Wildlife & Fisheries Branch Report 2017 – 01

Waterhen Lake

Fisheries Management Plan

Geoff Klein & William Galbraith

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FOREWORD

The purpose of the Waterhen Lake Fisheries Management Plan is to identify the main objectives and requirements for the commercial fishery, as well as the management measures that will be used to achieve these objectives.

This document also serves to communicate the basic information on the fishery and its management to Manitoba Sustainable Development staff, members of the Lake Waterhen Fishermen's Association, Skownan First Nation and other stakeholders/ resource users.

This management plan provides a common understanding of the basic "concepts" for the sustainable management of the fisheries resource.

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1. Introduction

The Waterhen Lake Fisheries Management Plan was developed to effectively manage the fisheries resource of Waterhen Lake. The plan sets out an approach to ensure the resource is protected and conserved, provides social/economic benefits to local communities, and ensures the long-term sustainability of the fisheries resource.

The plan will be reviewed and evaluated on an annual basis by Manitoba Sustainable Development (Wildlife and Fisheries Branch); Lake Waterhen Fishermen's Association; and if applicable, Chief and Council of the Skownan First Nation; and other pertinent resource users/stakeholders, such as recreational angler groups/ associations, commercial tourism lodge operators and outfitters, etc.

The plan integrates applicable federal and provincial legislation, policies and regulations, and recognizes existing constitutionally protected Aboriginal fishing rights to domestic/subsistence fishing, and by-laws under the Constitution of the Lake Waterhen Fishermen's Association.

Manitoba Sustainable Development (Wildlife and Fisheries Branch) retains the right to make decisions in the best interest of conservation and the fishery resource.

2. Fishery Objectives

The mandate of Manitoba Sustainable Development (Wildlife and Fisheries Branch) is to meet its Public "Trust" obligations by ensuring the rational, orderly use of our fisheries resource within the resource's capacity to produce harvestable surplus. In achieving this mandate the goals are to:

- ensure "No Net Loss" of quality and quantity of fish habitats;
- ensure that adequate supply exists to meet Constitutional obligations for Indigenous peoples to fish for food;
- have sustainable community supported fishery management strategies;
- provide a diversity of angling opportunities;
- provide consistent, professional, high quality service to our clients and recommendations to elected decision makers; and
- facilitate public participation in resource management and decision making process.

Manitoba Sustainable Development (Wildlife and Fisheries Branch) will strive to manage the Waterhen Lake commercial gillnet fishery based on the following objectives:

1. The fishery must be conducted in a manner that does not lead to over-fishing or depletion of the harvested populations and, for those populations that are depleted the fishery must be conducted in a manner that demonstrates activities leading to stock recovery.

2. Fishing operations (commercial, recreational and domestic/subsistence) should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including

habitat and associated dependent and ecologically related species) on which the fishery depends.

3. The fishery is subject to an effective management system that incorporates applicable federal and provincial legislation, policies and regulations and operational frameworks that require use of the resource to be responsible and sustainable.

To achieve and maintain these objectives, decisions made under this management plan will be based upon the following principles:

- **Fish Habitat -** Healthy aquatic ecosystems / fish habitat is a prerequisite to healthy fish stocks.

- **Public Trust -** Fish stocks are "**natural capital"** and represent a public "trust" managed by Manitoba on behalf of all Manitobans.

- **Biological sustainability** – Sustainability of fish stocks is paramount for long-term industry viability.

- **Pre-cautionary Principle -** Fish management decisions and actions, whose impacts are not entirely certain but which, on reasonable and well informed grounds appear to pose serious threats to either the economy, the environment, human health or social well being will be anticipated, mitigated and prevented as avoidance of serious threats to the fishery is less costly than rehabilitating a collapsed fish stock.

- **Integrated Management -** Consultation with government agencies, development proponents, fishers and the public will enhance awareness and understanding and the efficiency of fisheries management.

- **Tenure -** Individual allocations and tenure of access right will reduce over-capitalization and facilitate fishery rationalization.

- **Fairness -** Where adjustments to tenure or reallocation to another use or user is necessary, a fair process will facilitate transition to a desired state.

3. Priority of Allocation

Without healthy fish stocks, social, cultural and economic benefits accrued through harvesting activities may not be achieved and challenge the long-term sustainability of the fisheries resource. Therefore, sound fisheries management is needed in allocation decisions with conservation of these resources being the primary objective.

Allocation of provincial fisheries resources needs to recognize and consider many factors in balancing and determining priorities. While under some situations this may require reductions in harvesting activities by specific resource users, other situations may warrant a more equitable distribution. During the decision-making process government is obligated to give preference to

Indigenous rights holders but must take into consideration a measured approach that may require limits on harvesting activities if there is legitimate justification.

Recognizing the history and economic importance of the various fisheries sectors to other groups in society may represent valid reasons for allowing broader access to the resource and for placing some measure or restriction on Aboriginal harvesting rights. The situation in each case is to ensure that Aboriginal interests are given first priority and any measures applied to those rights be justified on the basis of important social policies.

4. Governance

4.1. Legislation/Regulations/Polices

The Government of Canada, under the authority of the *Fisheries Act (Canada),* retains ultimate legal authority and responsibility for fish and fish habitat conservation matters. However, the daily management and administration of federal fisheries regulations has effectively been delegated to Manitoba officials: The Minister of Sustainable Development, the Director of the Wildlife and Fisheries, and fishery officers employed by Manitoba.

Under the *Manitoba Fishery Regulations (Canada),* the Minister of Sustainable Development and Director of the Wildlife and Fisheries Branch have been given the authority to vary close times, species, quotas and gear types established under those regulations.

Manitoba, under *The Fisheries Act (Manitoba*), maintains constitutional jurisdiction to make laws relating to the use and allocation of fish in Crown (Manitoba) waters as part of the public property. This includes the right to determine who can fish on provincial Crown land (licensing), what conditions may be included in a licence, and what fee would be paid for the licence. This authority is exercised under *The Fisheries Act of Manitoba* and regulations to that Act.

Manitoba fisheries management activities are undertaken consistent with departmental policies, strategies, and directives in accordance with specific issues, opportunities and/or priorities.

In Manitoba, under the *Freshwater Fish Marketing Act (Canada*), the Freshwater Fish Marketing Corporation has exclusive jurisdiction over the export and interprovincial sales of commercially harvested fish.

In addition to federal and provincial legislated regulations, the Lake Waterhen Fishermen's Association has developed a series of by-laws pertaining to the commercial net harvest within the lake.

4.2 Enforcement / Compliance

Enforcement on Waterhen Lake with respect to fishery activities, inclusive of the commercial, recreational, and subsistence fisheries, is the responsibility of Manitoba Sustainable Development.

While Manitoba Sustainable Development is responsible for ensuring compliance with fishing activities, the federal Department of Fisheries and Oceans is the responsible body with respect to ensuring the sustainability and ongoing productivity of commercial, recreational and aboriginal fisheries. This is done by ensuring no person can carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support that fishery. The Department of Fisheries and Oceans has several provisions that allow for enhanced protection of important fisheries including fines and penalties for offences, inspector powers and a "duty to notify" which requires a person whose actions harm fish habitat to report it and take corrective measures.

4.3 Precautionary Approach

Management decisions and actions, whose impacts are not entirely certain but which, on reasonable and well informed grounds appear to pose serious threats to either the economy, the environment, human health or social well being will be anticipated, mitigated and prevented as avoidance of serious threats to the fishery is less costly than rehabilitating a collapsed fish stock.

Examples where Manitoba Sustainable Development (Wildlife and Fisheries Branch) has employed a precautionary approach in its decision-making process and management actions are as follows:

- *Exclusion of Channel Catfish for commercial harvest under Special Dealers Licences* – the Freshwater Fish Marketing Corporation agreed not to include Channel Catfish (*Ictalurus punctatus*) in the Special Dealer's Licence, which would allow for the purchasing and selling of Channel Catfish on a commercial basis, until an assessment of possible impacts on the fishery resource have been considered (case by case review).

- *Lake Winnipegosis experimental spring mullet season* – Manitoba, with support from the majority of commercial fishers, decided not to licence a spring mullet (*Catastomus commersoni*) harvest on tributaries of Lake Winnipegosis in the spring of 2004 due to concerns that the season posed a serious disruption to the natural Walleye (*Sander vitreus*) spawning run and recruitment success; as well as, impacting the overall sustainability of the lake's ecosystem.

- *Lake Winnipegosis 76 mm mesh perch fishery* – in 2008/2009 the 76 mm mesh Yellow Perch (*Perca flavescens*) fishery was discontinued as part of the Manitoba's commitment to the rehabilitation of the Lake Winnipegosis Walleye stock; as well as, supporting efforts to help address Walleye recruitment challenges and assist in the long-term recovery towards a sustainable fishery.

- *Lake Manitoba fall open water commercial fishing season proposal* – in 2008, Lake Manitoba Commercial Fisherman's Association proposed a number of recommendations including the establishment of a fall open water commercial fishery, re-assignment of existing Walleye quota, and other administrative processes. In response, Manitoba began a process to develop a fisheries management plan that ensures the long-term sustainability of the fisheries resource for all resource users and stakeholders.

- *Extension of the Lake Manitoba winter fishing season* – in 2010, there was a request made by commercial fishers for a winter season extension from March 15th to March 31st for the south basin of Lake Manitoba. The request was declined because of ongoing concerns about spawning stock resource conservation (primarily pre-spawn Walleye); the need to involve other stakeholders in lake management decisions; and the lack of a fisheries lake management plan.

5. Overview

5.1 Location

Waterhen Lake is located between Lake Winnipegosis and Lake Manitoba in the province of Manitoba (Appendix 1).

The lake is approximately 34 km long and 8 km wide, with water depths ranging from 1 to 4.4 m. In general the lake is shallow with an average depth of 3.7 m. Lake Winnipegosis empties into Waterhen Lake through both the Little Waterhen and West Waterhen rivers. Waterhen Lake then drains southward through the East Waterhen River into Lake Manitoba.

5.2 Participants

5.2.1 Communities

There are three communities located on or near Waterhen Lake. These include:

- Skownan First Nation located on the south shore of Waterhen Lake. The First Nation, as of March 2014, had a total registered population of 1,292, of which the total on-reserve population was 709 residents.
- The community of Waterhen is located on the east shore of the Waterhen River midway between Waterhen Lake and Lake Manitoba and has a population of 166 people year-round and 100 additional people throughout the cottage season.
- The community of Mallard located on the south-east end of Waterhen Lake has, as of November 2011, a population 150 residents.

5.2.2. Sustenance fishers

Sustenance fishing occurs on the lake through constitutionally protected Indigenous treaty fishing rights.

5.2.3. Commercial fishers

In order to participate in the commercial fishery individuals are required to be members of the Lake Waterhen Fishermen's Association. The Association operates within the bounds of a series of by-laws which limit the number of commercial fishers to a maximum of 22 licence holders. The Association supports a number of fisheries enhancement activities within the surrounding area through a financial check off system.

5.2.4. Commercial Tourism

There are four (4) commercial tourism lodge / outfitting operations that offer recreational angling opportunities in the area, primarily on the connecting tributaries of the Little Waterhen, East and West Waterhen rivers. These are as follows:

- *Harvest Lodge* – located on the Waterhen River between Waterhen Lake and Lake Manitoba.
- *Cat Eye Outfitters* – offers guided angling adventures in lakes, rivers and reservoirs throughout Southwestern Manitoba, including the Little Waterhen, East and West Waterhen rivers.
- *South Shore Lodge* – located on Lake Winnipegosis, the licence permits operator to offer angling service on the Waterhen River system.
- *SKO Outfitting* (Skownan First Nation Development Corporation) – offers guided angling adventures on the West Waterhen River, East Waterhen River and Waterhen Lake.

5.2.5. Recreational Anglers

Recreational fishing activities occur throughout the year contributing to the local economy. Most of the activity occurs during the open water season in the adjacent rivers.

Under Manitoba Angling Regulations, Waterhen Lake is part of the Southern Division and current General Limits and Southern Division Regulations apply. There are no special regulations for Waterhen Lake.

5.3 Type(s) of Fisheries

Waterhen Lake is classified as a multi-use fishery consisting of Indigenous domestic harvest, commercial gill netting, and recreational angling.

Domestic harvest by Indigenous communities in the area occurs throughout the year. However, the level of harvest by sustenance fishing is unknown.

There are two types of commercial fisheries on Waterhen Lake:

- a limited entry winter commercial fishery (maximum 22 fishers) using gillnets subject to harvest control rules (i.e. quota, seasons, and gear); and
- a year-round carp/sucker gillnet fishery subject to gear restrictions.

Recreational angling also occurs but is confined mainly to the tributaries of the lake (Little Waterhen, East Waterhen and West Waterhen rivers). The level of recreational harvest in unknown however, provincial angling regulations apply.

5.4 Commercial Fishing

5.4.1. History

Over the years there have been several management changes related to mesh sizes, quotas and commercial fishing seasons (Appendix 2).

- *Mesh Size*:

Historically, the minimum allowable mesh size of gillnets used on Waterhen Lake ranged between 102 mm and 108 mm. In 1992, however, a 76 mm experimental winter fishery was created to catch Yellow Perch and remove small Northern Pike (*Esox lucius*). The rationale for this decision was based upon the fact that catches of Yellow Perch in a 102 mm mesh gillnet are low since the largest Yellow Perch are too small to be recruited into a 102 mm mesh gillnet in large numbers. Furthermore, this experimental fishery was seen as a way to allow fishers to evaluate the potential of a Yellow Perch fishery on Waterhen Lake which had provided additional economic benefits to fishers on other lakes, as well as to take advantage of a market demand for smaller sized Northern Pike through the Freshwater Fish Marketing Corporation.

In 1994, the 76 mm winter fishery was discontinued because of concerns over the harvest of small Walleye. Subsequently, the minimum allowable mesh on Waterhen Lake was reduced from 102 mm to 96 mm as an acceptable adjustment for removing the smaller 76 mm mesh experimental Yellow Perch fishery.

A request from fishers was made in 1996 to again allow the use of the 76 mm mesh on Waterhen Lake as Yellow Perch were present in large numbers and Walleye catches had decreased. While a 76 mm Yellow Perch fishery was authorized under a *Commercial Fishing Season Variance*

(CFSV) that year, and again in 1997, 1998, 1999, and 2001, a number of management measures designed to protect Walleye stocks were also implemented:

- lake zoning that precluded the use of 76 mm mesh nets from designated areas of the lake; and,
- establishment of a 10 % tolerance limit on the number of Walleye harvested.

Since 2001, however, no 76 mm fishery has been authorized on Waterhen Lake and the minimum allowable mesh size of gillnets has remained at 96 mm.

During the 2013/2014 commercial fishing season a maximum mesh size regulation of 114 millimetres was implemented on Waterhen Lake. This management action was taken in accordance with the application of the harvest strategy for Walleye as established under the Lake Waterhen Fishery Management Plan.

Index netting from September 2014 indicated harvest control measures for the 2014/2015 winter commercial fishing season to be a minimum mesh size of 95 mm (3 ¾-inch) and a maximum mesh size of 114 mm (4 ½-inch). Yardage was not to exceed 50 nets per gang.

- *Quota*:

Prior to 1979, a lake quota of 45,360 kg comprised of Walleye, Northern Pike and Sauger (*Sander canadensis*) existed on Waterhen Lake. In 1972, however, the quota was reduced to 34,020 kg based on the outcomes/conclusions from a departmental survey (1971) to determine theoretical fish production capacity. The survey included a review of annual commercial production from 1963 to 1972, annual domestic use, local sales, loss to spoilage, and angler harvest.

In 1980, following a request from commercial fishers and the Skownan First Nation Band Council to address "high grading", Northern Pike and Sauger were removed from the lake quota leaving only Walleye as the quota species. To reflect the removal of these species from the quota, the Walleye quota was adjusted to 27,300 kg.

Since 1980, the Walleye quota on the lake has changed three times. In 1983 based on departmental stock assessments the Walleye quota was raised to 30,900 kg. Subsequently in 1987 the Walleye quota was increased to 36,300 kg. During the 2012/2013 commercial fishing season only, the lake quota was reduced from 36,300 kilograms (round weight) to 34,600 kilograms (round weight). This management action was taken in accordance with the application of the harvest strategy for Walleye as established under the Lake Waterhen Fisheries Management Plan.

- *Season*:

The commercial gillnet fishery on Waterhen Lake has been predominantly a winter fishery. Historically, the winter commercial fishing season was open from mid-November until mid-February. In the 1950s, however, the commercial fishing season was extended into mid-March.

Throughout most of the 1960s, the commercial fishing season commenced on the first day after November 1st that ice made and remained opened until March 10th. In the late 1960s and early 1970s, the end of the fishing season was extended to March 31st. Since 1971 up to the present day, the winter commercial fishing season has been open from '*when ice makes on or after November 1st to March 31st*'

The 76 mm winter fishery, when authorized, operated from mid to late January until the end of February or mid-March.

In 2002, a Common Carp (*Cyprinus carpio*) and sucker (Moxostomos and Catostomus species) fishery was established on Waterhen Lake. The season is closed from *October 30th to November 1st* with a minimum allowable mesh size of not less than 203 mm.

During the 2012/2013 commercial fishing season, in response to the reduction in the lake quota resulting from the application of the harvest strategy for Walleye as pursuant to the Lake Waterhen Fishery Management Plan, the fishing season was closed on Sunday, January 13, 2013, when the reduced lake quota was reached.

5.4.2. Fish Species

The winter commercial fishery is based primarily on Walleye as the only species harvested under the annual lake quota of 36,300 kg.

The remaining species harvested have unlimited quota including Lake Whitefish (*Coregonus clupeaformis*); Northern Pike; Yellow Perch; Sauger; White Sucker (*Catostomus commersoni*), and Shorthead Redhorse (*Moxostoma macrolepidotum*), marketed together as "mullet"; Cisco (*Coregonus artedi*), marketed as "tullibee"; and Common Carp.

Northern Pike and mullet are the only retained by-catch comprising more than 5 % of the harvest under the current 96 mm minimum mesh size gillnet fishery. Walleye, Northern Pike and mullet amount to about one third each of the retained catch from Waterhen Lake. Yellow Perch made up more than 5 % of the harvest only when the 76 mm fishery was operating. Northern Pike and mullet are extremely resilient to large mesh ($\geq$ 96 mm) gillnet fishing, and become the dominant species in Manitoba lakes where Walleye populations have collapsed due to commercial fishing; Lake Winnipegosis and Lake St. Martin are examples of this.

5.4.3. Fishing Regulations

The commercial fishing seasons on Waterhen Lake are established under the *Manitoba Fishery Regulations, 1987.*

The winter Walleye season is open from '*when ice makes on or after November 1st to March 31st*'. Commercial harvest during the winter fishing season is limited to the use of gillnets with a

mesh size not less than 96 mm and a maximum length of 5,700 m. The lake Walleye quota is 36,300 kg.

The Carp/sucker gill net fishery operates year round with a minimum mesh size of 203 mm with an unlimited annual quota.

5.4.4. Fishing Methods

During the winter season, gill nets are set under the ice using jiggers (*Figure 1*). A jigger is a plank of wood, about six feet long, that comes equipped with a steel-tipped wooded arm hinged to an iron rod. From the end of the iron rod is a long rope.

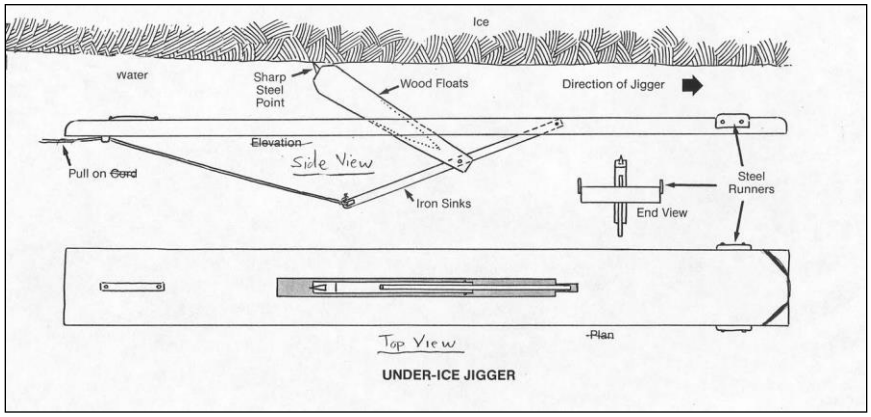

Figure 1 – Diagram of an ice jigger.

To set nets under the ice, a hole is first drilled through the ice. Once the jigger is in the water, the operator pulls at the rope, forcing the steel tip to dig into the ice. When this happens, the jigger slides ahead a short distance (i.e. a few feet). Then the rope is released and the steel tipped arm loses its grip on the ice. The operator then repeats the pull/release technique until the jigger has advanced the length of the net. When the jigger has advanced the required distance, a second hole is drilled and the jigger and rope is retrieved (*Figure 2*).

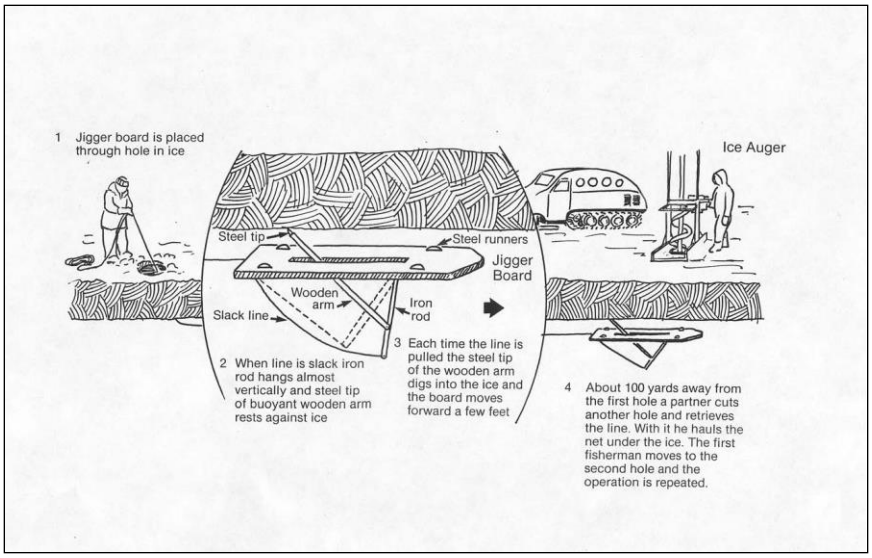

Figure 2 - Jigging under the ice.

Attached to the rope is the gill net. As the rope progresses under the ice, the gill net is gradually placed into position (*Figure 3*).

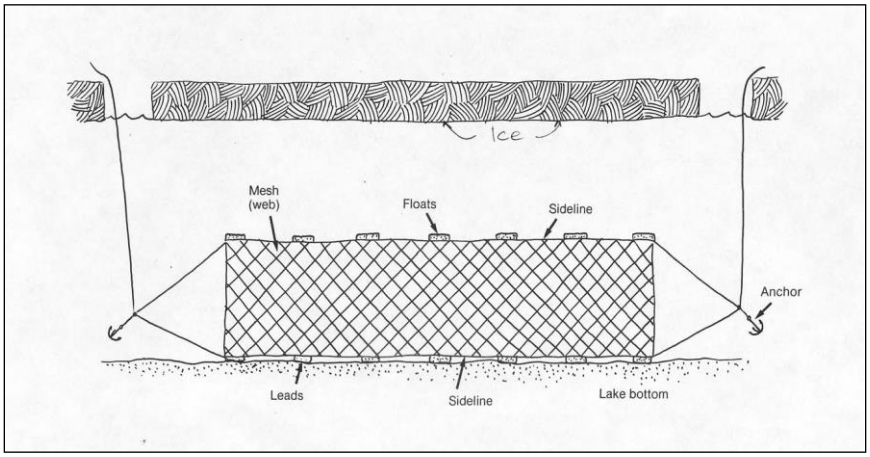

Figure 3 – Diagram of gill net set under the ice.

5.4.5. Landings and Value

Since the current lake quota of 36,300 kg was set in 1987, the average annual commercial production (all species) from Lake Waterhen has been 67,173 round weight kg, ranging from 15,560 round weight kg (2003/2004) up to 238,831 round weight kg (1991/1992). During the same period, the average annual commercial production for Walleye has been 18,734 round weight kg, ranging from 114 round weight kg (2002/2003) up to 45, 686 round weight kg (2005/2006). The average annual production of other non-quota species has been 48,439 round

weight kg, ranging from 13,997 round weight kg (2003/2004) up to 212,238 round weight kg (1991/1992) (*Figure 4*).

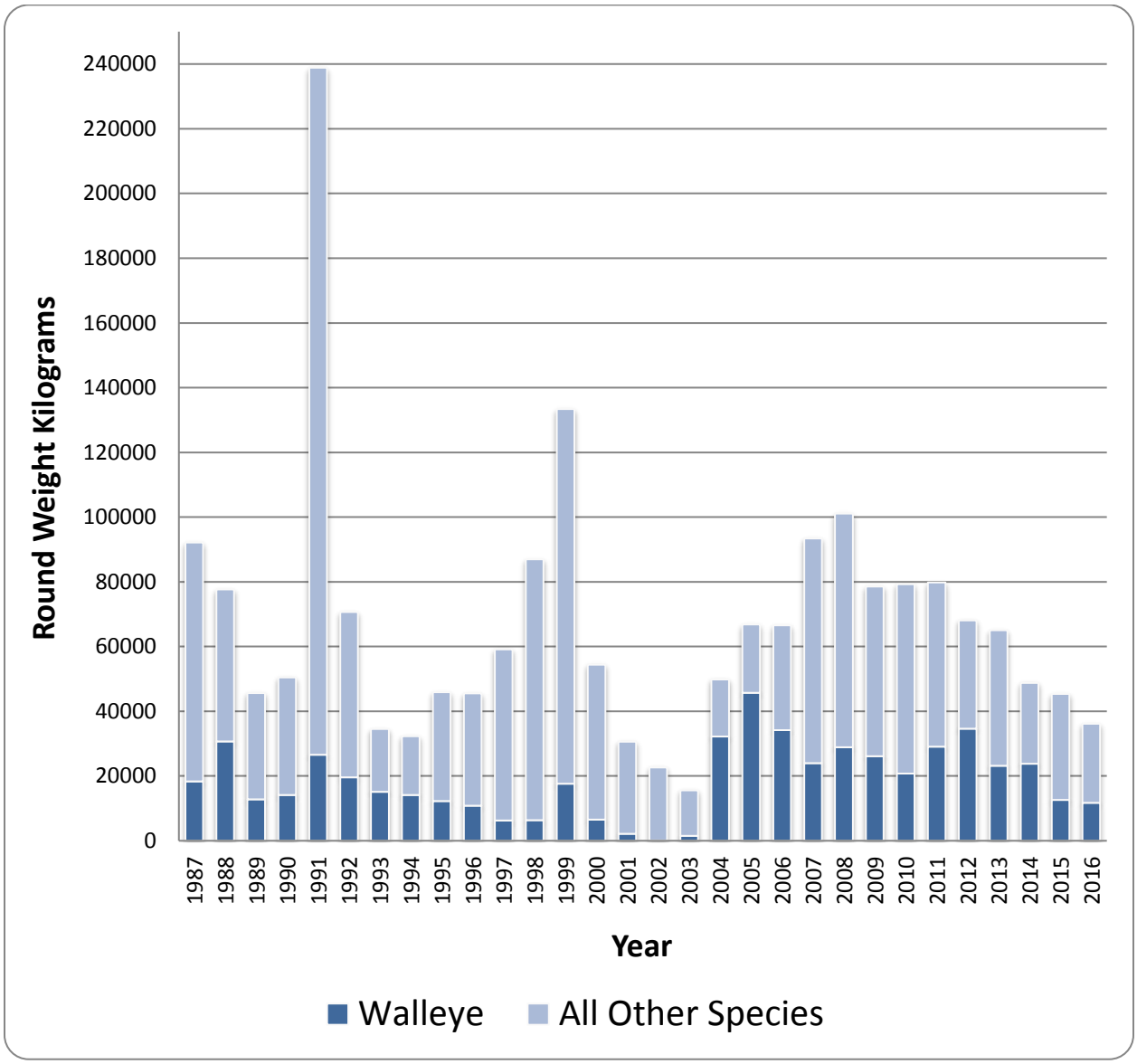

Figure 4: **Commercial production of Walleye, non-quota species and total (round weight kg) from 1987 to 2016.**

The landed value for all species during this period has averaged $105,649 per year, ranging from $9,069 (2003/2004) up to $347,111 (1991/1992). In terms of Walleye, the annual landed value has been $65,756 based upon a range of $475 (2002/2003) up to $142,237 (2005/2006) *(Figure 5*).

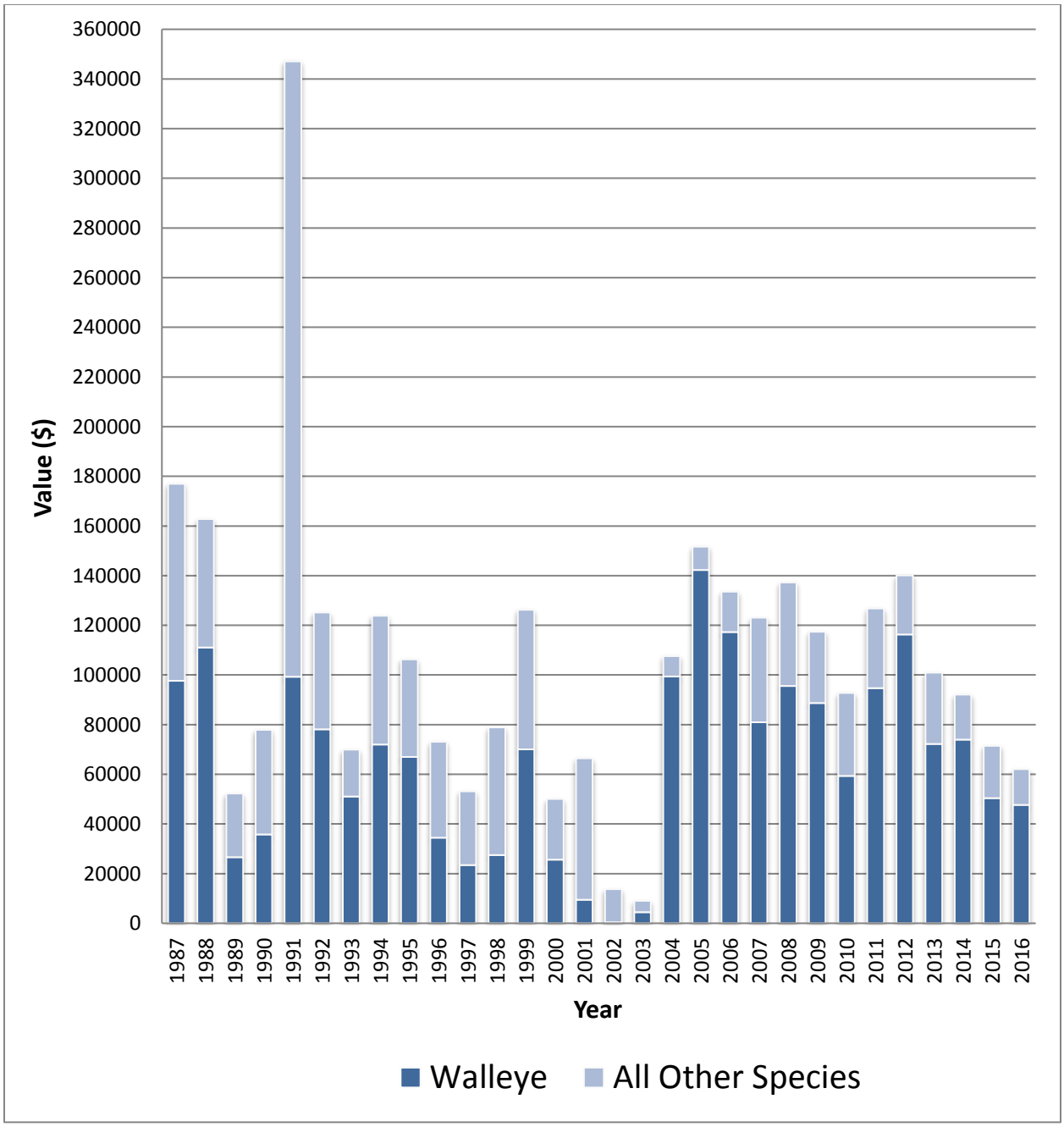

Figure 5: **Landed value ($) of Walleye, non-quota species and total from 1987 to 2016.**

6. Management

6.1 Management Measures

6.1.1 Data Collection

To ensure that the management plan is being executed effectively and therefore achieving the desired results, monitoring of the Waterhen Lake fishery through the collection of data will be undertaken from a variety of different sources.

Actions:

- ***Annual Index Netting***

Index netting is carried out each year in the month of September when water temperatures fall to between 10 and 15 degrees Celsius. Sites were randomly selected from a one-quarter kilometer grid according to the Fall Walleye Index Netting (FWIN) Protocol where 8 feet on water or more was available (Morgan 2002). Thirty index nets are set at the same thirty sites each year. Index nets are the North American standard gillnets as described in Bonar *et al*, 2009 (see Appendix 3). Thirty repeated sets was determined to be appropriate by power analysis of the initial 2009 index data to detect a 20% decrease in catch-per-unit-effort ($\alpha = 0.1$). Nets are soaked for approximately 16 hours covering two crepuscular periods.

Weight and length are recorded for all fish caught. For Walleye -- the species most susceptible to overharvest -- weight, length, sex, maturity and gut contents, if identifiable, are recorded annually. For age determination otoliths are taken from Walleye. Otoliths are broken and burned before the annuli are counted under 30X magnification. For Northern Pike – the sample size will be expanded to at least 200 specimens as part of the Fisheries Branch's on-going annual indexing program. See the Research Plan section for treatment of other species.

- ***Commercial Catch Sampling***

Starting in the winter of 2014, Manitoba Sustainable Development (Wildlife and Fisheries Branch) implemented a commercial catch sampling program to better understand the stock structure of Northern Pike in Waterhen Lake. This was achieved through the collection of *cleithra* taken from Northern Pike caught in commercial gillnets set in Waterhen Lake. Northern Pike are collected opportunistically during lake patrols from fishers lifting their nets, or from nets seized during enforcement activities. For Northern Pike sampled from the commercial fishery sex, age and length are recorded as well as the mesh size of the commercial gillnet.

- ***Commercial Log Books***

Log books are one of the data collection tools used in the fishery. A proportion of commercial fishers have agreed to complete and return log books to departmental officials. The log books will record harvest that is either retained catch not sold through the Freshwater Fish Marketing

Corporation or non-marketed catch that is either discarded by-catch or culled catch. The data collected through these log books is important to monitoring overall catch, particularly with regard to by-catch, and the assessment process.

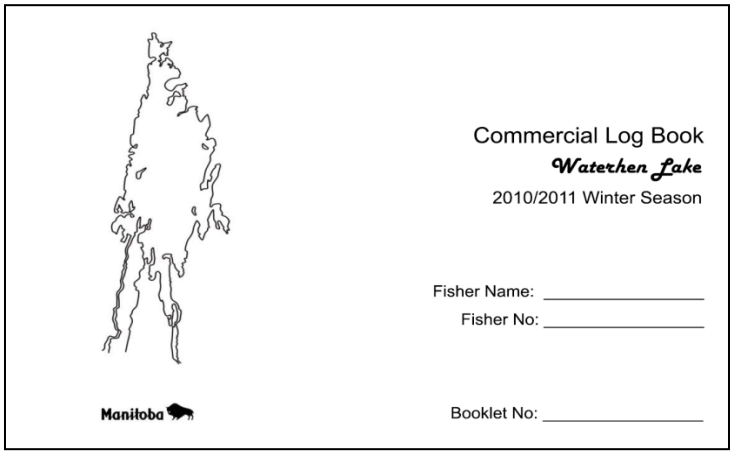

***Figure 6*: Front cover of Waterhen Lake Commercial Log Book.**

Date/Time Set: Lifted:

# of Nets in Gang: Net Length (yds):

Species*	3 3/4"		4"		4 1/4"		4 3/4"		Other	
Wallleye										
Pike										
Mullet										
Whitefish										
Carp										
Perch										
Tullibee										
Burbot										
Other										

* No. of Fish Retained (non FFMC) Non Marketed

***Figure 7*: Inside sheet of Waterhen Lake Commercial Fishing Log Book.**

- ***On-site (Basin Hole) Inspections***

Conservation Officers will undertake on-site (basin hole) inspections as part of their compliance monitoring patrols during the commercial fishing season. The officers will complete a Commercial Fishery Patrol Report (Appendix 4) that documents all aspects of the patrol: date,

time, weather, officers, locations and observations. Under observations officers will record the number of fish and species of fish discarded at basin holes. Conservation Officers will forward copies of these reports to the Sustainable Fisheries Unit (Wildlife and Fisheries Branch) for analysis and compilation.

6.2 Harvest Strategy

The Waterhen Lake winter commercial fishery targets two species: Walleye (*Sander vitreus*) and Northern Pike (*Esox lucius*). The harvest strategy governing the fishery was designed to sustain Walleye in Lake Waterhen, the species most prone to stock collapse owing to its late maturation. The Northern Pike fishery in Waterhen Lake is considered sustainable under the Walleye harvest strategy, because female pike will have spawned two or three times before they are susceptible to the minimum mesh size allowed in the Waterhen fishery.

Mullet is the only bycatch making up more than 5% of the harvest (Table 1). In Manitoba, mullet is the name given to any combination of species in the genera *Catostomus* and *Moxostoma*. In Waterhen Lake mullet refers to White Sucker (*Catostomus commersoni*) and Shorthead Redhorse (*Moxostoma macrolepidotum*). Redhorse are called 'red fin mullet'. Mullet are retained bycatch in the Waterhen fishery having some low market value relative to the target species; the average prices paid over the past five years are $3.13/kg for Walleye, $0.79/kg for pike, and $0.39/kg for mullet. High White Sucker populations are sometimes considered deleterious to more desirable Walleye and Yellow Perch (*Perca flavescens*) (Johnson 1977, Hayes *et al* 1992) implying competition, so it could be expected productive percid populations could negatively impact mullet. While this would generally be considered a good thing, a research plan has been developed to understand the impact of the Walleye harvest strategy on mullet.

Table 1. Round weight equivalents in kilograms of Waterhen Lake commercial harvest over the past nine years.

YEAR	WHITEFISH	WALLEYE	PIKE	PERCH	SUCKER	CARP
2007-08	500	23,979	42,739	517	25,609	45
2008-09	2,562	28,933	26,702	146	42,708	18
2009-10	2,319	26,156	17,149	151	32,183	553
2010-11	3,277	20,743	31,837	313	23,110	8
2011-12	4,343	29,116	24,564	306	21,473	10
2012-13	2,969	34,584	23,989	64	6,491	0
2013-14	4,145	23,163	30,588	118	6,972	34
2014-15	2,383	23,655	17,423	73	5,403	22
2015-16	2,206	12,650	17,928	185	15,851	32
2016-17	2,191	19,377	19,818	139	9,304	31
TOTAL	26,895	242,356	252,737	2,012	189,104	753
AVERAGE	2,690	24,235	25,274	201	18,910	75
PERCENTAGE	4%	35%	35%	0%	26%	0%

6.2.1 Target Species

6.2.1.1 *Walleye Sander vitreus*

Walleye is the highest value species in the Waterhen Lake commercial fishery and therefore the main target of the fishery. The historical record of the catch from Waterhen shows an erratic history until reasonable allowable catches were brought in under a 102 mm minimum mesh in 1972 (Figure 8). These management adjustments resulted in relatively stable fishing averaging 21 tonnes from 1975 until 1990. During the 1990s, adoption of a 76 mm minimum mesh collapsed the Walleye stock. Under a 36 tonne quota and an increase in the minimum mesh size to 96 mm the fishery recovered and in 2005 even exceeded the allowable harvest by 9 tonnes, essentially because no one was watching. Since 2004 the Waterhen Walleye fishery has experienced an unprecedented continued high level of fishing averaging 27.5 tonnes, or about 1.1 kg/ha. The 2012/13 fishing season was closed on January, 12th, 2013 as the fishers approached the quota.

The harvest rate of 1.1 kg/ha is high for a Walleye population, but Waterhen Lake offers superb Walleye habitat. The predicted thermocline would be at 10 m (Shuter *et al* 1983) in a lake where the maximum depth is about 5 m, so there is no stratification. The secchi depth is near optimal at about 1.4 m (Lester *et al* 2002), and the summer temperatures hover in the Walleye optimal growth range for almost two months (Christie and Regier 1988). In fact using Christie and Regier's Thermal Habitat Area model, the 36 t quota, is set low.

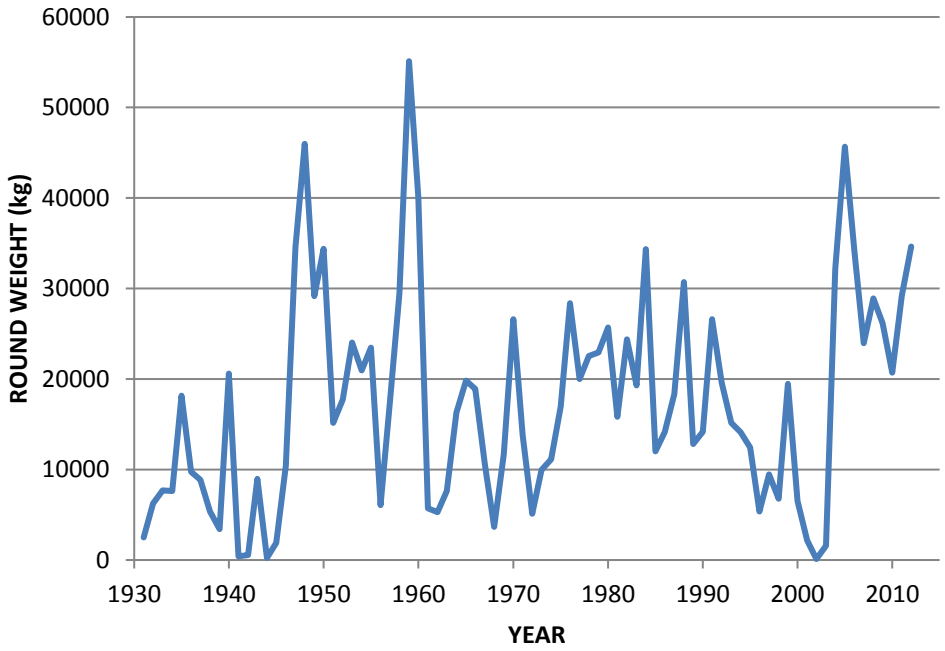

Figure 8. Historic record of Walleye deliveries from Waterhen Lake beginning in 1931/32 and ending in 2012/13.

The fishery is believed to have performed so well under the 96 mm minimum mesh regulation because of the difference in male and female growth trajectories (Figure 9). Male and female Walleye have very similar growth rates until their fourth year. Males mature at 2.4 years (50%) and 356 mm total length. Females mature at 4.3 years and 461 mm. The 96 mm minimum mesh prescribed on Waterhen Lake selects for an average Walleye of 477 mm (females are 76% mature at 477 mm). The male growth curve plateaus around the size selected for by the 96 mm mesh, while the females grow quickly beyond the 96 mm mesh. Thus, even though the minimum mesh catches females at the age of their first spawning, it preferentially harvests males because several year classes of males are vulnerable at the same time. The biased harvest of males is also evident in the disparate mortality rates between the sexes (Figure 10).

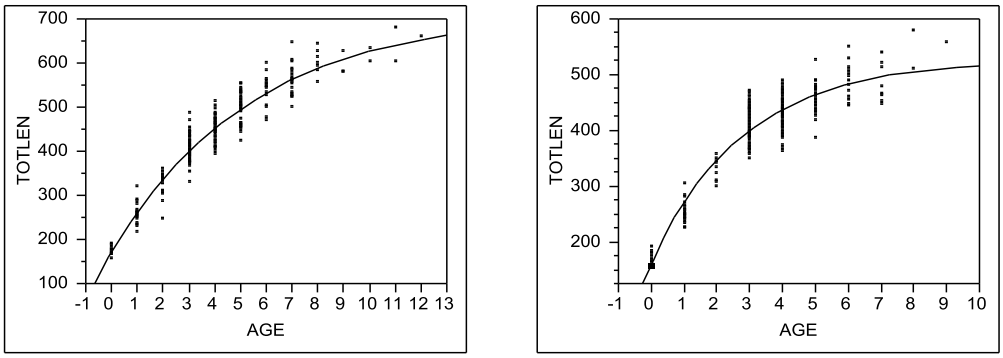

Figure 9. Von Bertalanffy growth models for female (left frame, L^{∞} = 713 mm, k = 0.184) and male (right frame, L^{∞} = 526 mm, k = 0.355) Waterhen Lake Walleye. Female walleye quickly grow beyond the average length of 477 mm selected for by the minimum allowable mesh of 96 mm, whereas male Walleye spend several years of their life at the size selected for by the 96 mm mesh.

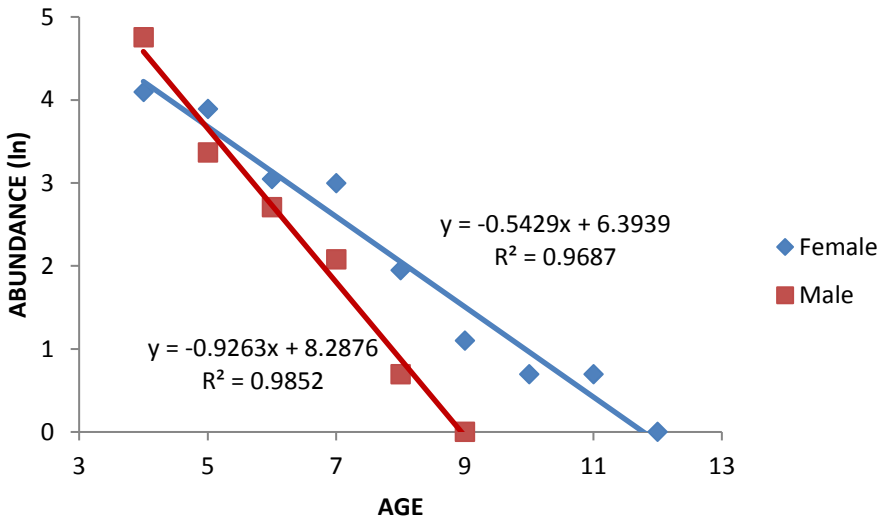

Figure 10. Total mortality rates for male and female Waterhen Lake Walleye. Males incur higher annual mortality due to continued selectivity by 96 mm minimum mesh. Data are from index sampling years 2009 – 2012 pooled. Male Z = 0.93, A = 60%; female Z = 0.54, A = 42%.

6.2.1.1.1 Harvest control rules for Walleye

Four performance indicators have been selected with the support of Waterhen Lake commercial fishers to guide the commercial Walleye harvest on Waterhen Lake. They are:

- catch-per-unit-effort;
- spawning stock biomass;
- spawning female age diversity; and
- total mortality.

Data for all of the performance indicators are fishery independent and based on an annual stock monitoring program that began in 2009. A detailed description of the stock monitoring program can be found in Section 6.1.1.

The performance indicators selected to govern the management of the Waterhen Lake Walleye gillnet fishery are assessed using lower and upper stock reference points. Individual performance indicators will be assessed as either "Low Risk" (highlighted as **green**), "Medium Risk" (highlighted as **yellow**) or "High Risk" (highlighted as **red**). Harvest control measures will be implemented in response to changes in performance indicators estimated from annual stock monitoring. Three of the harvest control measures are input controls involving mesh size and total allowable yardage, and the fourth is an output control, quota reduction. The reference points selected for the Catch-per-unit-effort (CPUE) and Spawning Stock Biomass (SSB) are based on the rationale that harvest over the past nine years has been at a sustained high level, and that the values measured for those performance indicators are therefore desirable (Table 2).

Table 2: Summary table of performance indicators selected to govern the Waterhen Lake Walleye fishery.

Index	Lower Limit	Upper Stock	Target
Catch-Per-Unit-Effort	2 fish per net night	5 fish per net night	6.3 fish
Spawning Stock Biomass	20 kg per 30 nets	40 kg per 30 nets	50 kg
Spawning Female Diversity	0.31	0.58	0.60
Total Mortality	70%	60%	53%

6.2.1.1.1.1 Catch-per-unit-effort:

Catch-per-unit-effort (CPUE) refers to the average number of Walleye caught in each index net in a single night and is a reflection of the Walleye stock density in the lake. In 2009, 13 nets were set in the index program. Power analysis of the 2009 CPUE data determined that 30 net sets were required to detect a 20 percent decline in the catch rate (with 80 % certainty). As a result, 30 nets have been set since 2010.

In the recent fishery of Waterhen Lake - that period since 2004 following the end of the 76 mm mesh gillnet fishery and the subsequent recovery of the Walleye stock - commercial production has remained above 20,000 kg per year. Within a historical context, 20,000 kg could be considered good fishing. After just a few years index netting, the CPUE does appear to be indicative of the ensuing commercial harvest (Table 3). With these data a CPUE of 5 was selected as the Upper Stock Reference Point. The lower reference point is set at 40 % of the upper stock reference point with no defensible justification (Figure 11). The average CPUE of the five years (2010 to 2014) with 30 net sets has been selected as the Target Reference Point, 5.8 fish per net night, reasoning that fishing associated with those values has been pretty good.

Table 3. Index netting catch-per-unit-effort and the commercial harvest of the ensuing season.

YEAR	INDEX NET SETS	INDEX CPUE	COMMERCIAL HARVEST (KG)
2009	13	8.8	26,156
2010	30	5.2	20,743
2011	30	5.8	29,116
2012	30	6.5	34,585
2013	30	7.6	23,163
2014	29	4.3	23,779
2015	30	5.4	12,650
2016	30	4.1	11,707

Application (Harvest Control Measure)**:**

A drop in CPUE from the Upper Limit Reference will result in a decrease in the net yardage allowed to each fisher. If CPUE in the index program continues to decrease, maximum yardage will also decrease until the Lower Reference Point of two Walleye per index net is reached. Twenty-one hundred metres of net will be allowed at CPUE values below the Limit Reference

Point to provide some income for the fishers. The fishery has remained strong (over 20 tonnes) since indexing began (Figure 4), there has been no need to shorten allowable yardage.

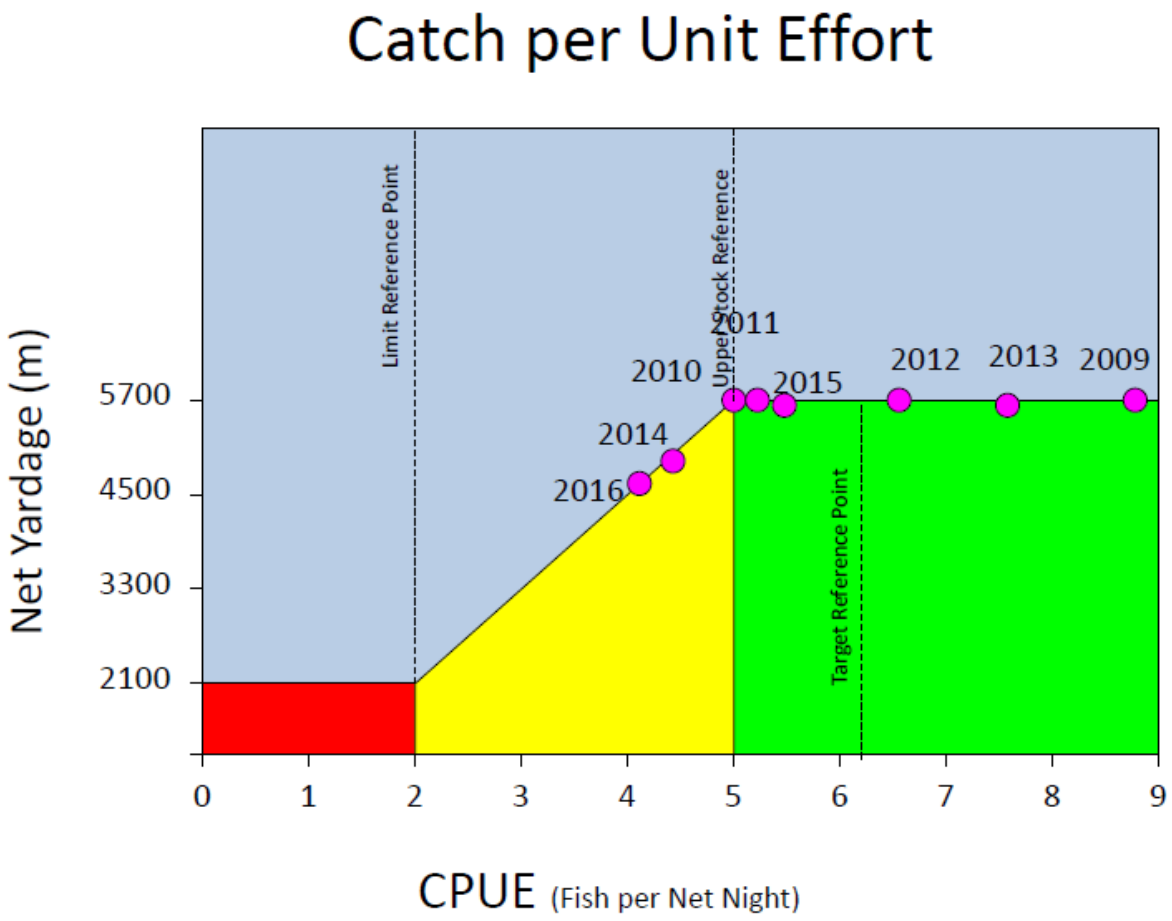

***Figure 11*: Harvest control scheme governing allowable yardage for the Waterhen Lake commercial Walleye fishery. Pink circles mark the catch-per-unit effort (CPUE) from the past eight years of index netting. If CPUE fell into the medium risk zone, allowable yardage in the commercial fishery would diminish.**

6.2.1.1.1.2 Spawning Stock Biomass:

Walleye year class strength varies due to environmental conditions. Nonetheless, spawner-recruit studies in western Lake Erie have attributed as much as 20 % of the variability in Walleye recruitment to spawning stock biomass (Madenjian *et al* 1996) and in a multi-lake study 10 % (Beard *et al* 2003). With limited index netting information to accurately estimate total spawning stock, the total mass of gravid female Walleye caught is being used as a surrogate for the standing stock of mature females. Resting females (i.e. mature females without developing eggs) are not included in the total.

The spawning stock biomasses (SSB) measured since 2009 were associated with good fishing in the ensuing commercial harvests. Only in 2011 was the total mass of spawning females in the

index nets just under 40 kg, so the Upper Stock Reference Point has been set at 40 kg. The Lower Reference Point has been arbitrarily set at 50 % of the Upper Stock Reference Point; the level expected to maintain sustainable yield of at least 20,000 kg.

Application (Harvest Control Measure)**:**

When SSB falls below the Upper Limit Reference of 40 kg – the level expected to maintain a sustainable Walleye yield of at least 20,000 kg – minimum mesh size in the fishery will be increased. The current minimum mesh size permitted in the gillnet fishery is 96 mm, which is capable of capturing immature females. When the SSB falls below 40 kg the minimum allowable mesh size will be increased to 102 mm. If the SSB falls to 30 kg the minimum allowable mesh size will be increased to 108 mm. Finally, at the Limit Reference Point of SSB = 20 kg, the minimum allowable mesh size would be 114 mm (Figure 12). Female Walleye caught in a 114 mm gillnet would be of a size that would have spawned at least once or twice which ought to be sustainable (Myers and Mertz 1998; Abrosov 1969). Increasing the minimum mesh size will allow more female Walleye in any recruiting year class to contribute to the SSB indicator.

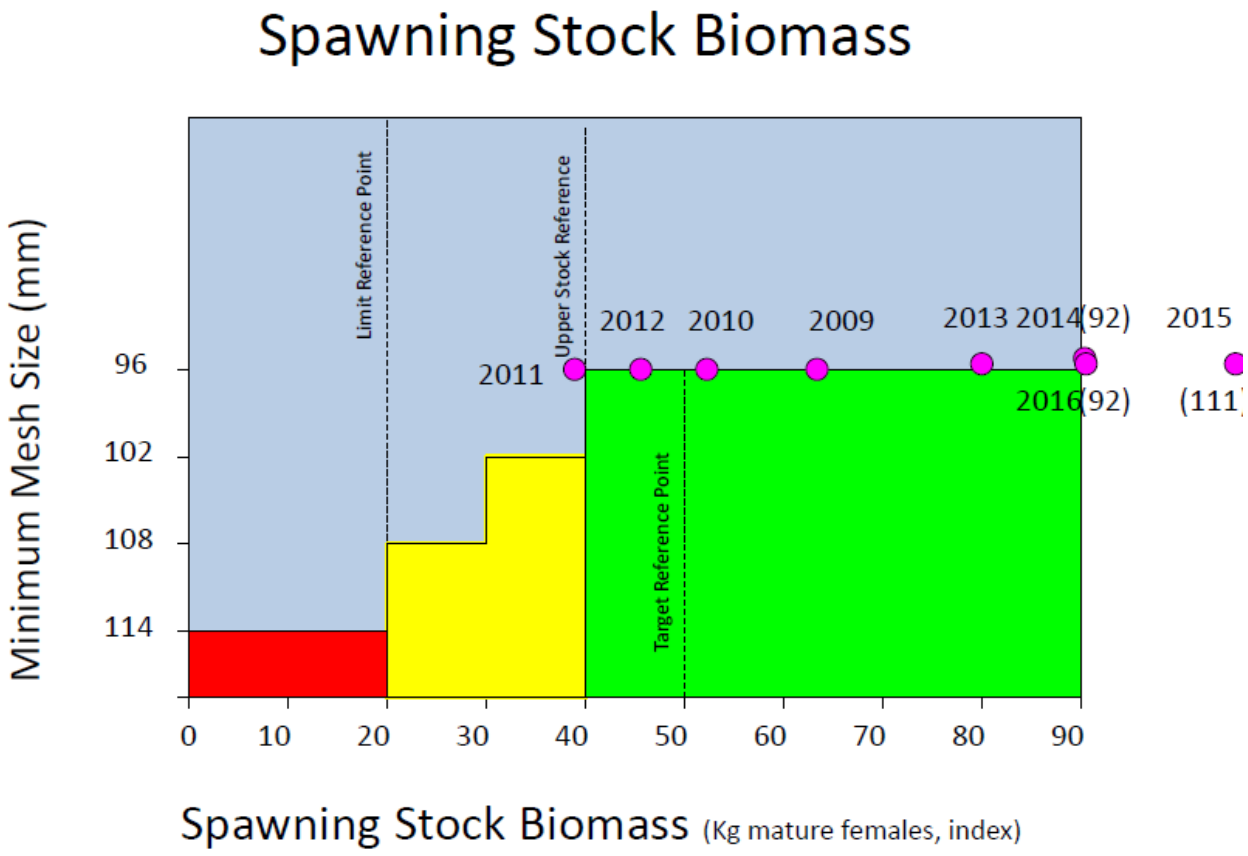

***Figure 12*: Harvest control scheme to avoid recruitment overfishing in the Waterhen Lake commercial Walleye fishery. Spawning stock biomass is reflected as the total kilograms of gravid female Walleye caught in all 30 nets of the annual index program. As spawning stock biomass decreases, the minimum mesh size allowed in the commercial fishery increases so more females recruit to spawning size.**

6.2.1.1.1.3 Spawning Female Age Diversity:

Spawning female Walleye of different ages confer different fitness to their eggs due to differences in egg size and quality (Johnson *et al* 2012). The presence of older Walleye in a population is known to result in higher recruitment (Colby and Nepszy 1981, Venturelli *et* al 2010). Studies of some marine species with weak spawner-recruit relationships, as Walleye typically exhibit, have also shown that greater age diversity among spawning females has enhanced the spawner-recruit relationship (Marteinsdottir and Thorarinsson 1998). The reference limits for Shannon Diversity (H) of mature female ages come from Gangl and Pereira's (2003) study of Minnesota's ten large lakes (Figure 13). Shannon's Diversity Index is being used as the measure of spawning female age diversity; calculated as:

$$H = (n\log n - \sum(k_i \log k_i))/n$$

Where n is the total number of mature females in the index nets, and k is the number of mature females of age i.

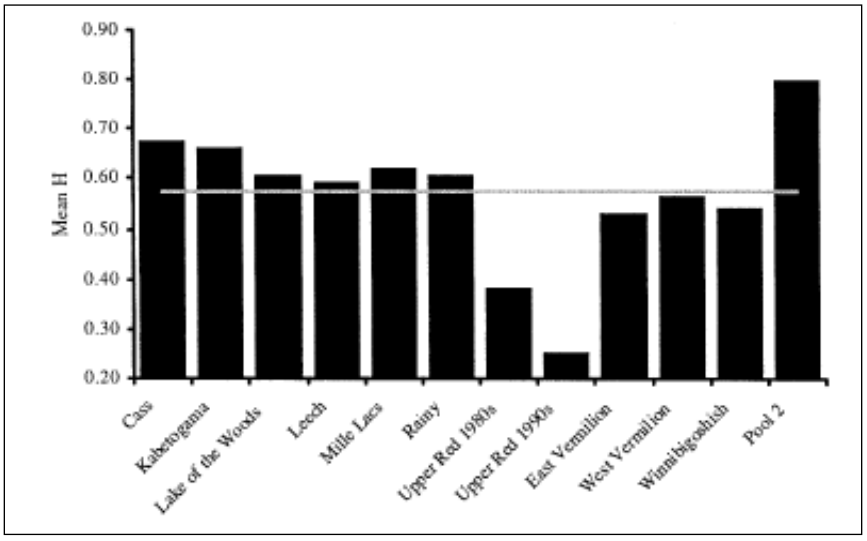

***Figure 13*: Shannon Diversity Index values for Minnesota's ten large lakes with Upper Red Lake shown pre and post Walleye stock collapse and Pool 2 of the Mississippi representing an unharvested Walleye stock. The line at H = 0.58 represents the lower boundary of the 80 % confidence interval around the mean of 0.60 for the ten large lakes (from Gangl and Pereira, 2003).**

The Target Reference Point of H = 0.60 (determined by Gangl and Pereira) is the mean value of the studied stocks and H = 0.58 the lower threshold of the 80% confidence interval, is selected as the Upper Stock Reference Point. The Lower Limit Reference Point of H = 0.31, the average of the Red Lakes' diversities before and after collapse, was selected as the Lower Limit Reference Point (Figure 14).

Application (Harvest Control Measure)**:**

Monitoring of the volatility of H will continue through the index netting program. When the performance indicator, H, is above 0.58 no maximum gillnet mesh will be implemented. However, when values fall below 0.58 into the "medium risk" (yellow) zone a maximum mesh size regulation of 114 mm will be in place to conserve and enhance age diversity among spawning females by protecting larger females from harvest. If the Lower Limit Reference Point of 0.31 is reached a maximum gillnet mesh size of 108 mm will be imposed. If the harvest control rules for SSB and Female Age Diversity are both in the critical zone we defer to the harvest control rule for SSB, i.e. minimum mesh size of 114 mm.

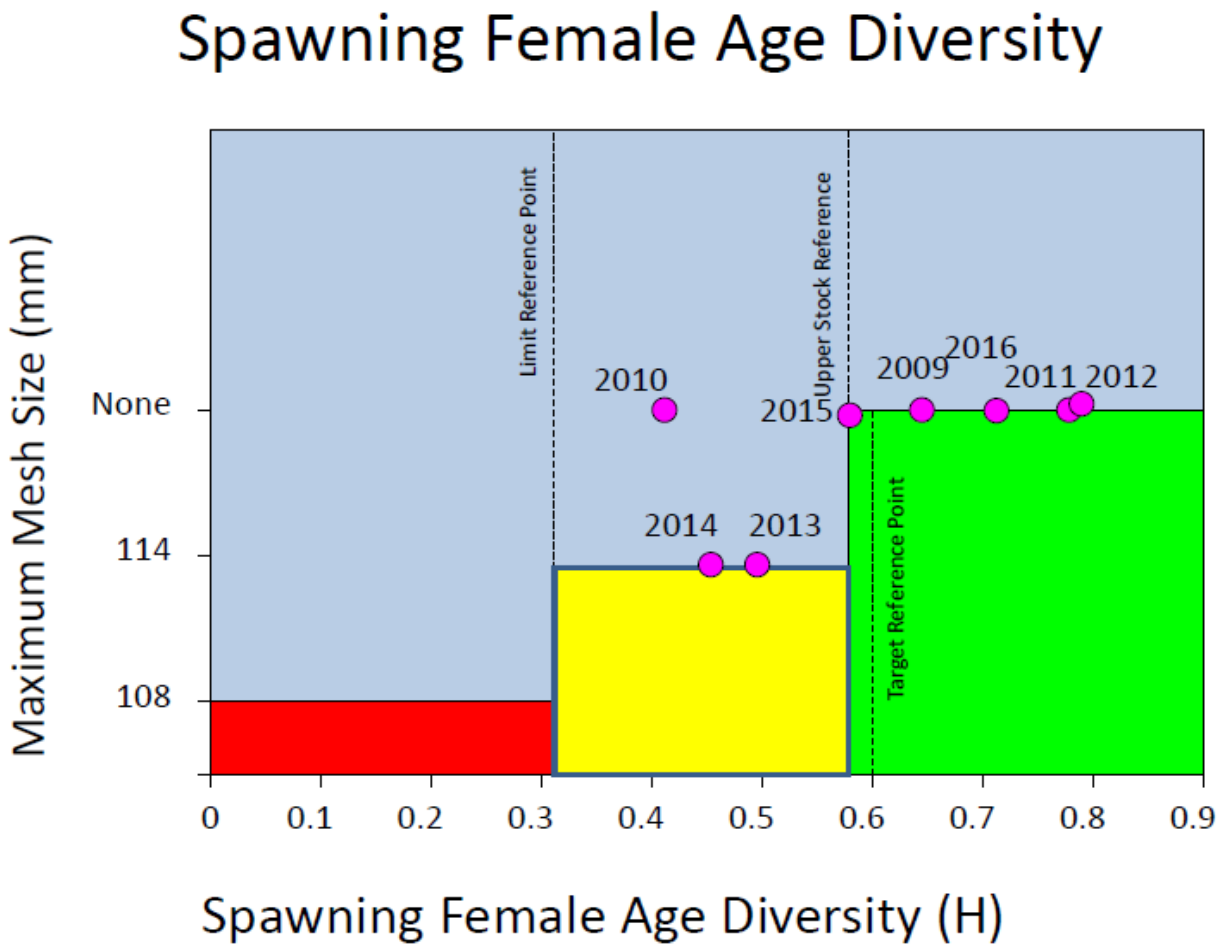

***Figure 14*: The harvest control rule for Shannon's Diversity Index for spawning female Walleye ages. When the performance indicator, H, is above 0.58 there is no maximum gillnet mesh, but values in the cautionary zone will result in a maximum mesh size of 114 mm or 108 mm to conserve and enhance age diversity among spawning females.**

6.2.1.1.1.4 Total Mortality:

Natural mortality is assumed to be near 24 % for the available 1575 growing degree days above 5°C (Lester *et al* 2000). Mortality due to recreational fishing is assumed to be low. Subsistence fishing cannot be easily quantified, but it is a constitutionally protected right that is the first priority of allocation after conservation. The commercial fishery is the principal source of mortality on Waterhen Lake. Due to the difficulty in partitioning mortality, the harvest control rules will be based on levels of total mortality. One historic estimate of mortality was available for Waterhen Lake Walleye because of a tagging study in the 1970s; that estimate (A) is about 46 %.

A Target Reference Point of A = 0.53 (or 53 %) was set which is a total annual mortality (A) equivalent to $F_{0.75ext}$ for Waterhen Lake's climate; approximately 1575 growing degree days; according to the Ontario guidance on safe fishing (Lester *et al* 2000). Preliminary modeling using Waterhen Walleye weights at age showed yield-per-recruit (with a 96 mm minimum mesh) was maximized at a total mortality of 70%. Only 13 % of the maximum yield-per-recruit was sacrificed at A = 0.5, but the spawning stock biomass more than tripled (sexes were not split for the modeling). This level of mortality, A = 70 %, has been selected as the Lower Stock Reference with some caution recognizing that it was also the rate of harvest that led to a contraction in the Lake Winnipeg Walleye fishery in the mid 1990s.

The Upper Stock Reference Point of 60 % is the Z_{ext} calculated by the Percid Community Synthesis Population and Yield Characteristics Working Group in Ontario's safe Walleye fishing guidance (Lester *et al* 2000). The reference points have been set at apparently high levels because mortality is being calculated by tracking individual year classes and averaging their mortalities rather than calculating mortality from the catch curve. Mortalities from catch curves are more erratic due to variable year class strengths, but also render a lower estimate of mortality, and therefore less precautionary (Gangl 2001). By way of example, the annual mortality estimate by year class from 2009 to 2012 is A = 64%, the catch curve of the pooled data generates a mortality rate of A = 48 %, comparable to the 1975 estimate from tag returns (Figure 15).

Application (Harvest Control Measure)**:**

If total annual mortality increases higher than 60 %, the lake quota for Walleye will be reduced to allow the stock to rebuild.

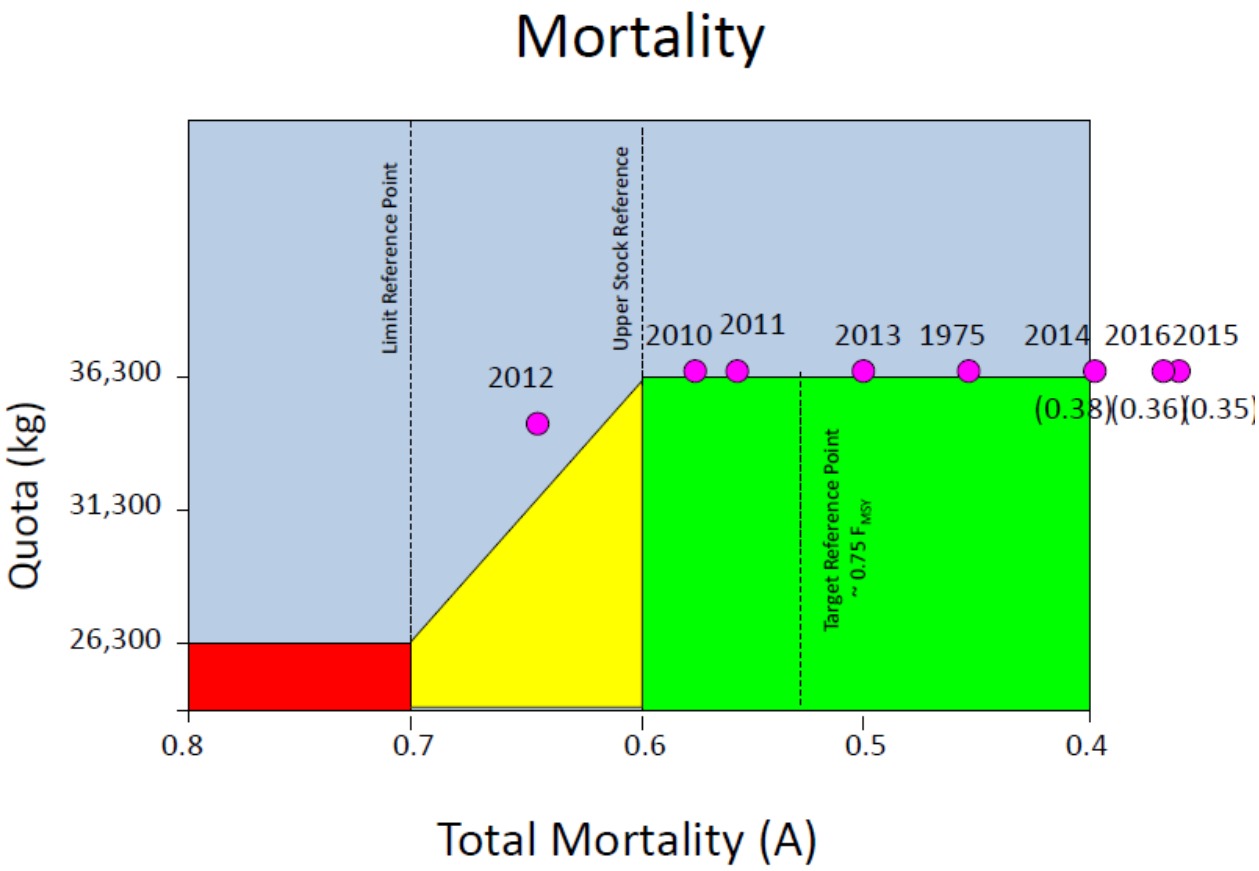

***Figure 15*: Harvest control scheme for total mortality. When total mortality climbs above 0.6, the Walleye quota for the Waterhen Lake fishery will be decreased to allow the stock to rebuild.**

6.2.1.2 Northern Pike Esox lucius

Waterhen Lake has a high capacity for producing Northern Pike due to its low surrounding elevations. The flat topography is typical of lakes in the glacial Lake Agassiz basin and results in expansive floods and slow runoff providing vast spawning and nursery habitat for pike. Nursery habitat adjacent to spawning habitat benefits pike (Casselman and Lewis 1996). Flooded areas will also warm more quickly than the adjacent lake allowing juvenile pike to exploit the best temperatures available for growth, which can be critical for year class strength (Casselman and Lewis 1996).

Northern Pike account for one third of the delivered volume from Waterhen Lake (Table 1). Pike are not subject to harvest control rules beyond those which govern the Walleye fishery. The

historical record of pike deliveries from Waterhen Lake indicates a long-term sustainable harvest of Northern Pike from Waterhen Lake of 10,000 kg to 35,000 kg (Figure 16).

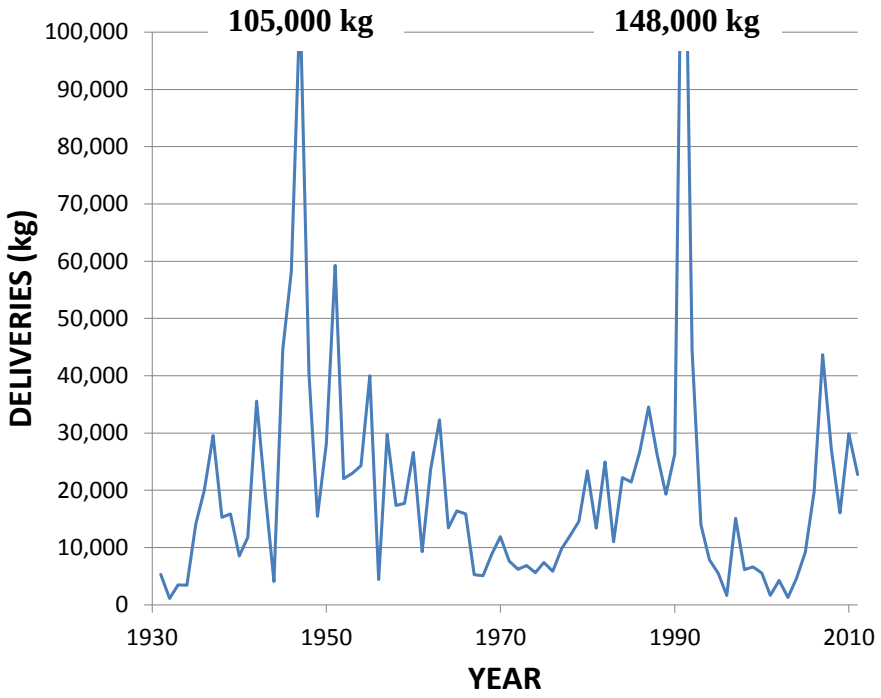

Figure 16: Annual commercial harvest levels of Northern Pike from 1931/1932 winter commercial fishing season to, and including, 2011/2012 winter commercial fishing season.

6.2.1.2.1 Interpretation of the Commercial Delivery History of Northern Pike from Waterhen Lake.

Waterhen Lake has produced 10 to 35 tonnes of Northern Pike per year with some notable aberrations in the delivery history: two massive spikes in the late 1940s and the early 1990s, and troughs in the 1970s and 1990s. The spikes are easily explained by changes in the minimum mesh sizes allowed. In 1946 the minimum mesh size in the fishery was lowered from 102 mm to 83 mm for two years and then returned to 102 mm. The reduced mesh size led to a peak harvest of 105 tonnes because smaller mesh sizes entangle many more pike than they gill (Pierce *et al* 1994), often baited into the net by gilled prey (Figure 17). The larger 148 tonne peak in deliveries in 1991 followed a decrease in mesh size to 76 mm. The use of 76 mm mesh continued for a decade and collapsed the Northern Pike population as well as the Walleye population resulting in the low deliveries throughout the 1990s until 2003. The consistently low deliveries during the 1970s require some speculation to explain, but are likely due to discards of pike -- which fetch a low price relative to Walleye -- following the 1972 decrease in the lake quota from a combined species (Walleye, Northern Pike, and Sauger) quota of 45 tonnes to 34 tonnes. Since 2004 the fishery has demonstrated Waterhen can consistently yield most of the 1972 quota in Walleye alone, so at one quarter the value of Walleye, pike were likely discarded. When pike

were removed from the quota in 1980, deliveries returned to their typical long-term levels of 10 to 35 tonnes.

Figure 17. A large Northern Pike tangled in a small mesh gillnet while attacking prey gilled in the net, in this case a Cisco (*Coregonus artedi*).

6.2.1.2.2 Northern Pike vulnerability in the Waterhen Lake commercial fishery

The Northern Pike harvest of 10 to 35 tonnes from Waterhen Lake seems variable, but pike generally live less than a decade and year class strengths vary due to a stochastic environment (Casselman and Lewis 1996), so a variable range would be expected. The difference in price between Walleye and Northern Pike causes effort in the fishery to be driven by the availability of Walleye, this also adds variability to pike deliveries; though some targeted pike fishing occurs after the eggs are ready for the roe market in late January.

While the 105 tonne spike in the 1940s following the use of 83 mm mesh and subsequent return to 102 mm mesh did not appear to collapse the pike stock, the 148 tonne removal (5.5 kg/ha) in 1991 and sustained 76 mm use did. The use of small mesh catches all sizes of pike, and the continued use of small mesh catches pike before they are able to spawn even once.

Net fishing to collapse a pike population is difficult as evidenced in the description by Colby and others (1987) of the spectacular management efforts made to decimate the pike of Heming Lake, Manitoba. Figure 18 shows the total lengths of pike caught in

experimental graded-mesh gillnets (North American standard nets). Smaller meshes catch the broadest size range of pike, and as mesh sizes increase, ensnared prey become too large for smaller pike, so the size range of pike narrows. Solving for equations describing the regressions of the 25th percentile of pike length versus mesh size and the 75th percentile indicates the baiting effect of gillnets attenuates at 121 mm, and Figure 15 shows it is already minor at 96 mm. The 75th percentile roughly approximates a legitimately gilled fish; one that is ensnared in the gill-net because its head went through the mesh, but the girth of its body prevented it from passing through completely.

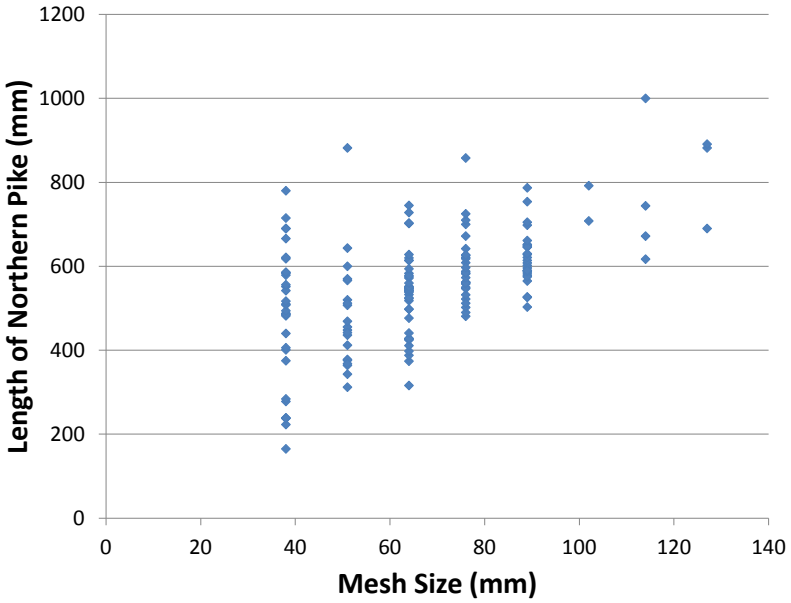

Figure 18: Lengths of pike caught at various mesh sizes in North American standard graded-mesh gillnets.

A study of Northern Pike in Waterhen Lake (Pellesier 2012) found female Northern Pike to be sexually mature at two years of age (2-year olds were 100% mature, n=5; 3 year olds were 93 % mature, n=14). The 96 mm minimum mesh in Waterhen Lake catches fish 5 years and older, thus female pike are afforded two or three spawnings before harvest which is sustainable (Myers and Mertz 1998; Abrosov 1969).

We believe the minimum mesh size limits and harvest control rules in place to govern Walleye fishing in Waterhen Lake also afford sustainable fishing for Northern Pike due to the early maturation schedule of female pike relative to Walleye. All commercial fishing ceases on the lake when the Walleye quota is met, and the historical record shows that when fishing large mesh the Walleye quota restricts Northern Pike harvest to levels well below the harvest required to collapse the fishery.

6.2.2 Retained By-catch

6.2.2.1 White Sucker (Catostomus commersoni)

Although the term 'mullet' includes Shorthead Redhorse and White Sucker in Waterhen Lake, redhorse have averaged only 7.4% of the mullet in four years of index data. Presumably their representation is similar in the commercial fishery and they will not require explanation as a major retained by-catch in the Waterhen fishery.

White sucker are more often the target of removal efforts rather than conservation (e.g.s Colby *et al* 1987, Brodeur *et al* 2001). The species has shown itself to be prolific in Lake Agassiz Basin lakes where Walleye fisheries have collapsed or severely contracted: Lakes Manitoba, St. Martin, and Winnipegosis. Diminished White Sucker numbers would be considered one of the successes of the Walleye harvest plan for Waterhen Lake as a functioning population of apex predators will limit White Sucker density (Bertolo and Magnan 2005). Female White Sucker reach maturity at a length of 421 mm in Waterhen Lake, which is also the size at which they are susceptible to a 96 mm mesh, the minimum allowed in the Waterhen fishery, and yet they persist in the lake. White Sucker presumably are able to persist because they are less susceptible to gill nets than Walleye, almost always being gilled by the net and rarely entangled.

Although the sustainability of White Sucker is not considered to be under any threat from the Waterhen fishery, a study is being planned for an undergraduate thesis project to better understand the demographics, growth, and susceptibility of White Sucker to the Waterhen Lake commercial fishery.

6.3 Allocation and Access

Allocation of the Waterhen Lake fishery resource will be consistent with existing priorities and management practices / approaches. Access to Waterhen Lake fish stocks for the purpose of commercial fishing will continue to be regulated through measures including:

Actions:

- Limiting the entry into the fishery through the issuance of a set number of commercial fishing licences consistent with the by-laws of the Constitution of the Lake Waterhen Fishermen's Association.

- Implementation of existing legislation, regulations and policies.

6.4 Regulatory Controls

Regulatory controls authorized under federal and provincial legislation, policies and regulations will be implemented to ensure that the Waterhen Lake fishery resource is utilized in a responsible and sustainable manner. In addition, voluntary controls will also be considered through discussions with local commercial fishers.

Actions:

- *Commercial Harvest Schedule*:
    - Season:
        - The winter commercial fishing season is open from '*when ice makes on or after November 1st to, and including, March 31st*'. Note: fishing in areas of open water is not allowed, even if the winter season has started.
        - The open water Carp / sucker fishing season will be open year-round except from *October 30th to, and including, November 1st*.
    - Mesh size: The minimum allowable mesh size allowed during the winter commercial fishing season is 96 mm. The minimum allowable mesh size used during the Carp / sucker open water fishery is 203 mm.
    - Quota: The lake quota for the winter commercial fishing season is set at 36,300 kg (measured in round weight) of Walleye.
- *Commercial Fishing Licences:*
    - Mesh yardage: The maximum gear length allowed per commercial fishing licence is 5700 m of gillnet.
    - Gear Type: A licenced fisher may use only gillnets to commercially harvest fish on Waterhen Lake.
- *Voluntary Closure*:
    - Zones: Three specific areas of Waterhen Lake are designated as closed zones to all commercial fishing due to their importance as spawning and rearing habitats (Appendix 5). This management measure is the result of the Lake Waterhen Fishermen's Association voluntarily deciding to close these areas to all commercial fishing as action to ensure the protection of critical spawning and rearing habitat in the Waterhen Lake ecosystem.

6.5 Compliance Monitoring

Conservation Officers conduct compliance monitoring of Waterhen Lake through patrols over the course of the year. In general, during open water there are weekly patrols, focused on the river systems and populated areas of Waterhen Lake (Mallard Bay). Open water patrols primarily address recreational angling and subsistence / domestic fishing. Over the course of the winter season it is estimated that there are on average four to five commercial fishery compliance patrols conducted on the lake. However, when notified of potential violations, Conservation Officers will investigate and have an increased presence on the lake. Conservation Officers also review commercial fish production records on a weekly basis to determine potential issues / violations. Officers will also make several patrols to other areas accessed by Waterhen Lake commercial fishers (such as Chitek Lake and Inland Lake) during the course of the winter season. These are not considered patrols of Waterhen Lake but do create a presence in the overall area and increase the opportunity to observe potential violations.

6.6 Introductions & Transfers

The management of the Waterhen Lake fishery will continue to be guided by The National Code on the Introductions and Transfers of Aquatic Organisms (2003) which was developed to protect aquatic ecosystems while encouraging responsible use of aquatic resources for the benefit of Canadians. It applies to all activities in which live aquatic organisms are introduced or transferred into fish bearing waters, or fish rearing facilities including aquaculture, commercial and recreational fishing, stock enhancement, biological control programs, etc. The Code establishes a mechanism for assessing proposals to intentionally introduce or transfer aquatic organisms so that all jurisdictions have a consistent process to evaluate and minimize the potential for:

- risks of harmful alterations of natural aquatic ecosystems;
- risks of deleterious genetic changes in indigenous fish populations; and,
- risks to fish health from the potential introduction and spread of pathogens and parasites.

Action:

- Manitoba's Introduction and Transfer Committee is the provincial mechanism developed under the Code to review any movement or transfer of aquatic organisms. Initial requests are forwarded to the Chair of Manitoba's Introduction and Transfer Committee. The Chair screens the request to determine if the movement or introduction is routine or non-routine. If routine a full Introduction and Transfer Committee review is not required and a permit can be issued with conditions, often within a month of receiving the request. If non-routine the applicant is required to fill out *Appendix III – National Code on Introduction and Transfer of Aquatic Organisms* which is circulated to the Introduction and Transfer Committee to complete an Aquatic Organism Risk Analysis. Based on the outcome of the assessment the Introduction and Transfer Committee may recommend to the decision making authority to approve with conditions or deny. It should be noted that the Introduction and Transfer Committee review is biologically and scientifically based and does not incorporate socio-

economic factors. This provincial permit requirement is over and above the permit that is required through the Canadian Food Inspection Agency's National Aquatic Animal Health Program. Currently import permits are required for susceptible species of finfish, molluscs and crustaceans based on their susceptibility to diseases of concern. These animals must meet the import requirements to enter Canada. In 2013 Canadian Food Inspection Agency's Domestic Movement Control Program will come into effect. Under this program any movement of susceptible species of finfish, molluscs and crustaceans within Canada will require a permit.

6.7 Stocking

Stocking is one of several management tools used by Manitoba to ensure the sustainable management and allocation of the province's fishery resources. The objective of the fish culture program is to enhance, restore and develop fish stocks in a way that ensures the ecological sustainability and economic viability while meeting resource enhancement objectives.

Action:

- To date, Waterhen Lake has been stocked with Walleye and Lake Whitefish fry on three occasions as follows:

***Table 3*: History of stocking efforts in Waterhen Lake**

Year	Fish Species	No. of Fry
1993	Lake Whitefish	2,000,000
2003	Walleye	2,500,000
2011	Walleye	1,200,000 (originally intended to be stocked in Chitek Lake)

Even though Waterhen Lake is not part of the province's regular stocking program, all future stocking efforts must adhere to the *Manitoba Stocking Strategy (2013)*.

6.8 Other

Continuation of the lost gear clean-up program by the Lake Waterhen Fishermen's Association is an important management measure that minimizes ecosystem impact through the prevention of harm to fish species as a result of 'ghost' fishing.

Action:

- Lost Gear Retrieval Program: Commercial fishers will continue to remove any abandoned gill nets found during the winter fishing season. If fishers are unable to remove a gill net due to being frozen in the ice, they will return and retrieve it once the lake becomes open in the spring. Commercial fishers will also retrieve any gill nets lost during the open water season when notified or if found.

7. Research

An important contributor to the effective protection of Waterhen Lake's aquatic ecosystem and sustainable management of its fishery resource is the data and knowledge obtained through a variety of past and ongoing research activities.

In the last few decades, several research projects have been carried out on Waterhen Lake and/or its tributaries. These past studies focused principally on stock status, primarily Walleye, through conducting creel census surveys to determine harvest levels by recreational anglers; as well as, a Walleye tagging study to determine seasonal fish movement through the water system. In addition to these studies research was also conducted on ecosystem health through the completion of a study that determined the level of mercury contamination in fishes from a variety of Manitoba waters, including Waterhen Lake.

Past research studies include:

- Derksen, A.J. 1979. *A summary report of mercury contamination in fishes from Manitoba waters to March*, 1971. Manitoba Department of Natural Resources. Fisheries Branch MS Report No. 79-55, 43 p.
- Edwards, G.A. and W. N. Howard. 1980. *Little Waterhen River Fish Movement and Walleye Tagging Study, 1971-1972*. Manitoba Department of Natural Resources. Fisheries Branch MS Report No. 80-8, 53 pp.
- Inland Waters Directorate, 1988. *Historical Streamflow Summary Manitoba to 1987*. Water Survey of Canada, Environment Canada, Ottawa.
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- Geisler, Marianne E. *Age and Growth Analysis of Walleye (Sander vitreus) in Waterhen Lake*. University of Winnipeg, Honour BSc Thesis (2012).

Pending research studies include:

- *Shannon Diversity of spawning female Walleye*: A study is currently undertaken on Lake Winnipeg to determine whether different age female Walleye spawn synchronously or arrive at different times at spawning grounds.
- *Benthic biota disturbance from winter gillnetting*: A study is being proposed to determine whether gillnetting through the ice has an impact on benthic invertebrate biomass and diversity.

- *Age, Growth and Maturity of* Moxostomos and Catostomus species: A study is being proposed to determine the age, growth and maturity of Moxostomos and Catostomus species to determine the sustainable stock status of these fish species in Waterhen Lake.

The focus of this plan's research strategy, subject to available resources, is to improve the quantity and quality of information pertaining to fish stock status, as well as, ecosystem structure and function, including habitat types.

All past and current research is posted for public access and viewing on the Manitoba Sustainable Development, Wildlife and Fisheries Branch, webpage:

http://www.gov.mb.ca/sd/waterstewardship/fisheries/commercial/commercial.html

This webpage will be updated when new research is published.

8. Species-at-Risk

The management of the Waterhen Lake fishery will continue to be guided by regulations set forth in the federally administered *Species at Risk Act* enacted in 2003. Canada's *Species at Risk Act* provides the legal framework for the protection and recovery of species that are designated as endangered or threatened. At the present time, there are no known fish species in Waterhen Lake listed under the *Species at Risk Act*.

Action:

If in the future a fish species found in the lake becomes listed under the *Species at Risk Act*, a recovery plan would be required. The recovery plan would be led by Fisheries and Oceans Canada and would include participation from Manitoba Sustainable Development and lake stakeholders such as commercial fishers. The recovery plan would outline detailed plans that would outline short-term objectives and long-term goals for protection, sustainability and recovery of the listed fish species.

9. Performance Review

The Waterhen Lake Fisheries Management Plan has been developed through an extensive consultative process. Manitoba Conservation and Water Stewardship will continue to consult and liaise with the Lake Waterhen Fishermen's Association, Manitoba Sustainable Development, and other pertinent stakeholders on a regular basis throughout the life of this plan, both through formal annual review processes as well as on a more informal *ad hoc* or issue-related basis.

9.1 Management Plan Evaluation Criteria

In order to determine if this Management Plan achieves its goals, a variety of management, science and enforcement performance indicators may be reviewed, as appropriate.

Actions:

- Assess the quality of data obtained from Commercial Log Books.
- Assess the quality of data obtained from the Commercial Fishery Patrol Reports.
- Assess population status through annual index netting program and commercial catch samples.

9.2 Annual (Post Season) Review

Post seasonal analysis sessions will be conducted with the Waterhen Lake Fishermen's Association, Chief and Council of the Skownan First Nation, Manitoba Sustainable Development and other pertinent resource users/stakeholders, such as recreational angler groups/ Associations, commercial tourism lodge operators and outfitters, etc. to review the previous year's fishing activities and to make recommendations on improving management measures.

Monitoring and research results will be disseminated to the general public through the Manitoba Sustainable Development, Wildlife and Fisheries Branch website, which, within one year of Waterhen Lake becoming certified, will include a section dedicated to Waterhen Lake eco-certification. This website will include, in addition, materials related to certification efforts on Waterhen Lake including the management plan, the action plan, the certification assessment report and annual audit reports.

Where University research is involved, theses and peer-reviewed publications will be prepared by the home organization and be available through normal University channels. In addition, these documents, links to these documents or citations for these documents (depending on copyright restrictions) will be made available to the public on the Manitoba Sustainable Development, Wildlife and Fisheries Branch website.

For directly involved stakeholders and interested parties, all monitoring and research results and associated materials, including University based research projects, will be presented, discussed and distributed at the annual Waterhen Lake commercial fisher association meeting, which will be followed by a general public meeting to be held in the Waterhen Lake area.

These materials will also be made available upon request to the Department of Sustainable Development, Wildlife and Fisheries Branch or to interested parties that attend the Wildlife and Fisheries Branch head office in person.

The approach stated above will provide the venue to disseminate and share information to all involved stakeholders and interested parties in a timely fashion and ensure the materials are widely and publicly available.

Actions:

- Generation of an annual stock assessment report detailing the state of the Waterhen Lake fishery resource.

- Generation of an informational package consisting of all monitoring and research results and associated materials, including University based research projects to be distributed to all directly involved stakeholders and interested parties.
- Creation and maintenance of a section on the Manitoba Sustainable Development, Wildlife and Fisheries Branch, website dedicated to Waterhen Lake eco-certification.

9.3 External Review Process

In order to determine if this Management Plan meets its goals/objectives an external review will be undertaken during the lifespan of the Management Plan. This independent 3rd party review will be conducted by fisheries professionals who possess the necessary knowledge and expertise with the sustainable management of freshwater fisheries.

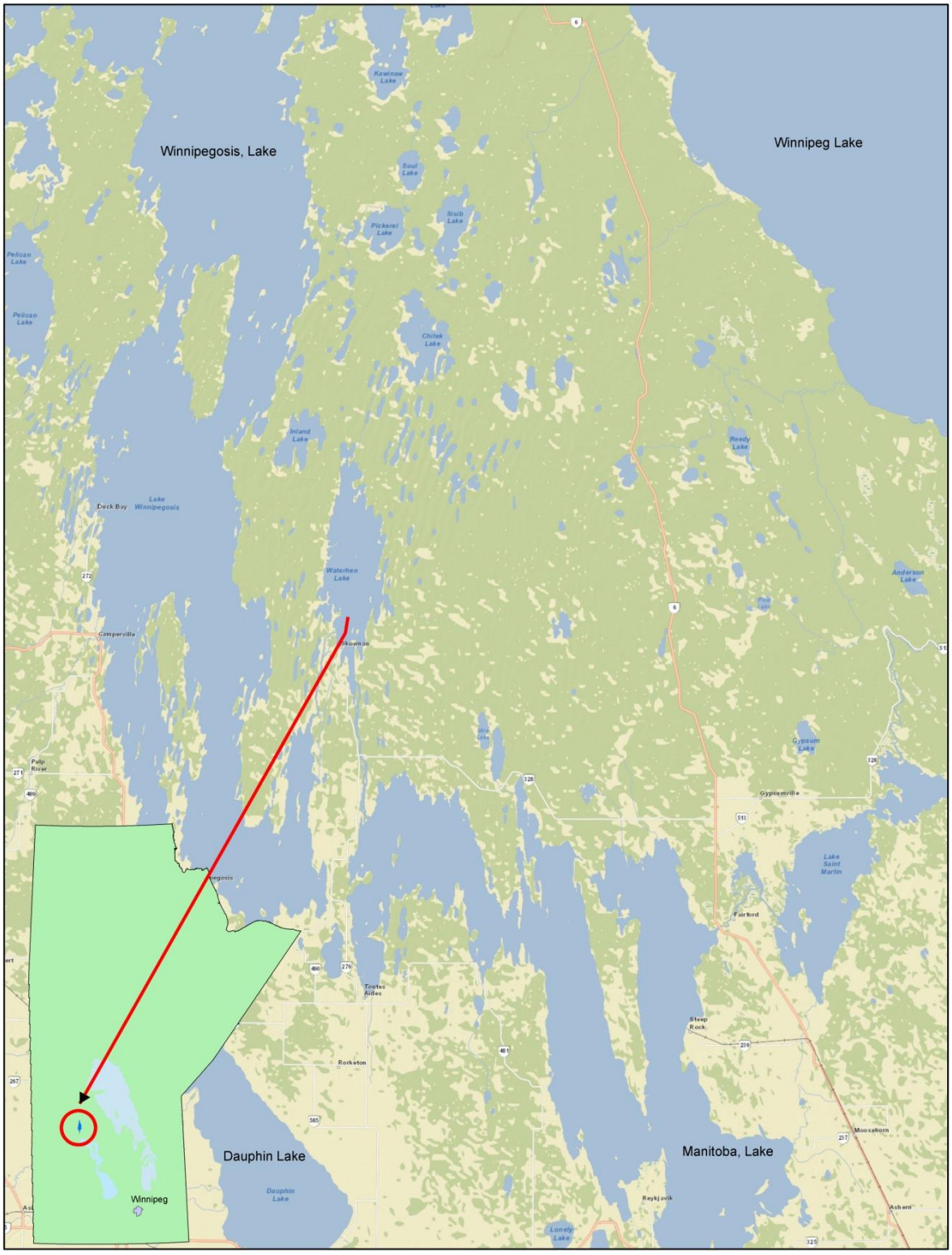
The team of external reviewers will consist of:

- Mr. Scott Gangl (MSc)
  Fisheries Management Section Leader
  Fisheries Management Section
  North Dakota Game and Fish Department

- Mr. Paul Bailey (MSc)
  District Fisheries Supervisor
  South-Central Fisheries District
  North Dakota Fish and Game Department

- Mr. Matt Hahn (MSc)
  Fisheries Biologist
  Wyoming Fish and Game Department

Appendix 1: Location of Waterhen Lake



Appendix 2: Management Adjustments on Waterhen Lake

Management Milestones	
Year	*Description*
1972	Lake quota for Walleye, Sauger and Northern Pike reduced from 45,360 kg to 34,020 kg.
1979 / 1980	Northern Pike and Sauger removed from quota. Only fish species listed under the quota is Walleye.
1980	Lake quota for Walleye reduced from 34,020 kg to 27,300 kg.
1983	Lake quota for walleye increased from 27,300 kg to 30,900 kg.
1987	Lake quota for Walleye increased from 30,900 kg to 36,300 kg – CFSV #87/7.
1992 &1993	An *experimental* 76mm fishery for Northern Pike and Yellow Perch operated on Waterhen Lake from January to March.
1994 & 1995	Discontinuation of experimental fishery because of concerns over the harvest of small Walleye.
1996	A 76 mm Yellow Perch fishery was authorized under Commercial Fishing Season Variance (CFSV # 96/1) from January 15th, 1996 to March 15th, 1996. A number of management measures designed to protect Walleye stocks were implemented: • lake zoning that would preclude the 76 mm mesh nets from designated areas of the lake; and, • establishment of a 10 % tolerance limit on the number of Walleye harvested.
1997	A 76 mm Yellow Perch fishery was authorized under Commercial Fishing Season Variance (CFSV # 97/1) from January 15th, 1997 to February 28th, 1997. A number of measures designed to protect walleye stocks were implemented: • lake zoning that would preclude the 76 mm mesh nets from designated areas of the lake; and, • establishment of a 10 % tolerance limit on the number of Walleye harvested.

1998	A 76 mm Yellow Perch fishery was authorized under Commercial Fishing Season Variance (CFSV # 1998/1) from January 15th, 1998 to February 28th, 1998. A number of measures designed to protect Walleye stocks were implemented: • lake zoning that would preclude the 76 mm mesh nets from designated areas of the lake; and, • establishment of a 10 % tolerance limit on the number of Walleye harvested.
2000	A 76 mm Yellow Perch fishery was authorized under Commercial Fishing Season Variance (CFSV # 2000/1) from January 28th, 2000 to March 2nd, 2000. A number of measures designed to protect Walleye stocks were implemented: • lake zoning that would preclude the 76 mm mesh nets from designated areas of the lake; and, • establishment of a 10 % tolerance limit on the number of Walleye harvested.
2001	A 76 mm Yellow Perch fishery was authorized under Commercial Fishing Season Variance (CFSV # 2001/3) from February 12th, 2001 to March 15th, 2001. A number of measures designed to protect Walleye stocks were implemented: • lake zoning that would preclude the 76 mm mesh nets from designated areas of the lake; and, • establishment of a 10 % tolerance limit on the number of Walleye harvested.
2002	A permanent year-round Carp and sucker fishery for Waterhen Lake was authorized under Commercial Fishing Season Variance (CFSV # 2002/4). The minimum gill net mesh size limit is 203 mm with an unlimited annual quota.

Lake Quota	
Year	*Limit*
Prior to 1972	45,360 kg
1972 to 1980	34,020 kg
1980 to 1982	27,300 kg
1983 to 1986	30,900 kg
1987 to present	36,300 kg

Mesh Size	
Year	*Mesh Size Extension*
1915 to 1927	108 mm
1927 to 1934	102 mm
1934 to 1936	108 mm
1936 to 1945	102 mm
1946 to 1948	83 mm
1949 to 1960	102 mm
1961 to 1970	108 mm
1971 to 1994	102 mm
1995 to present	96 mm

Commercial Fishing Season	
Year	*Dates*
1917 – 1922	November 20th to last day of February.
1922 – 1928	November 15th to last day of February.
1928 – 1934	November 11th to March 15th.
1934 – 1935	2nd Monday in December to 2nd Saturday in March.
1936 – 1947	November 11th to 2nd Saturday in March.
1947 – 1948	November 10th to February 15th.
1950 – 1951	November 11th to February 15th, extended to March 12, 1951.
1952 – 1953	November 11th to February 15th, extended to February 28th, 1953.
1953 – 1954	November 11th to February 15th, extended to March 6th, 1954.
1954 – 1955	November 11th to February 15th, extended to March 12th, further to March 26th, 1955.
1955 – 1956	November 11th to February 15th, extended to March 10th, further to March 17th, 1956.
1956 – 1957	November 11th to February 15th, extended to March 9th, 1957.
1957 – 1958	November 11th to February 15th, extended to March 8th, further to March 15th, 1958.
1958 – 1959	November 11th to February 15th, extended to March 14th, 1959.
1959 – 1960	November 11th to February 15th, extended to March 12th, 1960.
1960 – 1961	November 1st to March 11th, 1961.
1961 – 1968	First day that ice makes after November 1st to March 10th, 1962.
1968 – 1969	First day that ice makes after November 1st to March 10th, extended to March 31st, 1969.
1969 – 1970	First day that ice makes after November 1st to March 10th, extended to March 31st, 1969.
1970 – 1971	First day that ice makes after November 1st to March 10th, extended to March 31st, 1971.
1971 – Present	First day after November 1st that ice makes to March 31st.

Appendix 3: Waterhen Lake Sampling Protocol

Gear: North American standard gillnet (Appendix A, Table A.3 in Bonar et al 2009).

Feature	Description
Net type	Monofilament, 8-panel, sinking
Panel sizes	3.1 m (10 ft) long x 1.8 (6 ft) deep (Benthic) or 6 m (20 ft) deep (Pelagic)
Mesh bar size	19, 25, 32, 38, 44, 51, 57, 64 mm (0.75, 1.00, 1.25 1.50, 1.75, 2.00, 2.25, 2.50 in)
Monofilament diameters corresponding to mesh sizes	0.28, 0.28, 0.28, 0.33, 0.33, 0.33, 0.40, 0.40 mm (0.011, 0.011, 0.011, 0.013, 0.013, 0.013, 0.016, 0.016 in)
Mesh order	38, 57, 25, 44, 19, 64, 32, 51 mm (1.50, 2.25, 1.00, 1.75, 0.75, 2.50, 1.25, 2.00 in)
Hanging ratio	0.5
Soak time	Set late afternoon and retrieved the following morning, so that sample period encompasses both crepuscular periods. For sensitive species or populations, 2 hr sets during daylight
Catch per effort	Fish per net-night

Time of year:

Sampling will occur in the last week of September and first week of October corresponding to water temperatures between 10ºC and 15ºC.

Appendix 4: Commercial Fishery Patrol Report

Commercial Fish Patrol Log — Manitoba Conservation

REGION:		Officers:	Area:		
Date:					
Patrol Time			Weather	sky	
start:				wind	
conclude:				temp	

Operator /Fisherman					Fish							
Licence #	Name	Location / GPS	Area	Time	Whitefish	Pike	Pickerel	Sauger	Perch	Tulibee	Myria	Other
	hired hand		#nets		comments:							
	helpers											
	hired hand		#nets		comments:							
	helpers											
	hired hand		#nets		comments:							
	helpers											
	hired hand		#nets		comments:							
	helpers											
	hired hand		#nets		comments:							
	helpers											
	hired hand		#nets		comments:							
	helpers											
	hired hand		#nets		comments:							
	helpers											

Appendix 5: Areas of Waterhen Lake Closed to Commercial Fishing.

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