from lakes monitored as Lake Trout trend lakes, by FMZ as measured in BsM Cycle 2.*

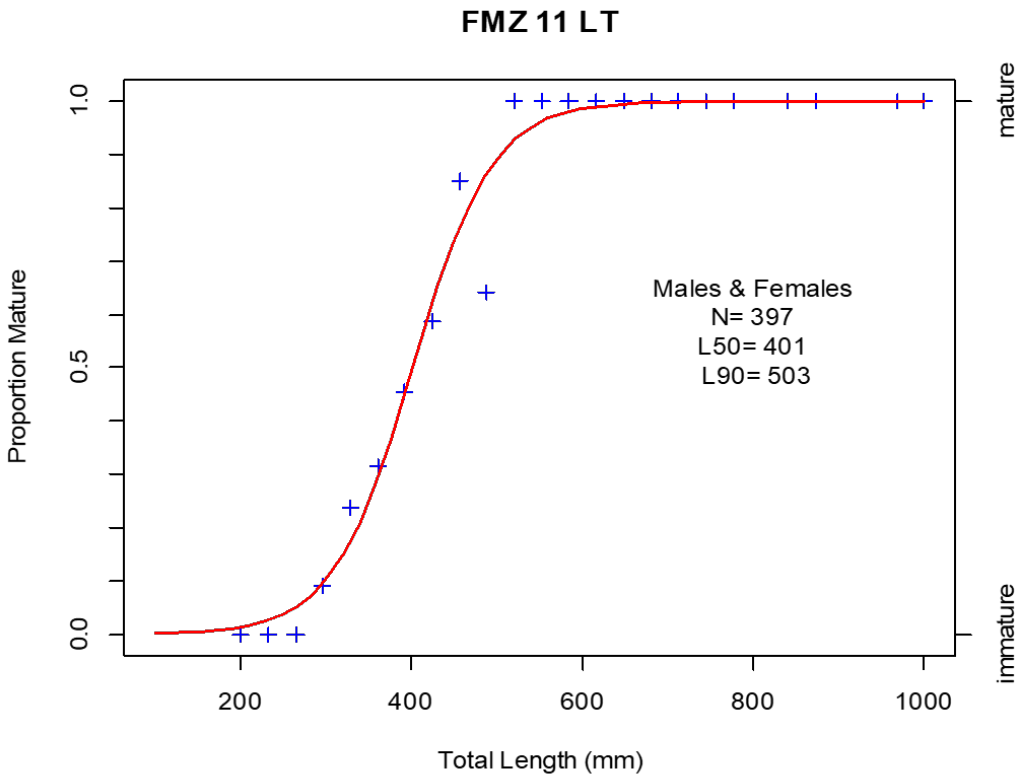


Figure 32. *Maturity schedule for FMZ 11 Lake Trout (sexes combined), as measured by BsM, Cycle 1.*

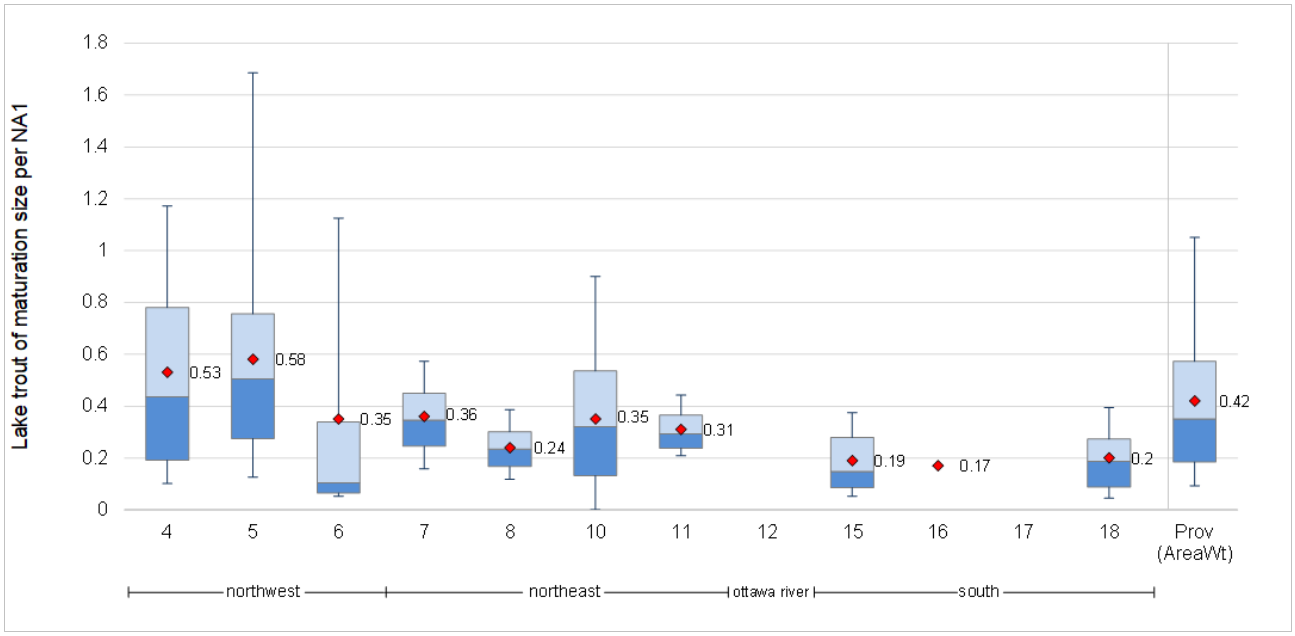


Figure 33. *Area weighted average CUE (fish per net) of mature size (>400mm total length) Lake Trout from lakes monitored as Lake Trout trend lakes, by FMZ measured in BsM Cycle 1.*

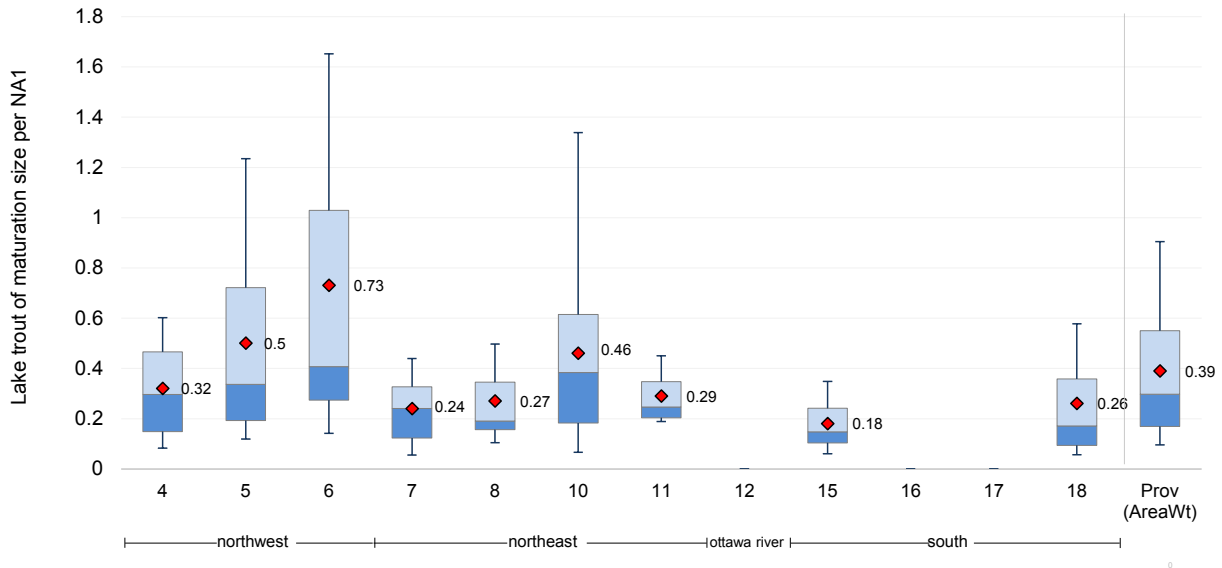


Figure 34. *Area weighted average CUE (fish per net) of mature size (>400mm total length) Lake Trout from lakes monitored as Lake Trout trend lakes, by FMZ measured in BsM Cycle 2.*

Age structure and mortality

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 the population typically gives a good indication of the health of the population. Fewer cohorts and/or declining average age typically results from high levels of mortality for those older age classes. Two complimentary indicators for describing the age structure of FMZ 11 Lake Trout are described as follows. First, the number of cohorts is presented and second, the average age of the recruited portion (>350mm) of the population. Here we define a cohort as any age class where 3 or more individuals of that age were detected. Figures 35 to 37 show the age structure results for FMZ 11 compared to the other FMZs, as measured in Cycle 1 of BsM.

As seen in Figures 35 and 36, age structure of FMZ 11 Lake Trout populations appears healthier than populations in FMZ 10. However, when we make use of Cycle 2 BsM data (Figures 37 and 38) we begin to see the benefits of the restrictive regulation implemented in FMZ 10 in 2010. Specifically, we begin to see in FMZ 10 that the range of observed values and the zone-wide area weighted mean have increased, whereas the same measures in FMZ 11 appear to be either declining or stable.

The age structure of a population can also be used to estimate the total instantaneous mortality rate via catch curve analysis (Robson and Chapman 1961) and ultimately an estimate of the annual survival rate. We calculated (sexes combined) annual survival rate of Lake Trout, where sufficient age samples (N > 20) were obtained at the individual lake level. The retention selectivity adjusted, area weighted, average annual survival rate of recruited size Lake Trout from Lake Trout trend lakes monitored by the BsM program in Cycle 1 is presented in Figure 39. These data demonstrate that FMZ 11 Lake Trout populations, as measured in Cycle 1 of BsM, had survival rates similar to populations in FMZ 10, but less than most northern FMZ's. However, when we make use of Cycle 2 of BsM (Figure 40), we notice the positive response to the FMZ 10 regulation in FMZ 10 populations, whereas FMZ 11 populations continue to show relatively poor survival.

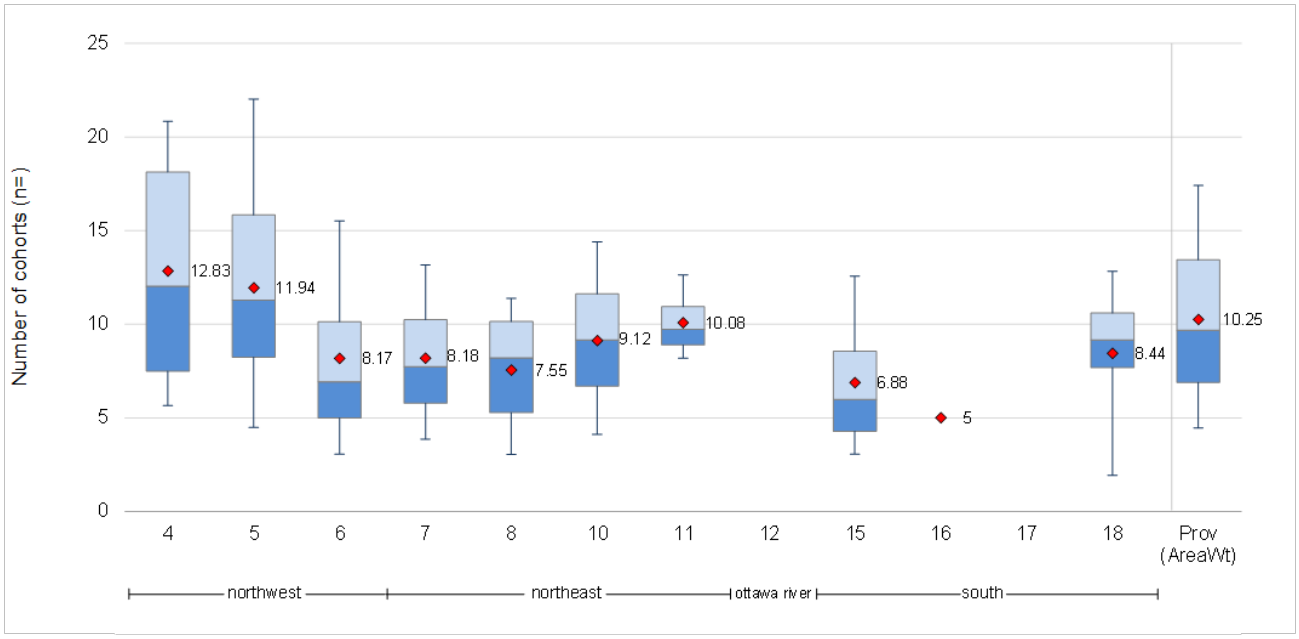


Figure 35. *Area weighted average number of Lake Trout cohorts from lakes monitored as Lake Trout trend lakes, by FMZ as measured by BsM Cycle 1.*

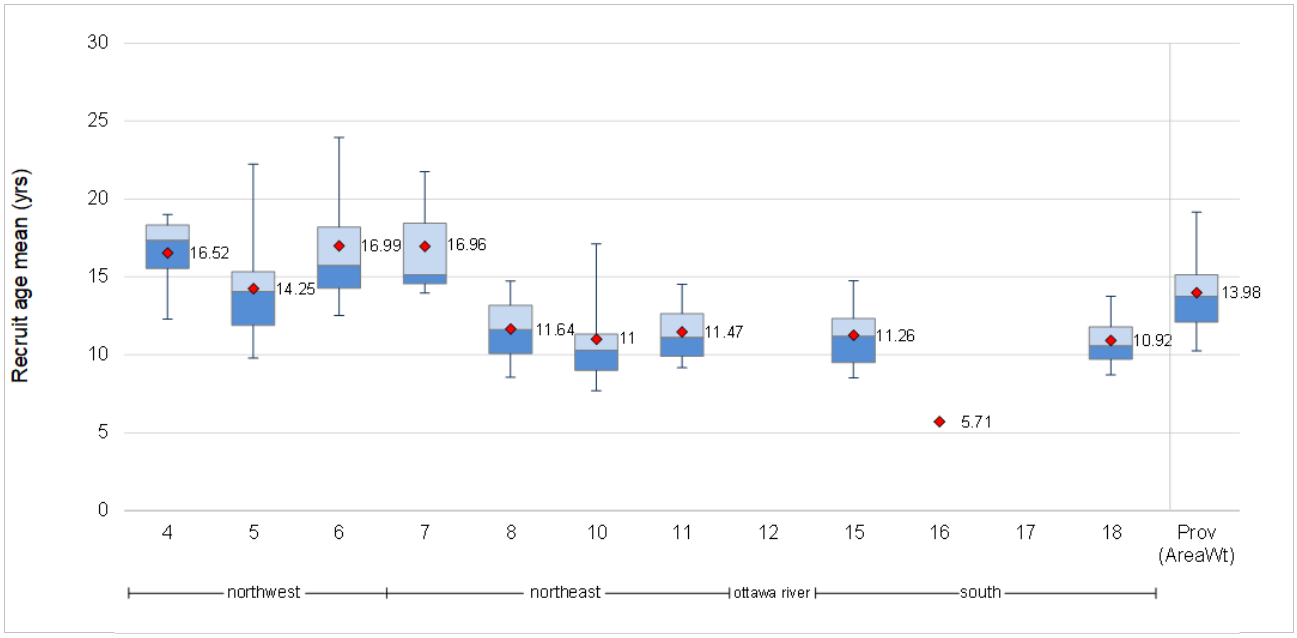


Figure 36. *Area weighted average age of recruited size (⩾350 mm total length) Lake Trout from Lake Trout trend lakes, by FMZ as measured by BsM Cycle 1.*

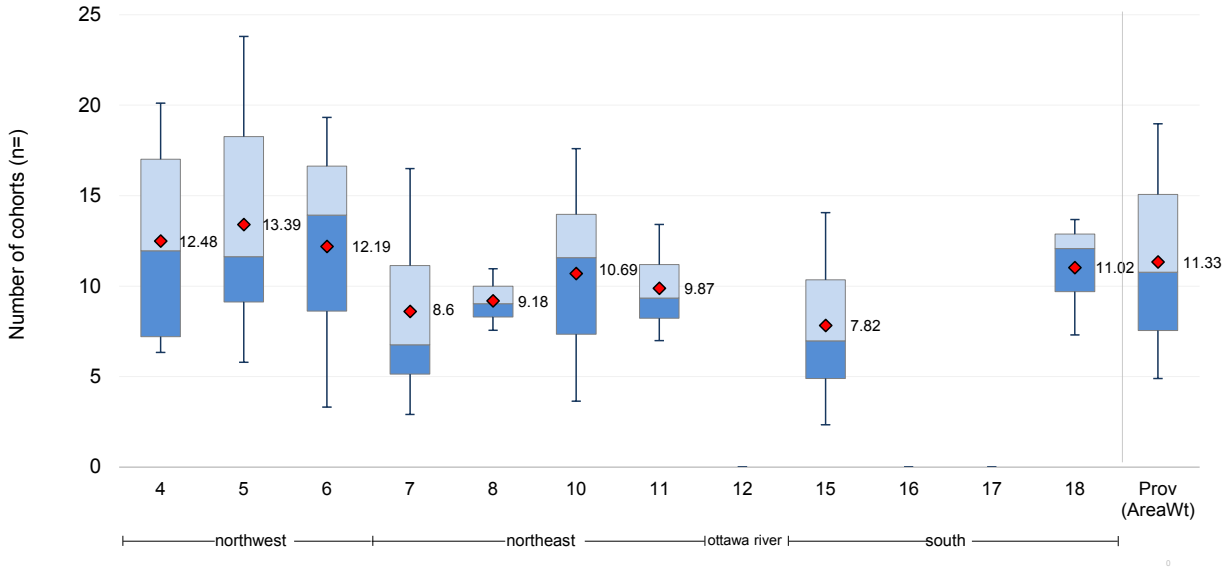


Figure 37. *Area weighted average number of Lake Trout cohorts from lakes monitored as Lake Trout trend lakes, by FMZ as measured by BsM Cycle 2.*

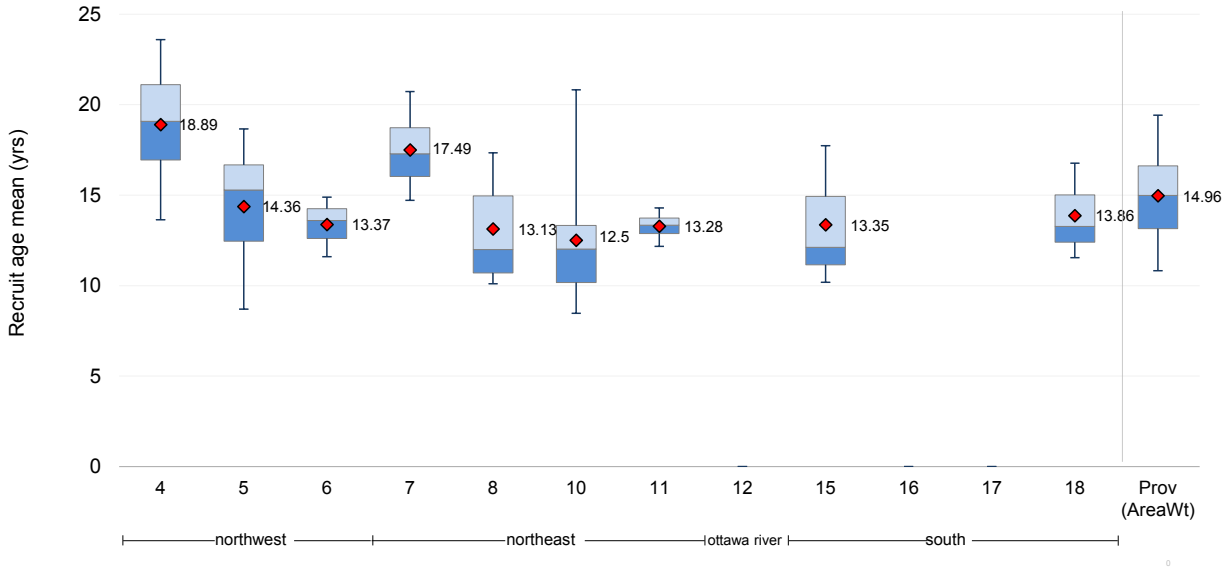


Figure 38. *Area weighted average age of recruited size (⩾350 mm total length) Lake Trout from Lake Trout trend lakes, by FMZ as measured by BsM Cycle 2.*

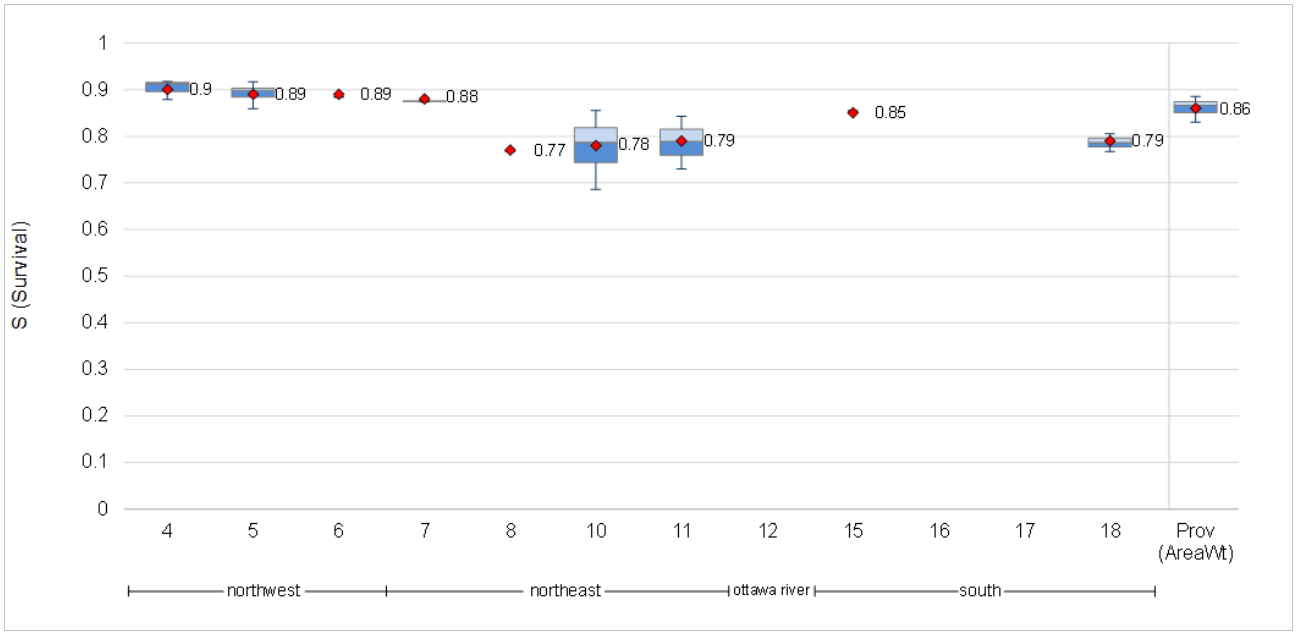


Figure 39. *Area weighted average retention selectivity adjusted annual survival rate of recruited size Lake Trout from Lake Trout trend lakes monitored by the BsM program in Cycle 1.*

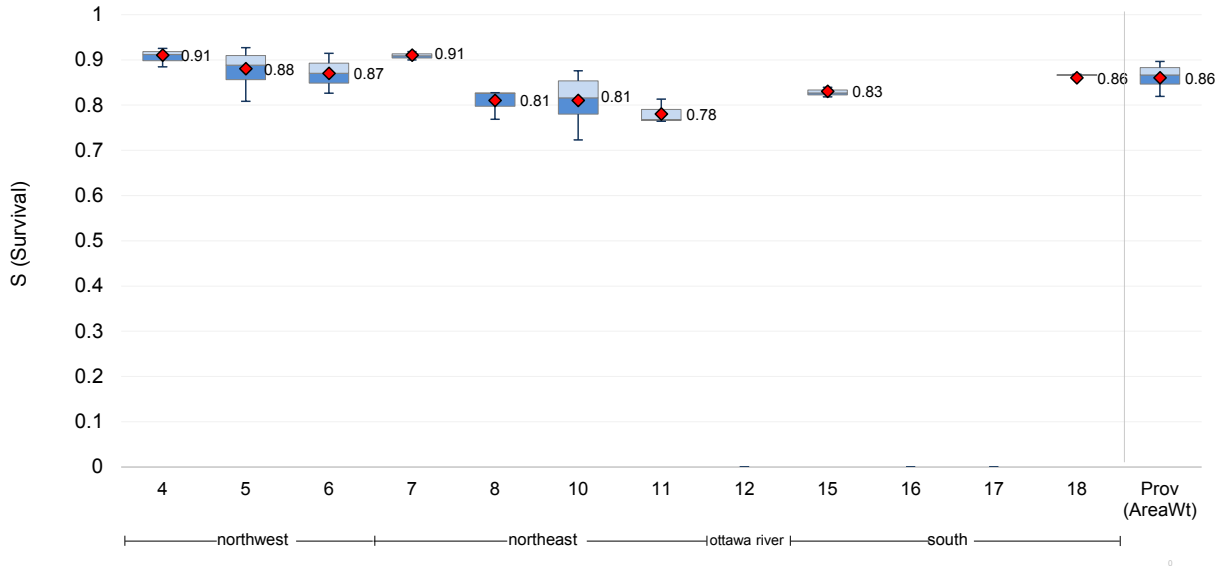


Figure 40. *Area weighted average retention selectivity adjusted annual survival rate of recruited size Lake Trout from Lake Trout trend lakes monitored by the BsM program in Cycle 2.*

Angling Pressure

Selinger et al. (2006) showed the mean regional benchmark for a sustainable level of fishing effort for 529 self-sustaining Lake Trout lakes in Northeast Region as 6.4 angler-hours per hectare (angler-hrs/ha). The mean annual angling intensity documented for the same self-sustaining lakes was 5.4 angler-hrs/ha. Similarly, activity counts & creel surveys conducted on 20 Lake Trout lakes within FMZ 11 during the period 2000 – 2002 estimated the average effort to be approximately 5 hrs/ha.

Figures 41 and 42 show the estimated angling intensity, as measured by the BsM program, in Cycle 1, via aerial angler counts, on Lake Trout trend lakes by FMZ for summer and winter respectively. The counts conducted by the BsM program in Cycle 1 in FMZ 11 did not include Lake Temagami and they therefore represent an underestimate of total Lake Trout angling effort for the FMZ. Combining the winter and summer estimates, we see that the amount of angling pressure on Lake Trout trend lakes in FMZ 11 (Temagami not included) is 3.19 angler-hrs/ha. We also see that summer effort on Lake Trout trend lakes in FMZ 11 is the highest among all Northern FMZ's while winter effort is relatively low when compared to other Northern FMZs. Making use of available angling effort data for lake Temagami (1995) shows that winter effort was approximately 1 angler-hr/ha and summer effort was approximately 2.8 angler-hr/ha (MNRF 1998). Assuming that effort on Lake Temagami has not changed significantly and incorporating these data into our zone calculations results in an area weighted winter angling effort estimate of 0.75 and an area weighted summer angling effort estimate of 2.63, for a combined area weighted zone-wide estimate of 3.38 angler-hr/ha on Lake Trout lakes.

Figures 43 and 44 show the estimated angling intensity, as measured by the BsM program in Cycle 2, on Lake Trout trend lakes by FMZ for summer and winter respectively. The BsM estimates in Cycle 2 did include data from Lake Temagami. Figures 43 and 44 show Lake Trout effort declined in Cycle 2 in most FMZs.

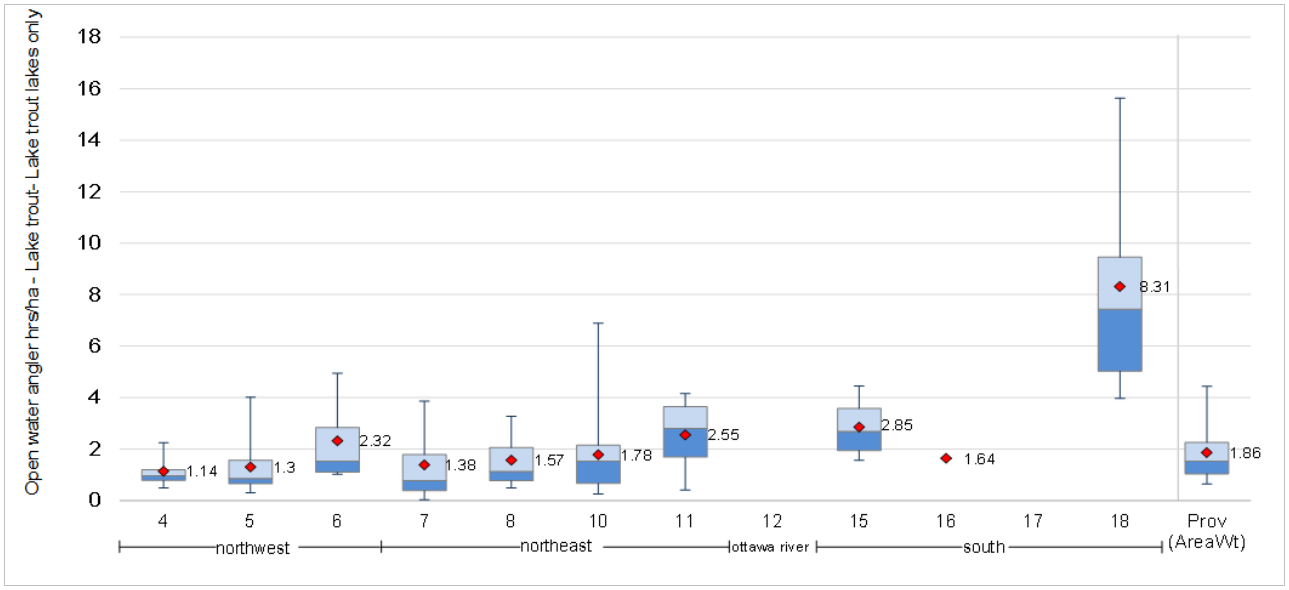


Figure 41. *Area weighted angling intensity during summer (hr/ha/yr) for Lake Trout trend lakes by FMZ, as measure by BsM during Cycle 1.*

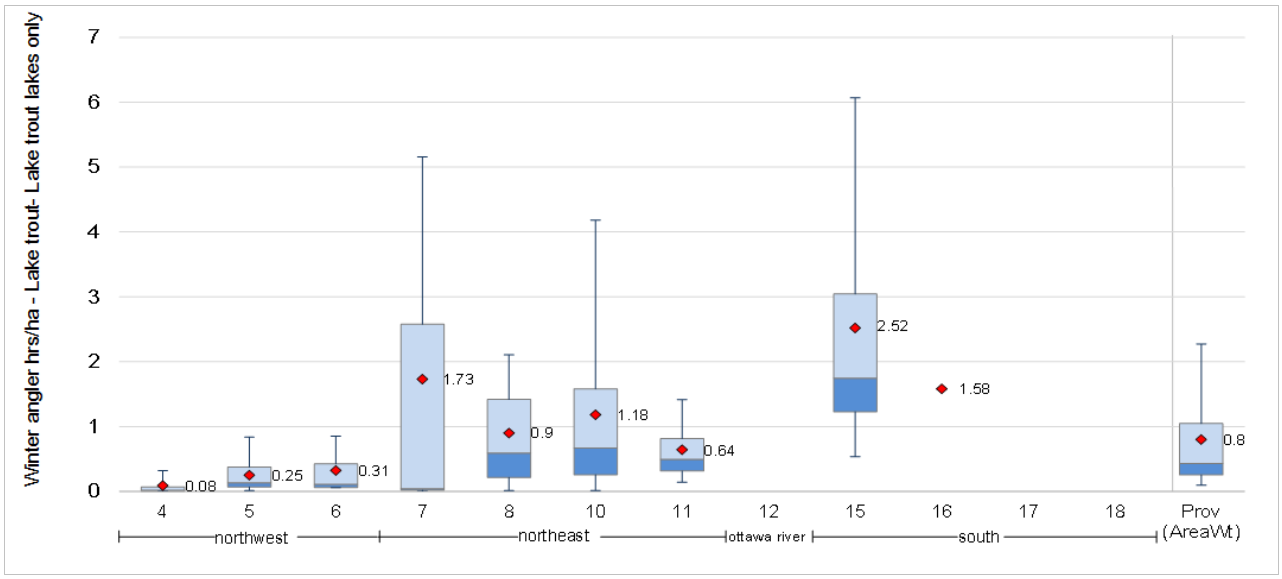


Figure 42. *Area weighted angling intensity during winter (hr/ha/yr) for Lake Trout trend lakes by FMZ, as measure by BsM during Cycle 1.*

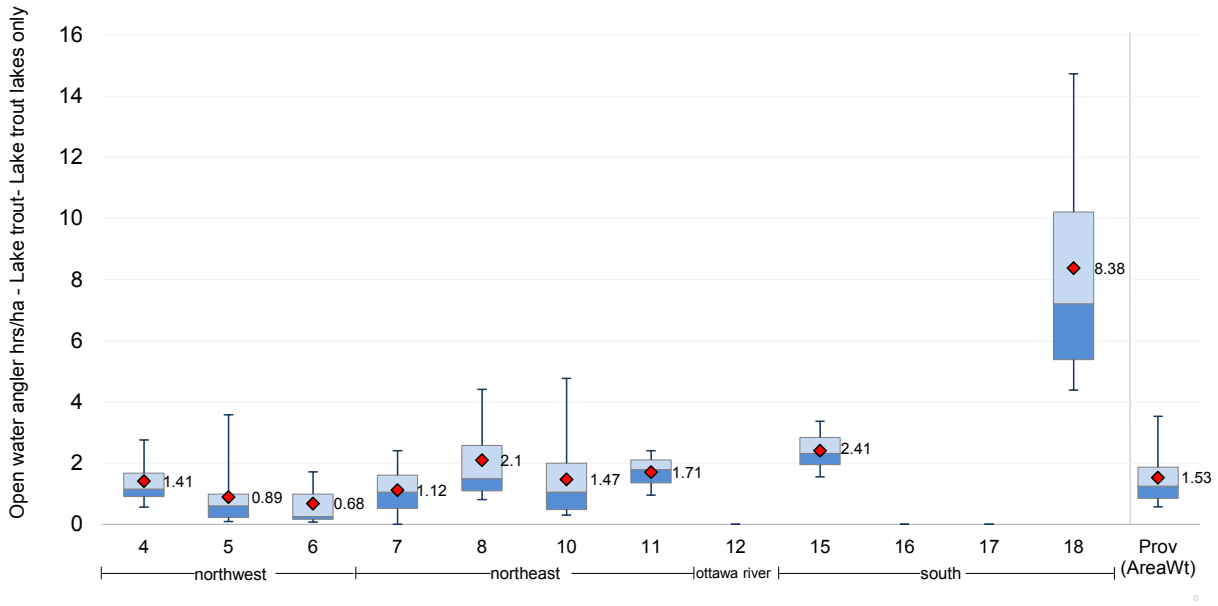


Figure 43. *Area weighted angling intensity during summer (hr/ha/yr) for Lake Trout trend lakes by FMZ, as measure by BsM during Cycle 2.*

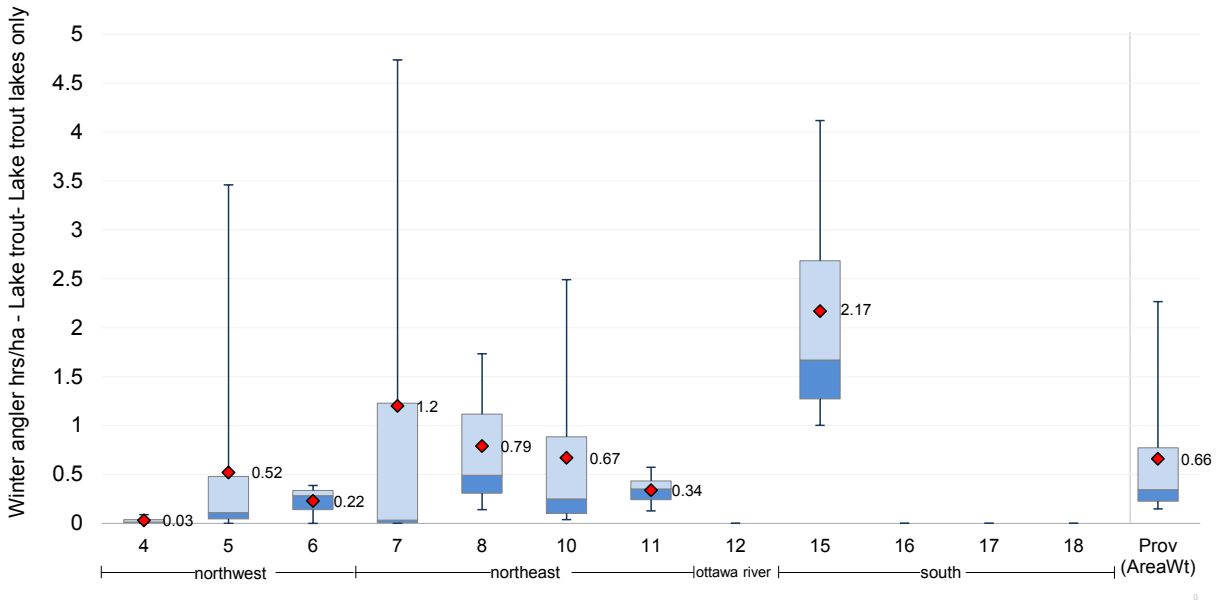


Figure 44. *Area weighted angling intensity during winter (hr/ha/yr) for Lake Trout trend lakes by FMZ, as measure by BsM during Cycle 2.*

Trout Lake

Trout Lake has been individually managed for several decades as well with extremely restrictive Lake Trout angling regulations. The reopening for one week in the winter of 1998 combined with the one week in June resulted in a harvest that

was 183% of that planned that also appears to have erased the accumulated benefits of the year-round closure. Winter harvest alone exceeded the annual allowable harvest. The winter angling season has been closed since 1999 while the June one week fishery remains. The Lake Trout population abundance appeared to have increased in 2005, particularly for young fish however CUE of adult fish has recently declined (CUE BsM Cycle 1 = 0.81; Cycle 2 = 0.54). Stressors other than documented harvest during the one-week season are predicted to be constraining recovery. As such, historical and current management of Trout Lake will be reviewed, and an appropriate suite of management actions will be identified to ensure the sustainability of the Lake Trout population in the lake.

Lake Trout Management Plan

The management objectives for Lake Trout in FMZ 11 include increasing the abundance of Lake Trout within the zone, specifically, the abundance of mature females. The primary metric used to monitor progress will be the AW CUE per BsM net gang, which can be used to detect changes in the abundance and age structure of populations. The following table summarizes the management plan for Lake Trout outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 6).

Table 6. *Summary of the Lake Trout Management Plan for FMZ 11*

Objective	**Indicator**	**Benchmark**	**Target**
To increase abundance of Lake Trout and maintain or increase number of Lake Trout cohorts.	**Abundance** FMZ Average AW CUE (recruits > 350mm) from BsM Lake Trout trend lakes.	FMZ Average AW recruited (> 350mm) CUE from BsM Cycle 1 = 0.39 Lake Trout per net.	FMZ average AW recruited (> 350mm) CUE at or above 0.47 (20% increase from benchmark) by 10 years from plan implementation.
			FMZ average AW recruited (>

			350mm) CUE at or above 0.55 (40% increase from benchmark) by 20 years from plan implementation.
	FMZ Average AW CUE (maturation size > 400mm) from BsM Lake Trout trend lakes.	FMZ Average AW mature (> 400mm) CUE from BsM Cycle 1 = 0.31 Lake Trout per net.	FMZ Average AW mature (> 400mm) CUE at or above 0.37 Lake Trout per net (20% increase from benchmark) by 10 years from plan implementation.
			FMZ Average AW mature (> 400mm) CUE at or above 0.43 Lake Trout per net (40% increase from benchmark) by 20 years from plan implementation.
	Age Structure and Mortality FMZ Average AW number of Lake Trout cohorts from BsM Lake Trout trend lakes.	FMZ Average AW number of Lake Trout cohorts from BsM Cycle 1 = 10.08.	FMZ Average AW number of Lake Trout cohorts from BsM at or above 10.08.

	FMZ Average AW mean age of Recruited (>350mm) Lake Trout from BsM.	FMZ Average AW mean age of Recruited (>350mm) Lake Trout from BsM Cycle 1 = 11.47.	FMZ Average AW mean age of Recruited (>350mm) Lake Trout from BsM at or above 11.47.
	FMZ Average AW annual survival rate of Lake Trout from BsM.	FMZ Average AW annual survival rate of Lake Trout from BsM Cycle 1 = 0.79.	FMZ Average AW annual survival rate of Lake Trout from BsM Lake Trout trend lakes at or above 0.79.
Identify and work with partners to monitor and restore where possible, acid-damaged Lake Trout lakes.	Partnerships identified to monitor and restore where possible, acid-damaged Lake Trout lakes.	Identify lakes that have potential for acid damage recovery by 20 years from plan implementation.	Monitor and restore identified acid damaged natural Lake Trout recruitment lakes by 20 years from plan implementation.
Prevent road or trail access within 400m of remote natural Lake Trout lakes.	Number of Lake Trout lakes without road or trail access within 400m.	43 remote natural Lake Trout lakes: (Aileen, Barter, Beland, Best, Boulton, Chambers, Cooper, Dees, Diabase, Florence, Gorrie, Grays, Gullrock, Jerry, Jim Edwards, Justin, Kokoko, Makobe,	No loss of remote roadless natural Lake Trout lakes in FMZ 11.

		Marina, McCulloch, McGiffin, Mountain, Reuben, Sugar, Sunrise, Turner, Trethewey, Whitewater, Wasaksina, Lower Twin, Upper Twin, High Lake, Turner, Solace, Pine, Pilgrim, Benner, Rodd, Bull, Maggie, Aaron, Lepha). Five of the above lakes are monitored by BsM.	
Educate stakeholders about the life history and managing expectations of the recovering FMZ 11 Lake Trout populations.	Number of outreach events attended Facts sheets. State of the resource reports from BsM produced.	Education materials to be produced	Increase communication with stakeholder groups (literature, status reports, tradeshows, other outreach opportunities).
Determine appropriate management direction for the Lake Trout population in Trout Lake.	Lake Trout recruited (> 350mm) CUE from BsM.	Lake Trout recruited (> 350mm) CUE from BsM Cycle 1 = 0.81 Lake Trout per net.	Maintain or increase Lake Trout recruited (> 350mm) CUE > 0.81 Lake Trout per net.

Manage Lake Trout habitat recognizing that they are significant components of cold-water fish communities.	Abundance of quality (well-oxygenated) deep-water habitat.	Current mean volume weighted hypolimnetic dissolved oxygen (MVWHDO) value in individual coldwater lakes.	Maintain MVWHDO at current value or higher at or above 7 ppm in Lake Trout lakes.

Management actions to meet the lake trout objectives

The management actions are presented below, along with the level of support by the FMZ 11 Advisory Council (Table 7). In summary, the management actions are to reduce the length of open water season by one month, retain present catch limits, and implement a zone-wide size restriction of 1 fish >40cm allowed, with 5 waterbody exceptions where 1 fish >50 cm is allowed. These changes were implemented in January 2020. Rational for the changes in FMZ 11 are primarily based on observed positive responses in FMZ 10 Lake trout populations, where a 1 fish >40 cm regulation and Labour Day season closure was put in place in 2010. In addition, a September catch and release for Lake Temagami has been implemented.

Table 7. *Management actions to Meet FMZ 11 Lake Trout Objectives.*

Management actions	**Advisory Council advice**
Reduce length of open water season by approximately one month, retain present catch limits, impose a size restriction. **Zone Wide Regulation:** • February 15 to third Sunday in March and third Saturday in May to Labour Day • Sport – 2 fish; Conservation – 1 fish • Not more than 1 greater than 40cm (15.7") **Large Bodied Populations** (Cross Lake, Kokoko Lake, Diamond Lake and Makobe Lake): • Season: same as zone wide regulation • Limits: same as zone wide regulation	Council recognized the current understanding of science on the increasing vulnerability of adult female Lake Trout through late summer and early fall and the importance of protecting them at this vulnerable time. BsM data has suggested that Lake Trout populations continue to show no improvements in general. To meet planned objectives and to increase Lake Trout abundance a size restriction was implemented. Lake Temagami and four other lakes in FMZ11 showed trout growth and population characteristics indicating larger body size at maturity than the

Management actions	Advisory Council advice
• Not more than 1 greater than 50cm (19.7") **Lake Temagami** (large bodied population): Season Open: • February 15 to third Sunday in March and • Third Saturday in May to September 30 Catch Limits (until and including Labour Day): • Sport – 2 fish; Conservation – 1 fish Catch Limits (day after Labour Day): • Sport – 0 fish • Conservation – 0 fish Size Restriction (Zone wide): • Not more than 1 greater than 50cm (19.7")	remainder of the zone, therefore permitting a greater size for harvest. During the draft plan public review period, many comments were received by MNRF that suggested that a season closure on Labour Day would be too restrictive to anglers and may potentially have economic consequences, especially to the Temagami area. Discussions also occurred surrounding the various risks and benefits of implementing a catch and release season for Lake Temagami.
Modify Lake Obabika Lake Trout exception regulation to re-open the season. • Season: same as zone wide regulation • Sport – 1 fish; Conservation – 0 fish	Council reviewed the Lake Obabika assessment data presented by MNRF and concurred that the natural Lake Trout population appears to have recovered however council was concerned that initial response to the reopening of the fishery may seriously deplete the stock hence they recommended a one fish per day for sport angler limit and zero for conservation.
Modify the Cut Lake and McConnell Lake fish sanctuary dates to reduce angler confusion by moving the sanctuary end date	Council recognized the value of these waters being closed in winter to angling in the McConnell

Management actions	Advisory Council advice
to the day before the FMZ 11 Lake Trout season opens in May. Adjust sanctuary start date in fall to match end of FMZ 11 wide Lake Trout season (day after Labour Day in September). Fish Sanctuary: • No fishing from January 1 to the Friday before third Saturday in May and In fall to be in force from the standard FMZ 11 Lake Trout season closure day after Labour Day to December 31.	Lakes area to protect these sensitive fisheries. Council also recognized a source of angler confusion when the present sanctuaries end in spring while the zone wide Lake Trout season is closed, and stays closed for upwards of three weeks. Similarly, council recognized that sanctuary dates in fall would have to align with the zone wide FMZ 11 Lake Trout season.
Maintain year-round season on Put-Grow-Take stocked Lake Trout lakes as identified as Additional Opportunities in the Ontario Fishing Regulations Summary Season: open all year Limits: Sport – 2 fish; Conservation – 1 fish No size restrictions.	Council did consider harmonizing the stocked Lake Trout seasons with the FMZ 11 natural Lake Trout seasons to divert angling pressure from the natural lakes. Council felt that the location, number and size of the stocked waters were not sufficient to make significant positive impact to warrant a change and recognized the value of providing additional opportunities to anglers.
Participate in Water Management Planning exercises including Standing Advisory Group proceedings to deliver plan objectives for Lake Trout recovery on regulated waters (MNRF, OPG, private or PWC); in particular, how to manage water flows and levels to improve natural recruitment of Lake Trout.	Council recognized that many activities have impacts on the status of Lake Trout and expects that appropriate management of water levels, particularly in fall and winter can improve Lake Trout recruitment.

Management actions	Advisory Council advice
Continue to integrate FMZ 11 FMP objectives into MNRF's resource management planning and approval processes including: 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 MNRF's Class EA for Resource Stewardship and Facility Development. 7) Aquaculture and Community Hatchery Program permitting and approvals. 8) Supporting and implementing the Crown Land use policy on natural Lake Trout lakes. 9) Continue to employ the Lake Capacity Assessment Handbook and 7 ppm dissolved oxygen criteria in the review of development proposals on Lake Trout lakes. Providing input to works in water or on shorelands to protect critical Lake Trout habitat.	When presented with the rationale for the Crown land use policy, and the 7 ppm dissolved oxygen criteria for Lake Trout the council supported these initiatives as protective of the critical deep-water habitat that is expected to be under pressure due to climate change.
Continue to work with enforcement staff to identify high priority threats to Lake Trout	None.

Management actions	Advisory Council advice
fisheries within the zone including introduced species (i.e. Smallmouth Bass, Yellow Perch and Rainbow Smelt), invasive species (Spiny Water Flea) and transmission of diseases (VHS).	
Working with partners to expand the scope of studies: 1) Update Lake Trout critical fish habitat values (e.g. spawning and nursery habitat). 2) Undertake assessments of acid damaged restoration lakes to determine the survival of stocked Lake Trout and the need for further restorative stocking. 3) Determine if stocked Lake Trout lakes are diverting angler effort/harvest – assess success of stocking efforts. Review the historical and current status of the management decisions and actions for Trout Lake and determine future requirements moving forward that will support the desired condition for the Lake Trout population in Trout Lake.	Council recognized that draw down of lakes following egg deposition has the potential for significantly reduced juvenile recruitment. Council was supportive of the efforts to recover acid damaged lakes first through natural recruitment and failing that, through restorative stocking. Council recognized the value of the PGT lakes in providing recreational activity that may take some pressure off natural lakes.
Education about Lake Trout biology and management: 1) To increase resource user awareness and acceptance of management actions 2) Increased communication with public and stakeholder groups; education and awareness initiatives (e.g. literature,	Council was clear that public education regarding the biology and management of Lake Trout was required in order to educate the public on the sensitivity of Lake Trout populations and their habitats and to improve

Management actions	Advisory Council advice
reports, presentations, workshops, forums, public meetings) 3) Increased angler awareness on proper handling and successful catch and release techniques. Develop literature or State of Resources for any Lake Trout specific areas of interest as deemed necessary.	understanding and stewardship of the management actions that are proposed for conservation of the Lake Trout resource in FMZ 11.
Continue to address information gaps and improve involvement of Indigenous communities in fisheries management planning process. To better inform fisheries management decisions as it relates to knowledge of fisheries use by Indigenous communities within the zone (e.g. Indigenous Traditional Knowledge, subsistence, ceremonial, and commercial harvests).	None

Fall angling

A reduction of the angling season by approximately one month in the fall for Lake Trout comes from the documentation of increased vulnerability to angling of adult female Lake Trout after the summer solstice in late June and peaking in later August and September Casselman (2002). Reducing the fall season is predicted to increase adult female survival, thereby increasing reproductive potential of Lake Trout within the zone. This success assumes no further increases in fishing pressure while this regulation is in place.

Table 8 presents several paired-sample t-tests for FMZ 11 Cycle 1 vs Cycle 2 comparison of several of the key Lake Trout indicators as rationale for the management actions. Recent results from BsM (Cycles 1 and 2) suggest that Lake Trout resources in FMZ 11 are not improving as desired by FMZ 11 objectives.

Table 8. *Summary of Lake Trout indicator comparisons of Cycle 1 and Cycle 2 for FMZ 11 to determine if there is a statistical difference between cycles.*

Indicator	**Cycle 1**	**Cycle 2**	**Statistical Difference**
CUE (fish per NA1) of recruited size Lake Trout (≥ 350mm Total Length)	Mean = 0.37 (SD 0.22)	Mean = 0.30 (SD 0.22)	No (P = 0.41)
CUE (fish per NA1) of mature size Lake Trout (≥ 400mm Total Length)	Mean = 0.30 (SD 0.18)	Mean = 0.27 (SD 0.20)	No (P = 0.68)
Number of Lake Trout cohorts (age classes)	Mean = 8.77 (SD 4.69)	Mean = 8.69 (SD 5.66)	No (P = 0.95)
Mean age of recruited size (≥ 350mm Total Length) Lake Trout	Mean = 10.66 (SD = 2.96)	Mean = 12.53 (SD = 3.0)	Yes (P = 0.04)

Considering all these results collectively suggests that the FMZ 11 Lake Trout resource is showing small signs of improvement in age structure only (mean age of recruited size fish), while all other indicators measured are showing continued decline or no change. In order to move towards achieving the stated objectives above, more restrictive recreational angling regulations are required.

Within the adjacent Fisheries Management Zone (FMZ 10), a similar size-based regulation was implemented in 2010. Analysis of BsM data from Cycles 1 and 2 has shown a statistically significantly positive response in FMZ 10 Lake Trout populations likely resulting from recent management actions taken there. FMZ's 10 and 11 share similar landscapes, similar lake characteristics and similar fish communities, and therefore we are expecting similar positive responses as a result of the regulatory change.

MNRF and the Advisory Council recognized that a reduction in the fall season may have a negative socio-economic impact in terms of Lake Trout angling opportunities

and as a result chose to leave 19 stocked Lake Trout, 28 stocked splake and 58 stocked Brook Trout lakes open during the fall along with bass, Northern Pike and Walleye.

Lake Temagami

Few tourism establishments are situated on Lake Trout only lakes in FMZ 11, therefore providing alternatives for September angling when adult female Lake Trout are highly susceptible. One notable exception exists, that being Lake Temagami. While consulting on the proposed changes, MNRF heard concerns from tourism operators in the Temagami area, as well as the Temagami municipal council. The concerns expressed identified that the September Lake Trout fishery is very important to the local economy. After careful consideration, and in an effort to mitigate against potential undue socio-economic impacts, a catch and release season for the month of September (for Lake Temagami only) was established. A catch and release season for Lake Trout from the day after Labour Day until Sept 30th for Lake Temagami is considered a reasonable compromise. Literature suggests that catch and release mortality rates between 10-25% should be anticipated. Opportunity exists for MNRF to work with tourism operators on Lake Temagami to educate anglers on importance of sustainable and ethical practices, as well as opportunity for MNRF to gather better information related to fishing effort and catch rates.

Lake Temagami has been identified as a significant Lake Trout resource within FMZ 11 that has the potential for a unique management regime. Examination of Lake Trout maturity data for Lake Temagami revealed that Lake Trout mature at a larger size (Figure 45) than most other lakes in the zone (Figure 31). Similarly, 4 other lakes were identified as having Lake trout populations with similar maturity schedules. Following the approach used in establishing the size-based regulation in FMZ 10, and advice found within MNRFs guidelines for Managing lake trout (set at length at 50% maturity), a slightly larger size-based regulation has been implemented on Lake Temagami and 4 other lakes (Table 7).

Monitoring strategy

Assessment initiatives on natural Lake Trout lakes that have been impacted by acidification will be developed and conducted, jointly or in cooperation with

Laurentian University (Cooperative Freshwater Ecology Unit), MECPMECP, MNRF or other partners. Assessment of these lakes are essential to ensure the correct management actions are taken to restore these lost or degraded Lake Trout populations.

Continue to monitor the approvals of road development (as possible) through overall Ministry review of natural resource management and permitting activities.

Increase angler monitoring and encourage regulatory compliance.

Continue to utilize information collected from National Recreational Fishing Surveys, consultant reports and LIO (Land Information Ontario).

Stocked lakes are not included in the BsM protocol and, as such, there is a need for reporting by anglers. Where that is not feasible, MNRF may need to undertake individual stocking assessment projects to determine the success of stocking efforts or to document introduced species. It is important to address any outstanding information gap by assessing the extent to which stocked lakes are successful in diverting pressure from natural Lake Trout lakes.

As a way to improve natural recruitment, cooperative observations of Lake Trout spawning activity on reservoir lakes containing natural Lake Trout populations will provide exact locations of egg deposition. MNRF can then make efforts to gauge the potential for water level manipulations and the timing of such alterations to adversely affect natural recruitment. This may prove to be an important component in ensuring Lake Trout populations in reservoir lakes contribute to achieving objectives of increased Lake Trout abundance.

Education

The sensitivity of Lake Trout populations needs to be clearly conveyed to the public to improve their understanding of the impacts of over harvest and degradation of habitats. Education and outreach to resource users is required for understanding of the rationale of management actions in order to improve compliance with fishing regulations.

Generally, the management of user expectations for natural Lake Trout waters, including the precautionary approach, is not well communicated. There is a

significant need for effective and clear communications that are easily disseminated to the public both at the FMZ 11 level and at the provincial level.

MNRF will continue to utilize stocked Lake Trout as a tool to divert fishing pressure from sensitive natural Lake Trout populations. Educational efforts and outreach are required to ensure the public has knowledge of the appropriate use of stocked fish as well as to learn from the public about how successful the stocking program contributes to meeting fisheries objectives in this plan.

6.3.3 Smallmouth and largemouth bass

Management issues, challenges and opportunities

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;
- High density bass populations impacting other sportfish populations (e.g. Lake Trout and Brook Trout);
- Climate change creating more suitable conditions in waters that would benefit bass;
- Unconstrained harvest of large bass resulting in higher densities of small bass;
- Encouraging the harvest of more bass may be difficult;
- Evidence that climate change may favour bass (annual increase in recruitment/abundance) at the disadvantage of other species;
- The growing season is longer, which has resulted in increased survival of both young of the year and small males; and
- Bass spawning season is earlier by as much as 10 days (1980-2010) on Lake Nipissing.
- Misconceptions by the public surrounding bass sensitivity to increased harvest or timing of season

Opportunities:

- Spring/early harvest of bass is proposed as a method of increasing angling opportunities

- Ability to develop regulations which protect the reproductive output (spawning adults) while increasing angling opportunities;
- General agreement that bass have potential and value to the tourism industry;
- Potential benefits for Walleye, Lake Trout and Brook Trout by directing fishing pressure away from the species and by attempting to reduce densities and in turn competition for resources;
- Little-targeted effort to date, no issues with sustainability at this time;
- To expand the collaboration/partnerships for out-reach and education hunter and angler clubs, fishing derbies/tournaments, etc.;
- To increase public awareness on the productive capacity of bass and the rationale for the management actions taken;
- To increase the transparency of monitoring results to foster greater public understanding and acceptance of management actions ; and
- To focus education efforts on their sporting quality and tourism value.

Status of smallmouth and largemouth bass

Smallmouth Bass are found in many waters throughout FMZ 11. Largemouth Bass are typically found in and south of the Mattawa River watershed, in Lake Nipissing and watersheds south and east of the lake.

Both species of bass are important sport species in FMZ 11 with Smallmouth Bass garnering the most attention, due mainly to its wider distribution. Bass ranked second, in terms of anglers preferred species in FMZ 11 according to the 2010 recreational survey (MNRF 2015b) with an estimated 713,000 bass caught annually, with 14% harvested. FMZ 11 also hosts numerous bass tournaments annually suggesting a well sought after recreational and sport fishery.

Smallmouth Bass were introduced by the Department of Lands and Forests to portions of the province during the 1940s and 1950s; however, documentation of the extent of those introductions is limited. There is evidence that Smallmouth Bass were native to some portions of FMZ 11 via the Great Lakes watershed. Largemouth Bass were native to the southern portions of FMZ 11 by linkages to the Great Lakes as well; however unauthorized introductions and later MNRF-led transfers in the 1970s and 1980s have resulted in the current expanded distribution.

Smallmouth 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). Ideal Smallmouth Bass habitat contains protective cover such as shoal rocks, talus slopes, and submerged logs. Their preferred water temperature is typically around 20 °C, cooler than that of the Largemouth Bass.

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. Recent science suggests that controlling the abundance of juvenile bass may best be accomplished by preferentially harvesting them while encouraging the conservation of adult bass (Loppnow et al. 2013).

The FMZ 11 Advisory Council were presented scientific literature collected in Algonquin Park, adjacent to FMZ 11, by Suski and Ridgway (2007) pertaining to climate change induced shifts in bass seasonal phenology. The authors documented that climate change was causing bass populations to spawn earlier in the year. Council also reviewed materials drafted by the FMZ 10 Advisory Council regarding bass management. From this assessment, two themes emerged: i) that range extensions of bass pose a threat to other native species and ii) bass, where they already exist, are being advantaged by climate change.

While bass may provide valued angling opportunities, they also can negatively impact other valued species, in particular 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 include 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.

Prior to the initiation of the Broad-scale monitoring program, little was known of the status of bass in FMZ 11, particularly of Largemouth Bass. Distribution of both species has undoubtedly expanded since the 1960s, both through authorized and unauthorized introductions.

Abundance and growth

When considering catch from Large mesh (NA1) nets alone, Smallmouth Bass were detected in 25 of the 30 lakes (20 Walleye trend lakes and 10 Lake Trout trend lakes) during both Cycle 1 and Cycle 2 of BsM. Smallmouth Bass were detected in all 30 lakes monitored by BsM in both Cycle 1 and Cycle 2 when considering catch from both Large (NA1) and Small (ON2) mesh nets. However, as described in section 6.2, when reporting catch statistics for most sportfish species from the BsM program, we only report results from the NA1 nets which are designed to provide adequate samples to describe these populations.

Largemouth Bass were captured in 4 lakes by BsM during Cycle 1 (Cadden, Clear, Mercer and Trout), but only 2 lakes (Clear and Mercer) had catches in NA1 nets. Largemouth Bass were detected in 6 lakes in Cycle 2 (Bear, Cadden, Clear, Deer, Nipissing, Stormy), but only 3 lakes (Clear, Deer, Cadden) had catches in NA1 nets.

In FMZ 11, Smallmouth Bass abundance in Walleye and Lake Trout trend lakes is relatively high compared to other northern zones, and average total length is relatively low compared to other northern zones (Figures 46 to 49). This trend is consistent with the known relationship between Smallmouth Bass density and average length where high density populations typically have smaller mean lengths (Chu et al. 2006).

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.

As shown in Figure 49, the pre-recruit growth rate of Smallmouth Bass in FMZ 11 is among the highest in the province, and this has surely contributed to the successful colonization of many lakes in the zone. Note that in FMZ 11, age samples were not collected from Smallmouth Bass during Cycle 1 of the BsM program but were in Cycle 2.

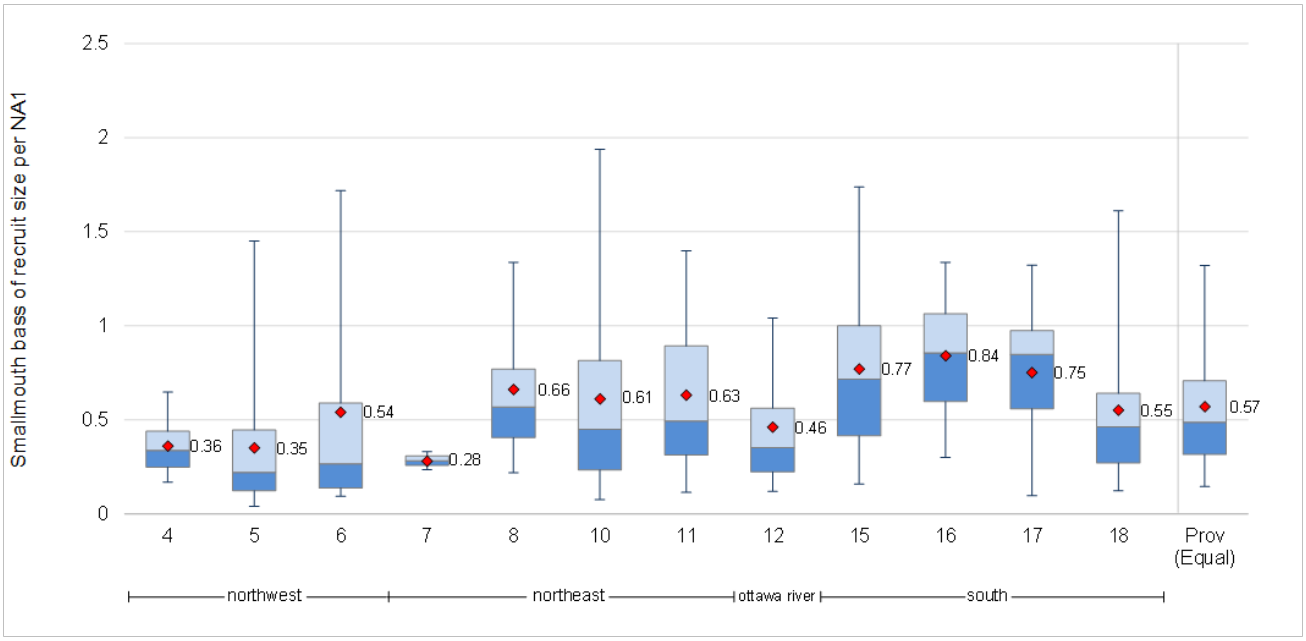


Figure 45. *Equally weighted average CUE of recruited size (>200mm) Smallmouth Bass from all lakes sampled by BsM in Cycle 1, by FMZ.*

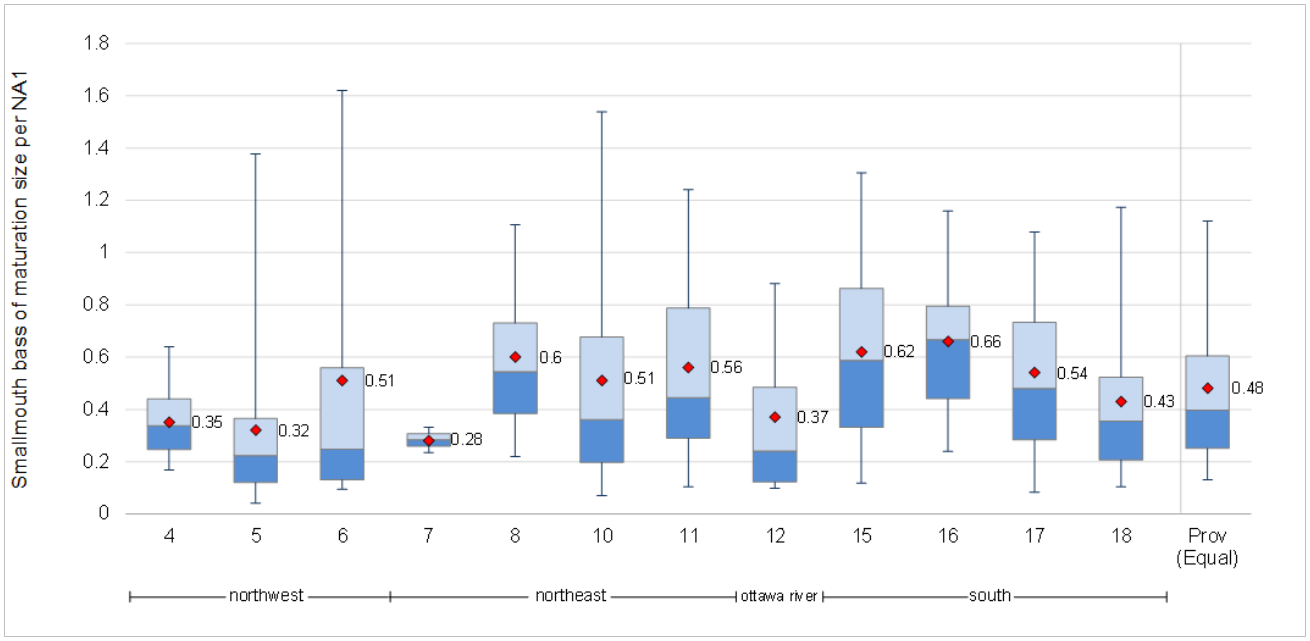


Figure 46. *Equally weighted average CUE of mature (>250mm) Smallmouth Bass from all lakes sampled by BsM in Cycle 1, by FMZ.*

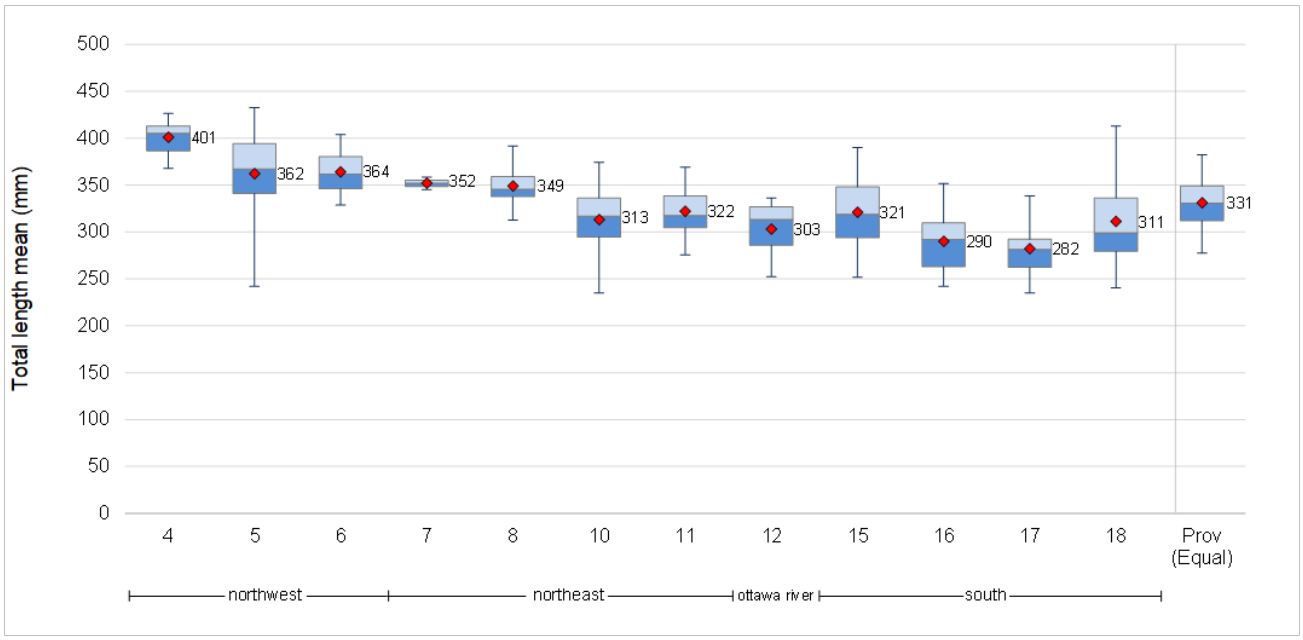


Figure 47. *Equally Weighted mean total length of Smallmouth Bass by FMZ from BsM Cycle 1.*

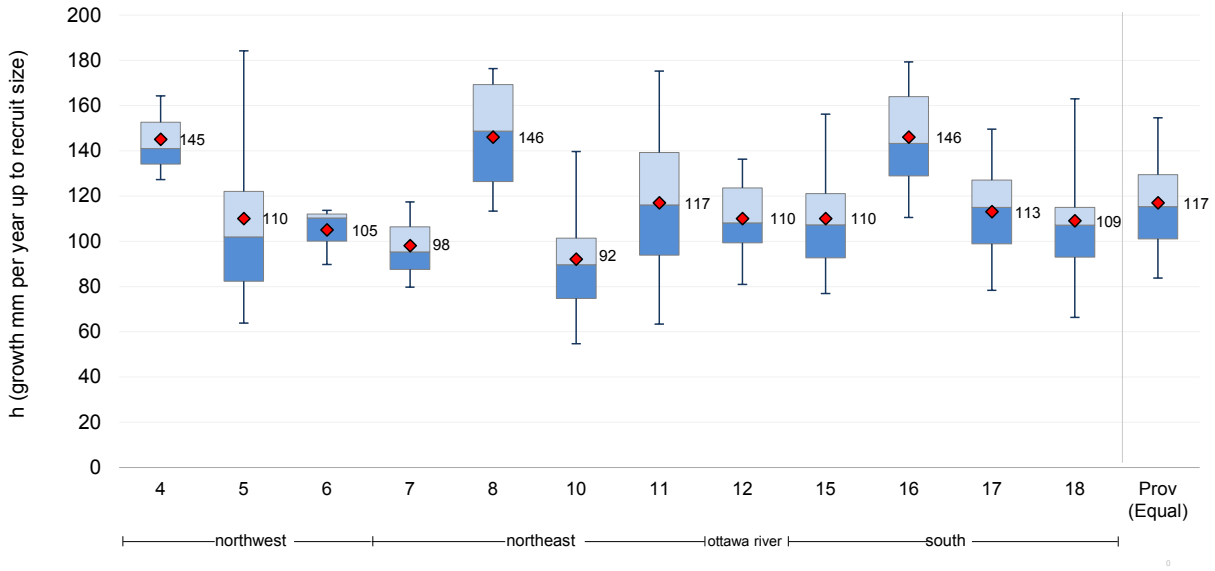


Figure 48. *Equal weighted average Smallmouth Bass growth in mm/yr up to recruited size (200mm total length) for all lakes by FMZ as measured by BsM in Cycle 2.*

Age structure

Although abundance measures are good indicators of population status, it is also important to track changes in population age structure. Changes in age structure may be signals of changes in fish density, mortality, and responses in the fish population to management actions. As seen in Figure 50, Smallmouth Bass populations in FMZ 11 are comprised of several different cohorts, having among the highest average number of cohorts in the province. Additionally, the average age of the recruited ($\geqslant$200mm) portion of Smallmouth Bass populations in FMZ 11 is relatively low compared to other northern zones (Figure 51).

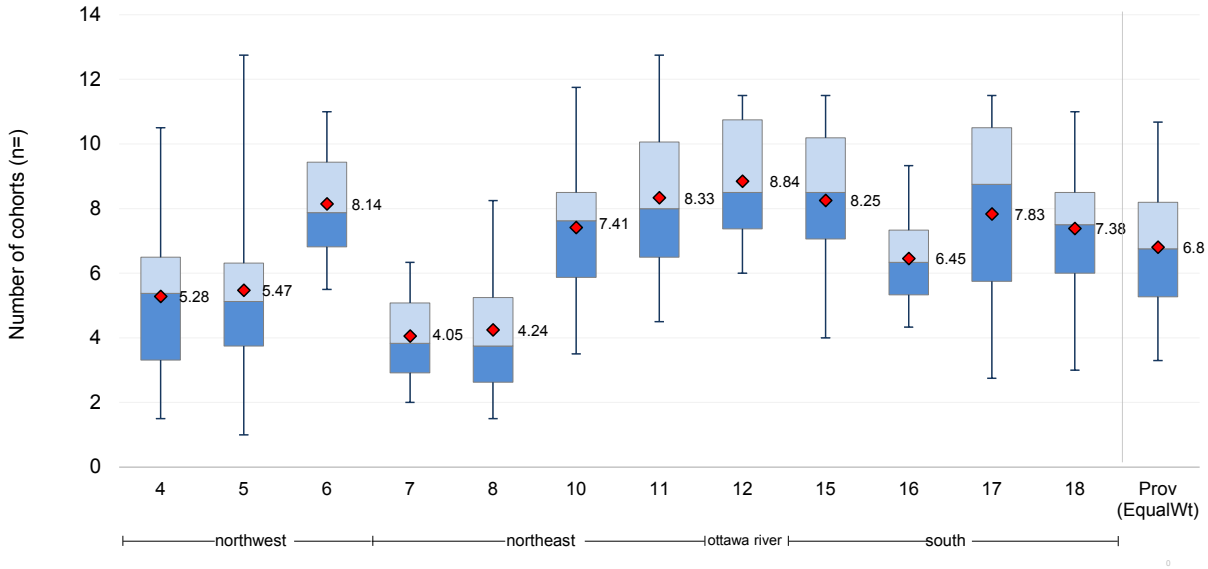


Figure 49. *Equal weighted average number of Smallmouth Bass cohorts (age classes) for all lakes by FMZ as measured by BsM in Cycle 2.*

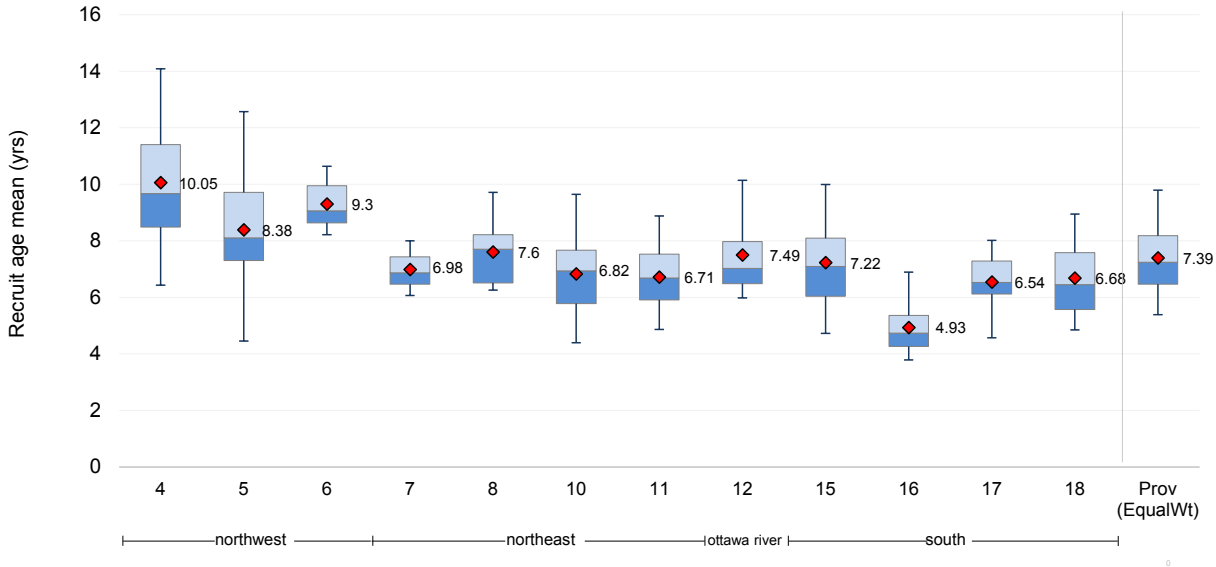


Figure 50. *Equal weighted average age of recruited size (> 200mm) Smallmouth Bass for all lakes by FMZ as measured by BsM in Cycle 2.*

Smallmouth and Largemouth Bass Management Plan

The following summarizes the management plan for Smallmouth and Largemouth Bass outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 9).

Table 9. *Summary of the Smallmouth and Largemouth Bass Management Plan for FMZ 11.*

Objective	**Indicator**	**Benchmark**	**Target**
Maintain sustainable bass population AW CUE	**Abundance**		
	Equally weighted Zone Mean Abundance (CUE) of recruited (⩾ 200mm) size Smallmouth Bass from all lakes in BsM.	BsM Cycle 1 = 0.63	Mean Abundance from BsM should be 10% lower than Cycle 1 BsM value.
	Equally weighted Zone Mean Abundance (CUE) of mature (⩾250mm) size Smallmouth Bass from all lakes in BsM.	BsM Cycle 1 = 0.56	Mean Abundance from BsM should be 10% lower than Cycle 1 BsM value.
	Population Size structure		

	Equally Weighted Zone Mean total length of Smallmouth Bass from all lakes in BsM.	BsM Cycle 1 = 322mm	Mean Total Length from BsM ⩾ Cycle 1 value (322mm).
	Age Structure		
	Equally weighted Zone Mean number of cohorts (age classes) of Smallmouth Bass from all lakes in BsM.	BsM Cycle 2 = 8.33	Equally weighted mean number of age classes ⩾ Cycle 2 value (8.33).
	Equally weighted Zone Mean age of recruited size (⩾ 200mm) Smallmouth Bass from all lakes in BsM.	BsM Cycle 2 = 6.71	Equally weighted mean age of Smallmouth Bass ⩾ Cycle 2 value (6.71).
Increase bass angling opportunities and to encourage harvest of bass.	Number of days season open.	Current number of days bass season open annually (approx.189 days) – regulation change came into effect January 1, 2008.	Increase number of angling days for bass by as many as 42 days/year for a total of 231 days/year.

Prevent the extension of the current bass distribution through unauthorized introductions.	Number of lakes with Smallmouth and Largemouth Bass (distribution of bass).	Number of lakes with Largemouth and Smallmouth Bass in FMZ 11 (107 Largemouth and 405 Smallmouth Bass lakes in FMZ 11 from the Land Information Ontario - LIO in 2013).	No new bass lakes as it relates to historical bass distributions.
Educate the public on the ecological implications of bass range extension, focus on compliance regarding unauthorized introductions and promote small fish harvest.	Educational Tools (e.g. MNRF website, status reports).	At present, no educational tools regarding bass ecology.	Produce literature on bass ecology and climate change, promote harvest of small bass, catch and release of bass >40 cm via literature. Incorporate the danger of unauthorized introductions into annual compliance plans as a high priority.

Management actions to meet smallmouth and largemouth bass objectives

The management action chosen was to change the current bass angling season to align with the present Walleye and Northern Pike seasons in spring. This change provides a number of benefits to anglers and benefits other species such as Lake

Trout where they coexist (Table 10). The longer season will allow more opportunities for the angler bringing socio-economic benefits. Bass feed in the same littoral (nearshore) zone and can out-compete Lake Trout and Brook Trout, reducing prey for all (Selinger et al. 2006). Therefore, the trout population may benefit from additional pressure placed on bass where they coexist. Making the open seasons consistent with Lake Trout, Northern Pike and Walleye will also minimize enforcement issues related to incidental catch of these species if the seasons were not consistent.

Table 10. *Management Actions to Meet Bass Objectives.*

Management actions	**Advisory Council advice**
Change current angling regulation to extend open season. This is intended to promote harvest of bass, particularly in waters where they have been introduced, and aligns with Walleye and Northern Pike open seasons: • Season: January 1 to third Sunday in March and third Saturday in May to December 31 • Limits: Sport–6 fish; Conservation–2 fish	Council was most supportive of this option as it opens up the season longer and coincides with the Northern Pike and Walleye seasons minimizing the impacts of incidental catches. It will likely also lower recruitment benefiting other species where they coexist.
Change current angling regulation on Lake Obabika to align with FMZ 11 bass regulation.	Council was unanimous in eliminating this lake specific regulation as it had no basis in science. Lake Obabika bass regulation to be harmonized with final bass regulation.
Ensure bass management objectives are integrated into other land use planning and approval process (i.e. scientific collectors' permits, licence to stock, activities reviewed under MNRF's Class EA	Supportive

for Resource Stewardship and Facility Development).	
Increase communication with stakeholder groups (i.e. literature, status reports, tradeshows, other outreach opportunities).	Supportive

Monitoring strategy

Continue to utilize information collected from BsM, National Recreational Fishing Surveys, stocking assessments, consultant reports and LIO (Land Information Ontario).

Local targeted monitoring by either the district or in conjunction with partners as determined by the outcome of the management action herein (e.g. spawning and habitat assessments).

Work with MNRF enforcement to track known incidences of bass introductions and to prioritize those lakes for further monitoring and management activities to meet Plan objectivesForestry Effectiveness Monitoring and Compliance Programs.

Education

The forecasts of climate change effects on bass recruitment and the resultant advantages bass will have need to be communicated to the public. The population and fish community dynamics of bass in FMZ 11 are also important concepts to get the public to support the harvest of small bass while generally releasing large (over 40cm fish).

It is essential the public understands the detrimental impacts of transporting bass to lakes where they do not occur. The magnitude of the impact of bass introductions may well exceed the impact on a single lake and single fish community as bass readily colonize new watersheds causing widespread irreversible ecological issues as documented in FMZ 10 and Algonquin Park (Vander Zanden et al. 2004). Unauthorized transfer of bass into a single lake on the western border of Algonquin

Park has resulted in bass throughout the adjacent and connected trout watershed in the western park with corresponding negative effects on natural trout waters.

Enforcement priorities will need to reflect identified threats to resources and clearly the unauthorized transfers of species have become a significant ecological issue. Elevating the issue within the annual enforcement plans by targeting not only anglers, but also baitfish dealers, at the zone level is essential to deterring these irreversible impacts.

Continuation of smallmouth bass sanctuaries on Trout Lake

Council and MNRF recognize that Trout Lake, within the municipality of North Bay, is subject to considerable fishing pressure and that the single most available species for catch and harvest is Smallmouth Bass. Results from BsM indicate Smallmouth Bass abundance remains below the average for the zone and therefore a precautionary approach is being recommended through the maintenance of the sanctuaries. Population and sanctuary status will be reviewed periodically. MNRF is clear that bass sanctuaries are not a part of standard management tactics.

6.3.4 Brook Trout

Management issues, challenges and opportunities

Brook trout (*Salvelinus fontinalis*) 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, coldwater springs have made them very susceptible to decline as the effects of cumulative stressors such as development and climate change make suitable habitat increasingly rare. In FMZ 11, anglers surveyed in 2010 reportedly kept 69% of all brook trout caught, relative to an average of 29% retention rate for other species, suggesting brook trout are a more sought-after species (Lennox et al. 2019).

Management issues:

- Loss of natural Brook Trout, in particular lacustrine populations, has been poorly documented as many losses preceded inventory initiatives (1970s);
- In the southern part of Zone 11, about 90% of historical natural Brook Trout populations have been extirpated (Lennox et al. 2019);
- The present status of many natural Brook Trout lakes in FMZ 11 is unknown;

- Angler expectations about the productivity of the species may be unrealistic as they are based mainly on stocked lakes. Relatively few users have experienced fully natural lacustrine populations in FMZ 11;
- Small, natural, remote lakes outside of provincial parks are vulnerable to overfishing and introductions of non-native species, often through the illegal use of non-baitfish and the illegal dumping of unused bait;
- Introduced species, most often Yellow Perch, Rock Bass and sunfishes, have led to losses of natural and stocked Brook Trout populations; and
- The stocked lakes in FMZ 11 are of especially high value as they constitute the readily useable waters that anglers rely on for Brook Trout angling opportunities.

Challenges:

- Approximately 5% of FMZ 11 Brook Trout lakes are characterized as accessible natural waters, the remainder are within protected areas; and
- Currently, the provincial BsM program does not target Brook Trout lakes as trend lakes, therefore alternative methods of assessment are required.

Opportunities:

- An opportunity to educate anglers on the role that stocked Brook Trout play in FMZ 11, and the role that adult Brook Trout play in resisting introduced species within a biological community;
- An opportunity to understand the impact of Aquatic Invasive Species, as several trout lakes have been lost due to introduced species (many stocked and natural Brook Trout lakes lost in the Temagami area alone since 1960);
- Opportunities exist to explore the role of alternative size based regulations within PGT stocked lakes, to create easily accessible trophy fisheries for Brook Trout.

Status of brook trout

Brook Trout are native to FMZ 11 and are distributed in various watersheds throughout the zone, with the waters of Lady Evelyn Smoothwater Provincial Park (LESWPP) containing the largest proportion of natural populations in FMZ 11. Significant concentrations of Brook Trout are also found east of North Bay and north

of the Mattawa River, and in the vicinity of Algonquin Provincial Park to the south. Another notable area is in Solace Park, near the headwaters of the Sturgeon River. Small lakes and streams also occur north of Lady Evelyn Lake in the north-central portion of the zone and in the Lorrain Valley, adjacent to Lake Temiskaming.

We have very little recent information on status of Brook trout in FMZ 11 because no natural brook trout lakes were selected by the BsM program and stocked lakes are not included in the program. The information currently available for Brook Trout in the Zone is collected primarily through fish caught as a non-target species through BsM, and through district-lead monitoring efforts.

Brook Trout are currently stocked in both former natural Brook Trout waters as well as introduced into waters within FMZ 11. There are presently 59 stocked Brook Trout lakes (North Bay District 2019 Stocking Summary) within the zone, which have been selected based on the ecological and socio-economic criteria established in the Guidelines for Stocking Fish in Inland Waters of Ontario (2002). Forty-one of these lakes are stocked to provide additional opportunities (year-round angling seasons) and are listed as such in the regulation's summary. The remaining 18 stocked lakes provide high quality open water and ice fishing opportunities where there is an enhanced opportunity to catch larger, trophy-sized fish. Regulations in these lakes are aligned with the natural lakes in the zone (February 15 to September 30 and size regulations.

Brook Trout are very vulnerable to impacts from introductions of competing and predatory fish, especially Yellow Perch, Rock Bass, sunfishes and Smallmouth Bass. The number of lost, natural lake-dwelling populations in FMZ 11 is assumed to have been considerable, although documentation of original distribution and losses of Brook Trout populations is limited. Fisheries management during the 1950s to 1970s endorsed supplemental stocking atop natural populations. Supplemental stocking has encouraged unsustainable levels of angling effort in the past, resulting in the depletion of natural populations in these waters. FMZ 11 anglers now rely almost exclusively on stocked Brook Trout for lake fishing, while streams where habitat remains also provide continued natural trout fishing. Most stocked lakes are in close proximity to roads and adjacent to larger lakes to afford easy access to anglers. By contrast, natural Brook Trout lakes in FMZ 11 persist in large part due to their remote

(roadless) nature. Brook Trout populations may have been affected over time by multiple factors including habitat disruption or loss due to incompatible land use practices, deforestation, mining and development, and reduced water quality resulting from these and other landscape changes.

Brook Trout Management Plan

The following summarizes the management plan for Brook Trout outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 11).

Table 11. *Summary of the Brook Trout Management Plan for FMZ 11.*

Objective	Indicator	Benchmark	Target
To provide angling opportunities for Brook Trout and divert pressure from high-use fisheries.	The number of natural, diversionary and stocked Brook Trout lakes and streams.	Current number of known natural lakes is 52 of which 22 are within LESWPP (Lennox et al., 2019).	Maintain natural Brook Trout lakes.
		Current number of diversionary lakes is 18.	Maintain the 18 diversionary lakes.
		Current number of Put-Grow-Take Brook Trout lakes is 41.	Maintain Put-Grow-Take stocked Brook Trout lakes in FMZ 11.
To provide enhanced protection to natural Brook Trout waters, recognizing the fragility of the natural Brook Trout resource in FMZ 11.	Brook Trout CUE in natural waters from BsM state lakes.	Brook Trout CUE in natural waters is currently unknown.	Continue to monitor.
	Number of Brook Trout year classes from BsM state lakes.	Natural lake Brook Trout year classes from 2 BsM Cycle 2 state lakes was 4.13.	Continue to monitor.

Objective	Indicator	Benchmark	Target
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.	The number of public engagements per year. The number of status updates. The number of information literature prepared and distributed.	Communications materials to be developed.	Deliver messaging on Brook Trout status and vulnerability as a component of outreach activities that may include sportsman shows, public meetings, discussions with user groups, etc. Prepare literature on FMZ 11 Brook Trout biology and status for electronic distribution.
Protecting Brook Trout waters from the introduction, establishment and spread of incompatible or invasive species.	The current (or historic) number of species and abundance of each in Brook Trout waters (lakes).	Fish community records for individual natural Brook Trout lakes (Aquatic Habitat Inventory database).	No additional species in natural Brook Trout waters (20-year target).

Management actions to meet brook trout objectives

The management actions are presented below along with the level of support by the FMZ 11 Advisory Council (Table 12). In summary, the primary management action proposed is to restrict the use of live baitfish in natural Brook Trout lakes in FMZ 11.

The proposed regulations retain the present season, and catch limits on natural Brook Trout lakes, but will prohibit the use of live baitfish in these waterbodies. The proposed baitfish restrictions on natural brook trout lakes in FMZ 11 is consistant with the 2020 release of Ontario's Sustainable Bait Management Strategy. Implementation of the policy requires changes to federal and provincial regulations. It will take one to three years to make these regulatory amendments. The former size restriction was removed (2020) from lakes identified as "Additional Opportunities" in FMZ 11 in order to enhance opportunities for anglers in these waterbodies.

During the planning process for FMZ 11, the Advisory Council supported the evidence that lacustrine Brook Trout populations are vulnerable to introductions of non-native species through live baitfish use and that, once these new species become established, the record of recovery of Brook Trout populations is very poor. Council was also adamant that stocked Brook Trout are high-value resource in FMZ 11 and that a transition to splake stocking due to non-native introductions was not desirable. They were thus supportive of a proposal to prohibit the use of live baitfish on all Brook Trout waterbodies, both PGT stocked and natural to achieve the plan objectives and prevent any further species introductions into Brook Trout waters.

The current management action proposed here reflects both council's desire to protect natural Brook Trout waters through baitfish restrictions, as well as maintaining opportunities for anglers to use live baitfish in PGT stocked lakes while also supporting Ontario's baitfish industry through the retention of live baitfish in PGT stocked Brook Trout lakes. This approach is, which is consistent with the direction outlined in Ontario's Sustainable Bait Management Strategy (2020).

Table 12. *Management Actions to Meet Brook Trout Objectives.*

Management actions	**Advisory Council advice**
Natural Lakes and Diversionary Waters – change angling regulation and gear restriction. Zone Regulation: • February 15 to September 30 • Sport – 5 fish; not more than 1 fish over 31 cm • Conservation – 2 fish; none greater than 31 cm	The Advisory Council recognized that restricting the use of live baitfish in all waters would minimize the introduction of new species. Some council

• No live baitfish. Additional Opportunity Lakes: • Open all year: • Sport – 5; no size restriction • Conservation – 2; no size restriction (The former size restriction was removed (2020) from lakes identified as "Additional Opportunities" in FMZ 11. Maintain current individual Brook Trout lake exceptions.	members felt that retaining the size restriction (1 fish >31 cm) on lakes identified as "Additional Opportunities" in FMZ 11 was no longer necessary in stocked lakes if live baitfish use is restricted, others felt that the size restriction should be removed, regardless of bait policy in order to enhance opportunities for anglers.
Public education about Brook Trout biology and management is crucial to communicate the role that fish stocking plays in Brook Trout management. Likewise, key messaging should be delivered that reiterates the sensitivity of Brook Trout populations to introduced species, and how the use of baitfish is a primary pathway of species introduction.	The Zone Advisory Council recognizes that education regarding the effects of fish introductions is the most effective means of preventing introductions.

Monitoring strategy

Continue to utilize information collected from the National Recreational Fishing Surveys, stocked lakes assessments, consultant reports and any information collected through the BsM program.

Local targeted monitoring by either the district or in conjunction with partners as determined by the outcome of the management action herein (e.g. spawning and habitat assessments).

Monitor angler effort on Brook Trout waters.

Conduct local targeted monitoring on waters where spiny-rayed species are reported to have invaded.

Monitor enforcement results to determine unauthorized introductions.

Forestry Effectiveness Monitoring and Compliance Programs.

Education

Of paramount importance in managing the future of Brook Trout is tto stop the spread of new species to Brook Trout waters, both natural and stocked. The permanent loss of Brook Trout populations normally occurs where competitive species (e.g. Yellow Perch) are introduced. Anglers should be aware of the reasons for population failure, including the arrival, establishment and spread of invasive or non-native species through various pathways, including the use of live baitfish (Hatton et al. 2019), the extent of Brook Trout losses in FMZ 11, and the role the size limit plays in resisting introductions.

6.3.5 Northern pike

Management issues, challenges and opportunities

Northern Pike in FMZ 11 are an underutilized species in many waters, due primarily to their small size and frequent angler opinion that they are not good table fare. The present regulation encourages anglers to harvest smaller Northern Pike in an effort to improve survival of mature fish and abundance of larger pike. Despite anglers' expectation that Northern Pike may thrive with climate change, there are science-based indications that spawning and early development of Northern Pike may be threatened by warmer spring temperatures (Casselman 2013).

Challenges:

- Many FMZ 11 lakes dominated by small Northern Pike and lack of quality sized fish;
- 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; generally, tourists value trophy Northern Pike much more than do Ontario residents;
- Potential to advantage Northern Pike through regulation to the potential detriment of Walleye or other sportfish species where they co-exist;
- Threat to Northern Pike populations from diseases (i.e. VHS);

- Evidence that climate change may reduce Northern Pike recruitment as they prefer 15 to 22˚C waters (Casselman 2013);
- Given that many Northern Pike are released after capture, Northern Pike survival may be dependent on good handling and release practices; and

Opportunities:

- Encourage the harvest of small pike (less than 61 cm, especially those less than 55 cm), and the conservation of large pike (over 86 cm);
- Reviewing the flows and levels of regulated waters in the zone to minimize impacts on spring spawning species such as Northern Pike;
- Consider the high risk associated with VHS introduction into Northern Pike waters via baitfish transportation and use in FMZ 11; and
- Conduct education campaigns focused on live release and fish handling techniques, on the value of large Northern Pike in the pike population and in the aquatic ecosystems.

Status of northern pike

Northern Pike can be found in most waters of FMZ 11, 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 were listed as the third most preferred species in both the 2005 and 2010 Surveys of Recreational Fishing in Canada after Walleye and bass (DFO 2015). Approximately 12% of the angler catch in FMZ 11 in both 2005 and 2011 was Northern Pike, while Northern Pike comprised 9% of zone wide harvest by number. Northern Pike regulations were most recently updated in 2002 because of the Regional Fisheries Advisory Council's review of the Fall Walleye Index Netting (FWIN) data and the recommendations from Casselman (2001). The current FMZ 11 regulation permitting six Northern Pike per day with only two over 61cm, and no more than one of the two over 86cm is designed to harvest the more abundant small fish and protect larger fish.

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. Zone specific analysis of the FWIN data showed that Northern Pike abundance in FMZ 11 lakes was less than the provincial average, and that average asymptotic length in FMZ 11 was greater than the provincial average (Malette and Morgan 2005).

Currently, the BsM program provides information for Northern Pike within the zone for management purposes and Cycle 1 results are considered the baseline from which progress is measured. Neither of these monitoring programs specifically target Northern Pike during the lake selection process, and therefore there is the potential to have missing coverage of Northern Pike lakes that do not have Lake Trout or Walleye. We recognize that the status measures reported here are from populations that coexist with other key sportfish species and that characteristics of Northern Pike populations in waters free of Walleye and/or Lake Trout may be different.

Provincial results from the BsM program support the trends described by Malette and Morgan (2005) and supports our understanding of life history characteristics and growth potential of Northern Pike in FMZ 11. Specifically, the positive relationship between Northern Pike abundance and proportion of lake area that is littoral, and, the negative relationship between Northern Pike abundance and mean length. Given the relatively low amount of littoral area in FMZ 11 lakes, it should be expected that abundance of Northern Pike will be lower than in other zones with a greater amount of littoral area, and FMZ 11 lakes should support larger fish because of the relatively low abundance.

Abundance and age structure

The BsM program detected Northern Pike in 26 of the 30 lakes (All 20 Walleye lakes and 10 of 14 Lake Trout lakes) sampled in FMZ 11 Cycle 1 (both gear types combined). When considering the NA gear alone (used in reporting catch statistics), Northern Pike were captured in 25 lakes.

Similar to results from the provincial FWIN program, BsM results show that Northern Pike abundance, particularly larger fish, in FMZ 11 lakes is less than in other Northern zones and less than the provincial average (Figures 52 and 53). The equally weighted mean Total length of Northern Pike by FMZ for the province is shown in Figure 54.

As described in earlier sections, the abundance of clear, cold and deep water in FMZ 11, explains the lower abundance in FMZ 11, and a greater maximum size of Northern Pike in FMZ 11, compared to other zones. In FMZ 11 observed pre-maturation growth rates support our understanding of the relationship with mean depth (Figure 55). However, maximum total lengths (Figure 56) are not as high as expected, suggesting that the largest pike in these populations may be heavily exploited and/or suffering from high levels of mortality. This is also supported by observed number of age classes (cohorts) across FMZ's (Figure 57), where we would expect FMZ 11 lakes to support a larger number of cohorts.

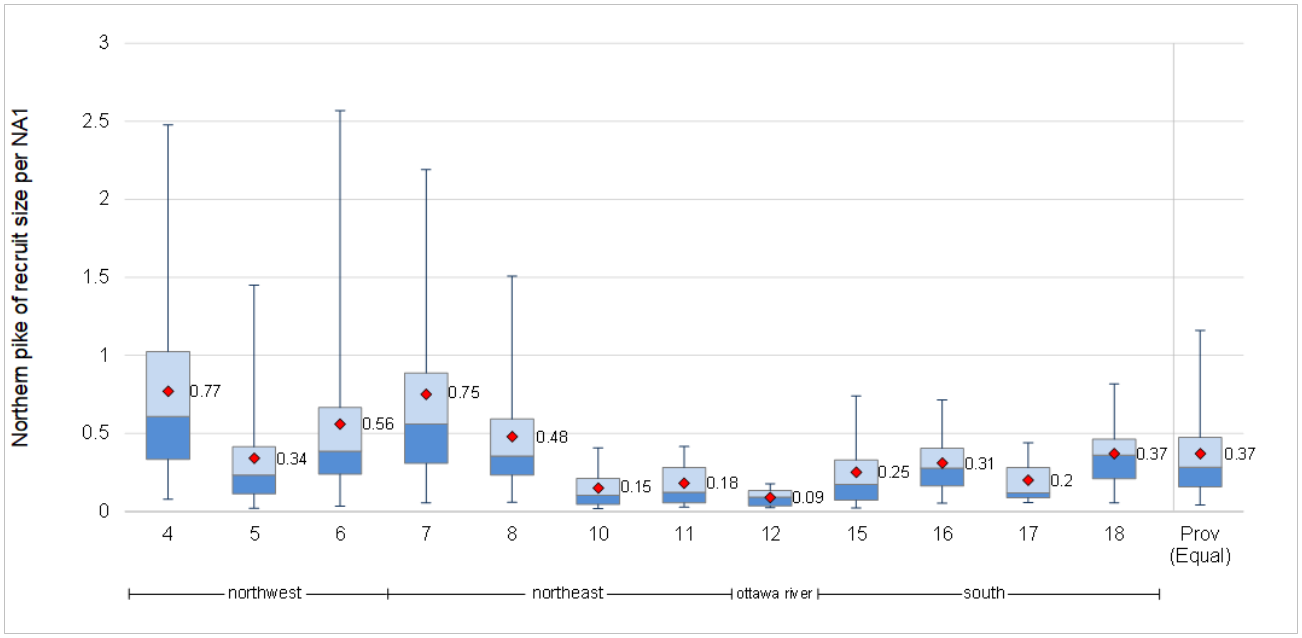


Figure 51. *Equally weighted average CUE of Recruited size (⩾ 500mm) Northern Pike by FMZ from BsM, Cycle 1.*

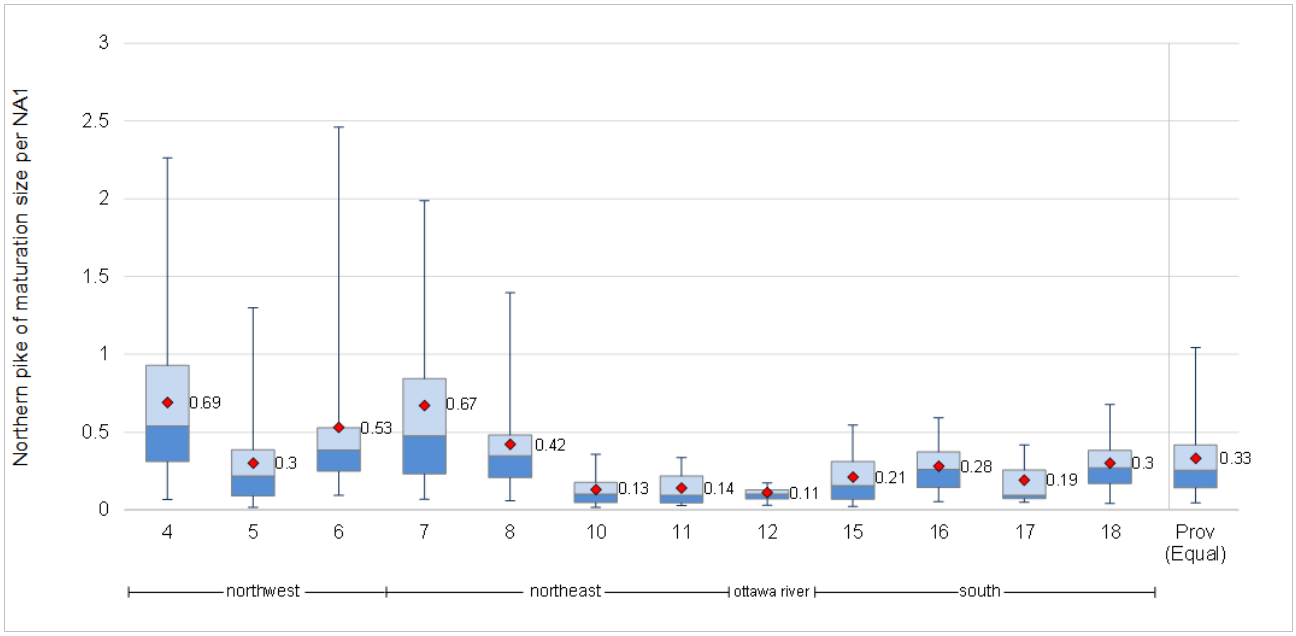


Figure 52. *Equally weighted average CUE of mature size (⩾ 525mm) Northern Pike by FMZ from BsM, Cycle 1.*

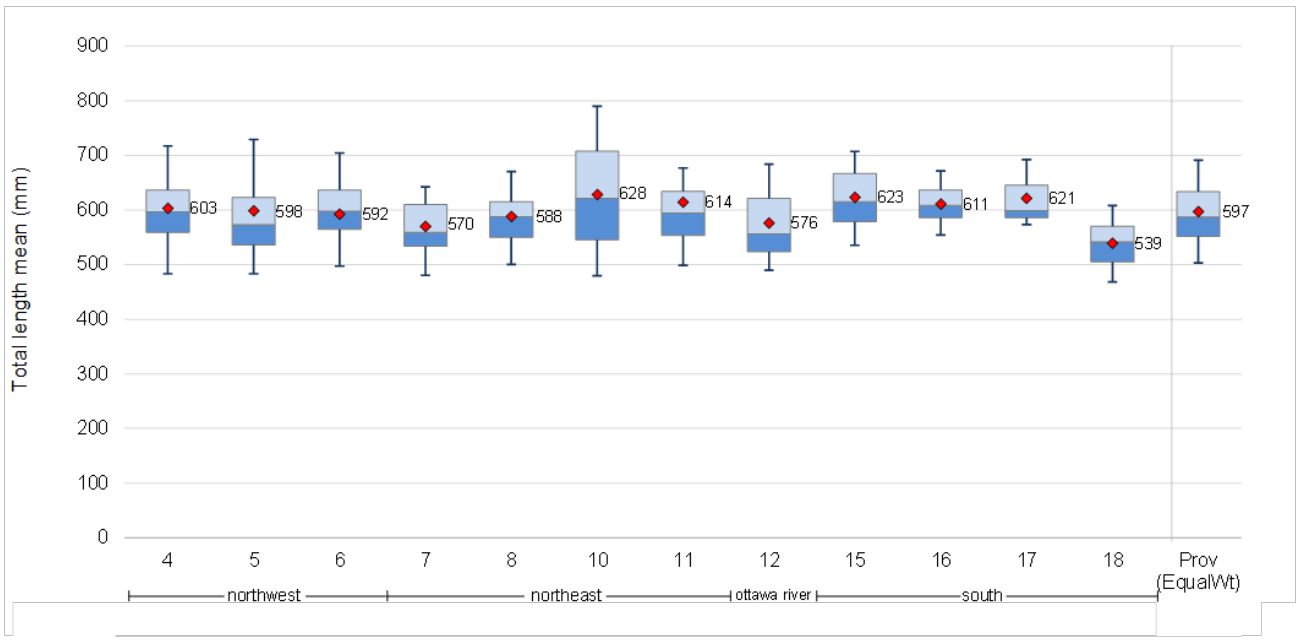


Figure 53. *Equally weighted mean Total length of Northern Pike by FMZ from all lakes in BsM Cycle 1.*

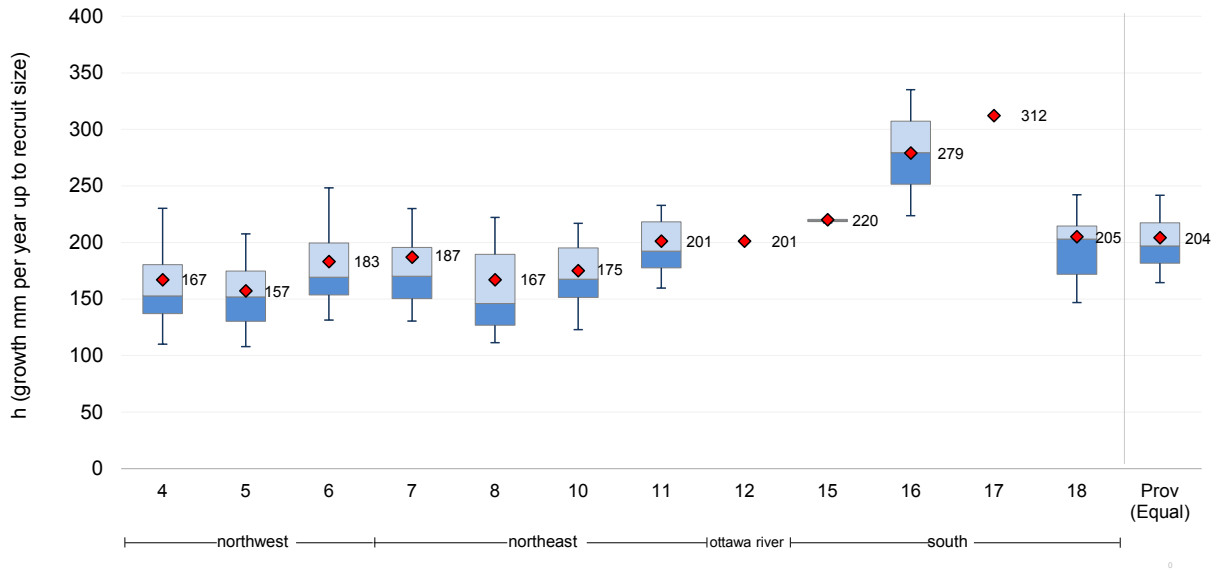


Figure 54. *Pre-maturation growth rate (mm/yr) of Northern Pike by FMZ from BsM, Cycle 1.*

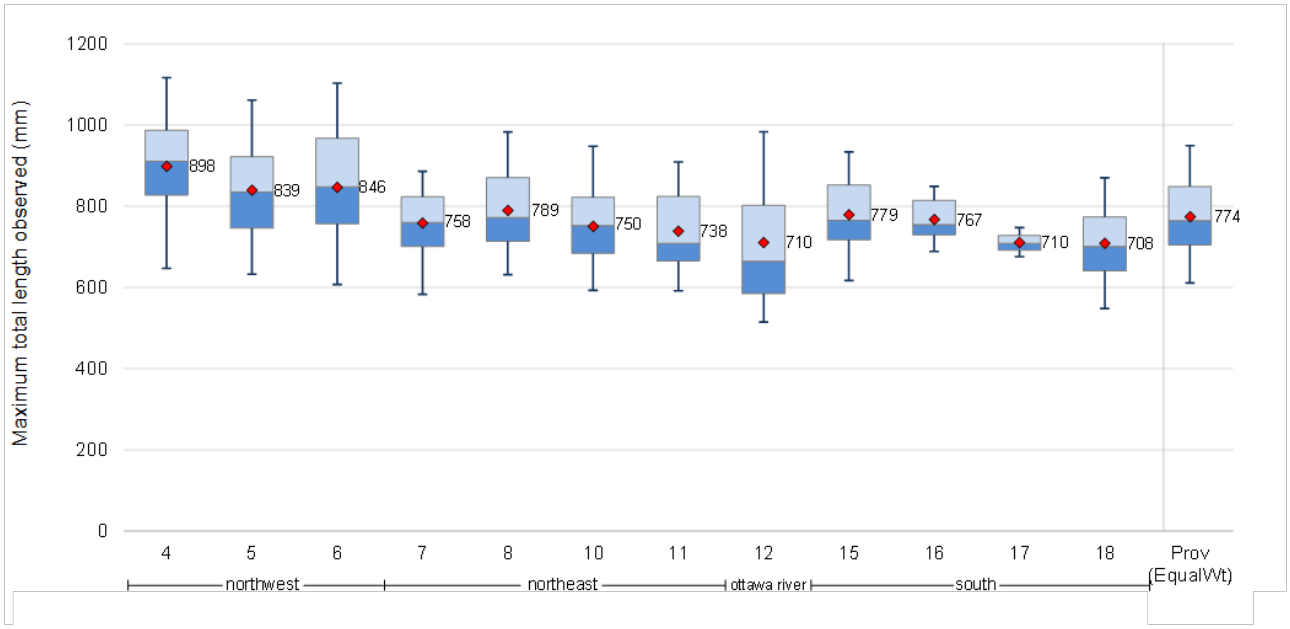


Figure 55. *Equally weighted mean max length of Northern Pike by FMZ from BsM, Cycle 1.*

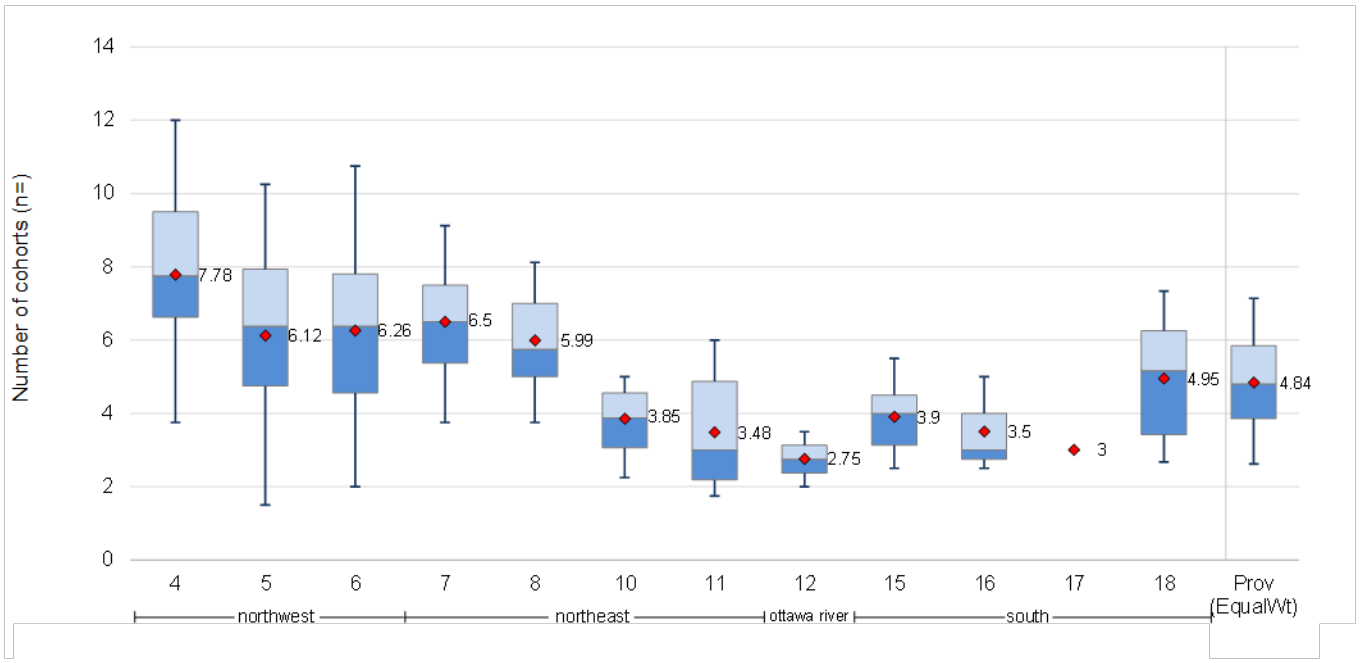


Figure 56. *Equally weighted mean number of age classes (cohorts) of Northern Pike by FMZ.*

Northern Pike Management Plan

The following summarizes the management plan for Northern Pike outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 13).

Table 13. *Summary of the Northern Pike Management Plan for FMZ 11.*

Objective	Indicator	Benchmark	Target
To ensure self-sustaining Northern Pike populations that provide enhanced quality and trophy fisheries throughout their existing range within FMZ 11.	Equally weighted zone mean for recruited size (⩾ 500mm) CUE	BsM Cycle 1 = 0.18	Equally weighted mean CUE >0.18
	Equally weighted zone mean for mature size (⩾ 525mm) CUE	BsM Cycle 1 = 0.14	Equally weighted mean CUE >0.14
	Equally weighted zone mean for Total length	BsM Cycle 1 = 614	Equally weighted zone mean Total length >614
	Equally weighted zone mean number of age classes (cohorts)	BsM Cycle 1 = 3.48	Equally weighted zone mean number of age classes >3.48
To enhance public knowledge of the rationale regarding Northern Pike	Fisheries outreach activities initiated and participated in within FMZ 11.	Regular outreach to clients at tradeshows, meetings, etc.	Initiate and participate in annual outreach activities.

regulations, fish handling and identification as well as the ecological implications of species and disease introductions.			
	Communications tools (literature, status reports and electronic media materials produced).	MNRF and council have developed FMZ 11 literature and a background document.	Make available status reports from BsM.
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.	Anglers recognize the angling, tourism and ecological value of healthy quality Northern Pike populations.	Currently, the regulation supports a quality fishery however no significant communication of the socio-economic and ecological values has been completed.	Actively promote Northern Pike as a high-value component of fish communities by participating in outreach activities.

Management actions to meet northern pike management objectives

The management actions are presented below along with an indication of the level of support from the FMZ 11 Advisory Council (Table 14). In the case of Northern Pike,

council felt that the present regulations are robust enough to achieve the objectives for Northern Pike in the zone.

Council reviewed regulations applied in other zones in the province and based on the status of Northern Pike from BsM, felt that there was no basis for modifying the regulations at this time. Provision of late winter angling opportunities for Northern Pike were discussed however the assessment of vulnerability of large pre-spawn female Northern Pike by Casselman (2002) led council to advise against lengthening the winter season.

Council also felt that the present regulation limits the harvest of large female Northern Pike in part through the size limits but, more importantly, via the third Sunday in March season closure. There is recognition that trophy Northern Pike (over 86 cm) are valuable components of the Zone 11 fishery both for residents and tourist operators. Further, council recognized the role that Northern Pike play in the aquatic ecosystems they inhabit as they are a keystone predator species in their fish communities.

Mitigation of spring levels in reservoir lakes has the potential to improve recruitment where spawning areas are not inundated in early spring or where water levels are dropped during the incubation period.

Council also felt that exploring the information from local Northern Pike tournaments may provide some insight into highly pressured fisheries, in particular from the perspective of long-term trends.

Table 15 presents several paired-samples t-tests for FMZ 11 Cycle 1 vs Cycle 2 comparison of several of the key Northern Pike indicators as rationale for the management actions.

Table 14. *Management Actions to Meet Northern Pike Objectives.*

Management actions	**Advisory Council advice**
Maintain current angling regulation (catch limit and size limit). Season: • January 1 to the third Sunday in March and third Saturday in May to December 31 Limits: • Sport – 6 fish; not more than 2 greater than 61 cm, of which not more than 1 fish over 86 cm • Conservation – 2 fish; not more than 1 greater than 61 cm, none over 86 cm Lake Obabika – harmonized Northern Pike regulations with FMZ 11 regulations. Augment BsM with local targeted monitoring, if required. Monitor VHS presence in FMZ 11 by: 1) participation in the National surveilancel program; 2) investigating reports of fish kills and submitting Northern Pike which die of unknown causes. Develop information transfer partnerships with tournament groups to gather, analyze and disseminate Northern Pike information. Education about Northern Pike biology and management to promote increased implementation support of management actions from anglers.	Council reviewed the status of Northern Pike in the zone and concluded the present regulations are appropriate including the late winter closure date (3rd Sunday in March).

Table 15. *Summary of Northern Pike indicator comparisons of Cycle 1 and Cycle 2 for FMZ 11 to determine if there is a statistical difference between cycles.*

Indicator	**Cycle 1**	**Cycle 2**	**Statistical difference**
CUE (fish per NA1) of recruited size Lake Trout (≥ 500mm Total Length)	Mean = 0.21 (SD 0.23)	Mean = 0.23 (SD 0.24)	No (P = 0.81)
CUE (fish per NA1) of mature size Northern Pike (≥ 525mm Total Length)	Mean = 0.17 (SD 0.18)	Mean = 0.20 (SD 0.20)	No (P = 0.46)
Mean Total Length of Northern Pike (mm)	Mean = 605 (SD 112)	Mean = 610 (SD 108)	No (P = 0.81)
Number of Northern Pike age classes	Mean = 3.5 (SD = 2.0)	Mean = 4.5 (SD = 2.3)	Yes (P = 0.02)

Education

Council felt that angler education would improve compliance if anglers could understand how the regulation benefits the resource and maintains angling quality. The Northern Pike regulation relies heavily upon live release to achieve the objectives set out by council and, as such, council felt that education on handling Northern Pike for live release would be of benefit to anglers and the resource.

6.3.6 Muskellunge (muskie)

Management issues, challenges and opportunities

Unlike with other sportfish species, there is no angling-related overharvest issue for muskie in FMZ 11. Optimizing the reproductive potential of muskie through habitat protection is the most significant challenge for the species in the zone. A significant threat exists in the potential for transporting and introducing VHS via infected baitfish or through other pathways of spread such as contaminated water in live-wells, into FMZ 11 waters.

Challenges:

- The potential for anglers to misidentify Muskellunge as Northern Pike;
- VHS monitoring and prevention;

- Lack of knowledge regarding critical habitat and population metrics; and
- Critical habitat protection, spring water levels and physical habitat destruction.

Opportunities:

- Muskies Canada Inc. is a strong advocate for the resource which may address shortcomings in muskie information in FMZ 11 including fish identification and health, catch information and potentially spawning habitat information; and
- Current recreational angling practices for muskie represent minimal to no concern from a fisheries management perspective.

Status of the muskellunge

Muskellunge are present in 28 lakes in FMZ 11 including Lake Nipissing and the French River. Muskie are distributed principally in and south of the French River-Nipissing and Mattawa River watersheds. Several lakes are well known provincially and beyond for their muskie populations including Lake Nosbonsing, Stormy and Clear Lakes, Trout and Turtle lakes as well as Lake Nipissing and some of its tributaries such as the Veuve and French rivers.

Angling for muskie 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 11, 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. Muskie angling is the model of socio-economic benefit with extremely low impact on the sustainability of the resource.

Muskie regulations were modified when the FMZ 11 regulations were developed in 2008. The intent at that time was to harmonize the early summer opening dates to the third Saturday in June. Muskie waters that were incorporated into FMZ 11 from former Division 15 had been opening the second weekend in June, a date that threatened spawning fish at the north end of its range in northeastern Ontario.

Assessment of Muskie 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.

The abundance and size distribution of muskie populations are not well known but generally are thought to be healthy. The primary threat from VHS transmission has not to date resulted in the visible loss of muskies as has occurred in some portions of southern and southeastern Ontario. Monitoring of VHS is presently confined to Lake Nipissing, a lake that has a higher than normal risk of contracting VHS within FMZ 11 given the high use of live baitfish from southern Ontario.

Muskies Canada Inc. is a strong advocate for the resource and a valuable partner in the management of Muskie 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 Muskie information in FMZ 10 including fish health, catch information and, potentially, spawning habitat information.

Muskellunge Management Plan

The following summarizes the management plan for Muskellunge outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 16).

Table 16. *Summary of the Muskellunge Management Plan for FMZ 11.*

Objective	Indicator	Benchmark	Target
To ensure healthy, trophy-focused, self-sustaining muskie populations throughout their native range within FMZ 11.	Data including CUE of muskellunge from Muskies Canada Inc. angler log program. CUE of Muskellunge in lakes sampled by BsM program.	Current CUE of muskie from angler log program.	Minimize annual adult mortality. Increase the proportion of large muskie in the population. Maintain or increase abundance in muskie waters
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.	Fisheries-related outreach activities within FMZ 11. Communications tools (literature, status reports and electronic media materials produced).	Outreach activities with muskie angler groups, tourist operators and general angling public has occurred and will continue. MNRF and council have developed FMZ 11 literature and a background document.	Initiate and participate in fisheries outreach activities. Make available status reports from BsM. Produce and distribute FMZ 11 literature for all major species.
To recognize and promote the significant social and economic value of muskie trophy fisheries relative to the	Produce public education materials illustrating how muskie regulations work to ensure sustainable	Thus far, no education products have been developed.	Actively promote muskie as a high value component of fish communities.

Objective	Indicator	Benchmark	Target
impact on the resource.	populations regardless of the level of effort expended.		

Management actions to meet muskellunge objectives

The management actions are presented below along with an indication of the level of support from the FMZ 11 Advisory Council (Table 17). In the case of Muskellunge, council felt that the present regulations were appropriate given the harmonization across the zone and the alignment of the regulation with the end of the spawning season.

The present FMZ 11 Muskellunge regulations are considered robust enough to ensure sustainability of a trophy fishery in the absence of serious health threats like VHS. Streamlined seasons and size limits across the FMZ will promote consistency and provide simpler regulations for anglers to follow.

Table 17. *Management Actions to Meet Muskellunge Objectives.*

Management actions	**Advisory Council advice**
Maintain current angling regulation (catch limit and size limit). Season: • Third Saturday in June to December 15 Limits: • Sport – 1 fish; must be greater than 122 cm • Conservation – 0 fish Apply this open season and catch and size limits to the entire French River (currently open first Saturday in June to December 15). Report on Broad-scale Monitoring data for muskie where appropriate. Report on data from Muskies Canada Inc. angler log information as available for FMZ 11. Monitor for VHS presence in FMZ 11 by investigating and submitting VHS-vulnerable species dying of unknown causes. Encourage partnerships with Muskies Canada and other resource stewardship groups. To provide an index of muskie health through volunteer angler diaries on individual lakes. Education of visiting anglers regarding the threat of VHS to Muskellunge. Education of anglers regarding Muskellunge biology and management.	Council was supportive of harmonizing the muskie season across the zone reflecting the end of spawning season.

Monitoring strategy

As priorities for management, Muskellunge assessment needs to focus on the lack of knowledge of critical habitats and on participating in VHS monitoring. Population assessment may be undertaken on a case-by-case basis where demonstrated problems have been documented, otherwise limited data from the BsM program may provide information. The robust nature of the regulation makes the absence of population assessment a low risk relative to that for other species in the zone. Since the current regulation protects from harvest all females well into sexual maturity, overharvest as a threat to sustainability is extremely unlikely at any foreseeable level of angler effort.

Continue to utilize information collected from BsM, National Recreational Fishing Surveys, consultant reports and LIO (Land Information Ontario).

Partnerships with muskie advocates such as Muskies Canada Inc. are the most likely avenue to monitoring muskie populations as muskie is not a target species for BsM. Development of a long-term index of muskie populations may be possible utilizing information from dedicated anglers who keep records of their catch and effort.

Local targeted monitoring by either the district or in conjunction with partners as determined by the outcome of the management action herein (e.g. spawning and habitat assessments).

The potential for impacts from reservoir manipulation during spawning and incubation is significant as many of the muskie waters in FMZ 11 have water level manipulation. At present, the precise locations of spawning sites and how they might be affected by water regulation are essentially unknown.

Monitor enforcement results to determine unauthorized introductions.

Forestry Effectiveness Monitoring and Compliance Programs.

Education

The potential transmission of VHS from infected waters or baitfish poses a concern for muskellunge as they are particularly susceptible. Education on the impacts of

transfer of live bait from infected zones is important to slow the spread of this disease.

Additional educational focus should be placed on safe catch, handling and release of these large fish as hanging muskie or other large bodied fish by their jaws to weigh or photograph before releasing can cause serious damage to gills, spine and internal organs.

Education on identification of muskellunge compared to pike may also assist in the identification of muskie waters and help with compliance.

6.3.7 Yellow perch

Management issues, challenges and opportunities

Management issues:

- Yellow Perch are successful invaders and are likely to establish and spread within a watershed, once introduced;
- Perch are easily introduced through natural and human-mediated activities, such as live bait; and
- 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.

Challenges:

- Within FMZ 11, most perch populations fail to reach a reasonable size for harvest – leading to limited angling opportunities; and
- Consistent lake assessments are required to monitor the community structure of lakes in which perch are present.

Opportunities:

- Capitalize on Yellow Perch as a target species for recreational angling; and
- Try to restore diverse fish communities to FMZ 11 trout lakes by exploring the introduction of compatible stocked fish (i.e. splake) to lakes that are dominated by Yellow Perch.

Status of yellow perch

Although a widespread, native species within FMZ 11, Yellow Perch has been introduced into numerous additional opportunity lakes within FMZ 11, 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 were introduced to Trethewey Lake in Lady Evelyn Smoothwater Wilderness Provincial Park in the 1980's likely via angler bait buckets. Trethewey Lake is a headwater lake for the Lady Evelyn River system known for its natural Brook Trout population. Yellow Perch are now found throughout the Lady Evelyn River system.

Yellow Perch have strong schooling behaviours and are prey for species such as Northern Pike, Walleye and to lesser extent adult Lake Trout and bass. 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 sufficient 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.

Abundance

Twenty-two (22) of 30 Walleye/Lake Trout trend lakes surveyed by BsM had Yellow Perch present in large (NA1) mesh nets, and in 29 of 30 lakes in small (ON2) mesh nets. Figures 58 to 62 provide comparisons of some key Yellow Perch BsM results from lakes in FMZ 11 and compared to those across other zones in the province. These measures will play a key role in tracking trends through time.

Based on the BsM data from Cycle 1, among northern zones, where Yellow Perch were detected, their abundance is highest in FMZ 11 based on catch in large (NA1) mesh nets (Figure 58). When considering catch from small mesh nets (Figure 59) abundance of Yellow Perch in FMZ 11 is second highest.

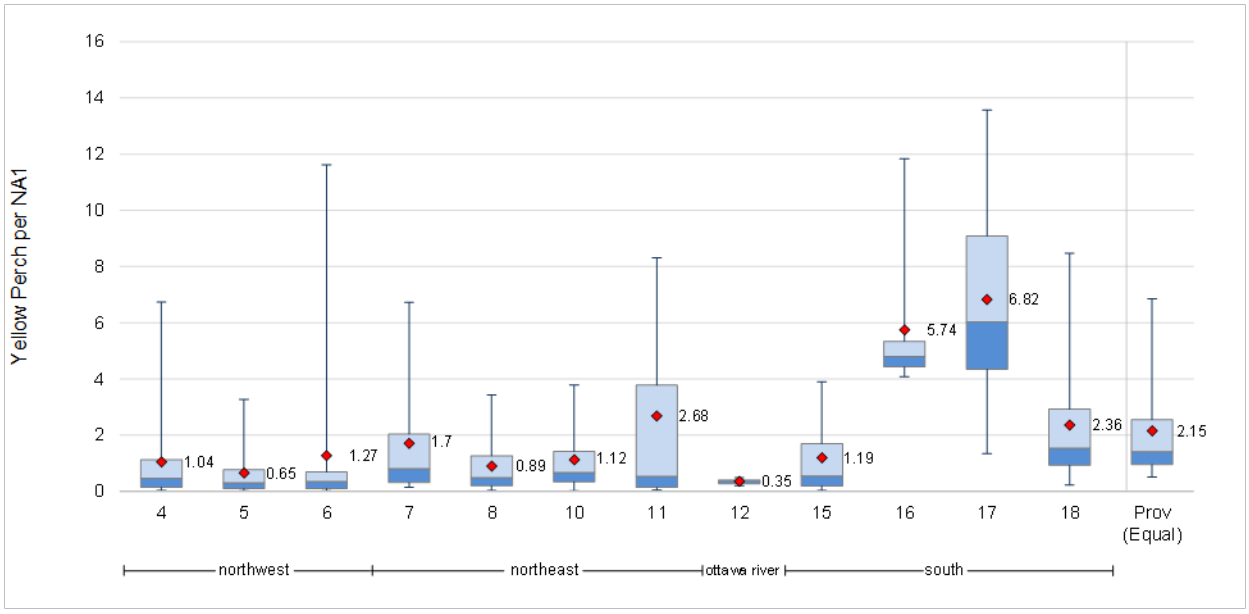


Figure 57. *Equally weighted average catch per unit effort of Yellow Perch by FMZ for large (NA1) mesh nets. Data from BsM Cycle 1.*

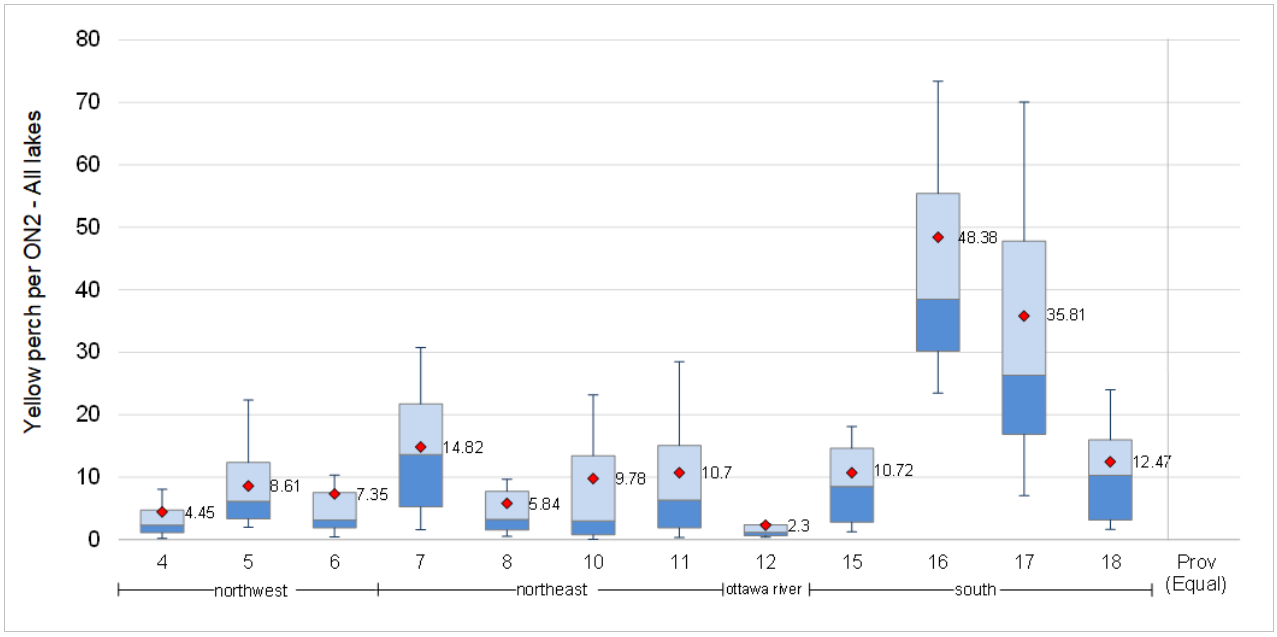


Figure 58. *Equally weighted average catch per unit effort of Yellow Perch by FMZ for small (ON2) mesh nets. Data from BsM Cycle 1.*

The relatively high catch rate of Yellow Perch within FMZ 11 is primarily driven by results from the small and extra-large lake size classes (Figures 60 and 61), where perch populations dominate the fish community in a few lakes. Lake Nipissing provides the best example of this, and when we examine results in concert with

recent changes in the Walleye population, this provides a good example of dynamic predator prey relationships between Walleye and Yellow Perch. We recognize that as the Lake Nipissing fish community potentially shifts back to being dominated by Walleye, the abundance of Yellow Perch will likely decline, and therefore the current high zone average CUE of Yellow Perch will likely not persist. The Cycle 1 equally weighted average catch per unit effort of Yellow Perch from NA1 nets, with Lake Nipissing results removed is 1.14 fish/net.

Size structure

Based on the BsM data from Cycle 1, provincially, where Yellow Perch were detected, the average total length is lowest in FMZ 11 and 10, based on catch in large (NA1) mesh nets (Figure 62). The relatively small size of perch in FMZ 11 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 (Scott and Crossman 1973).

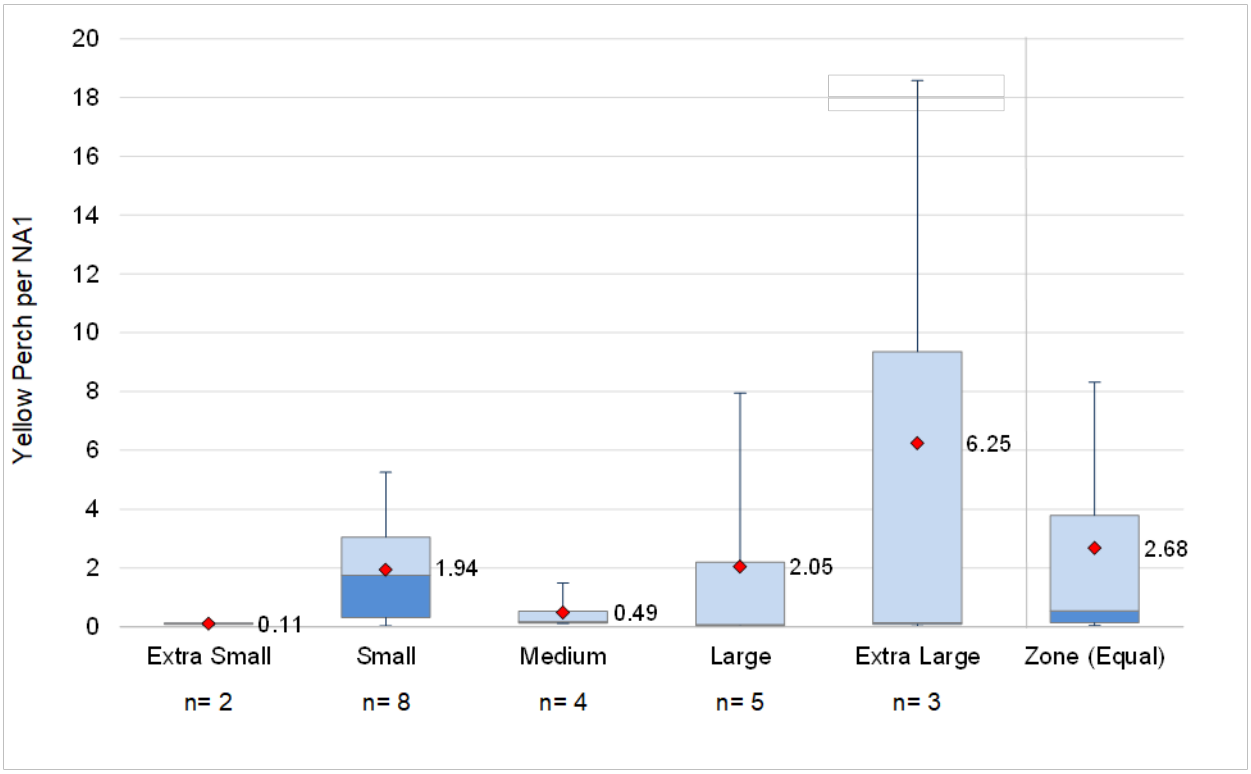


Figure 59. *Catch per unit effort of Yellow Perch for large (NA1) mesh gill nets within lake size bins for FMZ 11. Data from BsM Cycle 1.*

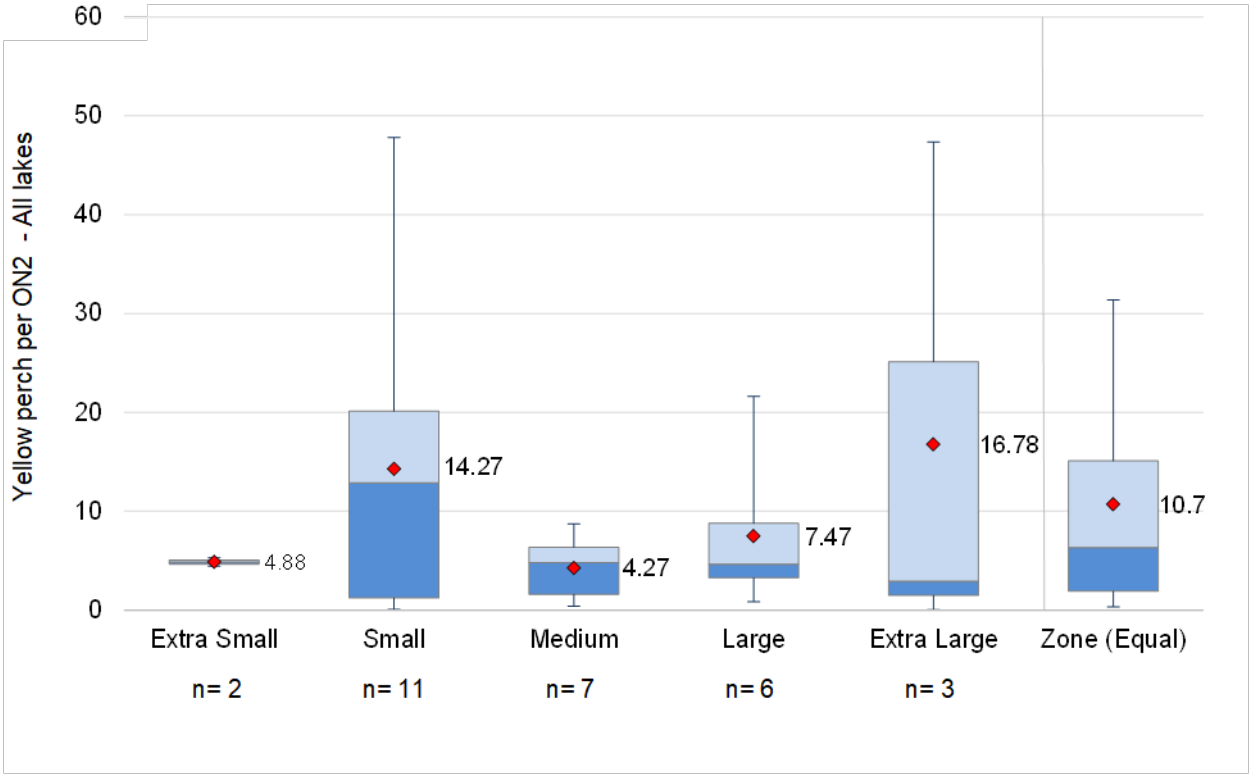


Figure 60. *Catch per unit effort of Yellow Perch for small (ON2) mesh gill nets within lake size bins for FMZ 11. Data from BsM Cycle 1.*

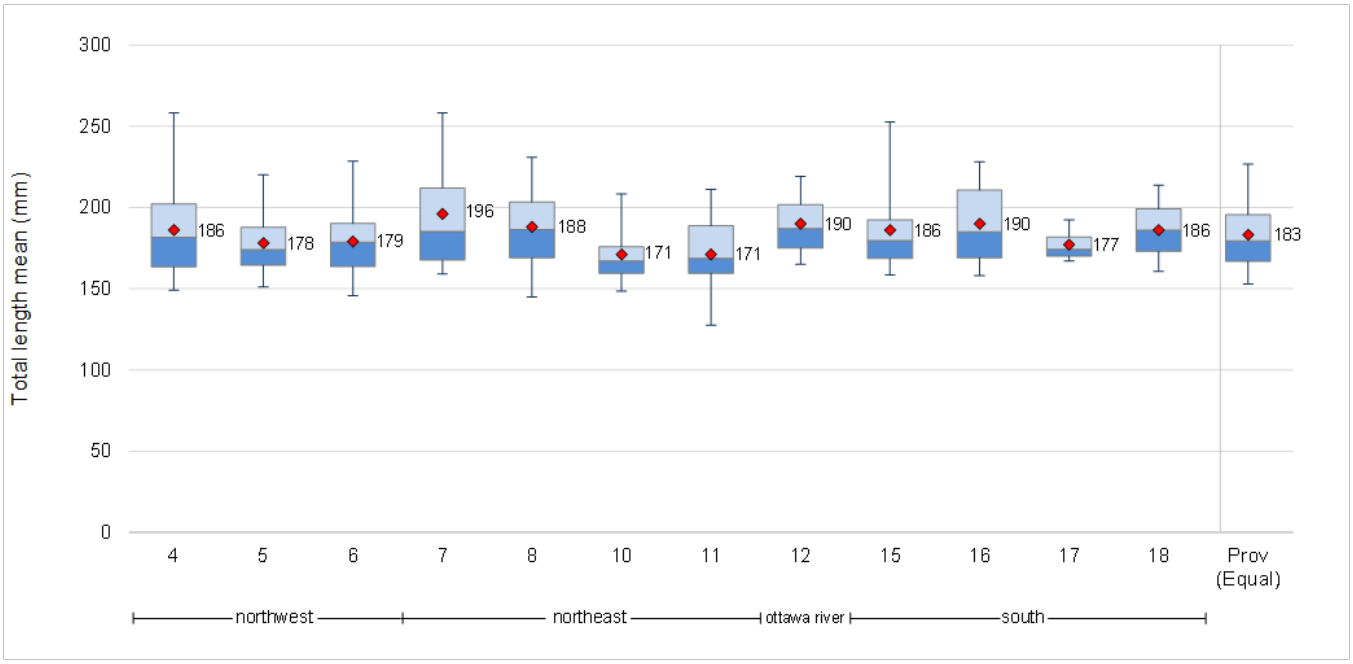


Figure 61. *Equally weighted average total length (mm) for Yellow Perch by FMZ for large (NA1) mesh nets. Data from BsM Cycle 1.*

Yellow Perch Management Plan

The following summarizes the management plan for Yellow Perch outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 18).

Table 18. *Summary of the Yellow Perch Management Plan for FMZ 11.*

Objective	**Indicator**	**Benchmark**	**Target**
Maintain Yellow Perch populations recognizing their importance as a game species and an important part of the ecosystems where they naturally occur.	Catch per Unit Effort (CUE) for large (NA1) mesh gill nets.	CUE for large (NA1) mesh gill nets from BsM Cycle 1 = 2.7	Maintain CUE for large (NA1) mesh gill nets = 2.7
	CUE for small (NA1) mesh gill nets.	CUE for small (ON2) mesh gill nets from BsM Cycle 1 = 10.7	Maintain CUE for small (ON2) mesh gill nets = 10.7
	Mean total length (mm).	Mean Total Length from BsM Cycle 1 = 171 mm	Mean total length $\geq$ 171 mm
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	Yellow Perch distribution across the zone.	Current distribution of Yellow Perch.	Maintain the current distribution of Yellow Perch.

for them to outcompete native species.			
Educate the public on the consequences of Yellow Perch introductions to native fish populations in order to reduce the spread of Yellow Perch beyond its historical range by means of engaging the public in stewardship activities that meet this goal.	Yellow Perch literature for distribution at open houses, MNRF website, Fish On Line, stakeholder meetings etc. in order to increase awareness and engage the public in BMP's for reducing/limiting perch introductions in sensitive waterbodies.	At present, the public largely has limited knowledge due to lack of communication.	MNRF to deliver messages on Yellow Perch (fish community role, under-utilization) through outreach activities, literature and electronic media.

Management actions to meet yellow perch management objectives

The management actions are presented below along with an indication of the level of support from the FMZ 11 Advisory Council (Table 19). Maintain the present FMZ 11 Yellow Perch regulations. FMZ 11 Yellow Perch regulations provide an opportunity for harvest that anglers rarely take advantage of and there are no current indications of overexploitation.

Table 19. *Management Actions to Meet Yellow Perch Objectives.*

Management actions	Advisory Council advice
Maintain current Yellow Perch angling regulation (catch limit and size limit). Season: open all year Limits: Sport – 50 fish; Conservation – 25 fish Encourage anglers to target and harvest Yellow Perch.	Council is supportive of the present Yellow Perch season and limit.

Monitoring strategy

Continue to utilize information collected from BsM, National Recreational Fishing Surveys, consultant reports and LIO (Land Information Ontario).

Utilize information collected from local targeted monitoring where necessary by either the district or in conjunction with partners as determined by the outcome of the management action herein.

Monitor enforcement results to determine unauthorized introductions.

Education

Making anglers aware of the palatable nature of Yellow Perch and their liberal limits may encourage use of this resource.

Anglers need to understand the ability of Yellow Perch to dominate a weak Brook Trout population resulting in poor prospects for recovery in the event of Brook Trout overharvest.

6.3.8 Coregonids: Lake Whitefish, Lake Herring and Shortjaw Cisco

Management issues, challenges and opportunities

Management issues:

- The potential for Lake Herring (*Coregonus artedi*) or Lake Whitefish (*Coregonus clupeaformis*) 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 predators and prey in northeastern Ontario lakes;
- Lake Obabika was known to have a severe imbalance of Lake Herring and Lake Whitefish due to angler depletion of the natural Lake Trout population. Comparisons with literature on interaction of coregonids with Lake Trout (Powell et al. 1986) in northeast region suggested that Lake Obabika was an extreme case. Recent review of Cycle 1 and 2 BsM data shows that this severe imbalance no longer exists, and that Lake Obabika is well within the ratios seen within FMZ11; and
- The status of Shortjaw Cisco (*Coregonus zenithicus*) in Trout Lake is currently being examined.

Challenges:

- Educating the public that these species, where they currently exist, are highly valuable components of balanced coldwater fish communities; and
- 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.

Opportunities:

- Except for Lake Temagami and Lake Nipissing, angler interest in Lake Whitefish and Lake Herring is exceptionally low across the zone; and
- Increased interest in these species could theoretically assist with Lake Trout recovery in those cases where recovery is being hindered by fish community effects.

Status of Coregonids

Lake Herring (cisco) and Lake Whitefish are the two most common coregonid species and are found throughout FMZ 11 in both coldwater and coolwater 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. Shortjaw Cisco is a Species at Risk in Ontario. These fish have been confirmed to be in the waters of Trout Lake (DFO 2012). Other than their presence, little is known about their

distribution and abundance. It is suspected that Shortjaw Cisco may also exist in Turtle and Talon lakes. Lake Herring and Shortjaw Cisco may be grouped and referred to as ciscoes in the following section.

Lake Herring are known in 144 waterbodies in the zone and 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 and have a daily and possession limit of 120 fish where used as bait.

Lake Whitefish are known in 134 waterbodies in the zone and, unlike Lake Herring, are targeted by anglers in some waters, particularly in winter. Lake Temagami has traditionally had a significant early winter tourist-operator-dominated Lake Whitefish fishery that may only be matched by the Lake Nipissing fishery in FMZ 11. Lake Whitefish may comprise a significant component of coldwater fish communities and function as both predator 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). Reversing such a fish community imbalance has been a significant challenge in natural Lake Trout lakes in the zone including Lake Obabika and Trout Lake.

The abundance of whitefish in FMZ 11 Walleye and Lake Trout trend lakes is lower than in most northern zones, but higher than the provincial average (Figure 63). Similarly, the abundance of Lake Herring is higher in FMZ 11 than its two closest neighbors (FMZs 10 & 15) but is higher than in other northern zones (Figure 64).

However, when examining abundance of Lake herring in Lake Trout trend lakes alone (Figure 65), it becomes apparent that they are much more abundant in FMZ 11 Lake Trout lakes than in the rest of the province. 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 (1986).

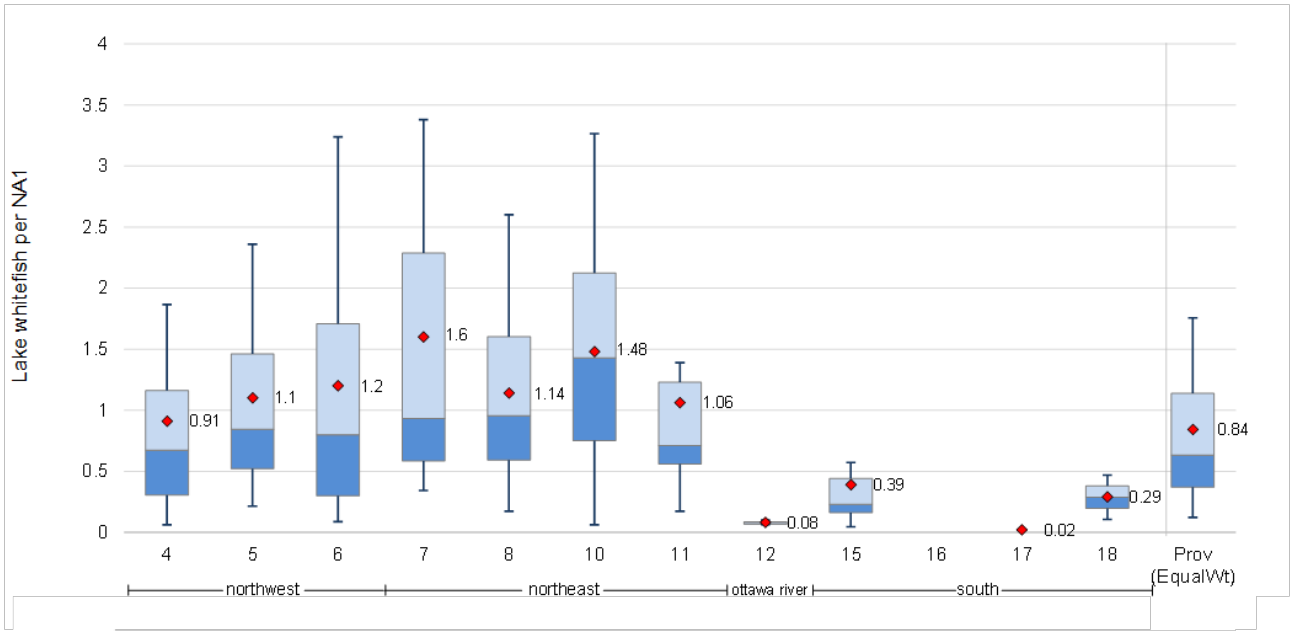


Figure 62. *Equally weighted mean CUE of Lake Whitefish by FMZ. Data from BsM Cycle 1.*

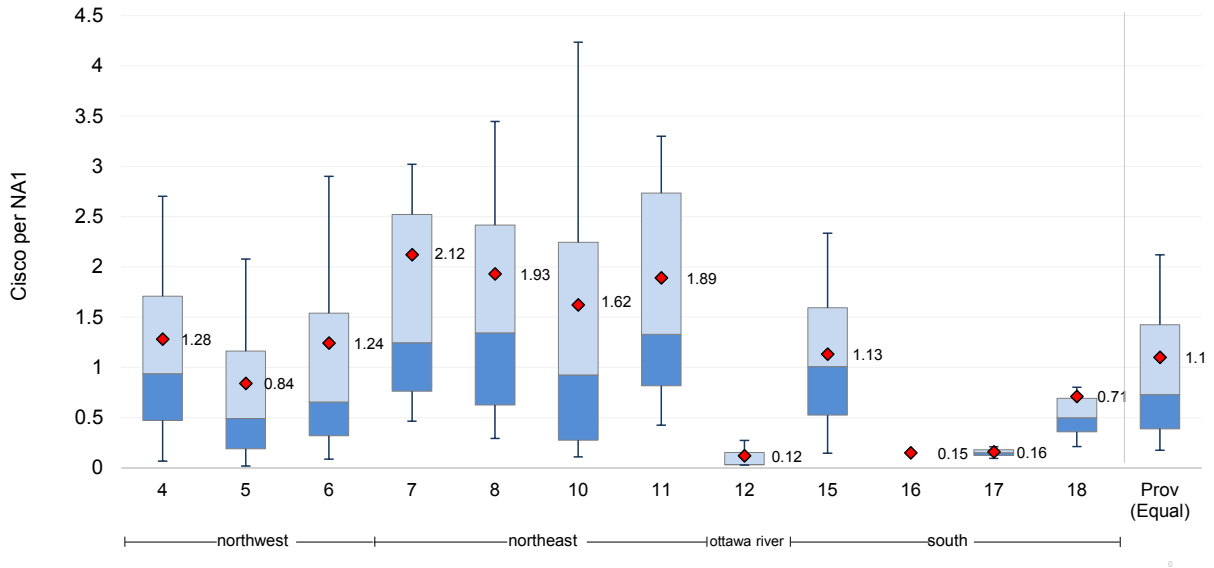


Figure 63. *Equally weighted mean CUE of Lake Herring by FMZ. Data from BsM Cycle 1.*

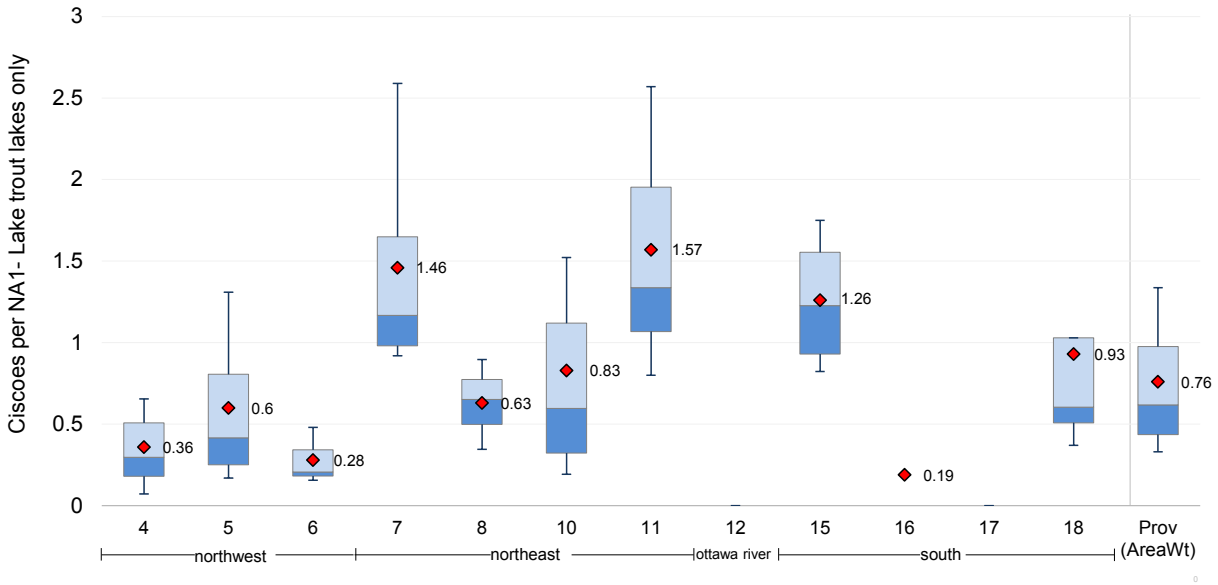


Figure 64. *Equally weighted mean CUE of Lake Herring by FMZ from Lake Trout trend lakes. Data from BsM Cycle 1.*

Coregonid Management Plan

The following summarizes the management plan for Ciscos and Lake Whitefish outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 20).

Table 20. *Summary of the Lake Whitefish and Cisco Management Plan for FMZ 11.*

Objective	Indicator	Benchmark	Target
Manage coregonids as valued components of FMZ 11 aquatic resources while recognizing their ability to influence stressed	Equally weighted mean CUE of Lake Whitefish.	Equally weighted mean CUE of Lake Whitefish from BsM Cycle 1 = 1.06	Equally weighted mean CUE of Lake Whitefish ⩾ 1.06

coldwater fish communities.			
	Equally weighted mean CUE of Ciscoe.	Equally weighted mean CUE of Ciscoe from BsM Cycle 1 = 1.53	Maintain Equally weighted mean CUE of Ciscoe = 1.53
	Equally weighted mean length of Lake Whitefish.	Equally weighted mean length of Lake Whitefish from BsM Cycle 1 = 400 mm	Maintain Equally weighted mean length of Lake Whitefish = 400 mm
Enhance the profile of coregonids in FMZ 11.	Angler utilization (harvest) of Lake Whitefish and Lake Herring.	At present, the public largely has limited knowledge due to lack of communication.	MNRF to deliver messages on coregonids (fish community role, under-utilization) through outreach activities, literature and electronic media.
Enhance the profile of Lake Whitefish as an alternative species for harvest.	Public awareness of the role coregonids play as prey and predators in fish communities.	Known highest angler yield in FMZ 11 is 0.035kg/ha on Lake Temagami.	Increased harvest of Lake Whitefish and Lake Herring especially, when Lake Trout angling.

Management Actions to Meet Coregonid Management Objectives

The management actions are presented below along with an indication of the level of support from the FMZ 11 Advisory Council (Table 21). Maintain the present FMZ 11 Lake Whitefish regulations. FMZ 11 Lake Whitefish regulations provide an opportunity for harvest that anglers rarely take advantage of and there are no

current indications of overexploitation. The pre-2008 greater limit was retained on Lake Temagami for Lake Whitefish where early winter Lake Whitefish angling has been of high value to tourist operators.

Table 21. *Management Actions to Meet Lake Whitefish and Lake Herring Objectives.*

Management actions	**Advisory Council advice**
Maintain current Lake Whitefish angling regulation (catch limit and size limit): • Season: open all year • Dipnet season: October 1 to December 15 • Limits: Sport – 12 fish; Conservation – 6 fish • Limit Exception (Lake Temagami): Sport – 25 fish; Conservation – 12 Maintain current Lake Herring angling and baitfish regulations: • Season: open all year • Dipnet season: October 1 to December 15 • Baitfish Limits: Sport – 10 dozen; Conservation – 10 dozen Encouraging anglers to harvest Lake Whitefish instead of Lake Trout could reduce Lake Trout harvest and help to maintain balance in the fish community. Working with partners, expand the Scope of Studies to develop and conduct a quantitative assessment of Shortjaw Cisco in Trout Lake using BsM data.	Council entirely supportive of the present Lake Whitefish season and limit.

Monitoring strategy

Employ targeted late summer juvenile Lake Trout assessment technique in waters where natural Lake Trout are not able to compete with coregonids to determine if additional recovery efforts are required.

Continue to utilize information collected from BsM, National Recreational Fishing Surveys, consultant reports and LIO (Land Information Ontario). BsM is an appropriate tool for assessing both species in FMZ 11. Many of the lakes surveyed by BsM contain Lake Trout or Walleye and often these waters will contain one or both of Lake Herring and Lake Whitefish. Monitoring of ratio of Lake Herring and Lake Whitefish relative to Lake Trout may provide fisheries managers with insight into challenges and opportunities to recover depressed Lake Trout populations. The BsM assessment will characterize the health of Lake Herring and Lake Whitefish in FMZ 11. Focusing on the relationship between coregonid catches and Lake Trout catches in BsM will characterize the zone-wide balance between the species in waters where they co-exist. Values to characterize imbalance were documented by Powell et al. (1986) in northeastern region waters in the 1980s.

Although there might not exist a significant sport fishery for Lake Whitefish in FMZ 11, it is still important to track changes in their abundance and other life history characteristics because they can act as a deep-water surrogate for other species such as Lake Trout. The preferred habitat of whitefish is similar to that of Lake Trout, but they do not experience nearly the amount of fishing mortality. Therefore, tracking changes in whitefish populations may serve to understand other, non-fishing, induced stresses that Lake Trout may be experiencing in the zone.

Local targeted monitoring may be required in specific lakes known or suspected of containing Shortjaw Cisco if these waters are not selected as BsM state lakes. Turtle and Talon lakes may be good initial candidates for examination.

Monitor enforcement results to determine unauthorized introductions.

Forestry Effectiveness Monitoring and Compliance Programs.

Education

Making anglers aware of the palatable nature of Lake Whitefish and their liberal limits may encourage use of this resource potentially to the benefit of Lake Trout. Anglers need to understand the ability of Lake Whitefish and Lake Herring to dominate a weak Lake Trout population resulting in poor prospects for recovery in the event of Lake Trout overharvest.

Educating anglers when angling in Trout Lake, where Shortjaw Cisco occur, under the ESA it is illegal to catch and keep this species. Need to be cautious if keeping Lake Herring from this lake. It is extremely difficult for biologist to distinguish these two species, so encouragement should be not to keep Lake Herring in Trout Lake.

6.3.9 Aurora Trout

Management issues, challenges and opportunities

Management issues:

- Calcium depletion in headwater lakes poses concerns for aquatic communities;
- The hatchery's original strain of Aurora Trout is highly subject to in-breeding depression, greatly reducing its effectiveness for both restorative and Put-Grow-Take (PGT) stocking;
- Introductions of new species by various pathways of spread, reduces the ability of Aurora Trout to persist in waterbodies; and
- The sole PGT Aurora Trout lake in FMZ 11 (Liberty Lake) does not appear to support pure strain Aurora Trout, due to water chemistry and aquatic community composition.

Challenges:

- Improving recreational angling opportunities for Aurora Trout within FMZ 11 as suitable lakes become increasingly rare;
- Ensuring that Lake Chemistry monitoring of Aurora Trout lakes is continued, and that findings support continued natural recruitment;
- Funding and support for the Aurora Trout program depends upon coordinated support from multiple agencies and may not be considered a priority given the species is no longer listed as a species at risk; and
- Acquiring funding to repeat population assessments in Whirligig and Whitepine lakes and to determine if Aurora Trout have colonized other lakes within Gamble township.

Opportunities:

- Work with Ontario Parks to protect the original Aurora Trout lakes in their Nature Reserve Zone within LESWPP and look for opportunities to recover populations within the natural watershed;
- Increase the use of 7/8th Aurora Trout for Liberty lake to improve survival and growth;
- Continue to monitor the Aurora Trout distribution in Gamble Township watershed;
- Continue partnerships with research groups and other government agencies to monitor water quality and fish communities within Aurora trout waters; and
- Consider modifying the current recreational fishing regulations to reflect recent changes in species distribution.

Status of the aurora trout

Aurora Trout are a colour phase of Brook Trout that are endemic to only two lakes: Whirligig Lake and Whitepine Lake located in the same watershed within Lady Evelyn Smoothwater Wilderness Provincial Park (LESWPP) in FMZ 11. Aurora Trout populations in Whirligig and Whitepine lakes were found to be declining as early as the 1940s and were extirpated from the wild by 1967 due to lake acidification. A captive breeding program established in the late 1950s managed to maintain a small captive breeding stock in order to support a remnant population. Reductions in atmospheric pollutants in the later 1980s, in concert with lake liming, enabled the re-establishment of self-sustaining populations of Aurora Trout in both lakes by the mid-1990s.

Aurora Trout were reintroduced into Whirligig Lakes and Whitepine lakes from Hills Lake Fish Culture Station.

Population assessments on the two lakes in 2003 reported an adult Aurora Trout density (fish over 28 cm long) of 38/ha in Whirligig Lake and an adult density (fish over 32 cm long) of 27/ha in Whitepine Lake. The population at the time of assessment was made up entirely of offspring from the original stockings. Standing biomass of these life stages was estimated at 17 kg/ha in Whirligig and 15.7 kg/ha in Whitepine Lake. Since this time, quantitative fisheries assessments have detected the presence of Aurora Trout in Marina lake, Little Whitepine Lake, and Aurora Lake within Gamble township. At this point it is uncertain if these fish are from the

naturally reproducing our hatchery-reared stock. Further assessments are required to determine the specific contribution of natural reproduction to population recruitment.

Since the initial discovery of this population in the two headwater lakes, Aurora Trout populations have been observed in additional small waterbodies within Gamble township. It is unclear if these represent colonization of the lakes or if minor populations have always existed, but their presence can be attributed to the effects of lake recovery efforts supporting natural reproduction in conjunction with restorative stocking and regulatory protection afforded by year-round fish sanctuaries.

Management history

Aurora Trout were first discovered in 1923 by anglers in the Temagami Region and were initially considered a new species (*Salvelinus timagamiensis*). In 1987, the Aurora Trout was designated as an endangered species by the COSEWIC (Committee on the Status of Endangered Wildlife in Canada) and COSSARO (Committee on the Status of Species at Risk in Ontario) in 2000.
Later, genetic studies suggested the Aurora Trout was not a species separate from Brook Trout even though traits such as colour, skeletal features and spawning behaviour might suggest a species designation. Therefore, Aurora Trout are now considered to be a regionally endemic Brook Trout variant and management objectives have been revised to reflect this change. Moving forward, zone-specific fisheries management plans will provide the primary direction for Aurora Trout management in Ontario.

By the early 1990s, there were nine lakes in the northeast region that were intended to provide angling opportunities for Aurora Trout from hatchery stock. Liberty Lake in Aston Township is currently the only lake that offers recreational fishing for Aurora Trout within FMZ 11, although other options for PGT stocked lakes are currently being explored.

Through time however, the small original spawning population within the hatchery system has become heavily subject to inbreeding depression and maintaining its genetic viability is an ongoing challenge. Research into the addition of wild (Nipigon) Brook Trout genetics yielding a 7/8th Aurora Trout for angling purposes is being

tested in selected stocked waters to enhance fish survival and recreational fishing opportunities.

A number of fisheries assessments have been conducted in Liberty Lake. Surveys ranging from 2000 to 2017 suggest that Liberty Lake is no longer suitable for pure strain Aurora Trout. Assessments have yielded significant numbers of Lake Herring, chub and White Sucker, all species that are known to reduce the productivity of Aurora Trout. Likewise, lake chemistry analyses have indicated that summer temperatures in Liberty Lake may limit the ability of pure-strain Aurora Trout to subsist. This is consistent with angler reports that the lake represents a relatively low-quality fishery to date.

Aurora Trout Management Plan

Regardless of designation, Aurora Trout have high ecological and social significance for the conservation of aquatic ecosystems in northeastern Ontario. By actively conserving Aurora Trout, MNRF is working to ensure the sustainability of a special component of the region's biodiversity. The following summarizes the management plan for Aurora Trout in FMZ 11 outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 22).

Table 22. *Summary of the Aurora Trout Management Plan for FMZ 11.*

Objective	Indicator	Benchmark	Target
Ensure the viability and long-term persistence of re-established and sanctuary populations of Aurora Trout in cooperation with Ontario Parks.	Original Aurora Trout lakes meet sustainability criteria. Restore populations within other lakes in the watershed.	Target set in the SARA Recovery Plan for the original lakes were:	

		Whirligig Lake (2003) 38 adults (>28 cm)/ha and 17.0 kg/ha	Whirligig Lake – 13 kg/ha and 29 fish/ha
		Whitepine Lake (2003) 27 adults (>32 cm)/ha and 15.7 kg/ha	Whitepine Lake – 12 kg/ha and 20 fish/ha
	Maintenance of existing brood population in the hatchery system and within Alexander Lake (or alternate waterbody if required).	Brood population is currently being maintained within the hatchery system.	Maintenance of existing brood population in the hatchery system and within Alexander Lake (or alternate waterbody if required).
			Protect additional self-sustaining populations of Aurora Trout in their native watershed including Aurora and Little Whitepine lakes.
Support the protection objectives of Ontario Parks in the original lakes/watershed in	Number of lakes in the Nature Reserve Zone and/or protected via	Two Lakes are presently within Nature Reserve Zone.	Consider expanding this zone on a limited basis as Aurora Trout colonize

the Nature Reserve Zone of LESWPP.	year-round sanctuary status.		new lakes within LESWPP.
Help Develop and support a watershed monitoring program with partners and, where appropriate, restore aquatic ecosystem components threatened by chemistry degradation.	Watershed monitoring program developed.		Continued support for and implementation of watershed monitoring program.
Use the story of the Aurora Trout to promote the awareness of both the acid precipitation history, and the more recent and widespread problem of calcium leaching from northeastern Ontario waters.	Resource users understand the long- term effects of acid precipitation.	Currently, the public has limited knowledge of the water chemistry issues.	Produce and distribute literature to outline the continuing impact of acid emissions on aquatic ecosystems.
Provide Aurora Trout angling opportunities within FMZ 11.	Existence of one or more Put-Grow-Take Aurora Trout lakes in FMZ 11.	One fishable lake presently exists in the zone (Liberty Lake).	Assess Liberty Lake for ways of improving Aurora Trout survival.

			Search for alternate lakes for additional fishing opportunities.

Management actions to meet aurora trout management objectives

The management actions are presented below along with an indication of the level of support from the FMZ 11 Advisory Council (Table 23). The consensus by the council was that the present regulations are appropriate to protect the original Aurora lakes through both an Ontario Parks designation of Nature Reserve Zone and through year-round fish sanctuaries. The FMZ 11 Advisory Council did not feel that it is appropriate to consider permitting angling in these waters. Sanctuary status will also be applied to any additional waters identified by MNRF for recovery actions within the original watershed (eg. Aurora and Little Whitepine lakes).

Angling for Aurora Trout is facilitated through the provision of one readily accessible lake in FMZ 11 which is amongst nine lakes in northeast region that are currently available for angling. These lakes have regulations designed to provide trophy opportunities and are consistent across the region.

Table 23. *Management Actions to Meet Aurora Trout Objectives.*

Management actions	**Advisory Council advice**
Liberty Lake, Aston Township: Maintain current angling regulation (catch limit and size limit). • Season Closed: Fish sanctuary closed all year in 2018, 2019 (closed for 2 consecutive years) • Season Open: August 1 to October 15, 2020 (open every 3 years) • Limits: Sport – 1 fish; Conservation – 0 fish **Whirligig and Whitepine Lakes, Gamble Township**: • Season Closed: all year (fish sanctuary)	Council supportive of the Aurora Trout season and proposed management actions.

Management actions	Advisory Council advice
Additional waterbodies within the original lakes watershed considered for recovery will require the same regulations as Whirligig and Whitepine lakes. Test the success of the 7/8 back-cross fish in Liberty Lake by stocking them to observe if they have better survivability. Develop a detailed assessment and action plan in concert with Ontario Parks and the Cooperative Freshwater Ecology Unit partnership. Education of anglers regarding continuing chemistry impacts from aerial deposition, in particular to bring focus to the issue of calcium depletion and its impact on fisheries in FMZ 11.	

Monitoring strategy

Assessment of Aurora Trout in FMZ 11 is primarily focused on the two original lakes in Gamble Township in LESWPP and is facilitated through a partnership involving MNRF, Ministry of the Environment, Conservation and Parks (MECP) and Laurentian University's Cooperative Freshwater Ecology Unit. At present, the monitoring of two original lakes is being led by the Cooperative Freshwater Ecology Unit, however MNRF is beginning to fill in knowledge gaps by conducting targeted monitoring on lakes within Gamble township as well as on Liberty Lake and candidate lakes for further Aurora Trout PGT fisheries.

Education

Aurora Trout provide a means of communicating the effects of airborne emissions on aquatic ecosystems and can continue to do so, particularly as the effects of calcium depletion become more apparent on Canadian Shield headwater lakes.

6.3.10 Atlantic salmon (Ouananiche)

Management issues, challenges and opportunities

Four Mile Creek, the only known spawning area for Atlantic Salmon in FMZ11, is prone to blockage by beaver, preventing passage of adult salmon to the highest quality spawning and incubation habitat. Compounding the problem is potential for municipal road damage during fall beaver dam removal.

Management issues:

- Ensuring annual passage of adult salmon to high quality spawning habitat;
- Minimizing harvest of Atlantic Salmon to allow the species to maintain itself; and
- Encouraging the natural selection of existing Atlantic Salmon stocks in Trout Lake.

Challenges:

- Establishing responsibility for obstruction removal on Four Mile Creek; and
- Potential inability to undertake annual assessment of natural recruitment in Four Mile Creek.

Opportunities:

- MNRF to facilitate a partnership that annually keeps the site clear of beaver dams in fall and does not threaten road failure; and
- MNRF to encourage partners to observe spawning salmon activity.

Status of the atlantic salmon

The Atlantic Salmon (*Salmo salar*) is a species that is normally anadromous (runs to the sea before returning as adults to spawn in freshwater). Some Atlantic Salmon populations exist isolated from the sea. These are known as landlocked populations and the fish are often called ouananiche. Ouananiche normally inhabit freshwater lakes and when reproductively mature, run up inflowing freshwater streams to spawn (potamodromous). In 1935, a tourist operator, without authorization, introduced Atlantic Salmon of unknown origin, but variously reported as being from Lac St-Jean in Quebec or Sebago Lake in Maine to Trout Lake in the City of North Bay. The population, while never robust, was periodically supplemented by stocking and a naturalized population became established in Trout Lake that used Four Mile

Creek to spawn, creating the only naturally reproducing Atlantic Salmon population in the province. In 1967, a derailment and spill of zinc concentrate into Four Mile creek appeared to eliminate further recruitment.

Atlantic Salmon were reintroduced to Trout Lake via a stocking of 10,000 smolts in Four Mile Creek in 1989. A further estimated 19,000 young salmon from three MNRF hatchery stocks, including ouananiche, were stocked between 1990 and 2003.

At present, the regulation is one Atlantic Salmon or one Lake Trout per day (less than 55 cm in length) during a one-week late June season in Trout Lake. Salmon have returned to Four Mile Creek to spawn since the 1989 reintroduction and have successfully reproduced each year since 1992; however, angling returns and fall observations of spawning activity suggest continued low density.

The Trout Lake population of Atlantic Salmon would best be characterized as extremely low density; however, this status is consistent with its history within the lake. Natural recruitment is limited but persists through time, so long as access to their critical spawning habitat is facilitated through annual obstruction removal in Four Mile Creek.

Atlantic Salmon Management Plan

The following summarizes the management plan for Atlantic Salmon outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 24).

Table 24. *Summary of the Atlantic Salmon Management Plan for FMZ 11.*

Objective	Indicator	Benchmark	Target
Encourage a self-sustaining Atlantic Salmon population in Trout Lake that supports a low intensity fishery	Recreational angling regulation (catch limit and size limit) in Trout Lake (City of North Bay and East Ferris Twp.).	Current recreational angling regulation; season open: third Saturday in June to the Friday before the fourth Saturday in June.	Maintain current recreational angling regulation; season open: third Saturday in June to the Friday before the fourth Saturday in June.

through minimal resource management intervention.			
		Catch and Size limits: Sport – 1 fish; must be less than 55cm. Conservation – 1 fish; must be less than 55cm.	Catch and Size limits: Sport – 1 fish; must be less than 55cm Conservation – 1 fish; must be less than 55cm.
		Aggregate limit of 1 Lake Trout or 1 Atlantic Salmon per day (total length less than 55cm).	Aggregate limit of 1 Lake Trout or 1 Atlantic Salmon per day (total length less than 55cm).

Management actions to meet atlantic salmon management objectives

The management actions are presented below along with an indication of the level of support from the FMZ 11 Advisory Council (Table 25). The current angling regulation on Trout Lake was established at the same time as the Lake Trout regulation on the lake. The harmonization of the Lake Trout and Atlantic Salmon regulation was conducted to minimize confusion for anglers who may have difficulty in identifying the difference in the species during the one-week open water season.

As the unique status of this population is based on it being the sole naturally reproducing inland Atlantic Salmon population in the province, it is contingent on MNRF to monitor and encourage that natural recruitment continues. Without natural recruitment, there is no fisheries management rationale for the continuation of the Atlantic Salmon program in FMZ 11. In support of natural recruitment, it has been found essential that barriers to fish passage in Four Mile Creek be removed. These

are typically beaver dams and are often removed with the aid of volunteer and municipal partners.

Table 25. *Management Actions to Meet Atlantic Salmon Objectives.*

Management actions	**Advisory Council advice**
Maintain current angling regulation (catch limit and size limit) – Trout Lake, City of North Bay and East Ferris Township. Season: • Third Saturday in June to the Friday before the fourth Saturday in June Catch & Size Limits: • Sport – 1 fish; must be less than 55 cm • Conservation – 1 fish; must be less than 55cm • Aggregate limit of 1 Lake Trout or 1 Atlantic Salmon per day (total length less than 55 cm) Ensuring the continuation of natural recruitment is the goal of Atlantic Salmon program on Trout Lake. Coordinate fall obstruction removal in Four Mile Creek with partners (e.g. City of North Bay, Trout Lake Conservation Association, North Bay Mattawa Conservation Authority and others) to permit spawning fish to access critical habitat.	No advice provided.

Monitoring strategy

Atlantic Salmon assessment can be accomplished via observations of fall spawning adults to provide an index of adult population size. This activity can be undertaken annually by interested partners such as the Trout Lake Conservation Association. Summer electrofishing is the most efficient means of assessing natural recruitment

to the fishery although it requires considerable specialized training that, typically, only MNRF staff have.

Review information collected through BsM to determine if useable for Atlantic Salmon population management (projected very small sample size).

Collect volunteer angler information as provided. Collect field officer and field staff information.

Conduct annual Four Mile Creek electrofishing to assess natural recruitment.

Continue to utilize information collected from the National Recreational Fishing Surveys and stocking assessments.

Monitor enforcement results to determine unauthorized introductions.

6.3.11 Splake

Management issues, challenges and opportunities

While splake appear to be a solution to several fisheries issues in FMZ 11, in practice they too have limitations on their applicability.

Management issues:

- Splake are not compatible with natural Lake Trout or Brook Trout, and their stocking is limited to watersheds where they are not expected to mix with these species;
- Stocked fish are expensive to rear and transport;
- Splake, like all stocked species, have habitat and fish community requirements that limit where they might appropriately be used;
- Provincial direction to provide a year-round season prevents the maximum benefit from harmonizing seasons with Lake Trout and Brook Trout (lower diversionary effects); and
- Year-round splake season tends to produce a winter fishery leaving few fish for open water anglers.

Challenges:

- Finding new waters compatible with the species, compliant with MNRF's environmental assessment (EA) requirements (Class EA for Resource

Stewardship and Facility Development) and which are easily accessible to anglers and to stocking;
- Assessing underperforming splake (e.g. poor angler returns, poor survival) waters to optimize use of the hatchery resources Opportunities;
- May still be some limited opportunities to stock splake in new waters; and
- Splake can provide diversionary fishing near natural Brook Trout and Lake Trout lakes, particularly if open seasons can be aligned.

Status of the splake

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.

Splake were introduced to the FMZ 11 area in 1983 as the hatchery product became widely available. Early success with splake can be attributed to the introductory/expansion phase of stocking in new waters. In the early years of splake stocking in FMZ 11, forage bases were being exhausted in small lakes where stocking was being undertaken on an annual basis or under high-density stocking conditions.

Splake were and still are stocked as a last resort in former Brook Trout waters where unauthorized introductions of incompatible species had made conditions unsuitable for Brook Trout survival. In 1999, provincial direction was to provide a year-round season for splake with a daily limit of five fish.

From the provincial splake toolkit: “Since splake catches are based entirely on a hatchery-reared product, there is no concern about biological sustainability of the resource. With a year-round open season, the only desire would be to distribute the harvest of fish among as many anglers as possible.”

By far, the majority of splake waters in FMZ 11 appear to be performing as expected, based primarily on angler reports. There are a minority of splake waters that appear to have weaker performance based on angler reports, and stocking assessments

can be conducted on these waterbodies by the North Bay district MNRF to identify the potential cause of performance limitations.

Splake Management Plan

The following summarizes the management plan for splake outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 26).

Table 26. *Summary of the Splake Management Plan for FMZ 11.*

Objective	Indicator	Benchmark	Target
Provide a stable, hatchery-reliant alternative to angling for native Lake Trout and Brook Trout in FMZ 11.	Number of waters stocked with splake in FMZ 11.	Currently there are 28 stocked splake lakes in North Bay district which makes up the majority of the zone.	Maintain or increase the number of quality stocked waters in FMZ 11.
Expand the use of splake, where feasible, employing ecologically sound principles and maximizing availability to anglers.	Number of waters stocked with splake in FMZ 11.	Currently there are 28 stocked splake lakes in North Bay district which makes up the majority of the zone.	Maintain or increase the number of quality stocked waters in FMZ 11.
Manage splake to prevent their escape in watersheds where they may affect natural Lake Trout and Brook Trout populations.	No introduction of splake into Natural Lake Trout or Brook Trout waters.	Currently there are 28 stocked splake lakes in North Bay district which makes up the majority of the zone.	No escapement of splake into Natural Lake Trout or Brook Trout waters.

Objective	Indicator	Benchmark	Target
Provide hatchery-dependent fisheries that are readily available to the public.	Maintain current liberal splake angling regulation (currently year-round fishery, no size limits, 5 splake/aggregate trout possession limit).	Current recreational angling regulations: year-round fishery, no size limits, 5 splake/aggregate trout possession limit.	Maintain current regulations.
Educate the public on the ecological threats to all fisheries (live fish introductions) including stocked fisheries.	Public awareness of ecological threats of introductions and invasive species.	No measure currently available.	Produce and distribute a literature on stocking fish in FMZ 11. Participate in outreach activities to promote the use of stocked waters and educate on the impacts of introduction and invasive species.

Management actions to meet splake management objectives

The management actions are presented below along with an indication of the level of support from the FMZ 11 Advisory Council (Table 27).

Council felt that the year-round splake season was incredibly popular with anglers and that harmonizing the season with natural Lake Trout and Brook Trout populations to maximize the diversion of fishing effort would reduce available angling waters significantly.

As splake fisheries are hatchery-dependent, there are no population sustainability concerns however sustaining the fishing opportunity through continued healthy status of the ecosystem is a priority given their important role in the FMZ 11 angling experience. Ensuring these waters are not the victims of unauthorized introductions is critical to their continued success.

The present five fish limit functions solely to distribute the harvest amongst anglers to optimize the angling experience. In the case of Blue Lake in McAuslan Township, the purpose of a winter closure is to continue to provide a quality open water splake experience in the McConnell Lakes area as per the 1987 District Fisheries Management Plan.

Table 27. *Management Actions to Meet Splake Objectives.*

Management actions	**Advisory Council advice**
Maintain current angling regulation (catch limit and size limit). Season: Year round Limits: Sport – 5 fish; Conservation – 2 fish Maintain current regulation - Blue Lake, McAuslan Township. Fish Sanctuary Closed: • January 1 to April 30, and October 1 to December 31 Gear Restriction: • Live fish may not be used as bait or possessed for use as bait. Monitor splake fisheries via angler observations. Conduct stocking assessments.	Council considered the potential for splake to divert angling pressure from natural trout waters by harmonizing seasons with natural trout seasons. After deliberation, they chose to support the present season and limits.

Management actions	Advisory Council advice
Where lack of angling activity or reports of poor angling results occur, conduct assessment to validate the best use of hatchery resources.	

Monitoring strategy

Continually collect volunteer angler information on stocked waters as provided.

Continually collect field officer and field staff information on stocked waters when provided.

Stocked waters are not included in BsM hence any assessment is the responsibility of the district stocking program. Conduct regular formal reviews of stocked lakes and conduct local targeted monitoring where appropriate where stocking success is in question or where new candidate waters are being considered. Where waters are being fished regularly and where there are intermittent reports from anglers and Conservation Officers, there is no requirement for formal assessment. Where lakes are being lightly fished despite ready access, or where angling success is poor, the waters require assessment to ensure the best use of hatchery resources. Frequency and intensity of stocking events may require modification as may the size of the stocked product. Ultimately, in some cases, cessation of stocking may be the most appropriate action.

Continue to utilize information collected from the National Recreational Fishing Surveys and stocking assessments.

Monitor enforcement results to determine unauthorized introductions.

6.3.12 Rainbow Trout

Management issues, challenges and opportunities

In FMZ 11, Rainbow Trout (*Oncorhynchus mykiss*) angling opportunities are not as utilized as other fisheries due to most anglers being generally unfamiliar with specific techniques effective at catching Rainbow Trout. This may be considered an opportunity as well, since extra promotion and education may allow more effort to be deflected from more fragile fisheries.

Management issues:

- Lack of knowledge regarding Rainbow Trout stocking performance;
- Species may not be amenable to standard gillnet assessment (ability to detect standard sampling gear and tendency to suspend);
- Limitation on use of Rainbow Trout due to the species' tendency to leave the stocked lake (migrate) where possible; and
- Gauging the demand for Rainbow Trout versus other hatchery products.

Challenges:

- Fostering angler stewards to report on their success in stocked Rainbow Trout waters; and
- Finding waters that have compatible fish communities and do not permit escape of fish.

Opportunities:

- Promotion of Rainbow Trout fishing given their underutilization; and
- Developing partnerships with angler stewards to gather fishery performance data.

Status of rainbow trout fisheries

Except for Aurora Trout, Rainbow Trout are the least frequently stocked salmonid species in FMZ 11. A total of 11 lakes are currently stocked with Rainbow Trout. Some of these waters are stocked with the Ganaraska strain while others are stocked with a fast-growing hatchery-derived domestic strain. In addition, one stream-dwelling population has naturalized in the Temagami area, although the population appears to be at a low density.

Rainbow Trout appear to provide more of a challenge to anglers, particularly through the ice, which, in turn, provides enhanced open water fishing due to lower winter harvests. Angling regulations in FMZ 11 have been liberal at five fish per day and a year-round season. The primary concern for these fish involves maintaining the simple fish communities that stocked fish require to perform well.

The lower intensity that these waters are fished complicates the collection of angler utilization and success information; much more so than on the more popular splake or stocked Brook Trout waters.

The majority of Rainbow Trout waters in FMZ 11 appear to be performing well, based primarily on angler reports. A minority of rainbow waters appear to have weak performance, based on reports by anglers; however, the inability to assess these lakes currently prevents a clear diagnosis of the problems.

Rainbow Trout Management Plan

The following summarizes the management plan for Rainbow Trout outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 28).

Table 28. *Summary of the Rainbow Trout Management Plan for FMZ 11.*

Objective	**Indicator**	**Benchmark**	**Target**
Provide a stable, hatchery-reliant alternative to angling for native Lake and Brook Trout in FMZ 11.	Number of stocked waters in FMZ 11.	Currently there are 12 stocked Rainbow Trout lakes.	Maintain or increase the number of quality stocked waters in FMZ 11.
Expand the use of Rainbow Trout, where feasible, employing ecologically sound principles and maximizing availability to anglers.	Number of stocked waters in FMZ 11.	Currently there are 11 stocked Rainbow Trout lakes.	Maintain or increase the number of high performing stocked waters in FMZ 11.
Manage Rainbow Trout to prevent their escape in watersheds where they may affect natural Lake and	Number of stocked waters in FMZ 11; no introduction of Rainbow Trout into Natural Lake	Currently there are 12 stocked Rainbow Trout lakes.	No escape of Rainbow Trout into Natural Lake Trout or Brook Trout waters.

Objective	Indicator	Benchmark	Target
Brook Trout populations.	Trout or Brook Trout waters.		
Provide hatchery-dependent fisheries that to the public.	Maintain current liberal Rainbow Trout angling regulation (currently year-round fishery, no size limits, 5 Rainbow Trout /aggregate trout possession limit).	Current recreational angling regulations: year-round fishery, no size limits, 5 Rainbow Trout /aggregate trout possession limit.	Maintain current liberal Rainbow Trout angling regulation.
Educate the public on the ecological threats to all fisheries (fish introductions) including stocked fisheries.	Public awareness of ecological threats of introductions and invasive species.	No measure currently available.	Produce and distribute a literature on stocking fish in FMZ 11. Participate in outreach activities to promote the use of stocked waters and educate on the impacts of introduction and invasive species.

Management actions to meet rainbow trout objectives

The management actions are presented below along with an indication of the level of support from the FMZ 11 Advisory Council (Table 29).

As Rainbow Trout fisheries are hatchery-dependent (with exception of the low-density established stream population), there are no population sustainability concerns however sustaining the fishing opportunity through a continued healthy

status of the ecosystem is a priority given their important role in the FMZ 11 angling experience. Ensuring these waters are not subject to unauthorized introductions is critical to their continued success.

The five fish daily limit is a distribution of harvest tool rather than a tool to limit overall harvest or to ensure population sustainability. Anglers rarely catch five Rainbow Trout per day in FMZ 11 waters.

The McConnell lakes area has a higher risk of "baitfish" introductions hence the Jimmie and Orient lakes restrictions on the use of live baitfish.

Table 29. *Management Actions to Meet Rainbow Trout Objectives.*

Management actions	**Advisory Council advice**
Maintain current angling regulation (catch limit and size limit). Zone Regulation: • Open year round • Sport – 5 fish; Conservation – 2 fish Maintain current regulation - Jimmie and Orient lakes, McAuslan Township. Exception Regulation: • Open year round • Sport – 5 fish; Conservation – 2 fish • Live fish may not be used as bait or possessed for use as bait. Monitor Rainbow Trout fisheries via angler observations. Foster angler stewards to collect information on catch and growth rates. Conduct stocking assessments.	No advice provided.

Management actions	Advisory Council advice
Where lack of angling activity or reports of poor angling results occur, conduct assessment to determine the best use of hatchery resources.	

Monitoring strategy

Continually collect volunteer angler information on stocked waters as provided.

Continually collect field officer and field staff information on stocked waters when provided.

Stocked waters are not included in BsM hence any assessment is the responsibility of the district stocking program. Conduct regular formal reviews of stocked lakes and conduct local targeted monitoring where appropriate where stocking success is in questions or where new candidate waters are being considered. Assessment of Rainbow Trout waters is more difficult than other stocked fisheries due to the species' ability to detect and avoid gillnets. Assessing the performance of Rainbow Trout fisheries in FMZ 11, through the monitoring of angling activity, is challenging since angling effort is sporadic and lighter than most other stocked fisheries. There may be opportunities to collect some angler success data through reports from MNRF's Fish ON-Line website.

Continue to utilize information collected from the National Recreational Fishing Surveys and stocking assessments.

Monitor enforcement results to determine unauthorized introductions.

6.4 Fish stocking

Management issues, challenges and opportunities

Management issues:

- Stocking often results in inflated angler expectations of harvest success within both stocked and natural waters; and
- Many anglers assume that fisheries issues can always be remedied with stocking, including issues of overharvest, disease, habitat loss or introduced.

Challenges:

- Maintaining artificial salmonid fisheries with increased introductions of spiny-rayed fish (i.e. Yellow Perch, Rock Bass, sunfish);
- 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;
- Some FMZ 11 waters, particularly in Lady Evelyn Smoothwater Wilderness Park, require stocking to recover natural fish populations lost due to acid damage and resources may be limited to do so; and
- Preventing inbreeding depression (maintaining genetic variation) in species such as Brook Trout that primarily exist within stocked populations in FMZ 11.

Opportunities:

- To inform the angling public of the role and limitations of stocking to instill value in the limited resource;
- Put-Grow-Take (PGT) fisheries can be employed to reduce fishing pressure on natural waters through providing additional opportunities, appropriate location, seasons and limits;
- The creation of updated provincial direction surrounding the Ministry's guidelines for stocking fish in inland waters of Ontario, to better reflect the current landscape.
- Re-examine lakes discontinued from salmonid stocking in the past to determine if new opportunities exist where stocking of other species has failed (e.g. stocking splake where Brook Trout stocking failed because of presence of perch); and
- Conducting much-needed stocking assessments within the district that also meet other FMP objectives (e.g. fish habitat surveying).

Status of stocked fisheries

Fish stocking occurs on many lakes in FMZ 11, similar to other zones in Ontario. MNRF stocking efforts are focused primarily on a variety of salmonid species: Brook Trout, Lake Trout, Rainbow Trout, Splake and Aurora Trout. The focus of fish

stocking in FMZ 11 is largely towards Put-Grow-Take fishing, where angling regulations have traditionally been in place to distribute additional opportunities for angling and harvest amongst anglers. A total of 28 splake, 19 Lake Trout, 59 Brook Trout, 11 Rainbow Trout and one Aurora Trout lakes are currently stocked for recreational fishing in FMZ 11.

A second, but less common role for stocking in FMZ 11 is to restore degraded populations. The recovery of acid-damaged Lake Trout lakes in the northwestern and north-central portions of the zone is underway, employing Lake Trout season closures and reintroductions of Lake Trout.

Supplemental stocking, defined as stocking in waters where natural reproduction occurs, was discontinued in FMZ 11 in the early 1990s as a result of findings of the provincial Lake Trout Synthesis (OMNR 1991). The Lake Trout Synthesis reported that stocking fish increased angler effort which, in turn, depleted the natural trout population. The intended result of supplemental stocking, to increase angler success, was often documented to be unsuccessful in improving fishing quality. Similarly, the Percid Synthesis of the early 2000s found that stocking Walleye where they naturally occur and reproduce was very unlikely to result in increased abundance or availability of Walleye and is discouraged as a means of increasing Walleye abundance. (OMNR 2004).

Stocked Fisheries Management Plan

The following summarizes the management plan for the stocked fishery outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 30).

Table 30. *Summary of the Stocking Management Plan for FMZ 11.*

Objective	**Indicator**	**Benchmark**	**Target**
To utilize hatchery products in an efficient manner to maintain PGT angling opportunities that	Number and location of stocked waters.	Presently there are 28 splake, 11 Rainbow Trout, 19 Lake Trout and 59 Brook Trout fisheries totally	Maintain or increase the number of high performing stocked waters in FMZ 11.

Objective	Indicator	Benchmark	Target
relieve fishing pressure on natural waters and to restore, where appropriate, natural fisheries using combinations of stocking or regulatory controls.		dependent on stocking (PGT) in North Bay district which makes up the majority of the zone. There is also one Aurora Trout PGT lake.	
To protect and restore native fish populations and sustain their genetic diversity through judicious use of fish stocking.	Natural salmonid population health in lakes.	Presently there are 52 natural Brook Trout lakes of unknown health and 93 natural Lake Trout lakes in various states of health in FMZ 11.	Improve the health of the 52 natural Brook Trout and 93 Lake Trout lakes in part through diversion of angling effort to stocked lakes.
To educate the public and stakeholders on the appropriate use and limitations of stocking as a management tool using provincial policy, stocking direction, best biological practices as well	Literature and presentations.	Role of stocking education limited to presentations provided to address issues.	Initiate and participate in outreach activities. Produce and distribute literature on stocking fish in FMZ 11.

Objective	Indicator	Benchmark	Target
as actual FMZ 11 examples.			

Management actions to meet stocking management objectives
There are practical limits to MNRF's ability to expand the stocking and stocking assessment programs. MNRF has attempted to maintain the present list of stocked waters, where best practices permit; introductions of spiny-rayed fish, however, have reduced the availability of waters suitable for stocking.

Reliance on angler reports and on staff visits to stocked waters as a part of other duties have become the primary means of gathering information on stocked fish performance. Unfortunately, when stocked waters underperform or are found to have introduced or invasive species, anglers often do not report the observations. Where angler or staff reports suggest underperformance, individual waters may require assessment to maintain efficient use of limited resources.

Suitable new waters in easily accessible locations are extremely limited in number; therefore, there are limited opportunities for expansion of the stocked waters program.

While in some cases remnant Lake Trout in acid damaged waters have produced healthy natural year classes over the past ten or more years, there are several FMZ 11 waters where Lake Trout ceased to exist due to acid damage. As water quality became suitable, these lakes required restorative stocking using compatible hatchery stocks and have had limited assessments conducted to determine if efforts were successful. Where assessments were done, it has often involved the aid of partner organizations.

Table 31: *Management Actions for Stocking.*

Management actions	Advisory Council advice
Population: 1) Continue with the present list of stocked waters, using the appropriate product, at the optimal frequency and density.	Council affirmed the separate value of the Brook Trout PGT stocking program versus

Management actions	Advisory Council advice
2) Where there is evidence that a specific stocked waterbody may be underperforming according to expectations, conduct assessments to determine the reasons. 3) For underperforming stocked waters, consider the options of stocking other products, altering stocking density or ceasing stocking altogether, depending upon the extent of the identified problem and considering the ecosystem goals and conditions. 4) Encourage partnership volunteer angler reporting of the status of stocked waters to aid in identifying underperforming waters.	switching these waters to splake.
Socio-economics: 1) Examine opportunities to expand the suite of stocked salmonid waters where suitable candidate waters can be found (i.e. ecologically suitable, easily accessible and beneficial for diverting pressure from natural salmonid waters). 2) Continue to produce stocking lists to encourage angler use of stocked waters	Council members indicated a preference for stocked waters near communities.
Ecosystem: 1) MNRF to ensure the conservation of biodiversity in FMZ 11, when considering the merits of stocking, by: committing to healthy ecosystems, protecting native fish populations and sustaining their genetic diversity. 2) Conduct mandatory review of potential new candidate waters under MNRF's responsibilities with respect to the Class Environmental Assessment (Resource Stewardship and Facilities Development).	Council supported the commitment to healthy natural fish populations. They also were supportive of restorative stocking of acid damaged waters.

Management actions	Advisory Council advice
3) Continue to undertake restoration stocking of acid-damaged Lake Trout waters in and outside LESWPP (with Ontario Parks) including Dees, Marina, Florence, Jim Edwards, Gullrock, Grays and Jerry Lakes and support partners in follow-up assessments of restoration success.	
Education: 1) MNRF to prepare and release a literature on the "Role of Fish Stocking in FMZ 11". 2) MNRF to develop outreach activities that include the role of stocking.	Council affirmed the role and value of fish stocking and particularly the science around supplemental Walleye stocking.

Management actions
Continue to search for appropriate new Brook Trout, Lake Trout and Rainbow Trout waters based on access and existing fish communities.

Work with enforcement staff to minimize losses of stocked lakes due to introductions through education, outreach and enforcement of bait use regulations.

Promote the use of stocked waters in FMZ 11 by making annual stocking list readily available.

Initiate outreach activities with support of FMZ 11 Advisory Council and other partners.

Incorporate FMZ 11 fish stocking management objectives in other district program planning and approval processes to ensure the protection and restoration of native fish populations and sustaining their genetic diversity through judicious use of fish stocking.

Monitoring strategy
Most fish stocking assessments in FMZ 11 were undertaken in the 1990s to confirm the appropriateness of stocking rates and of the product used. More recently, stocking assessment has focused on lakes where problems have been reported

and, often, the result has been a change in the species stocked due to introductions of spiny-rayed species. Brook Trout lakes have been most affected by introductions. Some have successfully been converted to splake lakes while others have not been successful and had to be removed from the stocking program.

Amongst the present list of stocked waters in FMZ 11, there are a number of Put-Grow-Take Brook Trout waters that have reports of incompatible species (i.e. Yellow Perch, Northern Pike, Smallmouth Bass or Pumpkinseed) or that do not appear to sustain trout over the winter likely because of low late winter oxygen concentrations.

The BsM protocol does not include stocked waters in the selection of lakes to be assessed. Stocking fish is an expensive proposition given rearing and distribution costs. Fisheries managers attempt to ensure stocking programs are as successful as possible and, where they are not performing as expected, the reasons for failure are examined and appropriate action is taken.

Evaluating the success or failure of stocked salmonid fisheries in FMZ 11 has been accomplished in multiple fashions. Most frequently, the amount of activity on stocked waters along with Conservation Officer, Field Technician and reliable angler field notes provide a reasonable understanding of success of stocked waters.

Where indications of angling inactivity, poor angling performance or observations of unexpected and incompatible fish species (e.g. Yellow Perch) are reported, individual lake stocking assessment (including gill netting) may be required to document the state of the resource to aid in further decision making.

Continually collect volunteer angler information on stocked waters as provided.

Continually collect field officer and field staff information on stocked waters.

Conduct an appropriate and thorough environmental assessment of new candidate lakes for consideration in order to to develop new opportunities.

Conduct regular formal reviews of stocked lakes and conduct local targeted monitoring where appropriate where stocking success is in question or where new candidate waters are being considered.

Continue to utilize information collected from the National Recreational Fishing Surveys and stocking assessments.

Monitor enforcement results to determine unauthorized introductions.

6.5 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 11, some of the biological parameters that we can track using BsM information are related 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.

Management issues, challenges and opportunities

Management issues and challenges:

- 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; and
- Degradation or destruction of aquatic and shoreline habitat due to human-mediated causes including development, pollution and vandalism.

Opportunities:

- Education opportunities for the public regarding anthropogenic stressors and their impact on aquatic systems;
- Opportunity to work with water regulators, including MNRF, Ontario Power Generation (OPG), Public Works and Government Services Canada (PWGSC)

and private operators, to negotiate site-specific flow and level agreements that are beneficial for critical life stages in aquatic ecosystems; and
- Opportunity to document effective recovery strategies for future fisheries management.

Status of the ecosystem changes

Ecosystem changes in Ontario and, more specifically, in FMZ 11 are a result of a number of local, provincial and global disturbances such as acid precipitation and climate change.

Acid precipitation

In FMZ 11, 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, including some western portions of FMZ 11, 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.

Several lakes lost their fish populations because of acid precipitation during the 1970s and 1980s. Some acid-damaged lakes, having retained a remnant fish population and are in some stage of recovery due to improving water chemistry. Other waters, such as Florence Lake in LESWPP, have received restorative Lake Trout stocking as the lake now has chemistry suitable for Lake Trout survival and recruitment. Restorative stocking of Lake Trout is continuing on seven lakes while a

further 20 are expected to recover through natural means as they have retained a small number of adult fish.

Climate change

Climate change is the most significant global-scale environmental variable which affects the lakes in FMZ 11. In recent decades, climate change has been demonstrated by the increasing prevalence of extreme weather events, unseasonable 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.

In FMZ 11, the spring of 2010 was a prime example of the effects of climate change. In that year, ice-out conditions occurred a month earlier than typical, followed by well above-average summer temperatures. Combined with a lack of spring rains, the result was exceptionally low lake levels and interrupted flow patterns that left critical habitats unavailable to spring spawning species. Higher than average water temperatures are detrimental to coldwater species (i.e. 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.

Management priorities

Species recovery

It is the ministry's primary 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 in an attempt to reverse the decline.

Species at risk

Species at risk (SAR) have been designated as "at risk" due to being very rare or declining and at risk of extinction for a variety of anthropogenic and natural reasons

(e.g. over-harvest and habitat loss). There are currently five fish species at risk found within FMZ 11, American Eel (endangered), Lake Sturgeon (endangered, Shortjaw Cisco (threatened), Northern Brook Lamprey (special concern) and the Silver Lamprey (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. As part of the management planning process, MNRF will continue to monitor the status of the fish SAR in the zone as key indicators of ecosystem health. Future management decisions or actions that have an impact on SAR within FMZ 11 will need to comply with the *Endangered Species Act* (2007) and align with provincial SAR recovery plans.

American eel

American Eel were historically abundant in the entire Ottawa River watershed (including portions of FMZ11) at times making up over 60% of the fish community based on commercial fishing records. Eels were an important food item for Indigenous people and remain a cultural symbol today. After European colonization, modern-day commercial American Eel harvest fisheries were also supported. Today American Eel are only found in the lower Ottawa River as many dams have been built in the Ottawa River watershed that block American Eel from moving upstream. American Eel numbers are now too low to support a harvestable fishery. To reduce sources of mortality affecting populations both recreational and commercial American Eel fisheries have been closed in Ontario waters since 2004. Quebec commercial eel fisheries were closed on the Ottawa River in 2013 in response to national eel recovery recommendations.

Lake sturgeon

Lake Sturgeon once supported both recreational and commercial fisheries. Lake Sturgeon decline has been impacted by a number factors such as fragmentation (building of 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.

Shortjaw cisco

There is currently little information on the status and distribution of Shortjaw Cisco within the zone. Current information is limited to confirmation of its presence in Trout Lake. As this species is not a sought-after game species, management direction included within the plan is to acknowledge it as a fish SAR and that it is 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. See also section 6.3.8 for further management plan direction.

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.

Invasive and introduced species

Amongst the most significant threats to aquatic communities in FMZ 11 are the arrival, establishment and spread of aquatic invasive species such as Spiny Water Flea, Round Goby (*Neogobius melanostomus*), Rusty Crayfish, Asian carp 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.

Within the waters of FMZ 11, Spiny Water Flea are found in the Sturgeon/French River system from Lake Temagami to Lake Nipissing. Purple Loosestrife, which negatively affects wetland areas that fish depend on for critical habitat, has also become established. Spiny Water Flea is being opportunistically consumed by Yellow Perch and Lake Herring. 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 (http://www.invadingspecies.com/); or by reporting to the invasive species hotline at 1-800-563-7711.

Other species such as Pumpkinseed (Lepomis gibbosus), Rock Bass and Yellow Perch, though generally not popular with anglers, have been documented in waters where they were not found in aquatic habitat inventories conducted during the 1970s. Permanent losses of the species most vulnerable to introductions, in particular Brook Trout, have been ongoing for decades in FMZ 11. Common Carp and Black Crappie have also become established in some waters in the lower portion of FMZ 11.

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.

Although some guidance does presently exist to inform in-water work and shoreline development projects within fisheries management zone 11, such as the guidance specific to designated lake trout lakes, many waterbodies still lack clear objectives and quantifiable targets for shoreline and littoral habitat management. It is thus important that future review processes for project applications include a mechanism to consider the cumulative impact of each project within a waterbody and across the landscape, in order to sustainably accommodate both the increasing demand for shoreline development, as well as protecting and retaining natural features and the life they support.

Water regulation (dams and power plants) has the potential to change the nature of flows and levels in a system, which may benefit some species but be detrimental to others. In some cases, management attempts are inadequate to ensure successful natural recruitment. Base flows or minimum ecological flows are not specified for many water control structure operating plans in FMZ 11. In addition, amongst species that are greatly sought by anglers (e.g. Walleye and Lake Trout), flows and levels in regulated waterways are not managed to ensure that basic life history

needs, such as spawning, incubation and emergence are met. Given the demands on these species in FMZ 11 and in order to meet the objectives of this plan, it is essential that maximization of productivity and survival is ensured, especially in early life stages.

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 (i.e. Walleye, pike and muskie) 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

In the face of such uncertainty and change, 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.

Water chemistry

The BsM program is tracking several measures of status (indicators) using water chemistry and physical attributes of lakes within FMZ 11 to understand potential trends in measures including dissolved organic carbon, phosphorus, pH, calcium and thermocline depth:

Dissolved organic carbon

Dissolved organic carbon (DOC) in freshwater systems is one of the greatest cycled reservoirs of organic matter on Earth. In general, organic compounds are a result of decomposition processes from dead organic matter such as plants or aquatic organisms. Presence of an abundance of these compounds can have resultant negative impacts on oxygenated habitat. When water contacts highly organic soils, these components can drain into rivers and lakes as dissolved organic carbon. DOC is also extremely important in the transport of metals (i.e. mercury) in aquatic systems. Metals form extremely strong complexes with DOC, enhancing metal solubility while also reducing metal bioavailability in the environment. FMZ 11 has a relatively low dissolved organic carbon level compared to the northeast and the provincial average (Figure 66).

Phosphorus

Phosphorus is an essential element for plant life, but when there is too much of it in water, it can speed up eutrophication (a reduction in dissolved oxygen in water bodies caused by an increase of mineral and organic nutrients) of rivers and lakes. A sign of this is excess algae in the lake. FMZ 11 has a relatively low phosphorus level compared to the northeast and the provincial average indicating lower levels of primary productivity on average (Figure 67).

pH

In chemistry, pH (potential of hydrogen) is a numeric scale used to specify the acidity or basicity of an aqueous solution. Waters with low pH values (more acidic) can have both direct and indirect impacts on fish. Extremely low pH waters can lead to precipitation of metals such as iron and aluminum than can be lethal to fish or can impact biological processes such as gas transport across fish gills leading to stress or death. Low pH can also lead to decreases in primary production of phytoplankton and zooplankton which support fish populations. FMZ 11 has a relatively neutral pH level whereas the northeast and provincial levels had a more basic pH level (Figure 68).

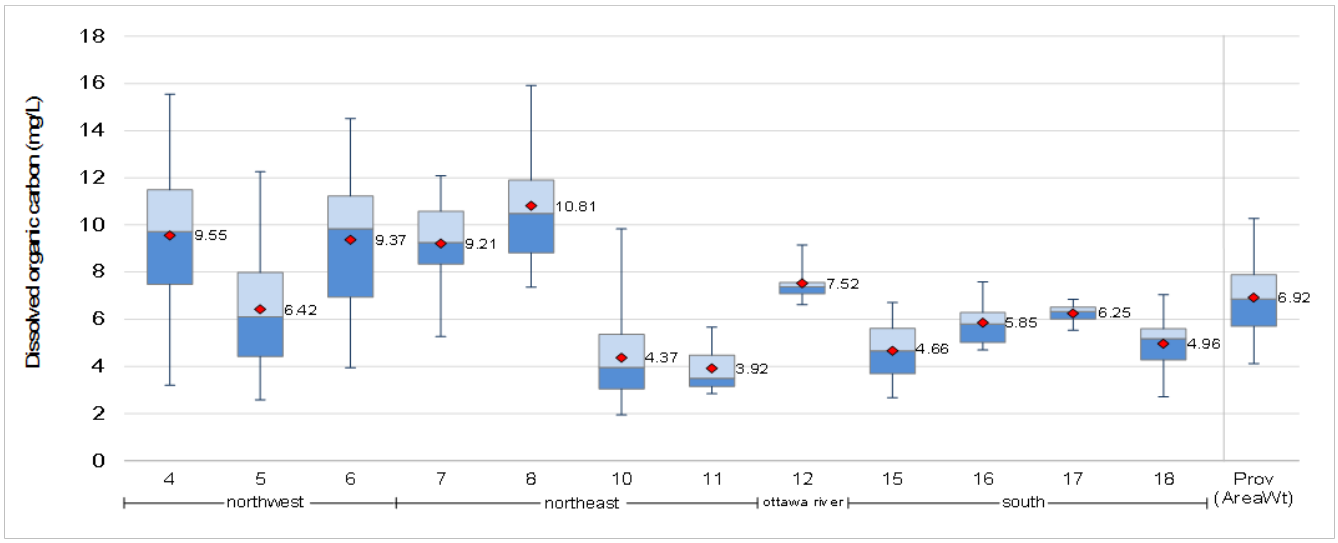


Figure 65. *BsM Cycle 1 mean dissolved organic carbon levels in FMZs.*

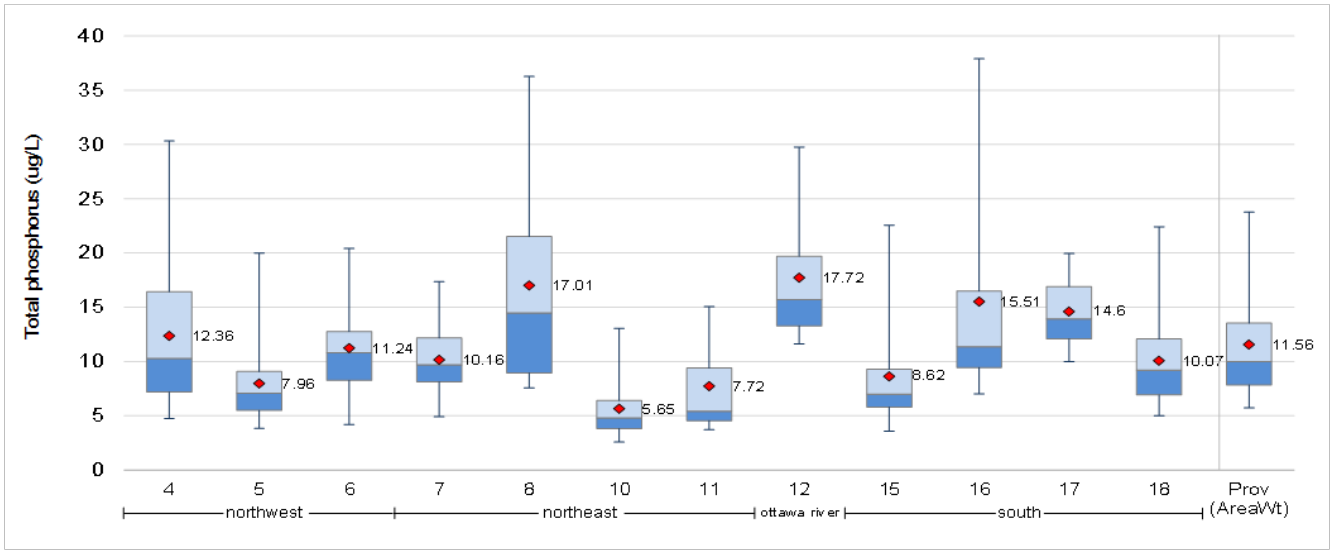


Figure 66. *BsM Cycle 1 phosphorus levels in FMZs.*

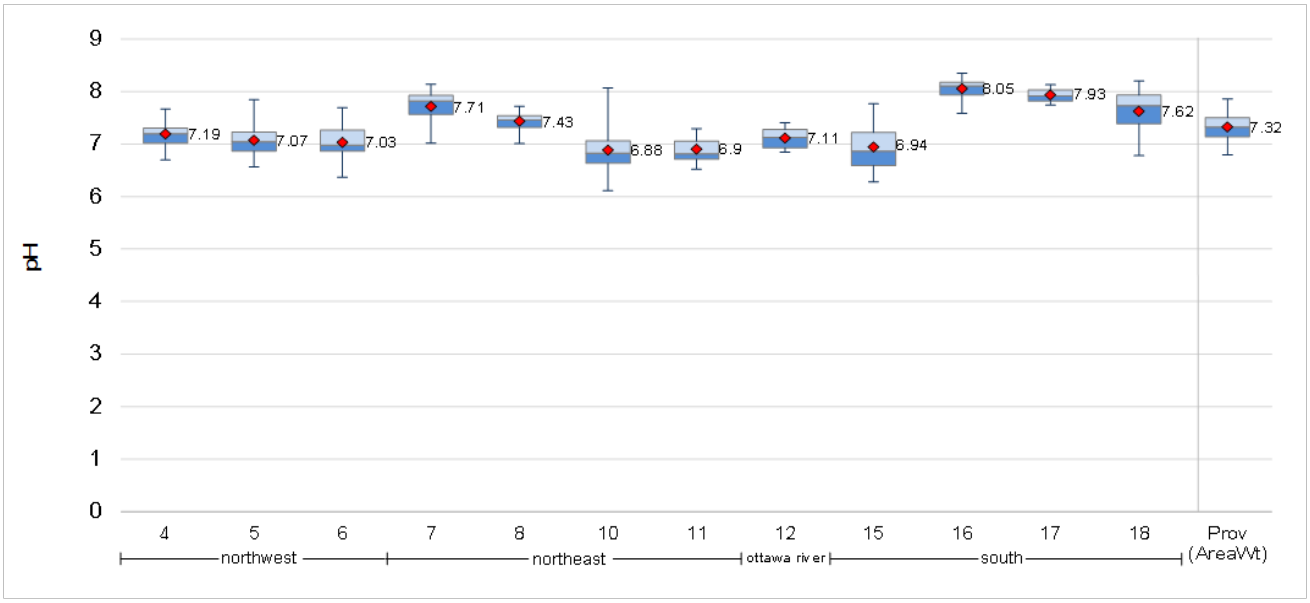


Figure 67. *BsM Cycle 1 pH levels in FMZs.*

Calcium

The presence of limestone and other calcium carbonate rock in lakes and streams helps to maintain a constant pH because the minerals react with the excess acid. However, acid precipitation can eventually overcome the buffering capacity of the surface water and lead to declines in available calcium important for survival of aquatic biota. FMZ 11 has relatively low calcium levels when compared within the northeast and to the provincial levels (Figure 69).

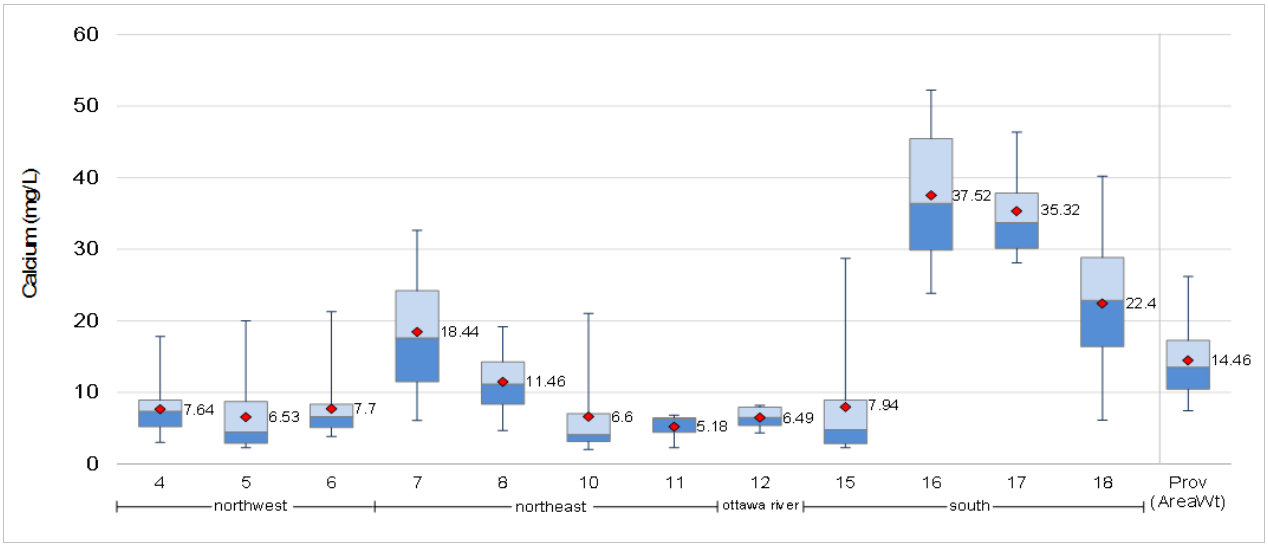


Figure 68. *BsM Cycle 1 calcium levels in FMZs.*

Thermocline depth

The thermocline is a thin but distinct layer in water bodies in which temperature changes more rapidly with depth than it does in the layers above or below. Thermocline depth is measured by the BsM program by analyzing both dissolved oxygen and temperature in the water column. Climate change is suspected to be influencing the depth of the thermocline due to warmer summer ambient temperature resulting in the thermocline depth moving deeper. FMZ 11 has similar thermocline depth when comparing within the northeast and to the provincial depths (Figures 70 and 71). Changes in deeper thermoclines can result in shrinking of available cold water, oxygenated refuge habitats that are critical for the survival of coldwater species such as Lake Trout and whitefish in summer months.

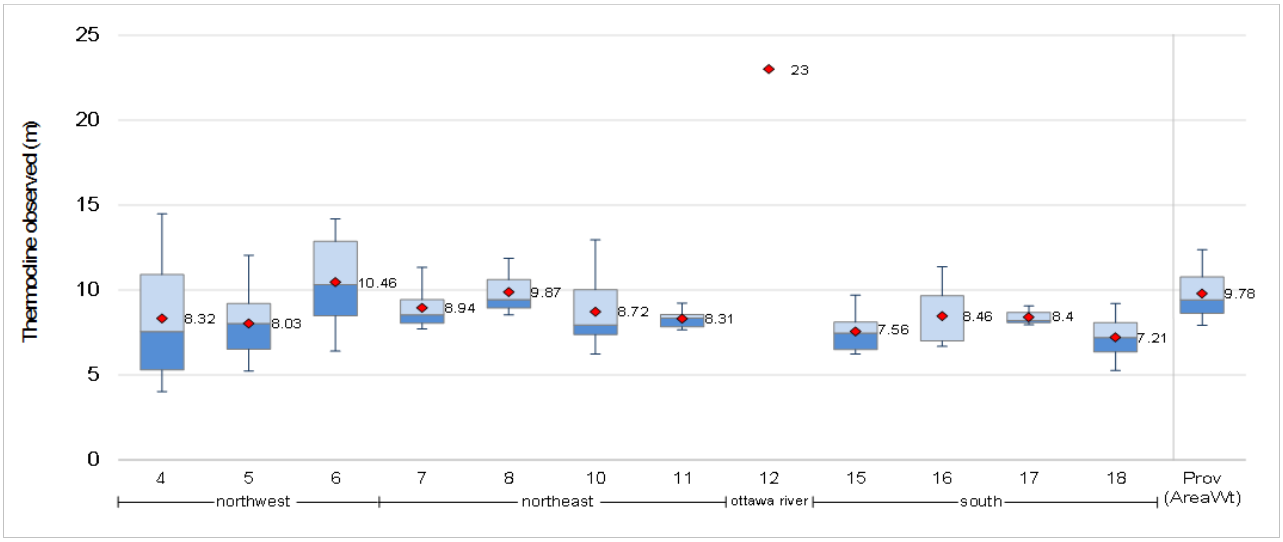


Figure 69. *BsM Cycle 1 thermocline depths in FMZs.*

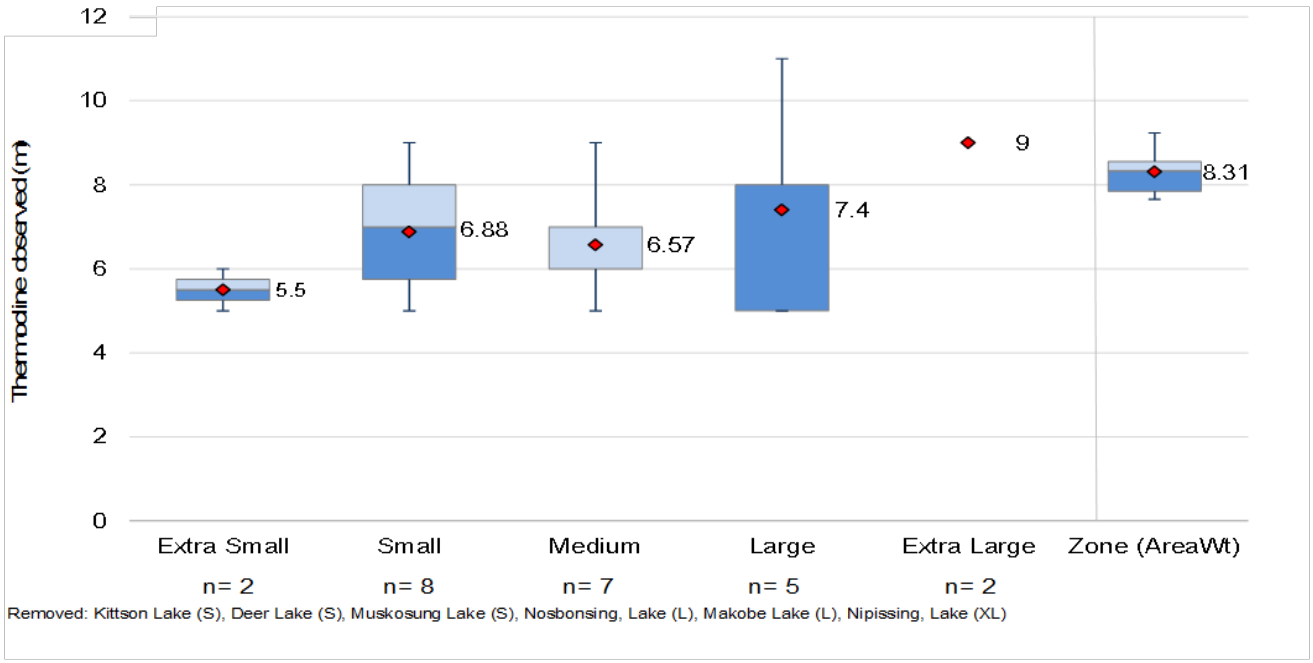


Figure 70. *BsM Cycle 1 thermocline depths in FMZ 11 by lake size bins.*

Objectives for ecosystem changes

Aquatic ecosystem objectives have been included in many of the individual species sections above. Council has been clear in deliberations that the ecosystem-based fisheries management approach, as espoused in the Terms of Reference, is critical to the success of achieving the desired future condition of aquatic resources in FMZ 11.

The following aquatic ecosystem direction was derived from MNRF's "Our Sustainable Future: A Renewed Call to Action" (OMNR 2011) and the "Horizon's 2020" (MNRF 2015c) strategic document to ensure healthy, resilient ecosystems:

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.

Ecosystem Changes Management Plan

The following summarizes the management plan for ecosystems changes outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 32).

Table 32. *Summary of the Ecosystem Change Management Plan for FMZ 11.*

Objective	Indicator	Benchmark	Target
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. **Species at Risk (SAR) Related Changes:** Lake	Use existing lake survey files (Aquatic Habitat Inventory), baseline BsM measures, SAR studies, water chemistry and climate change information to set benchmarks.	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

Objective	Indicator	Benchmark	Target
	Sturgeon, American Eel (Anguilla rostrata), Northern Brook Lamprey, Silvery Lamprey and Shortjaw Cisco (Abundance, distribution, etc.). **Water Quality Related Changes:** Nutrient loads/levels, blue-green algae blooms, changes to the level of dissolved oxygen and temperature. BsM also monitors dissolved organic carbon, phosphorus, pH, calcium and thermocline depth. **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 11 (Sudbury Environmental Studies), acid damaged		ecosystem indicators via each agency's respective field programs.

Objective	Indicator	Benchmark	Target
	lakes that have returned to natural recruitment, survival of fish stocked for fish community restoration.		
To identify and minimize the cumulative effects that could impact aquatic ecosystems by anticipating, preventing and mitigating significant negative ecological impacts to habitats and species.	Plan input and reviews undertaken to meet aquatic ecosystem cumulative effects objectives that result in positive outcomes for aquatic ecosystems.	To the extent possible, use historical data to define the natural range of variation for each ecosystem component and track trends through time. When applicable, reference scientific literature for best available science.	Participate in plan input and review that provides for positive ecosystem change in each project.
To increase public awareness of the value of an ecosystem-based fishery management approach that aims to conserve the	Increased public participation in stewardship actions that help maintain/create healthy lake ecosystems.	Pre-plan public participation levels and attitudes.	Report ecosystem changes at FMZ 11 Plan review intervals, outreach activities and/or through the dissemination of reports through

Objective	Indicator	Benchmark	Target
structure and function of aquatic ecosystems, in addition to conserving the fishery resource.			electronic (web) and other public media.

Management actions to meet ecosystem change objectives

The management actions are presented below along with an indication of the level of support from the FMZ 11 Advisory Council (Table 33).

Table 33. *Management Actions for Ecosystem Changes.*

Management actions	Advisory Council advice
Biological: 1) Resource Managers and Planners to consider this objective when conducting plan development or plan input and review for projects within FMZ 11. 2) Restore damaged ecosystems through development of comprehensive restoration plans that minimize anthropogenic stressors. 3) MNRF, in collaboration with key partners, to continue to monitor, assess and respond to changes to key components of the FMZ 11 ecosystems, using the best available science, with the intention of managing for resilient, naturally diverse ecosystems. 4) MNRF to report to the public on FMZ 11 specific actions taken and their results.	No advice provided.

Management actions	Advisory Council advice
Socio-economic: MNRF, 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).	None specifically provided.
Aquatic Ecosystem: Employ a precautionary approach to resource allocation and review of development proposals that is consistent with the aquatic ecosystem management direction within strategic direction (OMNR 2011, MNRF 2015a).	None specifically provided.
Education: 1) MNRF, in collaboration with key partners, to promote an FMZ 11 specific ecosystem-based fishery management approach by means of FMP, factsheets, State of Resource Reports, presentations, workshops, forums, etc. 2) MNRF to make FMZ 11 specific educational materials, noted above, publicly accessible via web publications.	None specifically provided

Management actions

MNRF, in collaboration with key partners (e.g. MECP, Laurentian University, Indigenous communities, Cooperative Freshwater Ecology Unit) to continue to monitor, assess and respond to changes to key components of the FMZ 11

ecosystems using the best available science with the intention of managing for a resilient diverse ecosystem that reflects the natural range of variation in the Zone.

MNRF, in collaboration with key partners (e.g. MECP, Laurentian University, Indigenous communities, Cooperative Freshwater Ecology Unit) to continue to monitor cumulative effects that could impact FMZ 11 aquatic ecosystems. Anticipate, prevent and, where feasible, mitigate significant negative ecological impacts on specific processes, habitats or species (e.g., SAR, water quality, food web dynamics and fish mortality).

In all project reviews, MNRF delivers the message that the cumulative impacts to ecosystems require a precautionary approach to resource allocation and habitat alteration.

Monitoring strategy

Collaborate with partners (financially, staffing, resources) such as MECP programs (i.e. Living with Lakes Centre, Lake Partner Program) to share data from each agency's respective field monitoring programs to assess and track changes through to key ecosystem indicators mentioned above.

Use data from BsM, local FMZ 11 site-specific assessments and assessments by partners to provide annual status reports of ecosystem change.

Report on cumulative effects (habitat alteration, significant seasonal variation) of newly introduced species or of new developments regarding introduced species) on an annual basis as a component of ecosystem change.

Partnerships with the Cooperative Freshwater Ecology Unit, MECP, Ontario Parks and the continuing Sudbury Environmental Studies of chemically stressed waters in northeast Ontario provide essential insight into the chemical recovery of sensitive waters in FMZ 11 and the Sudbury Basin.

The BsM program is tracking a number of measures of status (indicators) using water chemistry and physical attributes of lakes within FMZ 11 to understand potential trends in measures including dissolved organic carbon, phosphorus, pH calcium and thermocline depth.

Education

MNRF, in collaboration with key partners, to promote ecosystem-based fishery management by means of fisheries management plans, factsheets, State of the Resource, presentations, workshops, forums, etc. MNRF to make promotional materials noted above publicly available in accessible, central locations including the web.

6.6 Fish habitat

Management issues, challenges and opportunities

Management issues:

- Limited site-specific habitat information currently available;
- Cumulative impacts are currently not well quantified or understood;
- Changes to the implementation of the Federal Fisheries Act may affect fish and fish habitat protection resulting in less oversight and understanding of potential cumulative impacts

Challenges:

- Limited information exists to quantify the socio-economic importance of fish habitat;
- Gathering site-specific habitat information in anticipation of development projects to ensure fish habitat is preserved and impacts are mitigated;
- Balancing economic, social and ecological values of commercial development projects (e.g. new waterpower facilities).

Opportunities:

- Having project proponents or their agents collect relevant resource habitat information;
- Anticipating habitat information requirements for upcoming large-scale projects.

Status of fish habitat

Historically, the protection of fish habitat was limited to high profile critical habitat mitigation on the FMZ 11 land base. Since, 1997, Fisheries and Oceans Canada (DFO) has had an increased role in habitat protection in Ontario. Direct involvement by DFO

in large scale projects created a greater focus on aquatic resource protection and function. DFO's "No Net Loss" of fish habitat policy considerably elevated the emphasis placed on fish habitat protection and the use of mitigation measures in the province.

Quality fish habitat and its protection are the cornerstones to maintaining the productive capacity of aquatic ecosystems. Both the physical and chemical components of habitat provide the foundation for healthy aquatic ecosystems and are managed through several agencies including DFO, MNRF, MECP, MMA and Municipalities when reviewing development proposals or activities on in or near water.

While direct physical alteration of critical fish habitats (e.g. spawning areas) is highly visible and often garners quick condemnation, cumulative effects of disturbances to residential or commercial shoreline riparian areas can be similarly detrimental.

Large scale changes, such as new hydro-electric facility development can have significant ecosystem effects on sediment transport, fish movement, nutrient cycling/transfer and embryo incubation.

Fish Habitat Management Plan

The following summarizes the management plan for fish habitat outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 34).

Table 34. *Summary of the Fish Habitat Management Plan for FMZ 11.*

Objective	Indicator	Benchmark	Target
Maintain or enhance aquatic ecosystem structure (fish habitat), function and diversity that support healthy, sustainable, naturally-reproducing native fish communities, thereby providing fish and fishing	BsM ecosystem status and health indicators to be developed; significant fish habitat mapping by species is currently not available	To the extent possible, search historical data for reference points to track trends through time to current conditions for fish habitat, on a	Maintain or enhance fish habitats

Objective	Indicator	Benchmark	Target
opportunities and associated cultural, social and economic benefits to society.		waterbody basis, using the best available science.	
To ensure that future development within watersheds, particularly, in riparian areas minimizes cumulative impacts to habitats and species (e.g., avoid habitat loss, impairment of water quality, disturbance to SAR) while balancing the needs of social, cultural and economic interests.	No loss of fish habitat, degradation of water quality, new point sources of pollutants/ contaminants, loss of natural or naturalized shoreline, and increased risk of nutrient and sediment loading, and erosion.	Plan Start Conditions	Improve public knowledge of fish habitat through fish habitat literature and presentations that report on positive outcomes for fish habitat.
Promote public participation in, awareness and support of, an ecosystem-based fishery management approach which aims to conserve the structure and function of aquatic ecosystems that support healthy, sustainable, naturally-reproducing native fish communities in lakes and	Increased public participation in stewardship actions that help maintain or enhance healthy aquatic ecosystems.	Plan Start	None

Objective	Indicator	Benchmark	Target
rivers; thereby providing for optimum contribution of fish and fishing opportunities and associated cultural, social and economic benefits to society.			

Management actions to meet fish habitat management objectives

The management actions are presented below along with an indication of the level of support from the FMZ 11 Advisory Council (Table 35).

Fish habitat protection is required for all projects where proponents are working in or near water. Many projects proposed may alter these habitats and often the inventory of habitat values at the sites is lacking. Requiring the proponent to undertake the inventory using professional ecological consultants minimizes the cost to the province.

Proponents must assess their project proposals following DFO guidance. This ensures the proponent applies the correct mitigation measures and allows DFO to determine if a Fisheries Act Authorization is required. Further, it may also inform the proponent of alternate construction methods to avoid or mitigate potential impacts that their project may have on the aquatic ecosystem.

Project reviewers can more clearly respond to a proponent's design by taking direction from the fish habitat and aquatic ecosystem objectives of this plan. Partnerships established to restore damaged habitat also foster a stewardship of fish habitat on the part of participants.

In most cases, when made aware of alternative designs and approaches, and the concerns for shoreline development, property owners are willing to modify their projects to minimize impacts. The potential for minimization of habitat disturbance from educating the public appears to have a high likelihood of success.

Table 35. *Management Actions for Fish Habitat.*

Management actions
Biological: 1) Continued consideration for the need for habitat assessments to be undertaken by project reviews under MNRF's Class Environmental Assessments. 2) MNRF, in collaboration with key partners (e.g. Stewardship Councils, cottagers' associations Colleges and Universities), to maintain, enhance or restore damaged aquatic habitats within FMZ 11. 3) MNRF, in collaboration with key partners (e.g., Universities, Stewardship Councils), to measure existing water chemistry in natural Lake Trout waters (Mean Volume-Weighted Hypolimnetic Dissolved Oxygen) as baseline data for future reference. 4) MNRF, in collaboration with key partners (e.g. NBMCA, local municipalities, Indigenous communities, Universities, Stewardship Councils, MECP), to develop shoreline stewardship and etiquette factsheets for residential and seasonal property owners, tourist operators, and businesses. The messaging will include the importance of maintaining septic systems and naturalized shorelines, which retain fish habitat features, buffer the lake from nutrient loading and reduce erosion. Work with municipalities, NBMCA, and Indigenous communities to endorse factsheets, and include as part of resource management planning or municipal governance, where new opportunities exist. 5) Monitor ecosystem indicators (i.e. fish spawning and water levels) that may have an influence on habitat conditions and respond accordingly.
Socio-economical: 1) Resource Managers and Planners to consider and adhere to all relevant fisheries management objectives when reviewing proposals. 2) Ensure that partner resource managers, upon plan approval, are briefed on FMZ 11 habitat objectives and encourage key partner resource managers to

Management actions
incorporate those objectives into their decision-making processes within their jurisdiction or areas of delegated authority.
Educational: 1) MNRF, in collaboration with key partners, to increase public awareness of the value of an ecosystem-based fishery management approach which aims to conserve fishery resources and the structure and function of aquatic ecosystems. 2) MNRF, in collaboration with key partners (e.g., local municipalities, Indigenous communities, Universities, Stewardship Councils, NBMCA, MECP), to raise public awareness and public participation in shoreline stewardship that promotes the long-term sustainability of fish habitat and water quality in FMZ 11. 3) Deliver public messages on the value of an ecosystem-based approach which emphasizes habitat management and stewardship actions. 4) Prepare and distribute literature to raise awareness of the importance of protecting significant fish habitat which includes not only spawning habitat, but also nursery, rearing, staging, foraging and dispersal areas. 5) To increase public awareness and understanding as part of an educational campaign, MNRF, in collaboration with key partners, to create a variety of products that can be widely distributed (e.g. factsheets, posters, signs, stickers, rulers, presentations). 6) Work with NBMCA, local municipalities and Indigenous communities to endorse literature and incorporate the principles into by-laws if not already in place. 7) Make products publicly available in accessible, central locations (e.g. web publications, MNRF office, local Service Ontario offices). 8) Initiate outreach activities, participate in local forums, accept requests for presentations to local Ontario Federation of Anglers and Hunters (OFAH), rod and gun clubs, produce media releases, etc. Make all of these available to the public in accessible, central locations.

Management sctions

MNRF, in collaboration with key partners (e.g. Stewardship Councils, cottager associations, colleges and universities), to develop a project plan identifying priority locations or types of habitat, for future restoration projects.

MNRF, in collaboration with key partners (e.g., Stewardship Councils), to maintain, enhance or restore fish habitat in order to support the recovery of species at risk, including Lake Sturgeon, in their current or historic range.

MNRF, in collaboration with key partners, to document existing condition of critical habitats as a baseline for future reference.

MNRF, in collaboration with key partners (e.g. NBMCA, municipalities, Indigenous communities, Colleges and Universities, Stewardship Councils, MECP), to develop shoreline stewardship factsheets for property owners (residential, seasonal, tourist operators, and businesses). Messaging to include importance of maintaining septic systems and naturalized shorelines, that retain fish habitat features, buffer the lake from nutrient loading and reduce erosion. Work with NBMCA, Indigenous communities and local municipalities to endorse factsheet and include as part of resource management planning or municipal governance, if not already doing so.

Resource Managers and Planners to consider and adhere to all relevant objectives of aquatic ecosystems and fish habitat management within the FMZ Plan when reviewing project proposals.

Ensure that partner resource managers, upon plan approval, are fully briefed as to FMZ 11 Plan objectives, and encourage key partner resource managers to incorporate those objectives into their decision-making processes within their area of jurisdiction.

Support Water Management Plan reviews requests by our aquatic ecosystem partners.

Monitoring strategy

Aquatic Habitat Inventories, or lake surveys, were conducted, primarily in the 1970s, to characterize fish communities, to gather bathymetry data and to record visible critical habitat features. Since the early 1980s, assessment of habitat has focused on

critical physical habitat (spawning areas) and chemical habitat (temperature/oxygen profiles or pH). Most habitat assessments currently undertaken in FMZ 11 are in relation to development proposals and, where it is of a commercial scale, the proponent undertakes the assessment (normally via consultants).

The Province's BsM program will continue to collect information related to fish habitat. MNRF District's will also continue to collect information through regular values collection exercise and local monitoring as necessary

Participate in project reviews and ensure incorporation of aquatic ecosystem and fish habitat objectives from FMZ 11 plan.

Monitor provisions in project plans to ensure compliance with approved construction techniques, flow and level provisions in water management plans.

6.7 Water levels

In 2000, the *Lakes and Rivers Improvement Act* (LRIA) was amended to establish statutory authority for MNRF to order the preparation of a management plan for the operation of a dam and required 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. Existing waterpower facilities on rivers in provincial jurisdiction are required to prepare plans for the management of flows and levels at their generating stations. 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 on going public and First Nations and Métis community engagement or consultation. All WMPs will also be amended to incorporate mandatory changes regarding plan amendments, standing advisory committees, monitoring and reporting and implementation reporting. However, 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 Aboriginal 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.

A separate suite of objectives was not developed by the FMZ 11 Advisory Council. Water level issues are embedded in the regulated water flows and levels in each species section as they are recognized having potential to be an issue in regulated watersheds. Three water management plans (WMP) have been completed in FMZ 11: South River WMP, Sturgeon-Nipissing French WMP, and Matabitchuan River WMP. The Montreal River WMP remains in draft.

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. Each species section identifies the requirement for review of water level management as part of the achievement of fisheries objectives. Current facilities and operators of water control structures in FMZ 11 are associated with natural Lake Trout, Walleye and Northern Pike waters.

Management issues, challenges and opportunities

In FMZ 11, there are many water control structures that perform roles varying from purely recreational to flood mitigation to controlling water storage for waterpower to direct waterpower facilities. A significant number of facilities in the zone have had upgrades since 1990. In some cases, upgrades have increased their capacity to hold and pass water for electricity generation, yet some compliance and operating plans still have no specific provisions for the protection of aquatic resources.

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; and
- Operator objectives for reservoirs may directly conflict with those of fisheries (e.g. winter drawdowns on natural Lake Trout lakes).

Challenges:

- Gathering the appropriate fish habitat and flow/level information to determine whether there is a requirement for mitigation.

Opportunities:

- Ensure that flows and levels are incorporated in every facility compliance plan and facility-specific OMS (Operation, Monitoring and Surveillance) manual via input to Water Management Plans and via Standing Advisory Committee exercises.

Status of water levels

Effective management will require review and reporting on all water level control structures whether operated by MNRF, private entities, Ontario Power Generation (OPG) or Public Works Canada (PWC) 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 Plan

The following summarizes the management plan for water levels outlining the objectives, indicators, benchmarks, targets, management actions and monitoring strategies (Table 36).

Table 36. *Summary of the Water Management Plan for FMZ 11.*

Objective	Indicator	Benchmark	Target
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.	Identification of flows and levels that are required to maintain or enhance aquatic ecosystem structure (fish habitat), function and diversity of regulated waterways in FMZ 11.	Scientific literature, provision of permanent base flows, modification of levels to prevent dewatering of embryos or important habitats.	Establishment of temporal flows and levels on all regulated waterbodies employing site-specific requirements to optimize the benefit to aquatic ecosystems including Species at Risk and those under significant angling stress.
To ensure that water regulation within FMZ 11 recognizes and incorporates the socio-economic contributions of aquatic ecosystems in planning strategies	New water management plans and development of new facilities to include compliance with temporal flows and levels at all regulated water	Scientific literature, natural range of variation for flows and levels or mitigation of flows and levels based on conflicting water regulation function (e.g. early winter	In all new waterpower project reviews, provide specific temporal flows and levels to mitigate negative impacts to the watershed. Review existing

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 11.	sites to prevent cumulative impacts and to maintain aquatic ecosystems.	drawdowns for power production and spring flood control on Lake Trout waters)	waterpower facilities to provide compliance-based provisions for temporal flows and levels where they do not presently exist.
MNRF, in collaboration with key partners (OPG, PWC, private operators), to increase public awareness of the management practices employed on regulated waters and, more specifically, how that management relates to positive outcomes for aquatic ecosystems and the fisheries of FMZ 11.	Public has a better understanding and attitude towards management practices for water levels on the lakes.	MNRF, in collaboration with key partners, to derive education materials.	MNRF to deliver the message to the public of the multiple roles of water regulation on waterbodies. MNRF to continue to participate in all WMP standing Advisory Council meetings. Produce and provide educational material on where and how water regulation facilities in the zone provide positive outcomes for aquatic ecosystems and fisheries.

	Number of requests for amendments to water management plans.	Current and past and amendments to water management plans.	Reduced number of amendments to water management plans.
	Number of complaints to MNRF specific to fisheries habitat related to water level manipulation.	Current and past number of complaints to MNRF specific to fisheries habitat related to water level manipulation.	Reduce number of complaints to MNRF specific to fisheries habitat related to water level manipulation.

Management actions to meet water levels objectives

The management actions are presented below along with an indication of the level of support from the FMZ 11 Advisory Council (Table 37).

Not all of the water control structures, and their attendant reservoirs have specific, measurable provisions for critical habitat protection, despite sites being a part of water management plans. In some cases, there is an absence of specific temporal flow and level compliance points, thus there is the potential to significantly improve aquatic ecosystems, including fish populations, under stress.

There is also recognition that the role of these sites varies from direct power production to support of power production to flood control and maintenance of recreational water levels that benefit the public.

Provincial direction for aquatic ecosystems management is clear: sustaining water resources and their hydrological function, as well as maintaining water quality and quantity to sustain aquatic life, is the most socio-economically effective approach to long-term resource management and to mitigate or prevent cumulative impacts.

Table 37. *Management Actions to Meet FMZ 11 Water Levels Objectives.*

Management actions	**Advisory Council advice**
Biological/Aquatic Ecosystem: 1) MNRF to continue to participate in the Standing Advisory Councils for existing water management plans by delivering the provincial MNRF aquatic ecosystem management direction and taking a co-operative approach to water management. 2) MNRF 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). 3) 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.	Council recognized the positive contribution that appropriate fall/winter levels can have for Lake Trout based on the Kawagama Lake presentation during Lake Trout deliberations.
Socio-economics: Where new facilities (dams or power generating stations) are proposed within the FMZ 11 watershed or existing facilities are reviewing their water management plans, 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).	None specifically provided.
Education: 1) Produce integrated aquatic ecosystem products that include water level management publicly	None specifically provided.

Management actions	Advisory Council advice
available through web publications, local forums, and MNRF-led FMZ 11 outreach activities. 2) Through participation in water management plan Standing Advisory Councils, provide input to councils that positively impacts aquatic ecosystems.	

Management actions

MNRF to ensure that water management priorities will continue to 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 objectives, establish provisions for compliance flows and levels at water regulation facilities during planning where they do not presently exist.

Where new facilities (dams or generating stations) are proposed within the FMZ 11 watershed, or existing facilities are reviewing their water management plans, resource managers and planners to ensure that, early in the process, flows and levels are established for each facility to minimize cumulative ecological impacts, to support species and aquatic ecosystem objectives and to provide for the needs of the public and the environment (fish habitat).

Produce integrated aquatic ecosystem products that include water level management information and make the products publicly available through web publications, local forums, outreach activities and others.

MNRF to continue to participate in the Standing Advisory Councils for existing water management plans by delivering the provincial MNRF aquatic ecosystem management direction and by taking a co-operative approach to water management.

Provide education on actions that positively impacts aquatic ecosystems.

Monitoring strategy

Assessment of fish habitat affected by manipulated flows and levels requires knowledge of the critical habitat locations and elevations as well as the species

requirements. In many cases, this information is available. In some cases, there will be requirements to document spawning activity and subsequent dewatering during winter, for example, Lake Trout which deposit eggs in later October that incubate and develop in rock rubble spaces until late April. Spring levels for Walleye egg deposition and incubation in tailrace and spillway areas, and shallow wetland areas for Northern Pike and Muskellunge are often impacted by reservoir operations.

Where specific compliance-based flow and levels are absent, or do not take aquatic resources into account, investigate and assess the effects of regulated water levels on aquatic ecosystems, and in particular, on highly stressed fish populations.

Review and implement monitoring and reporting requirements of water management plan and operating plan.

Participate in Standing Advisory Council meetings, annually, to receive compliance reports from waterpower operators and to share FMZ 11 fisheries objectives.

Monitoring and assess the occurrence and nature of any complaints or amendment requests

7.0 Consultation

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. 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 general public and stakeholders.

Under the Ecological Framework for Fisheries Management, public input is one of the key pillars of the planning process. There are various ways in which public consultation is incorporated into the planning process. The FMZ 11 Advisory Council was intended to represent the public at large as well as to be the initial point of contact for MNRF to seek stakeholder input. Stakeholder input is important in the development of the objectives and management strategies for the plan and to be presented to the broader public for review and input.

In addition to receiving input from the FMZ 11 Advisory Council, where and when appropriate, 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.

After each critical stage in the development of the plan, MNRF held public consultation sessions. MNRF compiled and reviewed the comments received and where appropriate, made changes to the plan.

7.1 FMZ 11 Advisory Council

The FMZ 11 Advisory Council is comprised of representatives from a diverse group of local stakeholders. 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.

Affiliation of FMZ 11 Advisory Council members:

- Greater Nipissing Stewardship Council
- North Bay/Mattawa Algonquin's of Ontario
- Ontario Federation of Anglers and Hunters (OFAH)
- North Bay Hunters and Anglers (OFAH)
- Nosbonsing Anglers and Hunters (OFAH)
- Temiskaming Anglers and Hunters (OFAH)
- Youth Anglers
- Anglers at Large
- Nature and Outdoor Tourism Ontario (NOTO)
- Temagami Tourism Operators Association (TEMTOA)
- French River Tourism Operator
- Nipissing Naturalists
- Cassels and Adjoining Lakes Cottage Association
- Upper French River Cottage Association
- Municipality of North Bay
- Municipality of Temagami
- Commanda and Area Naturalists

- An Independent Science Advisor
- Fisheries Expert

The purpose of the FMZ 11 Advisory Council is to provide advice to MNRF to assist with the development of the management objectives and strategies for the zone's fisheries. A Terms of Reference (TOR) was developed that further describes the purpose, principles, organizational details, roles, responsibilities and operating costs for the council.

7.2 Indigenous community involvement

The *Constitution Act*, 1982 recognizes and affirms Aboriginal and treaty rights of the Indigenous peoples of Canada. MNRF has a legal duty to consult Indigenous communities when any proposed activity or decision may adversely impact those rights. With respect to fisheries, the courts have clarified that conservation of fishery resources is the first priority, after which existing Aboriginal and treaty rights take priority before allocation and management of the resources for recreational, commercial food and bait fisheries.

Indigenous communities also have a long history of, and strong interest in, fisheries resources management. Indigenous Traditional Knowledge (ITK) has been gathered by Indigenous peoples through generations of depending on the land and water resources for their survival and way of life. Aboriginal rights and interests help guide fisheries management planning and activities in Ontario. MNRF acknowledges the importance of ITK in decision making and continues to explore opportunities to increase Indigenous involvement in fisheries management through collaborative partnerships.

Indigenous involvement has been encouraged during the development of this Fisheries Management Plan. Invitations to participate on the Advisory Council were extended to the Indigenous Working Group on three occasions, beginning in the summer of 2010. Initial introductions and an invitation to participate were extended on June 29, 2010, and follow-up invitations were extended on November 17, 2010, and February 1, 2013. Shortly thereafter, an invitation to participate letter was also sent to each First Nation community.

During the development of the draft plan, calls were made to bands within and proximal to FMZ 11 to share information and gather input. All of the First Nation (FN) communities took advantage of the offer to have MNRF staff present an FMZ 11 information-sharing package.
The following are the dates of our meetings:

- Dokis FN (January 2, 2014)
- Henvy Inlet FN (January 24, 2014)
- Wanapitae FN (April 4, 2014)
- Nipissing FN (September 9, 2014)
- Antoine Algonquin FN (September 24, 2014)
- Mattawa-North Bay Algonquin FN (October 14, 2014)
- Temagami FN (October 1, 2014)
- Matachewan FN (April 22, 2015) and
- Quebec First Nations: Temiskaming, Wolf Lake and Eagle Village (September 9, 2014)

In each case, MNRF staff encouraged further dialogue regarding the planning process and provided contact information via the Resource Liaison Specialist.

MNRF intends to continue collaborative efforts with Indigenous communities in a proactive, flexible management framework that balances the subsistence, commercial and recreational demand for fisheries resources. A collaborative approach will foster an understanding and respect between the fisheries resource managers and their objectives. In addition to this, open, transparent data collection and sharing among parties will contribute to an overall understanding of use patterns and aid in management solutions for the betterment of the fisheries.

In recognizing the importance of understanding the recreational and commercial fisheries and collaborating with allocation planning, Indigenous involvement was strongly encouraged and sought at all stages of development of the plan. Letters requesting participation to local Indigenous Community Representatives were initially sent inviting their participation on the FMZ 11 AC which resulted in one member eventually being involved on the Advisory Council as council members (North Bay/Mattawa Algonquin's member).

Indigenous perspectives were incorporated into the plan via both involvement on the Advisory Council and through other discussions or consultation.

7.3 Public Consultation Program

The following section highlights how the FMZ 11 Advisory Council, Indigenous communities, and the public were consulted during the development of the fisheries management plan (Figure 72).

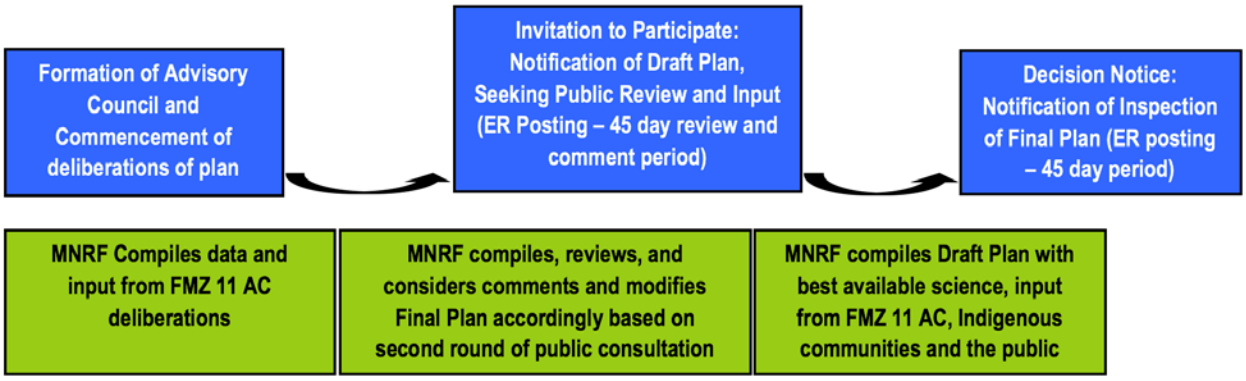


Figure 71. *Fisheries management planning consultation process.*

FMZ 11 Advisory Council participation

The FMZ 11 Advisory Council was established in September of 2010, at the outset of planning. Members were encouraged to keep their respective groups apprised of the developments in plan preparation throughout the planning period. The council, in concert with MNRF staff, developed and distributed literature on various species and their status in FMZ 11 during this period. The council itself prepared a two-page bulletin in the spring of 2013 that outlined the work being undertaken. These documents have been distributed at trade shows, the public planning phases of Lake Nipissing's Management Plan and to council members for distribution amongst their organizations. In addition to deliberating on the development of the plan, council members were also instrumental in acting as stewards of the zones fisheries by means of communicating key messaging and participating in the open house sessions.

Background information report

An FMZ 11 Background Information Report was completed in 2009 (OMNR 2009) establishing the most recent status of the aquatic resources in FMZ 11. The FMZ 11

Advisory Council reviewed the document prior to its completion. It is a technical document, but it is freely available for inspection by the public. Since this time, additional information has been collected via the province's Broad-scale Monitoring program and is reflected in information included throughout this plan.

Draft plan consultation

This stage of consultation provided an opportunity for input on the proposed objectives and management actions to guide fisheries management in FMZ 11. Draft plan consultation consisted of open houses, letters to stakeholders, letters to First Nation communities, posting on the Environmental Registry website and meeting with First Nation communities and stakeholder groups, at their request.

Draft Plan consultation notification was distributed through the following methods:

- Letters to Stakeholders
- Letters to First Nation Communities, and community/council meetings, as requested
- Newspapers: Sturgeon Falls West Nipissing Tribune, North Bay Nugget and New Liskeard Temiskaming Speaker
- Council members advising those they represent
- Policy Proposal Notice Published on the Environmental Registry (21 January 2019) for 47 days.

The draft plan was also available at MNRF District offices in North Bay, Kirkland Lake, Pembroke, Parry Sound and Sudbury, on the MNRF website, and on the Environmental Registry of Ontario for public review and comment. Open houses allowed the public an opportunity to view and comment on the draft plan which were held in the following locations: North Bay, Temagami, Temiskaming Shores and West Nipissing.

Final plan notification

After the development and review of the draft plan, MNRF compiled and reviewed the comments received and where appropriate, made changes to the plan. Once the plan received internal review and approval, the final plan decision notice was posted on the Environmental Registry of Ontario with a copy of the final plan for public reference.

8.0 Reporting, review, and amendment process

Zone Fisheries Management Plans do not have a "sunset" date; rather they are reviewed in response to resource issues and changes in status based on monitoring and assessment. Once the plan has been finalized, an FMZ 11 Action Plan will be developed. Using the prioritized list of plan actions, the FMZ Fisheries Team will lay out a schedule describing the timelines appropriate to complete the actions. The appropriate timelines for each action will vary and depend on the nature of the objectives. Actions will be assigned to the appropriate staff by year allowing for potential coordination of action delivery. The action plan will quantify the degree to which some actions are implemented (e.g. timing of reporting and review, the number of surveys completed, or the number of educational materials completed in a given year).

Reporting

The current BsM program monitors waters on a five-year schedule. Once data from BsM is summarized, zone reports will be posted online on the FMZ 11 section of the Ontario website. Status updates will be prepared, based on BsM, and will describe the trajectory of the resource towards objective achievement.

Review

The purpose of review will be to assess the level of achievement of the management objectives, confirm the validity of goals and objectives included in the plan, and to identify sections of the management plan requiring updates. As per the timelines identified in the zone Action Plan, results of the review will be reported back to the FMZ 11 Advisory Council.

Amendment of the plan can occur prior to a comprehensive review being conducted. Depending upon the nature of any changes that are required, public consultation may or may not be required. It is anticipated that amendments to the plan would only occur if there is a significant management issue (i.e. stemming from monitoring and assessment results) that would have an immediate effect on fisheries across the zone.

9.0 References

Aurora Trout Recovery Team. 2006. Recovery Strategy for the Aurora Trout (*Salvelinus fontinalis timagamiensis*) in Canada. 2006. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada. Ottawa 35pp.

Aurora Trout Recovery Team. 2010. Recovery Strategy for the Aurora Trout (Salvelinus fontinalis timagamiensis) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural resources, Peterborough, Ontario. 35 pp.

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. 2001. Status of Pike Population in Selected Northeast Region Walleye Lakes in the Late 1990s: A Cursory Analysis and Review of Pike Data Collected in Fall Walleye Index Gill Netting in the Late 1990s. With an Addendum on Regulations and Size Limits. Ontario Ministry of Natural Resources. 9 pp.

Casselman, J. 2002. Reducing the Selective Harvest of Mature Female Lake Trout and Other Species (The Physiological Basis and a Case-History Synopsis). Unpublished manuscript. 5 pp.

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

Chu, C., C. Nicholas, C. Collins, N.P. Lester, B.J. Shuter. 2006. Population dynamics of Smallmouth Bass in response to habitat supply. Ecological Modelling 195: 349–362.

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.

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

DFO. 2013. Advice on taxonomic validity and designatable units of Shortjaw Cisco (Coregonus zenithicus) populations in Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2013/044 DFO (Department of Fisheries and Oceans). 2010. Survey of Recreational Fishing in Canada. 27 pp.

Hatton, E. Hunt, L., Drake, D.A.R.,Buckley, J., Fera, S., Henry, S. and T. Johnson (2019). Current and potential aquatic invasive species in Ontario and the Great Lakes region: A compilation of ecological information. Science and Research Information Report - Ontario Ministry of Natural Resources and Forestry 2019 No.IR-16 pp.v + 158 pp. ref.9

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.

Hunt, L.M. 2005. Recreational Fishing Site Choice Models: Insights and Future Opportunities. Human Dimensions of Wildlife 10 (3): 153-172.

Hunt, L.M., E. Camp, B. van Poorten, and R. Arlinghaus. 2019. Catch and Non-catch-related Determinants of Where Anglers Fish: A Review of Three Decades of Site Choice Research in Recreational Fisheries. Reviews in Fisheries Science & Aquaculture 27 (3): 261-286.

Kaufman, S. 2007. The Effects of Stocking on the Walleye fishery of Lake Nipissing 2000 to 2006. Ontario Ministry of Natural Resources. 9 pp.

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.

Lennox, P., G. Forward, K. Mitchell, K. Kruzick, M. Gorrie. 2019. A synthesis of Ontario's natural lake dwelling brook trout population data: Implications for Fisheries Management Zone 11. Science and Research Technical Report TR-30. Science and Research Branch, Ministry of Natrual Resources and Forestry. 25 pp.

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): 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 4 (3): 191-206.

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.

Ministry of Natural Resources and Forestry (MNRF). 2014. Lake Nipissing Fisheries Management Plan. Ministry of Natural Resources and Forestry. 149 pp.

MNRF. 2015a. 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. 2015b. 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.

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

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.

Ontario Ministry of Natural Resources (OMNR). 1991. Lake Trout in Ontario, Management Strategies: Lake Trout Synthesis Management Strategies Working Group 1991. Ontario Ministry of Natural Resources. 90 pp.

OMNR. 1998. Status of the Fishery Report Lake Temagami Lake Trout Fishery. Ministry of Natural Resources and Forestry. 48 pp.

OMNR. 2004. Status of the Fishery Report Lake Temagami Lake Trout Fishery. Ministry of Natural Resources and Forestry. 48 pp.

OMNR. 2004. Strategies for Managing Walleye in Ontario. Percid Community Synthesis. Walleye Management Strategies Working Group. Ontario Ministry of Natural Resources. 29 pp.

OMNR. 2009. Background Document for Fisheries Management Zone 11. Ontario Ministry of Natural Resources. 50 pp + appendices.

OMNR. 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.

OMNR. 2011. Our Sustainable Future: A Renewed Call to Action. Toronto: Queen's Printer for Ontario. 24 pp.

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.

Robson, D.S., and D.G. Chapman. 1961. Catch curves and mortality rates. Transactions of the American Fisheries Society 90: 181-189.

Rowe, R. and T. Inwersen. 2003. Highway 805 Lake Trout lakes: State-of-the-Resources report. Ontario Ministry of Natural Resources. North Bay. 32 p.

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, 1973. 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): 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

10.0 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 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) – 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 CUE indicates a declining population, while an unchanging CUE 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 – 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 MNRF.

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

Diversionary lakes – Additional opportunity or put-grow-take stock lakes that have the same regulations as natural lakes.

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 MNRF

Environmental Assessment Act **(EA Act)** – Environmental assessment legislation mandated by the Ontario Ministry of Environment and Climate Change.

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 MNRF.

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 also 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 MNRF.

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

LESWPP - Lady Evelyn Smoothwater Wilderness Provincial Park.

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 functions. 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).

North Bay Mattawa Conservation Authority (NBMCA) – The North Bay-Mattawa Conservation Authority (NBMCA) was founded in 1972 by the Province of Ontario and the NBMCA's 10 member municipalities. As a community-based, non-profit environmental organization, the NBMCA is dedicated to conserving, restoring, developing and managing renewable natural resources on a watershed basis. The NBMCA is one of 36 Conservation Authorities who are members of Conservation Ontario.

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

ON2 – Ontario small mesh gear described in Sandstrom et al. (2015). Also called "Small mesh" gillnet that target smaller fish (size range of interest to large fish).

Ontario Biodiversity Strategy (OBS) – MNRF strategic direction document.

Our Sustainable Future: A Renewed Call to Action (OSF) – MNRF 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 MNRF

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) – MNRF'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 can 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 coolwater habitat of the lake (known as the epilimnion) from the coldwater 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 a highly contagious disease in fish. The VHS virus is shed in the urine and reproductive fluids of infected fish. Fish can be exposed by direct contact, objects (i.e. nets, bait buckets), orally (predation) or vectors (preying birds or mammals). 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.