

Fisheries Management and Decision Making in Canada's Inland Waterways of Ontario

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SUMMARY

Ontario's waterways have been heavily exploited since the 1800s, eventually leading to the development of fisheries management strategies in the late 1900s. Under the *Fisheries Act*, the Ontario Ministry of Natural Resources and Forestry (OMNR) is responsible for fisheries management in the Province, working collaboratively with the Federal Department of Fisheries and Oceans (DFO), which primarily manages fish habitat, and the Ontario Ministry of Environment and Climate Change (MOECC) on issues surrounding water quality. Guided by several documents, such as, the *Strategic Planning for Ontario Fisheries* documents and the *Ecological Framework for Fisheries Management* (2008), recently the province has created a *Provincial Fish Strategy: Fish For the Future* report for public comment, and finalized in 2015. Moving from lake-by-lake management to a landscape approach in 2008, OMNR established a Broad-scale Scientific Monitoring program for the Province's lakes. Ontario's fisheries include recreational, commercial, Aboriginal, and bait fisheries, in addition to internationally managed Great Lakes fisheries and watersheds. The Ontario-specific management changes and monitoring program are still relatively new and as yet there have been no assessments to their effectiveness.

ACRONYMS

Aboriginal Communal Fishing Licence (ACFL)

Bait Harvest Area (BHA)

Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health (COA)

Committee on the Status of Species at Risk in Ontario (COSSARO)

Department of Fisheries and Oceans (DFO)

Ecological Framework for Fisheries Management (EFFM)

Fisheries Management Zones (FMZs)

Fisheries - Western and Indigenous Knowledge Systems (Fish-WIKS)

Food, social and ceremonial (FSC)

Lake Nipissing Fisheries Management Plan Advisory Council (LNFMPAC)

Ontario Ministry of Natural Resources and Forestry (OMNR)

Ontario Ministry of Environment and Climate Change (MOECC)

Specially Designated Water (SDW)

Strategic Planning for Ontario Fisheries (SPOF I and SPOFF II)

INTRODUCTION

The waterways of Ontario have a long history of exploitation, beginning with the early settlers in the 1800s and increasing throughout the 1900s. Culminating in a marked deterioration in water quality and ecosystem health, including species decline and introductions, the management strategies during the latter half of the 1900's (i.e. after World War II) were characterized by addressing overexploitation and enhancing fisheries through stocking fish and deliberate introductions of non-indigenous species, such as brown trout (Kerr 2010). During the last quarter of the 1900s, the Province also established a department dedicated to managing fisheries (then named the Department of Fish and Game) and policy documents, namely the Strategic Planning for Ontario Fisheries (SPOF I and SPOFF II) (Kerr 2010). Prior to 1997, the Ontario Ministry of Natural Resources and Forestry (OMNR) had primarily been responsible for fish habitat management while the Department of Fisheries and Oceans (DFO) retained the authority to authorize alteration, disruption and destruction of fish habitat. Post 1997, a Memorandum of Understanding (MOU) was signed between OMNR and DFO where the federal government reassumed responsibility for the enforcement of harmful alteration of habitat offences and the introduction of deleterious substance provisions of the *Fisheries Act*. This MOU now involves more agencies with an interest in fish habitat and water quality (Kerr 2010).

Charged with fisheries management and conservation, OMNR's vision is to maintain, "healthy ecosystems supporting native self-sustaining fish communities, and fisheries that provide long-term ecological, social, economic, cultural and health benefits for the people of Ontario". While their mission is, "to provide leadership in the management of Ontario's fisheries, and the protection, restoration, and recovery of fish communities and their supporting ecosystems" (OMNR 2015). The tools employed by OMNR to manage Ontario's fisheries are regulations and licensing. They are responsible for the policy, planning and program development of fisheries management practices; quota allocation to each type of fishery (Aboriginal, recreational, commercial, and baitfish); enforcement; fish culturing and stocking; management of species at risk; management of invasive species; and habitat rehabilitation (OMNR 2014a). The priority in quota allocation is first to the conservation of the fisheries as a resource, followed by Aboriginal and Treaty rights to fish for food, social and ceremonial (FSC) purposes, and then the remainder of the fisheries; recreational, commercial food, and bait (OMNR 2014b).

Aim of Paper

Fisheries management and decision-making in Ontario is governed by the Ontario Ministry of Natural Resources, working in concert with the Federal Department of Fisheries and Oceans, and the Ontario Ministry of Environment and Climate Change. This paper examines the major fisheries in Ontario, the regulating bodies, guiding policies and frameworks utilised during fisheries decision-making. Specifically, it examines how the OMNR approaches fisheries management and highlights a recently adopted management strategy where OMNR has moved from a lake-by-lake regime to managing lakes at the landscape level. There are also international management agencies for the Great Lakes and water bodies shared between the USA and Canada. Wherever possible, relevant knowledge systems are highlighted.

Knowledge Systems in Place

With respect to the knowledge systems being utilised by OMNR, they are western, with scientific knowledge being integrated into decision making. The OMNR has however acknowledged other knowledge systems, namely Traditional Knowledge, and remark that there are fundamental differences in approaches between western science practitioners and traditional knowledge holders and that they are continuing to seek ways to incorporate diverse perspectives into management activities (OMNR 2005b). The Traditional Knowledge programmes are administered by the Ministry of Environment and Climate Change (Chiblow and McGregor 2014). The new Great Lakes Protection Act (2015¹) requires that if First Nations or Métis communities offer Traditional Ecological Knowledge about the health of the Great Lakes, the Province has to take it into consideration in decisions about the Great Lakes.

FISHERIES LEGISLATION AND DECISION MAKING

Legislation

Canada's *Constitution Act, 1867* gives the Federal Government authority over inland and seacoast fisheries, in addition to property and civil rights to the Provinces, and authority over natural resources. Fisheries in Ontario are managed by the Canadian Department of Fisheries and Oceans (DFO) and the Ontario Ministry of Natural Resources and Forestry, hereafter

¹Bill 66, An Act to protect and restore the Great Lakes-St. Lawrence River Basin: http://ontla.on.ca/web/bills/bills_detail.do?locale=en&Intranet=&BillID=3115

referred to as OMNR. Fisheries management and decision making are primarily governed by the Federal Fisheries Act, 1985 (R.S.C. 2012), The Ontario Fishery Regulations (SOR/2007-237), Aboriginal Communal Fishing Licences Regulations (2009), Ontario's Fish and Wildlife Conservation Act (S.O. 1997), and Ontario's Endangered Species Act (S.O. 2007) (more Acts and Regulations are found in Table 1, OMNR 2014a). The mandates of authorities such as the 36 watershed Conservation Authorities (Conservation Ontario: <http://www.conservation-ontario.on.ca/>), Transport Canada, and the Ontario Ministry of the Environment also support waterways and usage in the Province. The Fisheries Act gives OMNR authority to issue licences, and implement licence conditions, for commercial food and bait fisheries, recreational fishing, fish stocking, aquaculture, and scientific collections (OMNR 2014a).

Table 1: Legislation, regulation and agency responsibilities for management of fisheries, fish communities, and their supporting ecosystems in Ontario (OMNR 2014a)

Legislation	Agency	Provisions related to fish
Federal Legislation and Regulations		
Canada National Parks Act, 2000	Parks Canada	Allows for park wardens to enforce Fisheries Act provisions on Park lands
Canadian Environmental Assessment Act, 2012	Environment Canada	Regulates the process to predict the environmental effects of proposed initiatives before they are carried out
Fisheries Act (Fisheries Protection Provisions)	Fisheries and Oceans Canada (& delegated authorities)	Regulates activities affecting fish and fish habitat, deposit of sediment and other deleterious substances
Ontario Fishery Regulations, 2007	Fisheries and Oceans Canada (& delegated authorities)	Regulates aspects of fisheries management in Ontario (including seasons, limits and methods)
Navigation Protection Act	Transport Canada	Regulates works built on, over, through or across any navigable water
Species at Risk Act, 2002	Environment Canada	Protects Species At Risk and the habitats critical for their survival
Provincial Legislation		
Beds of Navigable Waters Act, R.S.O. 1990	Ministry of Natural Resources	Regulates the beds of navigable waters on Crown Land

Conservation Authorities Act, R.S.O. 1990	Conservation Authorities	Furtheres the conservation and management of natural resources in watersheds; regulates floodplain management
Drainage Act, R.S.O. 1990	Ministry of Agriculture and Food	Permits individuals and municipalities to initiate and maintain drainage works
Endangered Species Act, 2007	Ministry of Natural Resources	Protects Species At Risk and their habitat
Environmental Assessment Act, R.S.O. 1990	Ministry of the Environment	Sets out requirements for the assessment of the effects on the environment of public and private projects
Environmental Protection Act, R.S.O. 1990 (Beaches Protection Act)	Ministry of the Environment	Regulates the removal of sand and gravel from beaches
Fish and Wildlife Conservation Act, 1997	Ministry of Natural Resources	Complements the OFR, 2007 with provisions that relate to licensing, selling and possession of fish
Fish Inspection Act, R.S.O. 1990	Ministry of Natural Resources	Regulates the standards of fish processing and sale
Food Safety and Quality Act, 2001	Ministry of Agriculture and Food	Regulates the standards and quality of fish used for food
Great Lakes Protection Act, 2015	Ministry of Environment and Climate Change	Enables Ontario to address environmental challenges to the Great Lakes; climate change, harmful pollutants and algal blooms.
Lakes and Rivers Improvement Act, R.S.O. 1990	Ministry of Natural Resources	Regulates activities affecting lakes and rivers, including construction of water control structures
Municipal Act, 2001	Ministry of Municipal Affairs and Housing (Municipalities through enactment of by-laws)	Requires and regulates approvals for construction over municipal lands, including shore and other road allowances, whether dry land or flooded
Nutrient Management Act, 2002	Ministry of the Environment Ministry of Agriculture and Food	Enforcement of pollution prevention provisions Management of nutrients applied to agricultural lands
Planning Act, R.S.O. 1990	Ministry of Municipal Affairs and Housing (& delegated authorities)	Requires planning decisions to have regard to matters of provincial interest, such as the conservation & management of natural resources
Ontario Water Resources Act, R.S.O. 1990	Ministry of the Environment	Regulates discharge into waterbodies and withdrawal of water

Public Lands Act, R.S.O. 1990	Ministry of Natural Resources	Regulates land-use and development plans and alteration on shorelands
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Current Fisheries Management Decision Making Processes

The OMNR is structured into larger divisions (Fig. 1), broadly described as policy development, program delivery, and corporate support. Program delivery takes place by the Ministry's Field Services Divisions organized within three administrative regions², Northwest (main office in Thunder Bay), Northeast (South Porcupine), and Southern Region (Peterborough). As previously mentioned, fisheries management within the Province of Ontario is undertaken by the OMNR in collaboration with governmental departments, namely the Federal Department of Fisheries and Oceans Canada (DFO), and the Ontario Ministry of Environment and Climate Change (MOECC). DFO is primarily charged with the management of fish habitat, and the MOECC on issues surrounding water quality. The OMNR establishes catch and possession limits, size limits, seasons, and gear used by recreational and commercial fishers (OMNR 2014a). Interactions between OMNR and DFO for fisheries management are very rare, as OMNR conducts its own science and engages with the Federal Minister of Fisheries and Oceans generally only when a brand new regulation is proposed, for example a minimum size limit for a fish which has never previously been harvested by the recreational fishery before (pers comm, interview outcome).

While the management of fish habitat in Ontario falls under the *Fisheries Act* and is administered by DFO, with the recent changes³ to the *Fisheries Act* in November 2013, there have been changes to how habitat protection takes place moving forward, and are presently being adapted. The Ministry supports habitat protection, restoration and enhancement under programs such as the Land Stewardship and Habitat Restoration Program. In Ontario, many federal, provincial and municipal agencies also enforce legislation designed to examine the effects of human activities in and around water. The agencies include; DFO; Environment Canada; Transport Canada; Parks Canada; Ontario Ministry of the Environment; Ontario Ministry of Natural Resources; Ontario Ministry of Agriculture, Food and Rural Affairs; and

²Locations of OMNR administrative regions: <https://www.ontario.ca/government/ministry-natural-resources-and-forestry-regional-and-district-offices>

³Changes to the Fisheries Act: <http://www.dfo-mpo.gc.ca/pnw-ppe/changes-changements/index-eng.html>

Conservation Authorities throughout Ontario (DFO et al. 2007). Ontario's border with the USA introduces International decision making processes, some are facilitated by the International Joint Commission (for boundary waters, Boundary Waters Treaty, 1909) which established the Great Lakes Executive Committee for issues surrounding water quality. For fisheries management, United State Departments and Agencies (i.e. Minnesota Department of Natural Resources, US Environmental Protection Agency) and the Great Lakes Fisheries Commission are the most common organisations working with OMNR (OMNR 2012c). The function of these International joint boards is typically to make recommendations to be considered by both Canada and the USA.

Public consultations for government ministries, falling under the Environmental Bill of Rights, OMNR included, take place primarily through the Environmental Registry online. Public notices of proposals for new legislation, regulations, or policies etc... are posted on the registry. Policy directions are led by the Ministry's strategic documents, *Our Sustainable Future* (2004, 2011) *Our Sustainable Future: A Renewed Call to Action* (2011); *Biodiversity: It's In Our Nature* (2012); *MNR's Statement of Environmental Values* (SEV); and the *Joint Strategic Plan for Management of Great Lakes Fisheries* (OMNR 2015). The new Fish Strategy, completed in 2015, incorporates many of the components from these documents (OMNR 2015). OMNR has developed principles by which the fisheries should be managed (OMNR 2004, 2011). There are five ecological principles, three principles of conduct, and five goals:

Ecological Principles are: (1) Ecosystem Approach; (2) Natural Capacity; (3) Naturally Reproducing Fish Communities; (4) Protect, Restore, Rehabilitate; and (5) Fish and Aquatic Ecosystems are Valued.

Principles of Conduct are: (1) Aboriginal and Treaty Rights; (2) Informed Transparent Decision Making, and (3) Collaboration.

Goals are: (1) Healthy ecosystems that support self-sustaining native fish communities; (2) Sustainable fisheries that provide benefits for Ontarians; (3) An effective and efficient fish

⁴Details of how the International Joint Commission and the Great Lakes Executive Committee were established: <http://www.ijc.org/en>

⁵Environmental Registry: <http://www.ebr.gov.on.ca/ERS-WEB-External/content/about.jsp?f0=aboutTheRegistry.info>

management program; (4) Science and information to inform fisheries policy and management decisions; (5) Informed and engaged stakeholders, partners, Aboriginal communities and general public (OMNR 2014a).

There are several objectives which have been fleshed out under each goal. For example, Goal 3 addresses fisheries management, taking place across Provincial, Federal, and International boundaries, with the defined objectives including, sound governance, effective regulations, policies and practices, in addition to, achieving a high level of compliance. Goal 5 speaks to managing fisheries with a participatory approach; including community and Aboriginal Knowledge, noting that “The use of traditional knowledge, in concert with a foundation grounded in science, balances decision-making and ultimately contributes to better resource management” (OMNR 2015, p.35).

Ontario is divided into 26 OMNR Districts (Figure 1) which were formerly used for fisheries management planning, and accordingly, District Fisheries Management Plans were developed during the mid-1980s using the *Strategic Plan for Ontario Fisheries* (SPOF I, 1976) as a framework. Until recently, these plans were the only formal examples of fisheries management planning addressing more than regulations but also including objectives for the District's fisheries. Implementation of the plans, however, resulted in an increase in regulations due to a focus on individual waterways (OMNR 2014a). To move away from the lake-by-lake management paradigm of the recreational fishery, due to its large cost and inability to address the mobility of anglers to move their fishing pressure to lakes with fewer regulations (Lester et al. 2003), 20 Fisheries Management Zones (FMZs) (Figure 2) have been implemented to replace the existing 37 Fishing Divisions (OMNR 2005a). The FMZ Plans are now in the process of replacing the District Plans. The creation of the FMZs incorporated angler movement patterns, ecology, fishing pressure, and access roads. While management now occurs by these larger zones, some lakes designated as Specially Designated Waters (SDW), such as Lake Nipissing, are managed on a lake basis given the significance or high risk status of the fisheries (OMNR 2014a). In addition to the regulatory streamlining and fisheries management planning,

other key components of the EFFM were to increase public engagement, and to introduce a Broadscale fish community Monitoring Program in 2008 (OMNR 2008, Sandstrom et al. 2013).

Ontario Ministry of Natural Resources

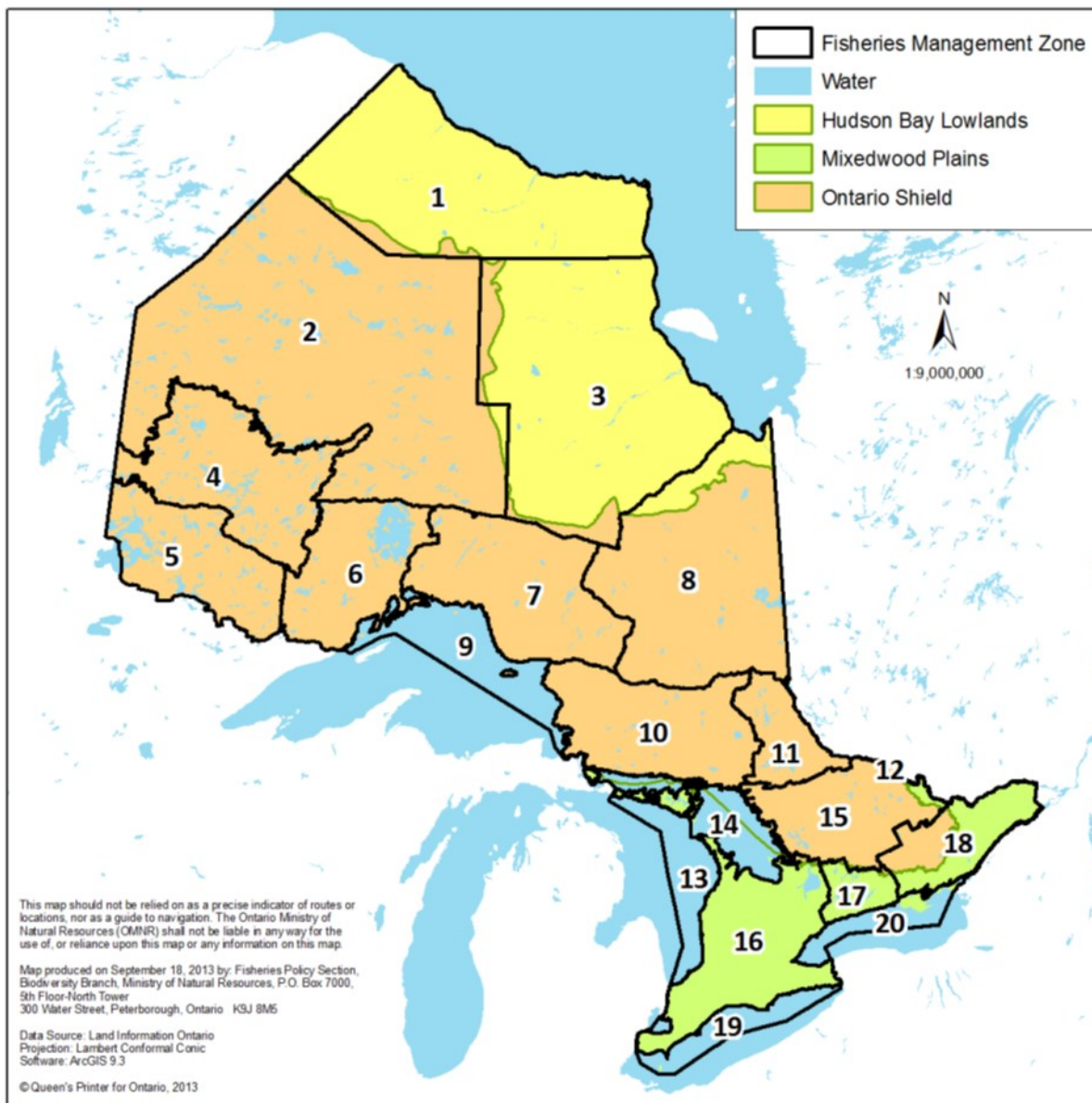
Regions and Districts



Figure 1: Map of OMNR regions and districts⁶

⁶Map found here: <http://www.ontario.ca/document/map-ministry-natural-resources-and-forestry-office-locations>

Figure 2: Ontario's 20 Fisheries Management Zones overlaid atop the province's four ecozones (Hudson Bay Lowlands, Ontario Shield, Mixed Wood Plains and Great Lakes)



(from OMNR 2015). The FMZs were created in 2005.

Ecosystems

Ontario hosts approximately 128 native and 17 naturalized species of fish⁷, 25% of the world's self-sustaining populations of Lake Trout and 22% of the Muskellunge populations in North America (OMNR 2014a). The province's waterways and aquatic communities are characterized as being from a lake or river and their temperature preferences (cold, cool, and warm water). Ontario has four ecozones (Figure 2); Hudson Bay Lowlands, Ontario Shield, Mixed Wood Plains, and Great Lakes. These four ecozones were subdivided into FMZs in 2008 (Fig 2). The fishery and associated industries contribute more than \$2.5 billion to Ontario's economy including 41000 person years of employment, resident and non-resident anglers, tourism, more than 500 active commercial fishing licences, and 1200 commercial bait fishing licences (OMNR 2015).

Species at Risk

Species in Ontario are assessed by the Committee on the Status of Species at Risk in Ontario (COSSARO) which consists of a team of experts in science or Aboriginal Traditional Knowledge from the private and public sectors, the Lieutenant Governor in Council decides who the members are (OMNR 2014a). Ontario's Species at Risk (Species at Risk in Ontario, SARO, *Endangered Species Act, 2007*) list includes 27 fish and 13 mussel species, most of which reside(d) in the Great Lakes and tributaries. Recovery strategies are science-based and are developed and implemented with the help of different people, including stakeholders and Aboriginal peoples (OMNR 2014a).

Strategies and Frameworks

To guide the management of fisheries in Ontario, a document outlining the new Provincial Fish Strategy was circulated for comment in January 2014 and finalized in 2015 (OMNR 2015). The primary purpose of the Strategy is to, "improve the conservation and management of fisheries resources; and to encourage fishing as an activity that contributes to the individual well-being and the social, cultural and economic well-being of communities in Ontario". Additionally the Strategy is to aid OMNR in responding to changing stressors on the fisheries. The strategy acknowledges that fisheries management takes place with the

⁷It is unknown how many of these species are commercially harvested.

collaboration and coordination of all levels of government, Aboriginal communities, and stakeholders (OMNR 2015). There are recurrent themes and messaging throughout the Provincial Fish Strategy, namely that adopting an ecosystem-based approach is more appropriate to address the management challenges of the Province, and that with the ecosystem-approach comes a shift in focus to broader scales, spatial, temporal, and/or biological, called the “landscape approach”. This landscape approach incorporates fisheries management planning for a species across an entire FMZ, rather than lake-by-lake. By acknowledging that there are gaps (i.e. a Risk-Based Approach) in their knowledge of Ontario’s ecosystems they will be “learning through doing” (Adaptive Management Approach) (Figure 3) (OMNR 2015). One of the goals of the Fish Strategy is to collect and implement “science-based information and advice” from research and monitoring activities. This includes developing legislation and policy based on this science. establish an advisory council; create a fisheries management plan which are reviewed every 5 years; amend the fishing regulations under the Fisheries Act based on the plan; monitor and assess the zone on a regular basis; and then amend the plan and management actions, if necessary, based on monitoring and assessment results.



Figure 3: Fisheries management framework within an adaptive management cycle (from OMNR 2015).

The current proposed Strategy is not the first such plan. In response to fishery declines resulting from the post-war economic growth (Lester et al. 2003), OMNR developed the above mentioned first *Strategic Plan for Ontario Fisheries* (SPOF I) in 1976 (OMNR 1976), and a second version was produced in 1992 (OMNR 1992) to incorporate a more ecosystem-based approach. In 2005 the *Ecological Framework for Fisheries Management* (OMNR 2005a) replaced the 37 existing fishing divisions with the 20 FMZs in place today which were based on biological, climatic, and social considerations. The Strategic Policy for Ontario's Commercial Fisheries followed in 2011. The present version of the Ontario's Provincial Fish Strategy: Fish for the Future, 2015, incorporates and replaces the 1992 version of the Strategic Plan for Ontario's Fisheries and provides the needed strategic guidance for short and long-term management of the Province's fisheries (Figure 4) (OMNR 2015). Additional strategic management directions for the Provincial Fish Strategy were incorporated from *MNR's Statement of Environmental Values, Our Sustainable Future: Renewed Call to Action* (2011), *Ontario's Biodiversity Strategy: Protecting What Sustains Us* (OBD 2011), and *Biodiversity: It's in our Nature* (2012) (OMNR 2014a). There is also the voluntary *Joint Strategic Plan for Management of Great Lakes Fisheries* (1997) which is an agreement between Canada, the USA, and US Tribal resource management agencies. While each Great Lake is also an FMZ, the commercial and recreational fisheries are managed bi-nationally (OMNR 2015). The Joint Strategic Plan fosters cooperation among the jurisdictions and its implementation is facilitated by the Great Lakes Fishery Commission⁸ (OMNR 2014a). Fish community objectives for each Great Lake are jointly agreed to by all agencies, OMNR included. Each Great Lake is partitioned into commercial fishery quota management zones, where OMNR issues licences, sets annual individual species catch quotas, and monitors harvests by commercial fishermen within quota management zones in Canadian waters (OMNR 2015).

⁸Great Lakes Fishery Commission: <http://www.glfc.org/>



Figure 4: Schematic of how the Ontario Provincial Fish Strategy provides the link between high-level strategic direction and the various tools and activities used to manage Ontario’s fisheries (from OMNR 2015). Here MNRF (Ministry of Natural Resources and Forestry) is the same department as OMNR, only abbreviated differently.

Stocking

The practice of stocking fish reared from hatcheries, in addition to the transfer of wild fish, into waterways has long played an important role in the province's fisheries and their management. Stocking activities are guided by the OMNR developed "Guidelines for Stocking Fish in Inland Waters of Ontario" (OMNR 2002) with the goal of doing so in an ecologically responsible manner. There are nine provincial hatcheries, 60% of the stock is to rehabilitate native populations (OMNR 2014a), indicating past management regimes were not effective (Lester et al. 2003). While 40% is allotted to supplementing and supporting recreational fisheries, half of the stocking takes place in the Great Lakes and the remainder is to inland lakes (OMNR 2014a).

Broadscale Monitoring Program

The sampling methodology uses a combination of two types of gillnets: 1) Large mesh which targets fish larger than 20 cm in length and of the greatest interest to anglers, this gillnet has been proposed by the American Fisheries Society as a standard from sampling angler harvested freshwater fish in North America, and 2) small mesh targeting smaller fish and those of interest to the large fish, and is a new standard developed in Ontario (Sandstrom et al. 2013). Lakes greater than 20 hectares, with a target of 5% of all lakes in the province, are sampled in a 5 year cycle, with the first year of sampling across the Province taking place in 2008 (which was the year of implementation, OMNR 2008). Baseline samplings have also taken place in 2009 and 2010 in other FMZs. In accordance with the 5-year sampling cycle, most FMZs have either recently had their second broad-scale monitoring or are preparing for it. Additional variables to be monitored include water chemistry (working with MOECC), fishing effort, contaminants, and invasive species, among others. The overarching goal of the Broadscale Monitoring program is to collect information to support fisheries on the FMZ level (OMNR 2008).

FISHERIES

Recreational Fisheries

The Provincial Heritage Hunting and Fishing Act, 2002 allows that a person has a right to hunt and fish in accordance with the law. Recreational fisheries are primarily regulated by the Ontario Fishery Regulations, 2007 under the Fisheries Act (Federal). Approximately 1,238,000 resident and non-resident anglers fished in Ontario in 2010, the majority taking place in the southern region (OMNR 2014a). The sport fishery is managed by licensing, catch limits, fishing seasons, gear restrictions, and size restrictions among others. In 2010, the top three species harvested were (1) walleye, (2) perch, and (3) smallmouth bass (DFO 2012).

Commercial Food Fisheries

Most commercial food fisheries take place on the Great Lakes, they also exist on the large inland lakes such as Lake of the Woods, Lake Nipigon, and Lake Nipissing (OMNR 2014a). There are approximately 500 active commercial licences including approximately 100 held by Aboriginal communities and individuals. In 2011, 12000 metric tonnes of fish were landed with a value of approximately \$33 million, in addition to \$231 Million from the associated industries (OMNR 2014a).

Commercial fisheries are regulated by the OFR under the Federal Fisheries Act in addition to conditions attached to the fishing licence. Licences are issued in accordance of the Fish and Wildlife Conservation Act, 1997. They have defined quotas and species allowed to be fished in a complete waterbody, or an area within the waterbody (OMNR 2014a). The management of recreational and commercial fisheries in the Great Lakes is facilitated by The Great Lakes Fishery Commission. The Great Lakes are divided into quota management zones (Fig 5). The OMNR issues the licences within the Canadian waters of the lakes, sets the species quotas, and monitor catches within their management zones, and the USA within theirs (OMNR 2014a).

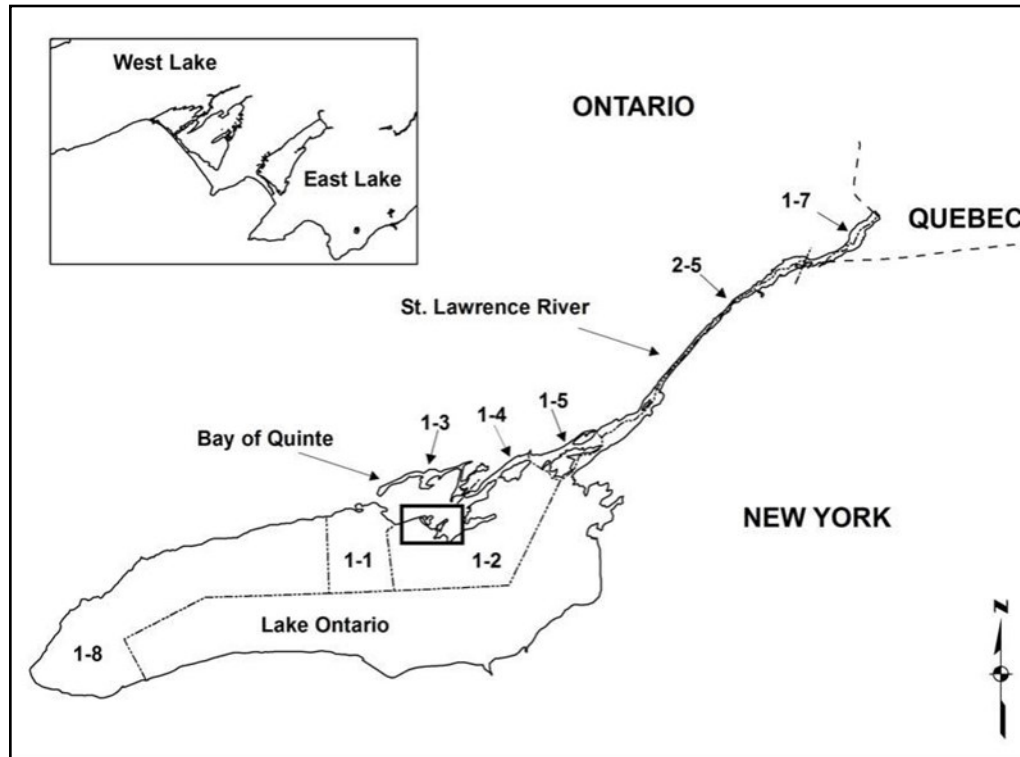


Figure 5: Commercial Fish Quota Zones in Lake Ontario and the St. Lawrence River, illustrating how a Great Lakes are partitioned into quota management zones for commercial fisheries management (from OMNR 2014a).

Commercial Bait Fisheries

Ontario hosts one of the largest live bait industries in the country. While licences are required to harvest, buy, or sell live bait (fish or leeches) to use commercially, upwards of 60% of anglers use live bait to fish in Ontario. There was a total of 1208 commercial bait licences issued in 2010, 651 were dealer licences and 557 were harvesters. A person may hold more than one licence. Emerald shiner (*Notropis atherinoides*) is the most commonly harvested species, in addition to Lake Herring and leeches. Most of the baitfish fishing occurs in the southern part of Ontario (Lakes Simcoe and Erie) while the leeches are from NW Ontario (OMNR 2014a). There is no limit or quota on the number of baitfishes that may be harvested but rather a “block system” based on the bait harvest area (BHA). However it is not clear how a block system operates (OMNR 2014a).

Management for the bait fishery does not appear to have changed in recent years. The bait fishery is divided into more than 3000 BHAs and the BHAs in each OMNR District may range

from being a pond, to the Township or watershed boundaries. Bait harvesters can be licensed for more than one BHA (OMNR 2014a). As per the Environmental Bill of Rights (ECO 2013), OMNR has recently completed a period of comments on a Provincial Bait Policy Review⁹ to improve the management of live bait fisheries.

Aboriginal Fisheries

There is an acknowledgement in the Fish Strategy that Aboriginal fisheries pre-date the Province of Ontario and that they continue to be important to diet, culture, and economies (OMNR 2015). The first “discovery” of the Great Lakes by a European is estimated to have been in 1610 (Kerr 2010). Hurons, Cree, Ojibwe, Algonquin, Iroquois (Haudenosaunee or Six Nations) are among the First Nations People within Ontario's Provincial Borders. First Nations people are not bound by Ontario's angling regulations as per their Treaty and Aboriginal Rights¹⁰. Specifically, a licence is not needed for people who belong to an Aboriginal community with established treaty fishing rights in Ontario if they are fishing within their traditional or Treaty area and the fish is for food, social, or ceremonial purposes, as per the Interim Enforcement Policy¹¹ (IEP). The IEP was developed to reflect the protections provided under section 35 of the Constitution of the Aboriginal Right to harvest for subsistence, and outline the situations which would trigger enforcement action, such as unsafe hunting or destruction of habitat (OMNR 2005b). However, people should be prepared to provide identification indicating that they are part of a community. If they are fishing outside of a traditional territory or treaty area, an “Outdoors Card”, which is a general fishing or hunting licence allowing harvest in the Province, or permission from a First Nation in the Territory or Treaty area to fish there, is needed¹², OMNR 2005b).

As previously mentioned, resource allocation is first to conservation and next to

⁹Provincial Bait Policy Review-Angler Use and Movement of Baitfish in Ontario on the Environmental Registry: Nov 5-Dec 19 2014: <http://www.ebr.gov.on.ca/ERS-WEB-External/displaynoticecontent.do?noticeId=MTIzNjc4&statusId=MTg1Njly>

¹⁰The Treaties within Ontario can be found at <http://www.ontario.ca/aboriginal/ontario-first-nations-map>

¹¹Interim Enforcement Policy: https://www.attorneygeneral.jus.gov.on.ca/inquiries/ipperwash/policy_part/projects/pdf/IEP_2005.pdf

rights-based FSC fisheries. Aboriginal commercial fisheries receive allocations in accordance with OMNR's understanding of case law (OMNR 2014a) and OMNR has sought to negotiate harvesting arrangements with the First Nations and Métis (OMNR 2005b). Additionally, the Anishinabek/Ontario Fisheries Resource Centre in North Bay, ON (A/OFRC), a not-for-profit corporation and advisory body providing advice to the Minister of Natural Resources and the Grand Council Chief for the Anishinabek Nation on the management of natural resources affecting Anishinabek First Nations (which includes the Algonquin and Ojibwe First Nation People). They also provide a formal bi-lateral table for the Anishinabek FNs and the OMNR to discuss resource management issues, exchange info, facilitate a common understanding and collaborate on resolutions (OMNR 2005b). The A/OFRC reports to a Board composed of First Nation and non-Aboriginal members, including OMNR (OMNR 2015). Their mission is to, "...be an independent "Centre of Excellence" for fisheries assessment and management, recognized and trusted by First Nations, governments and all users of fisheries resources. Our mission is to report on stock status, evaluate stresses on fish populations and habitats, offer management recommendations, and facilitate information sharing and participation among all stakeholders to promote sustainable fisheries and resolve conflict".

In 1994 the Minister of Natural Resources was authorised by the Federal Minister of Fisheries and Oceans to make use of a secondary tool to the Ontario Commercial Fishing Licence, the Aboriginal Communal Fishing Licence (ACFL) which could be issued to an Aboriginal Community as a legal mechanism for regulation of subsistence or commercial fish harvesting (i.e. Aboriginal Communal Fishing Licence Regulations under the Fisheries Act). The OMNR's approach to issuing ACFL was through negotiated agreements. Agreements have been negotiated with some First Nations in Ontario, listing Sagamok, Serpent River, Mississauga #8, and the Saugeen Ojibway (Saugeen #29 FN and the Chippewas of Nawash Unceded FN) (OMNR 2005b). The OMNR states that the agreements are often the results of many years of negotiation, public consultation and outcry, and conflict between all parties, native and non-native fishers, and Government, however it is not clear if these agreements were renegotiated or are still in place. Additionally, with respect to commercial fisheries, Nipissing First

¹²Do I need a fishing licence if I'm a member of an Aboriginal community? <http://www.ontario.ca/faq/do-i-need-fishing-licence-if-im-member-aboriginal-community>

¹³From the A/OFRC website: <http://www.aofrc.org/>

Nation (NFN) operates a commercial gillnet fishery on Lake Nipissing which it manages independently, as NFN did not accept or negotiate an ACFL agreement. There is some acknowledgement that the OMNR needs to consider current and future FNs harvest when making fish allocation decision to avoid issues with exploitation (OMNR 2012c).

CASE STUDIES

To illustrate the scale of the fisheries and harvested waterways, including the decision making processes, as managed by OMNR, three case studies are presented below. Lake Nipissing is a Specially Designated Water with Aboriginal and non-Aboriginal commercial fisheries, the Great Lakes are managed internationally by Committee, and Fisheries Management Zone 5 in southwest Ontario highlights how fisheries management changes take place at the level of the FMZ.

Lake Nipissing

Lake Nipissing is located within FMZ 11 (Figure 2) and is considered a Specially Designated Water (SDW), a waterway that needs more careful management, planning and monitoring, within the FMZ. At approximately 87, 325 hectares, it is the largest lake in the FMZ, and the 5th largest in the Province. It is surrounded by a population of 75,000 people many are found within the large municipalities of North Bay, West Nipissing, and Callander, and two First Nations communities, Nipissing First Nation and Dokis First Nation (DFN). The Lake is important to both NFN and DFN for subsistence fishing, however the harvest levels are unknown. NFN operates commercial fisheries, a recognized treaty right, for walleye, whitefish, and northern pike (OMNRF 2014).

The recreational fisheries are managed by OMNR. The Lake Nipissing Fisheries Management plan (FMP) is in the process of being developed by the OMNR along with the input from the Lake Nipissing Fisheries Management Plan Advisory Council (LNFMPAC). This FMP addresses the recreational fishery, and not the commercial, but intends to identify areas where OMNR and FNs can collaborate, particularly when the fisheries overlap. The

LNFMPC began as an advisory committee in 2012 and is now a standing committee of 10-15 volunteers from a variety of stakeholder groups and representatives from governmental agencies with an interest in the management of the Lake, including NFN, DFN, FMZ 11 Advisory Council, anglers, tourism outfitters etc.. (OMNRF 2014). The Council was developed to provide advice to OMNR with the development of the future management objectives and strategies (OMNRF 2014).

The fish that are managed in the Lake are walleye, Northern pike, yellow perch, smallmouth and largemouth bass, muskellunge, lake herring and whitefish. Walleye, however, are the most prized fish and are subjected to the most angling pressure, both recreationally and commercially. In the recreational fishery, the catch limit is two fish with a sport licence, and one fish on a conservation licence. These catch limits are unchanged, however there is a new minimum size limit where fish larger than 46 cm are allowed to be retained, previous regulations were no walleye between 40-60 cm (OMNRF 2014).

Lake Nipissing has a naturally reproducing population of walleye, and there is also a scale stocking program cited to be primarily an educational and partnership development tool, although there is apparently no correlation between stocking and angler catch rates, or addressing declines in the Walleye population (OMNRF 2014). As it is a SDW, monitoring and assessment activities take place annually. Walleye fishing on Lake Nipissing was extensive during the 1970s and 1980s and a management recommendation followed in the 1990s, that the level harvested from all fisheries combined be no more than 100,000 kilograms. Despite this cap on harvest, walleye populations declined resulting in further quota reductions in the 2000s to 66,000 kilograms (Figure 6) (OMNR 2012a).

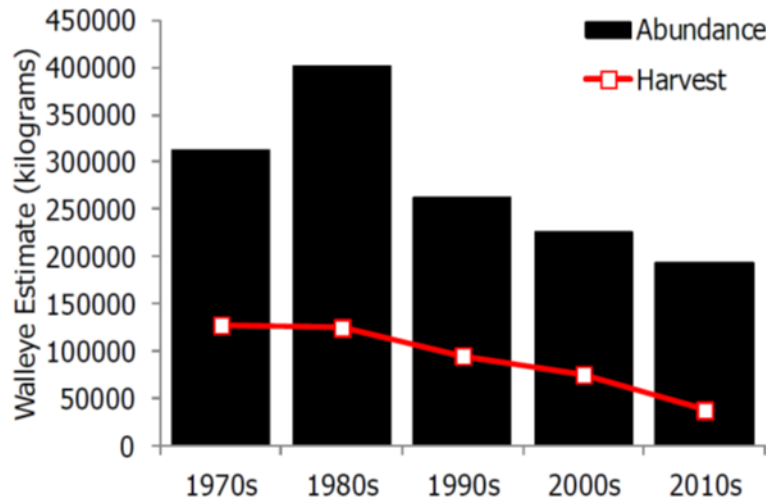


Figure 6: Estimated abundance and harvest level of Walleye in Lake Nipissing by decade (from OMNR 2012a).

With respect to the commercial fishery on Lake Nipissing, conducted with gillnets, the OMNR recognizes the constitutional right of DFN and NFN to fish the lake for food and *R. v. Commanda 1991* recognized NFN's right to commercially fish Lake Nipissing (OMNRF 2014). An Aboriginal Communal Fishing Licence (ACFL) establishing harvest levels, reporting, and net marking was developed by OMNR but not accepted by NFN (Demille and Quinney 2012). Nipissing First Nation established their own Fisheries Laws in 2005, which included establishment of harvest levels in accordance with past harvest levels (DeMille and Quinney 2012). The Fisheries Laws have been amended by NFN as required, such as in 2015 when the season was shortened, in addition to other regulations, in response to declining fish populations (McLeod 2015). There does not seem to be current reporting of catches by NFN to OMNR and therefore data is lacking (OMNR 2012a). The OMNR however is also of the position that the walleye population is stressed and current levels are about half of what it was in the 1980s (Figure 6, OMNR 2012a).

The OMNR acknowledges that it wants to continue to collaborate on monitoring the walleye fishery with the FNs while recognizing the Aboriginal and Treaty rights of both Dokis and Nipissing First Nations to fish Lake Nipissing for sustenance. In addition, *R. v. Commanda 1991* recognized Nipissing First Nation's right to commercially fish Lake Nipissing. Collaboration will foster respect and open and transparent data collection and sharing. Past collaborations during the last Fisheries Management Plan included collaboration between NFN

and OMNR on the 2012 and 2013 surveys and developing the Walleye Management Risk Assessment Model (OMNR 2014b).

Great Lakes

Ontario borders four of the five Great Lakes, Ontario, Erie, Huron, and Superior, and fisheries management is approached collaboratively with the USA. The two countries collaborate on management strategies through The Great Lakes Fishery Commission (GLFC), created by the Convention on Great Lakes Fisheries (1954). The Commission is made up of four Canadians appointed by the Privy Council of Canada, and four from the United States who are appointed by the President of the United States of America. Each Great Lake, Superior, Michigan, Huron, Erie, and Ontario, has a dedicated committee. The overall management of the Great Lakes appears to still be compartmentalized (as opposed to an "ecosystem" approach), where the International Joint Commission and environmental protection agencies are concerned with issues that impact water quality, and the Great Lakes Fisheries Commission and Departments of Natural Resources on both sides of the border are responsible for fisheries. One example of this would be the Great Lakes Water Quality Agreement (2012) and the Great Lakes Strategy (OMNR 2012c) both primarily address water quality for the health of the Great Lakes ecosystems. Because the fisheries rely on healthy waterways, it is assumed that there is some interaction between the two groups of agencies, however it is not clear how this takes place.

The Lake Erie Committee, for example, is comprised of fisheries agencies from Ontario, Michigan, New York, Ohio, and Pennsylvania. The Committee established a set of fish community goals and objectives for the Lake, as per the request of the GLFC to all of its committees, in 2003 (Ryan et al. 2003). The goals and objectives are not explicitly a management plan but to be used to guide management activities, strategies, and research priorities for Lake Erie, such as a strategic plan to rehabilitate Lake Trout (Markham et al. 2008). Lake Erie is the southernmost Great Lake, and like the other lakes, has undergone a large shift since the 1800s due to factors such as overexploitation of species, deforestation of the

watershed, dams, and nitrification. The most notable change has been the loss of indigenous species due to introductions of non-native species (Ryan et al. 2003). According to the Terms of Reference¹⁴, the Committee meets once per year with additional meetings convened by the Chair as needed for additional items. The purpose of the Committee is to develop and coordinate joint projects and programs and to determine sustainable lake-wide harvest allocations for walleye and yellow perch, among other responsibilities. Decision making is achieved by consensus of the membership. In absence of consensus, the reasons behind this are reported in the committee's report to the GLFC, but it is not clear what the GLFC does, if anything, to reach a decision, if one is sought, after this.

With respect to Lake Trout, for example, management decisions and knowledge generation takes place in collaboration, with the United States Geological Survey providing stock assessment and research support for rehabilitation, while DFO provides research support, sea lamprey control, and fish-contaminant testing. Management and regulatory decisions are primarily made by the Lake Erie Committee and are typically based on recommendations provided by the Lake Erie Cold Water Task Group (Markham et al. 2008). There are several agreements and documents governing the Great Lakes ecosystem which are Ontario specific. One such example is the Ontario Great Lakes Strategy (OMNR 2012c), and another is the Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health (COA 2014), between the Federal Government (Environment Canada) and the Province (MOECC). Renegotiated every few years, it outlines how each government division will work collaboratively to support the Great Lakes basin ecosystem. This Agreement facilitates the interaction between the Provincial Ministries and the partners of the Canadian Federal Great Lakes Program (1989) which provides the framework to work to meet Canada's obligations under the Canada-US Great Lakes Water Quality Agreement (1972). Additionally, this agreement, in Annexes 12-14, provides details on how they will engage communities, First Nations, and Métis Peoples, and facilitate participation in the different protection and stewardship activities within the Basin. More specifically, in Engaging First Nations (Annex 13¹⁵), the goals are to collaborate and relationship build with FNs to assist in restoring, protecting and conserving Great Lakes ecosystem health and to enhance understanding for the Great Lakes by

¹⁵See Annex 13 of the COA: <https://ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=E9A42FF1-1>

considering Traditional Knowledge.

Fisheries Management Zone 5

Fisheries Management Zone 5 is found in the Northwest Region, located in the southwest portion of northwestern Ontario (Figure 2 and 7). The management regime across Ontario in general has recently shifted from being focused on individual lakes to making decisions across an entire FMZ (Jackson and Armstrong 2014). The new FMZ incorporated at least parts of five previous plans and addressed the lack of objectives for the entire FMZ, that is, at the landscape level (OMNR 1997, OMNR 2005a). In FMZ 5, fishing regulations have been relatively unchanged since 1999, but in 2013, planning began for regulatory change in the walleye and northern pike recreational fisheries and the need for science-based objectives to guide decision making and management became obvious. The FMZ Planning Council began the stages initiating a Fisheries Management Plan founded by long-term objectives for the fisheries.

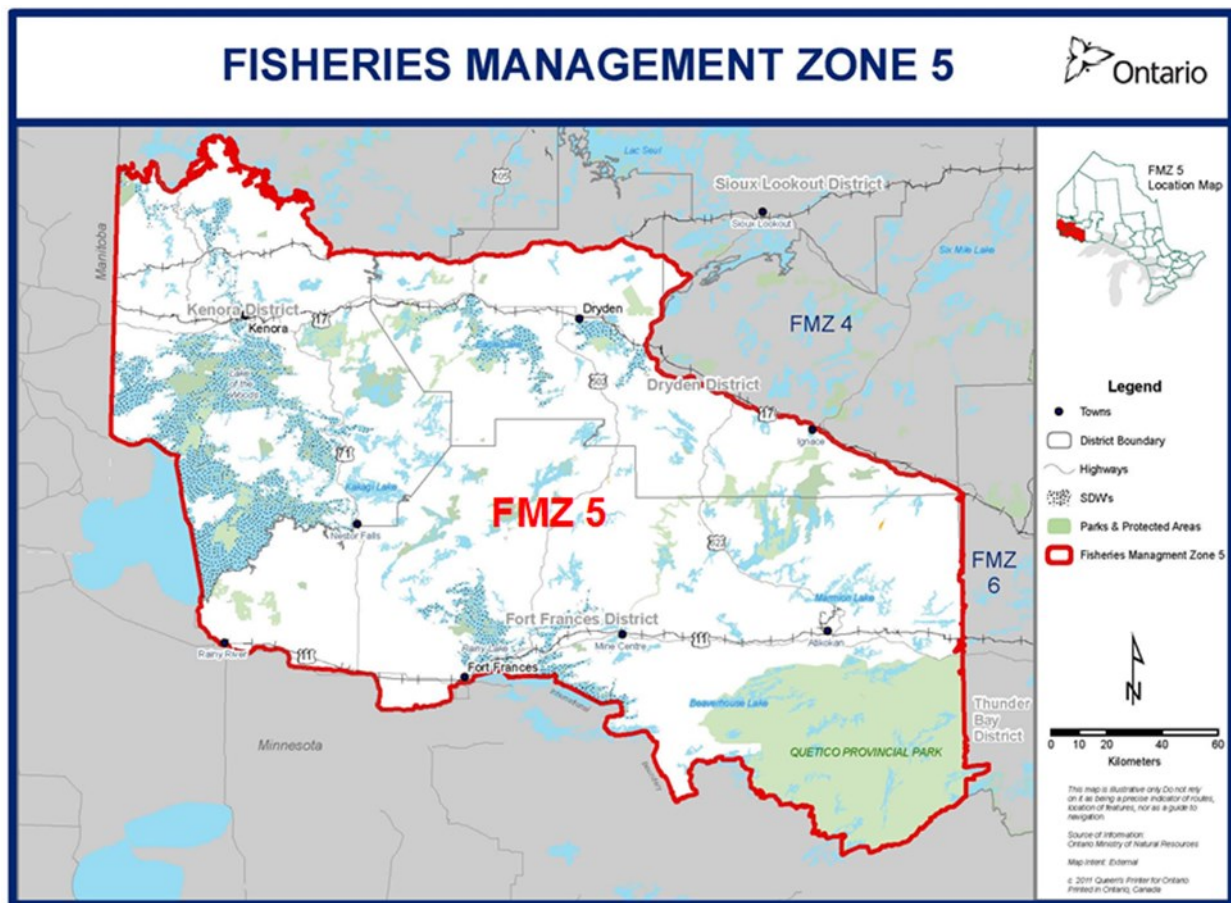


Figure 7: Fisheries Management Zone 5 (from Jackson and Armstrong 2014)

In 2010, Fisheries Management Zone 5 was assessed using the BROADSCALE Monitoring program (Sandstrom et al. 2013), implemented in the Province in 2008 (OMNR 2008). With the new data and FMZ planning being initiated in Ontario, the FMZ planning council set out to incorporate the BROADSCALE Monitoring data to support changing the walleye and pike regulations (Sandstrom et al. 2013). The council set out to answer two basic questions, (1) "What do the populations look like?", and (2) "Are the fish populations healthy?" (Jackson and Armstrong 2014). Public and Aboriginal consultation of the Fisheries Management Plan occurred in three stages (OMNR 2014b):

Stage 1: Invitation to participate: February 2012–March 2012.

Stage 2: Review of the draft Fisheries Management Plan for FMZ 5: October 15–Nov. 30, 2012

Stage 3: Posting of Final Plan on Environmental Registry: March 2014

The FMZ 5 Advisory Council, composed of a diverse group of local stakeholders and with Aboriginal Community observers, as they are consulted outside of the Advisory Council meetings (ie. Nation-to-Nation approach) but are privy to the discussions, provided valuable insight and information throughout all stages of plan development.

Table 2: Sport fish species composition of FMZ 5 lakes (note: only includes 1564 lakes with species composition information; total lake area = 455, 450 ha) (from OMNR 2012b).

Species	% lakes larger than 10 ha.	% of lake area
Northern pike (<i>Esox lucius</i>)	75	89
Walleye (<i>Sander vitreus</i>)	52	66
Lake trout (<i>Salvelinus namaycush</i>)	36	65
Smallmouth bass (<i>Micropterus dolomieu</i>)	36	62
Lake whitefish (<i>Coregonus clupeaformis</i>)	23 (likely an underestimate)	58
Muskellunge (<i>Esox masquinongy</i>)	6	18
Largemouth bass (<i>Micropterus salmoides</i>)	6	12
Black crappie (<i>Pomoxis nigromaculatus</i>)	6	10

In FMZ 5, most of the fishing effort is for walleye however fishing for pike is second; favoured by non-residents due to pike's aggressiveness while biting the line (OMNR 2014b).

Using pike as an example, pike is widely distributed around Ontario and also in FMZ 5 (Table 2). They are found in a wide variety of lakes, however not all lakes are able to sustain large pike; larger, deeper lakes typically have lower pike abundance but larger pike (OMNR 2014b). These large pike are important for trophy angling but also for reproduction as most large pike are female (Jackson 2011). With respect to angling regulations, there have been some changes over time. Prior to 1989, there was a possession limit of 6 pike but no size restrictions. While from 1989 to 1999, the limit was 6 pike with one of those fish allowed to be over 70 cm (OMNR 2014b). In 1999 onward, the limit was reduced to 4 fish, with a protective slot of 70-90cm, and only 1 of those fish was allowed to be over 90cm (OMNR 2014b). The goal of the 1999 management decision was to allow for trophy fishing but reduce the pressure on large pike to increase recruitment to the > 90cm size class.

Prior to the Broadscale Monitoring program, the status of the pike population was based primarily on netting data from 1993-2009 (Sandstrom et al. 2013), and the data indicated that the management measures beginning in 1989, i.e. only 1 fish 70cm or larger, was successful at allowing that proportion of large pike to increase, including the protective slot (Jackson 2012). The current specific objectives set for FMZ 5 (Table 3) are: (1) Maintain current overall northern pike abundance in FMZ 5, (2) Maintain large size >70cm/27.5" northern pike in population, (3) Manage pike size distribution to provide anglers with trophy angling for pike >90cm/35.5" in those lakes that can provide such opportunities, (4) Provide anglers the opportunity to consume the preferred size of northern pike (60-80cm), and (5) Maximize pike angling opportunities (OMNR 2014b).

As mentioned above, in an effort to lessen fishing pressure on large pike in the 1990s, a regional level change was made ad-hoc, in absence of science, to implement the protective slot of 70-90cm. Ultimately this regulation was accepted by non-residents (tourists), as increasingly anglers are becoming more knowledgeable about the importance of large fish. However it was viewed as being overly restrictive by the resident fishers as their preferred size for consumption is near 70 cm and smaller pike are bony and hard to clean. In response to this, the anglers began targeting more walleye, adding pressure on those populations. The FMZ 5 Advisory Council met with stakeholders and presented the option of changing the size limit to no fish larger than 75 cm (or 29.5") as the best compromise to maintain the biomass of large fish (with acknowledgement that a decline would result) and provide opportunity for anglers to harvest

their preferred pike for consumption (OMNR 2014b). From here, the OMNR biologists ran some analyses, and surmised that an increase to 75 cm would give anglers a fish which was approximately 2 more kilograms and actually was a good compromise for all involved, including the pike. The current harvest regulations are 4 fish, none being > 75cm, and the season continues to be open all year (no change) (OMNR 2014b). Other management actions (Table 3) included providing education around techniques for cleaning pike for consumption with the goal of increasing the use of smaller pike for food, and proposing monitoring activities, i.e. the Broadscale Monitoring Program, to assess whether the management actions were achieving the objectives (OMNR 2014b).

Table 3: Summary of FMZ 5 Northern Pike Management Objectives and Management Actions (from OMNR 2014b)

Objectives	<p>Biological</p> <ol style="list-style-type: none"> 1) To maintain current overall northern pike abundance in FMZ 5. 2) To maintain large size northern pike in population (>70cm). <p>Social</p> <ol style="list-style-type: none"> 3) Manage pike size distribution to provide anglers with trophy angling for pike>90cm/35.5” in those lakes that can provide such opportunities. 4) Provide anglers the opportunity to consume the preferred size of northern pike. 5) Maximize pike angling opportunities within sustainability of population.
Indicator	<ol style="list-style-type: none"> 1) Pike Abundance Indicator: Area weighted catch per unit of effort (#/large mesh nets) of northern pike from fixed Broadscale Monitoring lakes containing northern pike (except QPP). 2) Large Pike Indicator: <ol style="list-style-type: none"> a) Proportion of northern pike larger than 70 cm caught in large mesh nets from Broadscale Monitoring trend lakes containing northern pike (all lakes combined except Quetico Provincial Park, see OMNR 2006). b) Proportion of northern pike larger than 90 cm caught in large mesh nets from Broadscale Monitoring trend lakes containing northern pike (all lakes combined except Quetico Provincial Park). 3) Trophy Pike Opportunities Indicator <ol style="list-style-type: none"> a) Proportion of lakes with northern pike larger than 90cm from Broadscale Monitoring trend lakes containing northern pike (except Quetico Provincial Park). b) Regulation provides protection of trophy size fish and opportunity to catch trophy sized fish. 4) Ability to harvest preferred size pike indicator <ol style="list-style-type: none"> a) Regulation allows opportunity to harvest pike in preferred range between 60 and 80 cm. 5) Pike Angling Opportunity Indicator <ol style="list-style-type: none"> a) Length of pike fishing season

Benchmark (i.e. sustainability line, current value, etc...)	1) 2010 median catch/net (2 gangs) – 0.8 pike/net (range from 0.4 – 5.2) 2 a) 2010 - 16% of all pike captured in FMZ 5 larger than 70cm 2 b) 2010 - 3% of all pike captured in FMZ 5 larger than 90cm 3 a) 2010 - 34% of Broadscale Monitoring lakes caught at least 1 pike larger than 90cm 3 b) - ability of regulation to protect current and future trophy size pike 4) - ability of regulation to allow harvest of pike between 60 cm and 80 cm 5) Currently can angle for pike 365 days/year
Target (interim targets)	1) Green/good- median catch ≥ 0.8 pike/net Yellow/caution – median catch 0.6-0.8 pike /net; Red/Fail – median catch < 0.6 pike/net 2 a) Green/good- $\geq 15\%$ of pike captured larger than 70cm Yellow/caution – 10 -15% of pike captured larger than 70cm Red/Fail – $< 10\%$ of pike captured larger than 70cm 2 b) Green/good- $\geq 3\%$ of pike captured larger than 90cm Yellow/caution – 1.5-3% of pike captured larger than 90cm Red/Fail – $< 1.5\%$ of pike captured larger than 90cm 3 a) Green/good- $\geq 35\%$ of lakes with pike > 90 cm; Yellow/caution - 25-35% of lakes with pike > 90 cm; Red/Fail - $< 25\%$ of lakes with pike > 90 cm 3 b) – meet indicator 4) – meet indicator 5) – pike angling season to remain at 365 days/year
Date	2020 for all targets
Management Actions	1) 0 over 75cm (29.5”) size limit, Limits S-4/C-2; Season: open all year 2) Maintain conservation limits for non-residents camping on Crown land 3) Education around cleaning pike for consumption.
Monitoring Strategy	Broadscale Monitoring of FMZ 5 to assess northern pike objective achievement at 5 yr cycle (next survey scheduled for 2015).

The FMZ has also established overarching objectives for commercial fisheries management that are in line with the Province's goals and objectives, specifically (OMNR 2014b):

“Commercial fisheries management in FMZ5 will support commercial fishing opportunities in a manner that:

- 1) Meets Aboriginal and treaty rights obligations and contributes to the social and cultural welfare of all the people of Ontario both now and in the future.
- 2) Supports an industry with harvest levels that sustain healthy fish populations over the long term within the zone.
- 3) Addresses current biological, social, economic and human health concerns when considering new commercial food fishing opportunities.

4) Promotes the development and use of ecologically sustainable and ethical fishing practices and considers Canada Food Inspection Agency standards and regulations.”

To meet the objectives, they propose to work together with commercial fish partners to use both science and traditional knowledge to assess the ecosystem and harvested species and apply the knowledge to decision making. They also intend to develop best management practices to reduce incidental bycatch and promoting ecologically and socially acceptable practices, among others (OMNR 2014b). The FMZ Advisory Council sought the involvement of the Aboriginal Community at all stages of development of this Fisheries Management Plan. Two members were involved as observers. Letters were sent to all Aboriginal communities to advise them of the initiation of the Advisory Council, at the Invitation to Participate stage, prior to the draft plan to share thinking to date and at draft plan review stage. Meetings were held with the Fort Frances Chief Secretariat, Grand Council Treaty 3, and commercial fishermen from Onigaming First Nation, as FNs seek to be met Nation to Nation (OMNR 2014b). The outcomes of these interactions were not reported nor if the collaborative approach of using science and traditional knowledge in decision making is taking place.

The FMZ shares several lakes, rivers, and species-specific fish stocks with the United States at the border with Minnesota (OMNR 2012). Collaborative work typically involves Lake of the Woods, Rainy River, and South Arm of Rainy Lake (i.e. SDWs), however there are other shared populations within the FMZ that are considered separately. Some fish within the Lake of the Woods are cooperatively managed through the Ontario-Minnesota Fisheries Committee, comprised of two senior resource professionals from OMNR and two from the Minnesota Department of Natural Resources (MN DNR). Established in 1983, their Terms of Reference were revised in 2000. They rely on scientific advice and research from both agencies as well as staff from Voyageurs National Park in Northern Minnesota. Management is a landscape approach and both agencies must be in agreement that the lake is overharvested. Further, as issues arose, sub-committees were established e.g. Lake Sturgeon Management. The International Committee has prepared the “Ontario-Minnesota Boundary Waters Fisheries Atlas for Lake of the Woods, Rainy River, Rainy Lake, Namakan Lake and Sand Point Lake” in 1984, 1992, 1998, and the current version in 2004 (OMNR and MDNR 2004) which provides the necessary background information, including socio-economic information and data from monitoring

programs, for joint fisheries management decision making (OMNR 2012c). For an example of how the management takes place for these shared lakes, the Minnesota portion of the Lake of the Woods and the lower extend of the Rainy River, are the responsibility of the MN DMR Area Fisheries Managers in Baudette, MN (IJC 2014). The upper part of Rainy River is the jurisdiction of the MN DMR in International Falls, MN. Lake sampling takes place using their specific protocol (IJC 2014).

DISCUSSION

Ontario fisheries management and decision making takes place under the Ontario Ministry of Natural Resources and Forestry with minimal interaction with the Federal Department of Fisheries and Oceans. The knowledge systems and information utilised in decision making is largely scientific however, it has only been within the last decade that fisheries management planning with explicit scientific objectives has taken place. There is evidence of ad-hoc decision making during the lake-by-lake management paradigm and relatively short-term planning, with the exception of the Great Lakes where there is evidence of longer-term management plans and activities. While commercial and recreational fisheries continue to be profitable and active, Ontario fisheries managers have several challenges to consider, such as incorporating habitat degradation, over fishing, declining water quality, invasive species, and climate change, across International, Provincial, and Territorial borders, into decision making.

The three case studies highlight the complexity and diversity associated with managing inland fisheries in Ontario. In the Lake Nipissing example, the area is surrounded by a relatively large population, including two First Nations, Nipissing First Nation (NFN) and Dokis First Nation (DFN). While OMNR manages the highly lucrative recreational fishery, pursued by both tourists and residents in the area, the commercial fishery on Lake Nipissing reflects the recognition of the courts in *R. v. Commanda 1991* for the NFN commercially fish Lake Nipissing. This is in addition to the constitutional right of DFN and NFN to fish the lake for food, social and ceremonial (FSC) purposes. While a mechanism exists for OMNR to issue an Aboriginal Communal Fishing Licence (ACFL) establishing harvest levels, reporting, and net marking, this was not accepted by NFN, resulting in the establishment of NFN's own Fisheries

laws, governing harvest levels, length of fishing season and the imposition of other regulations, in response to declining fish populations. Given the diversity of users, rules and reporting requirements among the different parties involved in managing the fisheries, an outstanding challenge for Lake Nipissing is the lack of accurate shared data from the commercial, recreational and FSC fisheries on which effective management decisions may be based.

The Great Lakes case study draws attention to the multiple jurisdictions at the national, provincial and state levels involved in managing the transboundary water bodies that comprise the Great Lakes. Despite the establishment of a joint bilateral mechanism between Canada and the USA, the overall management of the Great Lakes appears to lack integration across the agencies responsible for water quality with those responsible for fisheries. Given the endorsement of both countries in adopting an ecosystem approach, considerable effort needs to be made in putting this integrated approach into practice. It is noted that some agreements, notably the Canada Ontario Great Lakes Agreement on Water Quality and Ecosystem Health, specifically addresses the need to collaborate and relationship build with FNs to assist in restoring, protecting and conserving Great Lakes ecosystem health and to enhance understanding for the Great Lakes by considering Traditional Knowledge. However, there appears to be little evidence of incorporating traditional knowledge into decision making affecting either transboundary fisheries or water quality management.

The case study relating to Fishery Management Zone (FMZ) 5 demonstrates yet another spatial scale for fishery management in Ontario as the management regime across the province shifted from being focused on individual lakes to making decisions across an entire FMZ. The creation of the 20 FMZs in 2005 were in response to a need to better incorporate angler movement patterns, ecology, fishing pressure, and access roads when making decisions at the district level and the development of district management plans. In addition to the regulatory streamlining and fisheries management planning, other key components were to increase public engagement, and to introduce a Broadscale fish community Monitoring Program in 2008. It would appear that among the three case studies, managing by FMZ represents the best approach for implementing an ecosystem approach to fisheries within the inland region. However, it needs to be reiterated that, given the differing jurisdictional authority in different parts of the FMZ, management decision making for the entire FMZ can be complicated. Nonetheless, efforts are directed at long term strategic planning, complemented by species specific

operational rules for harvesting that are consistent with provincial and the state objectives. To meet the objectives, FMZ Advisory Council recognized the need to work together with commercial fish partners to use both science and traditional knowledge to assess the ecosystem and harvested species and apply the knowledge to decision making, specifically to the development of the districts Fisheries Management Plan. As noted in the description of the case study, the participation of First Nations in this process was encouraged but the outcomes of these interactions were not reported nor if the collaborative approach of using science and traditional knowledge in decision making is taking place.

The current Broadscale Monitoring Program (Sandstrom et al. 2013) and Fisheries Management Planning exercises were created for a more ecosystem-based, Landscape Approach to management, i.e. managing for a species across a FMZ. While OMNR has recently adopted these new methods to monitor and manage fisheries using a science-based approach, managing a species by landscape suggest managing species using an average across an FMZ. One drawback to this approach is that occasionally a lake may do poorly in a given zone but this may be missed and not addressed as a result of the methodology being used. While past management was focused on managing on a lake-by-lake, it is worth noting however it did have some successes, for example the pike management in FMZ 5. Management of the Great Lakes watersheds still appears to take place in silos, where one suite of agencies manage issues of water quality, and others are responsible for fisheries. Ontario, with their new Broadscale Monitoring Program, has recently begun to better link the water quality work of the MOECC with the fisheries monitoring and management of OMNR.

CONCLUSION

While there have been recent changes in the approach to fisheries management and decision making, and efforts to streamline the processes, there remain many guiding documents and a nested regulation framework of regions, ecozones, districts, FMZs, and SDWs. There are additional layers when Provincial, International, and Park (Provincial and National) boundaries with their own strategies and boards are considered. This is all in addition to building Nation-to-Nation relationships with First Nations. From an observer's point of view, it is challenging to understand exactly what is happening on the water with respect to management and how these

different levels of management might collaborate, intersect, or influence one another. For example, do the International Boards influence the policy and decision making for other water bodies and watersheds?

As previously mentioned, the OMNR and FMZs are working to better integrate science into the management and policy frameworks, namely via the Broad Scale Monitoring Program (Sandstrom et al. 2013) established to support the science and assessments. This program has been a recent development, with the baseline sampling being in from 2008-2010, and the first repeat sampling of the 5-year cycle has just begun. A note however, that the 5 year monitoring cycle and management plans is similar to how DFO revises its assessments. There is acknowledgement and engagement of First Nations People and traditional knowledge however it is not clear how much alternative knowledge systems have influence on current operations. OMNR has the will to manage proactively and have had an involved and engaged process to create the Fisheries Policy (OMNR 2015), and while it builds on past policies and strategies, it is still in its infancy.

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