Fish and Wildlife Branch Report

Dauphin Lake
Summary Report 2022

Natural Resources and Northern Development
2022

Manitoba

Introduction

Fisheries staff from Manitoba Natural Resources and Northern Development conduct annual fish stock assessments on Dauphin Lake. This report includes results from the stock assessment completed in 2022. Each year, an index gillnetting project is performed on Dauphin Lake to provide an updated assessment on the species composition and to evaluate the success of the walleye recruitment in the lake. Information on length, weight, and age was collected from walleye (*Sander vitreus*) and northern pike (*Esox lucius*) caught in the nets, all other species were counted and bulk weighed. Walleye was the most abundant species caught in the gill nets followed by white sucker (*Catostomus commersoni*), yellow perch (*Perca flavescens*), and northern pike. Data analysis conducted includes Catch-per-unit-effort (CPUE), relative abundance, age frequencies, and a variety of other population health metrics.

Location

Dauphin Lake is located to the south of Lake Winnipegosis and to the west of Lake Manitoba in the province of Manitoba (see *Figure 1*).

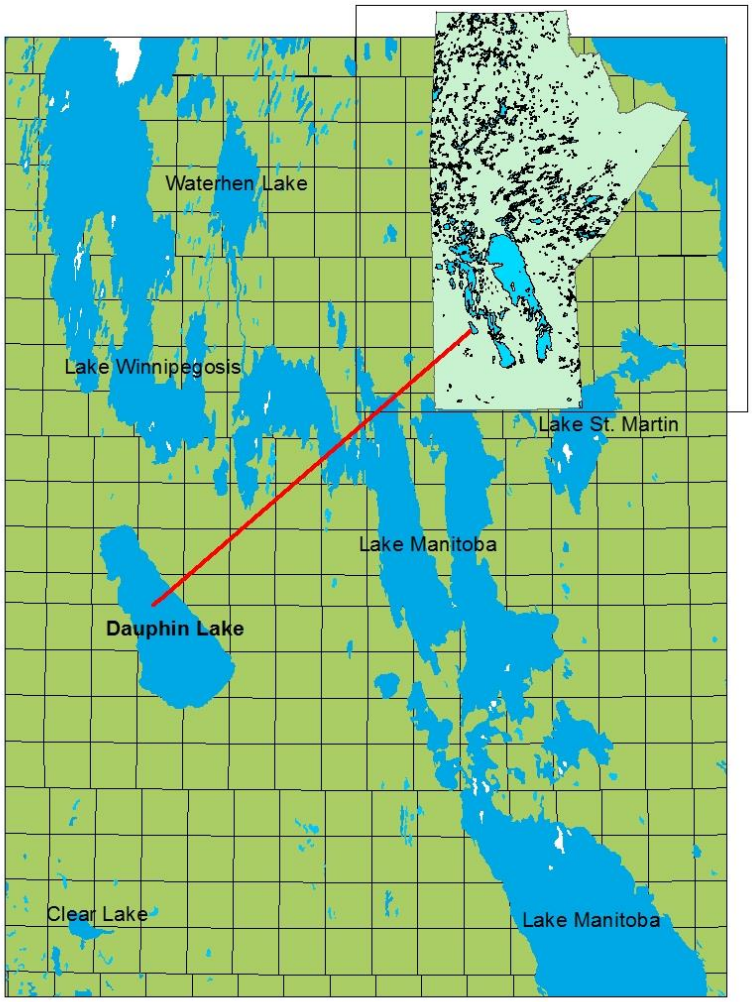

Figure 1: Map of location of Dauphin Lake.

The lake is 520 km^2, approximately 42 kilometres long and 12 kilometres wide, with water depths ranging from 1 to 4.0 meters on average. Dauphin Lake drains into Lake Winnipegosis through the Mossy River.

Fish Species

The winter commercial fishery is based primarily on walleye (*Sander vitreus*) as the only species harvested under the annual lake quota of 6,804 kilograms (15,000 lbs). The remaining species harvested have unlimited quota including lake whitefish (*Coregonus clupeaformis*); northern pike (*Esox lucius*); yellow perch (*Perca flavescens*); sauger (*Sander canadensis*); white sucker (*Catostomus commersoni*), and shorthead redhorse (*Moxostoma macrolepidotum*), marketed as "mullet"; cisco (*Coregonus artedi*), marketed as "tullibee"; and common carp (*Cyprinus carpio*).

Stock Assessment

Manitoba Natural Resources and Northern Development (Fisheries) conducts annual index gill net surveys and beach seining to assess the status of walleye and other fish stocks in Dauphin Lake. Figure 2 shows the catch composition from index gill net surveys in 2013-2022. Walleye were the dominant species in the catch in all years, with a slight decrease in percent composition of the catch from 2021 to 2022.

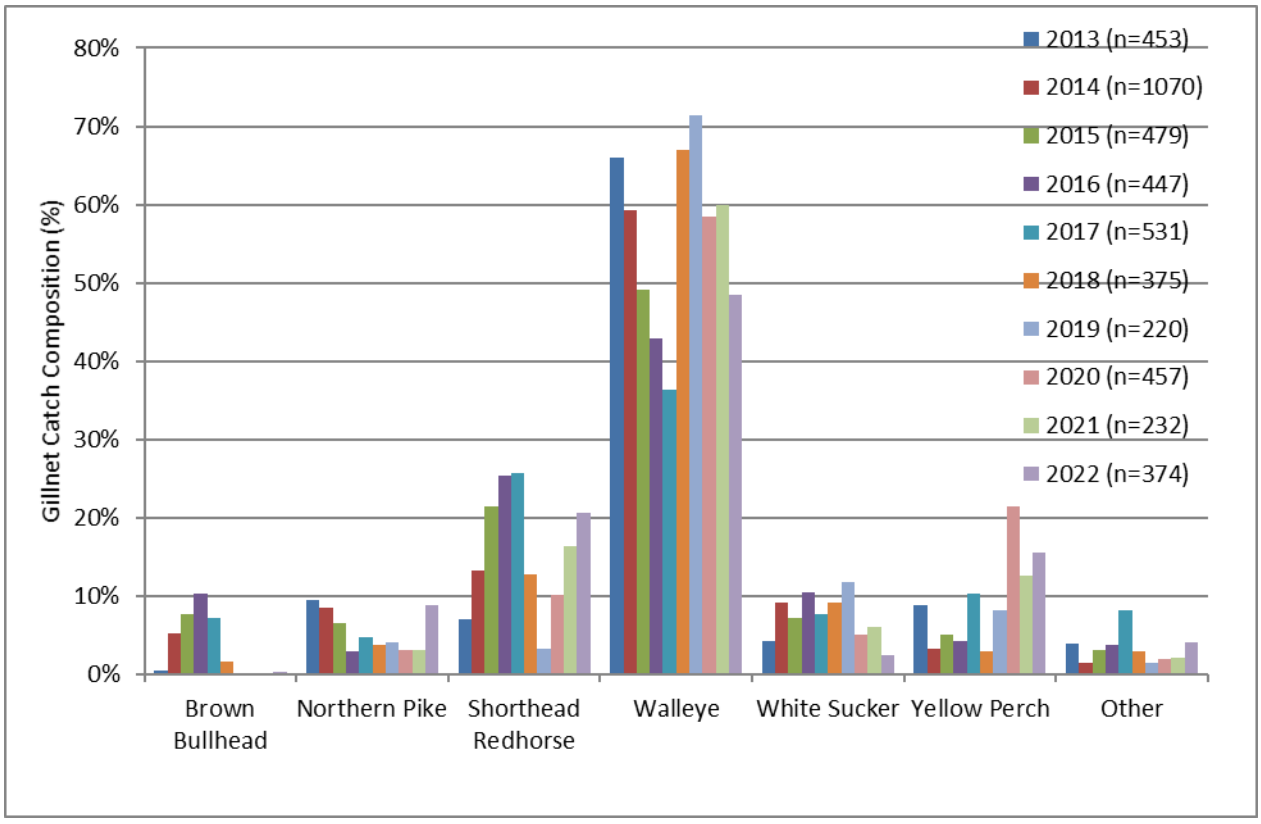

Figure 2: Catch composition of species from index gill net surveys from 2013 to 2022. (Other species include common carp, cisco, freshwater drum, silver redhorse, burbot, goldeye, quillback, and sauger.)

Walleye

Relative abundance of all walleye from index netting generally exhibited an increasing trend since the mid 1990s, but has shown occasional declines based on variable recruitment and harvest rates over the years (Figure 3a and 3b).

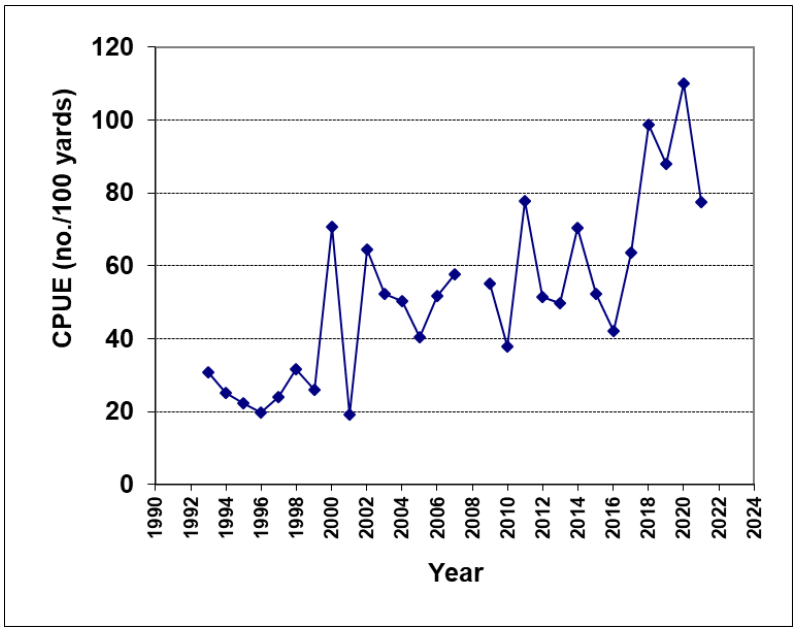

Figure 3a: Catch-per-unit-effort of all walleye caught during annual monitoring, 1993 to 2022.

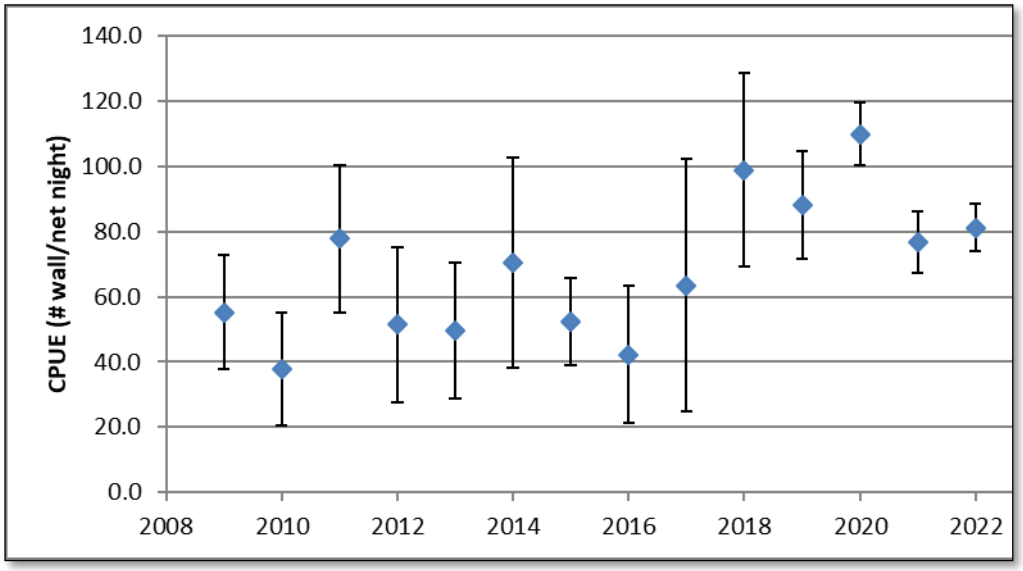

Figure 3b: Catch-per-unit-effort of all walleye caught during annual monitoring and associated variation in catch, 2009 to 2022.

A wide variety of age classes with variable abundance were found from aging 181 walleye caught (Figure 4). A total of 17 age groups were caught during 2022, ranging in age from 1 to 19 years. The strong 2012 year class (age 10) was the most abundant year class in the sample (12.7%). The number of age groups in the walleye population in Dauphin Lake (more than 8 age classes) is one indicator of a stable stock (Sullivan 2003). Figure 5, shows historical walleye age class abundance from 2014 to 2021 assessments.

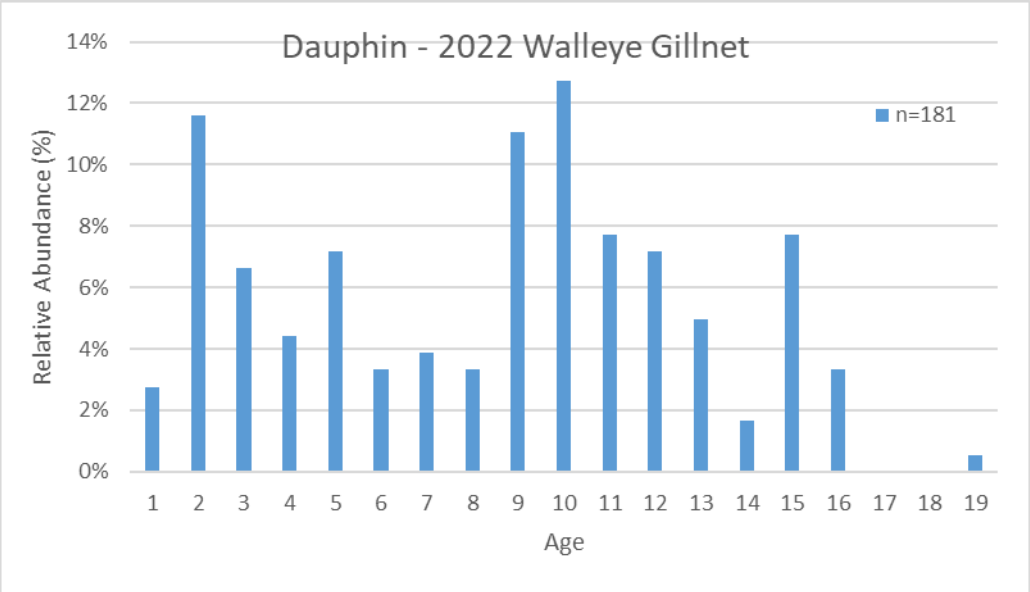

Figure 4. Relative abundance of walleye age classes from index gillnet survey from 2022.

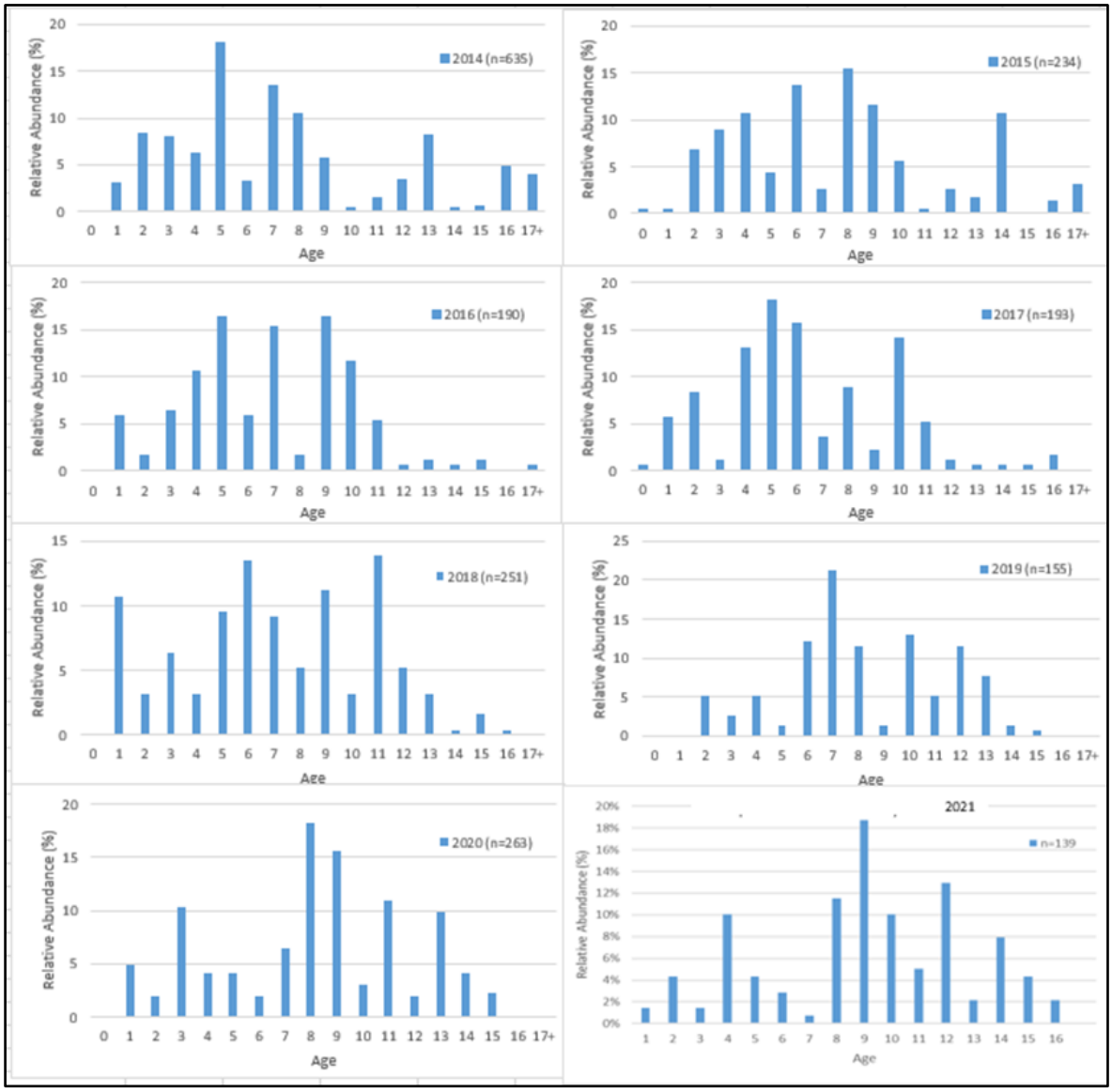

Figure 5: Relative abundance of walleye age classes from index gillnet surveys from 2014 to 2021.

In 2022, the mean age of walleye captured in the stock monitoring program decreased from 9.07 (in 2021) to 8.38 years of age. A mean age between six to nine years is an indicator of a stable population, in combination with other positive stock status indicators (Sullivan 2003). For early growth (ages 1 to 7), using omega (ω = Linf*k), Dauphin Lake walleye grow faster than expected, based on growing degree days (GDD from Environment Canada - Canadian Climate Normals 1971-2000). Gangl and Pereira (2003) estimated early growth (omega), based on climate, for the area to be about 105, in Dauphin Lake it was 197 in 2020 (and 183.5 in 2019). The rapid growth is likely due to the nutrient rich waters and abundance of food sources available.

Female total length at 50 % maturity was smaller than expected (i.e. females reached maturity at smaller sizes than expected, based on how quickly walleye in Dauphin Lake grew since age 3). From Gangl and Pereira (2003), predicted total length at 50 % maturity for Dauphin Lake was 508 mm. Female total length at 50 % maturity was 407 mm in 2022.

Reproductive rate of walleye populations increase with the mean age of adult female walleye, in part because older female walleye produce larger and potentially higher quality eggs (Venturelli et al.

2010). In 2022, mean age of mature female walleye was 8.7 years old (Figure 6). Mature female walleye ranging in age from 4 to 16 represented 50% of all walleye caught in index gill nets. This suggests a high proportion of prime spawners in the Dauphin Lake walleye population, which is important for recruitment.

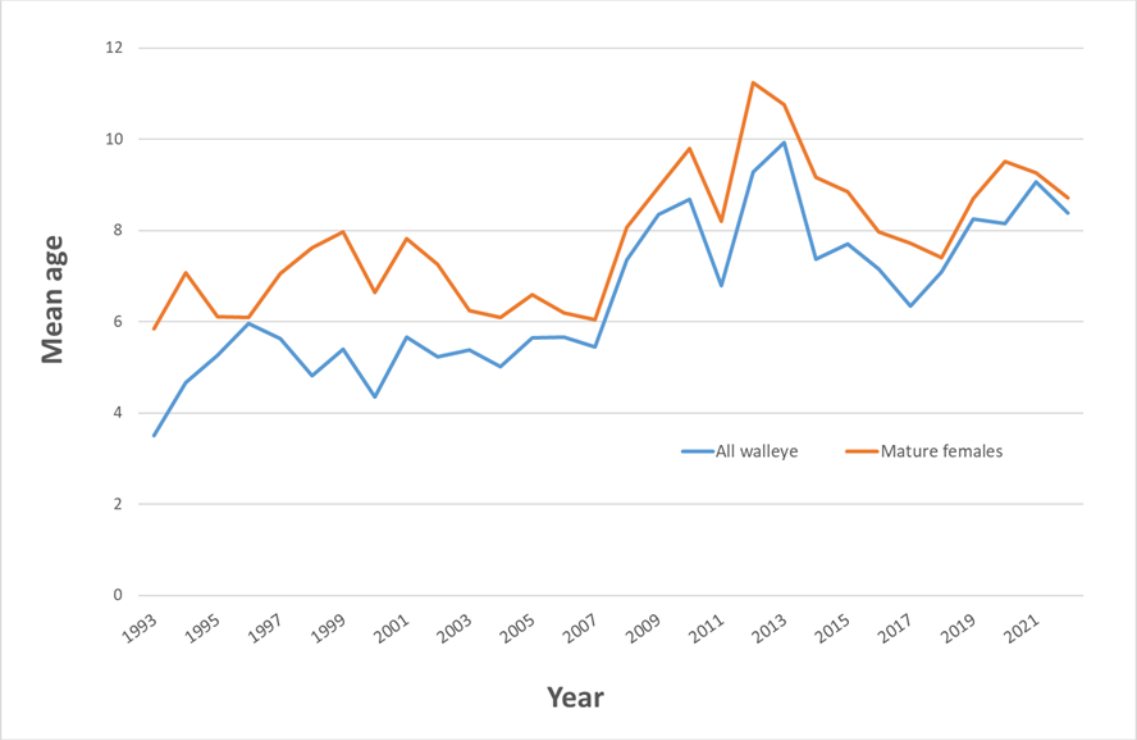

Figure 6: Mean age of walleye (sexes combined and mature females only) from 1993 to 2022.

Biologically, mature female fish are considered to be more important than mature male fish for the production of future year classes. In the Valley River, larval walleye abundance was positively related to mature female biomass in Dauphin Lake (Johnston et al. 1995). The relative abundance of mature female walleye increased back to the high end of the near-term range in 2022 (Figure 7). The relative abundance of immature female walleye in the population increased as well in 2022, to 10.8 fish per 100 yards of net.

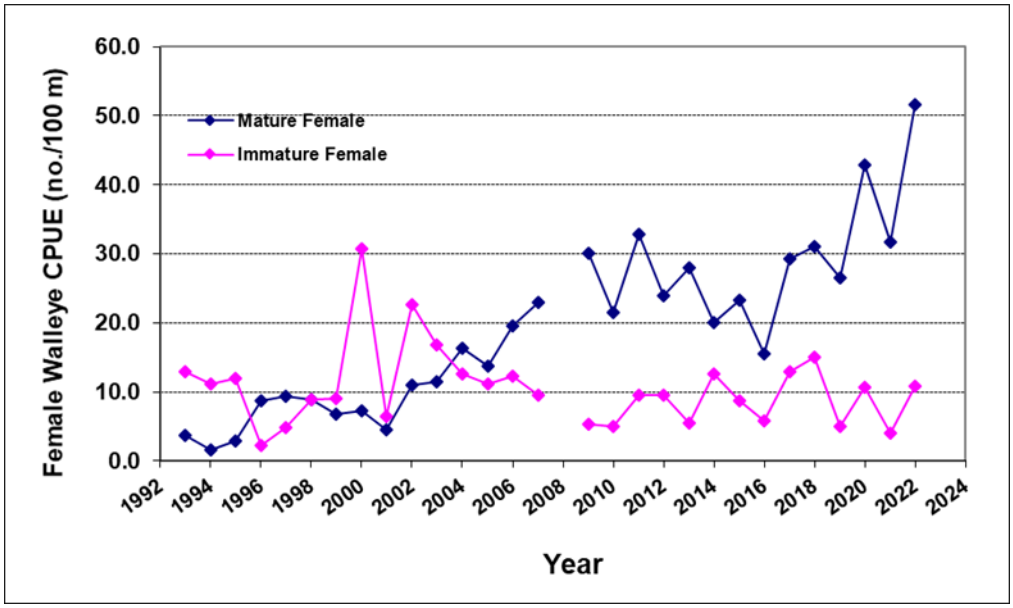

Figure 7: Catch-per-unit-effort of mature and immature female walleye caught during annual monitoring 1993 to 2022.

The age-at-maturity of all walleye generally decreased after 2006 and increased in 2012 to 5.3 years (Figure 8). Female age-at-maturity in 2022 (3.72 years) was down from 2021 (4.02 years). Age-at-maturity is influenced by the strength of year classes ages 4 and 5. In 2022, age-at-maturity of female walleye (3.72 years) was less than a published threshold of 5.1 years, based on growing season length (Gangl and Pereira 2003). Failing to exceed a threshold of a biological performance indicator is considered a negative indicator of stock status.

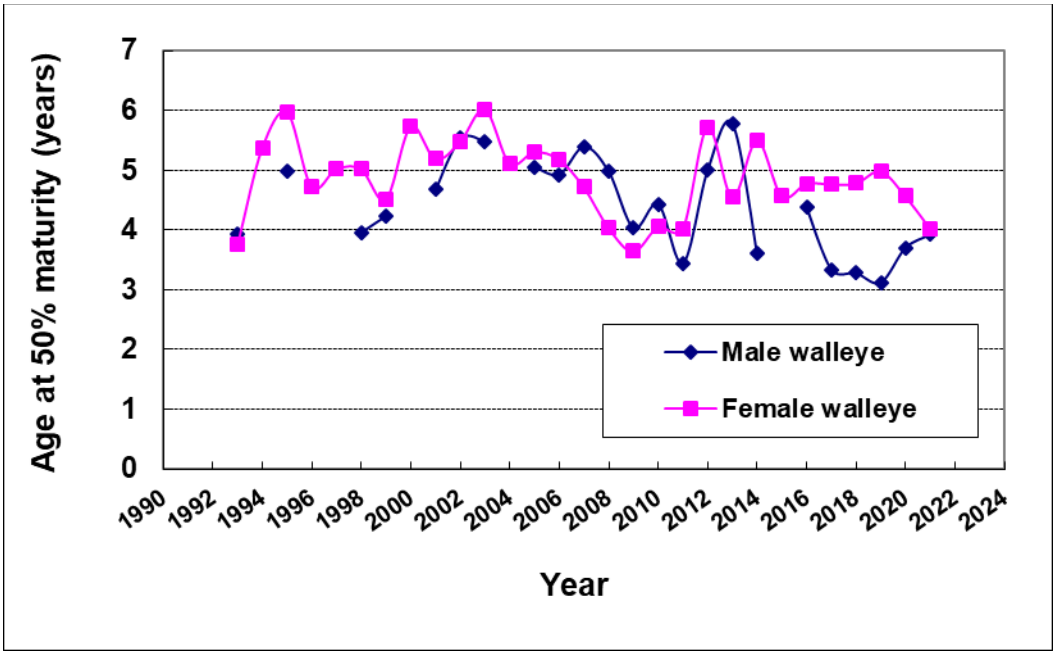

Figure 8: Age of maturity of walleye from annual monitoring in Dauphin Lake, 1993 to 2022.

Based on 2022 stock monitoring results, the annual mortality rate of female walleye ages 10 to 14 was 36.2%. This mortality rate is within recently published sustainable exploitation rates (Lester et al. 2014). In 2022, annual mortality rate decreased slightly compared to the 2015-21 estimate of annual mortality

for female walleye (ages 9 to 18) which was 38.5%. The walleye population is being harvested within a reasonable range.

Average length of walleye age classes from index netting have recently exhibited a decreasing trend for ages 8 and over since 2014 (Figure 9). This decline seems to indicate that some growth limiting factor is affecting older walleye either as a biological compensation mechanism (e.g. too many fish and crowding occurring) or limited food supply (e.g. not enough food to support current population levels) for length growth to continue at older ages. When taking into account relative weight indices, walleye are still healthy for their weight (Wr > 0.75).

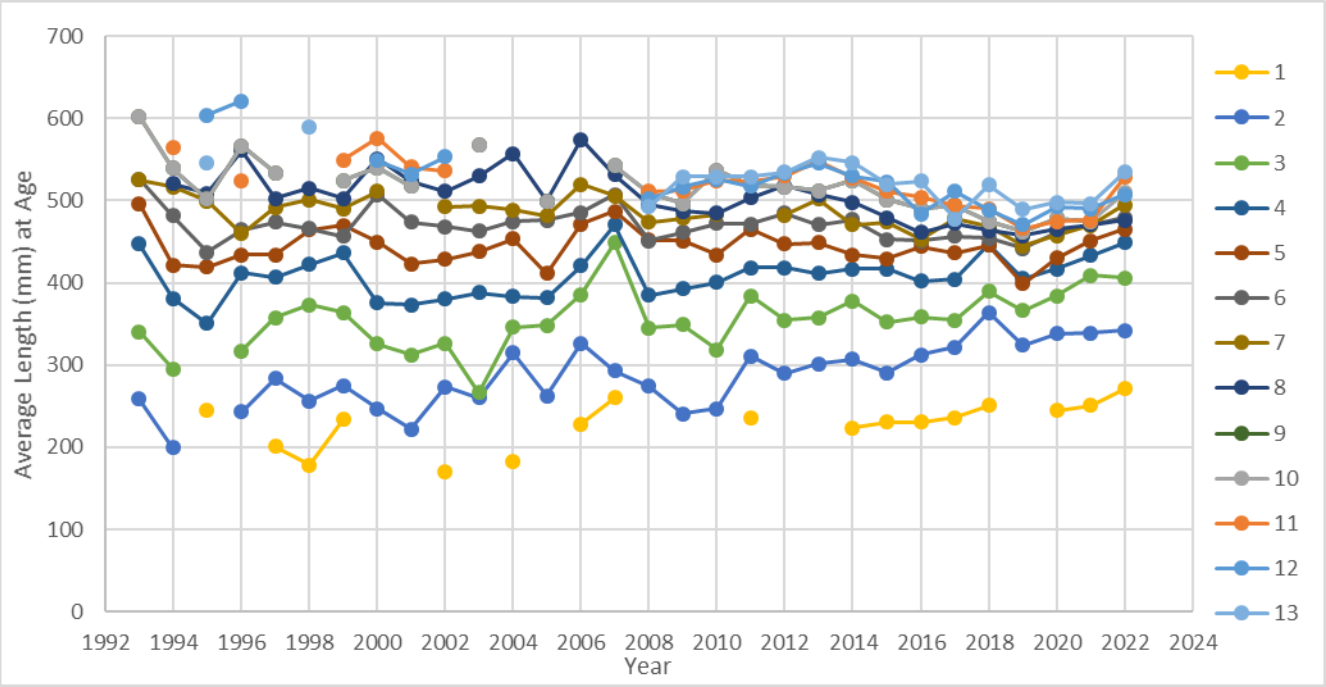

Figure 9: Average total length (mm) of walleye age classes from Dauphin Lake, 1993 to 2022.

The Von Bertalanffy growth function for 1996, 2012, 2017, and 2022 shows that young walleye grow quickly and reach a maximum total length at age 8. It is presumed then that given higher walleye populations that growth is being stunted by physiological compensation functions. This has left a disproportionately large percentage of the fish at the lower end of the slot (45-50cm) and few fish that grow to a large size (>50cm) in recent years.

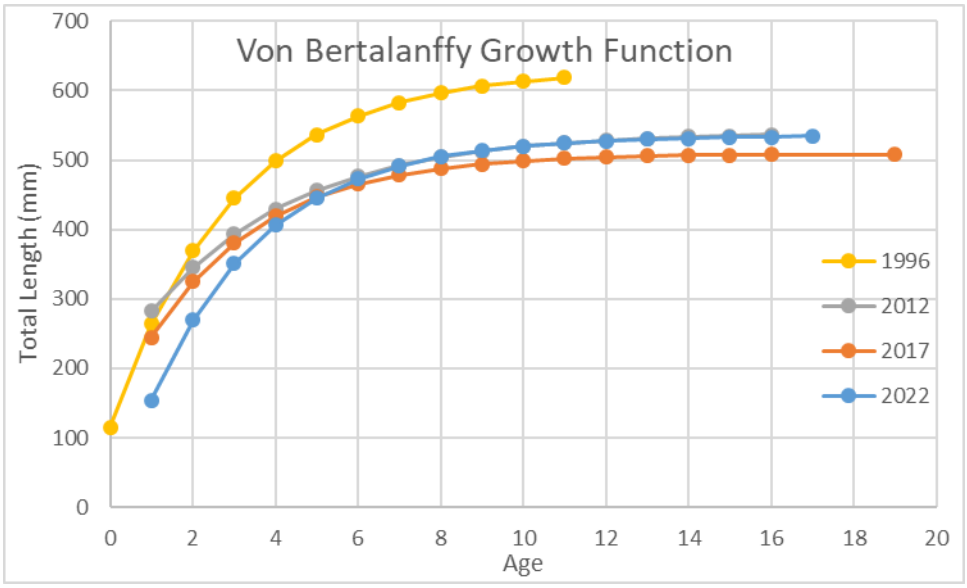

Figure 10: Von Bertalanffy growth function of walleye age at total length from Dauphin Lake, 1996, 2012, 2017 and 2022.

Northern Pike

Near-shore and vegetated habitat areas were too shallow to effectively net, which is where pike are typically found. In the far-shore areas assessed a low level of northern pike abundance with relatively uniform population structure was found (Figure 11). A total of 7 age groups were caught during 2022, ranging in age from 0 to 8 years. Due to the low composition of pike stocks, no specific measures are in place to manage the species.

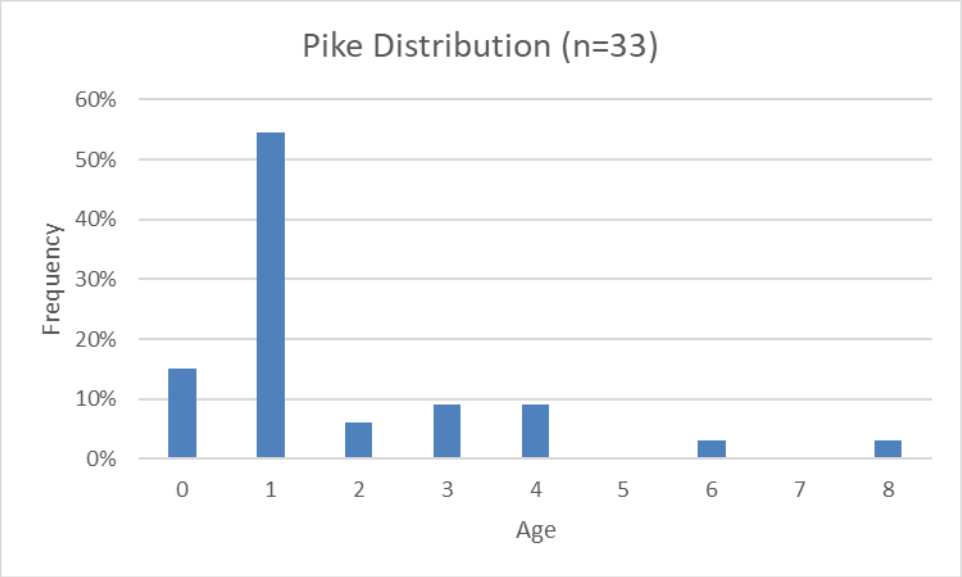

Figure 11. Relative abundance of pike age classes from index gillnet survey from 2022.

Stream Flows

Environmental factors, such as spring stream flows and water warming rates, can have a measurable effect on walleye spawning success. In the Valley River, walleye larval abundance was positively related to spring mean flow (Johnston et al. 1995). The year-class strength of walleye in Dauphin Lake was positively related to abundance of larval fish in the Valley River (Johnston et al. 1995). The average stream flow for the first ten days following ice out (typically when flows tend to be highest) and the date of the peak spring flow are shown for the Turtle River (Figure 12) and the Valley River (Figure 13) from 2000 to 2022. Annual mean flow was generally higher in the Valley River than the Turtle. Magnitude and timing of peak flow was variable. The date of peak flow was usually earlier in the Valley River than the Turtle River, and ranged from late March to late May.

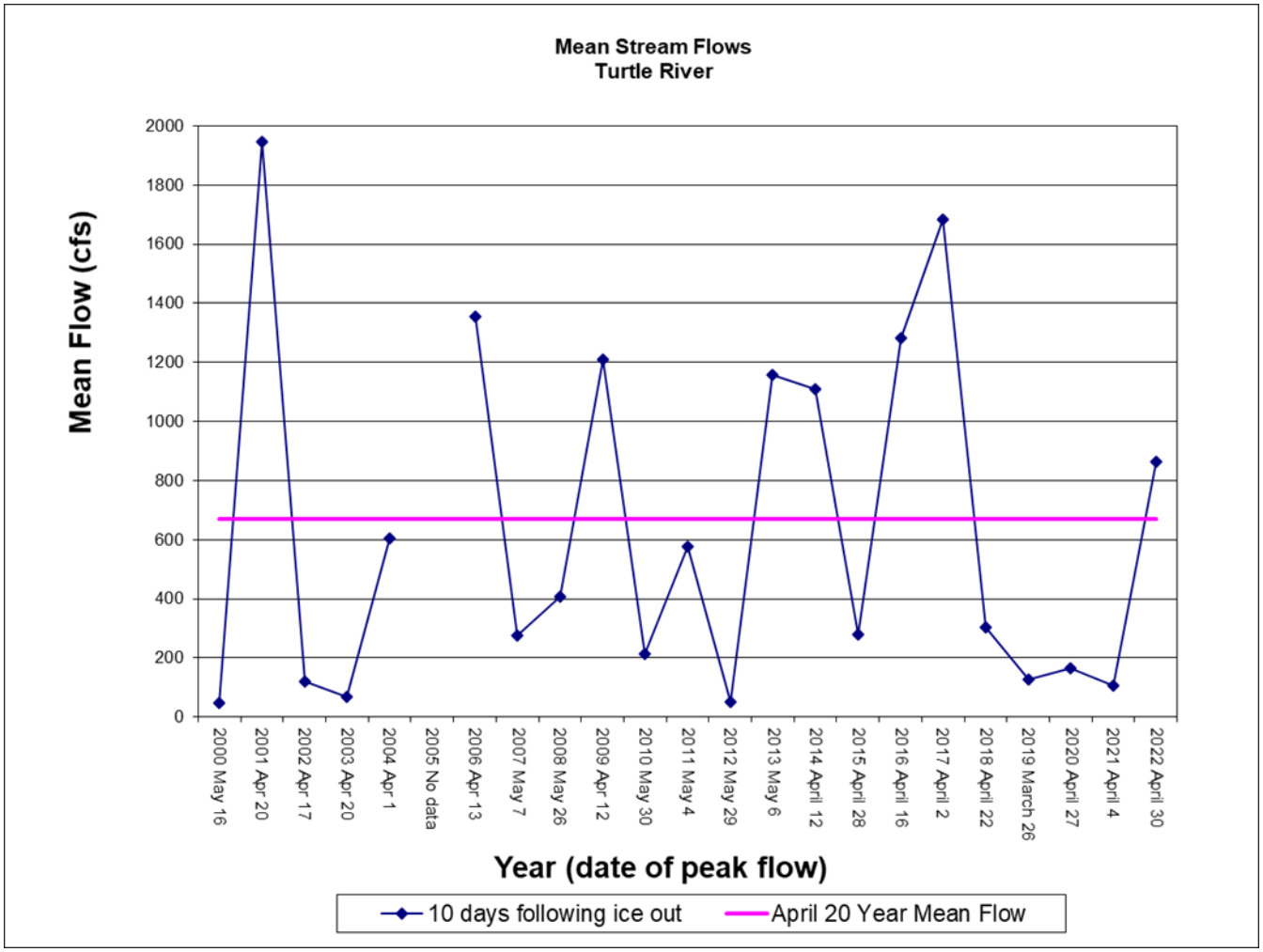

Figure 12: Mean spring stream flows in Turtle River from 2000 to 2022. No data available for 2005.

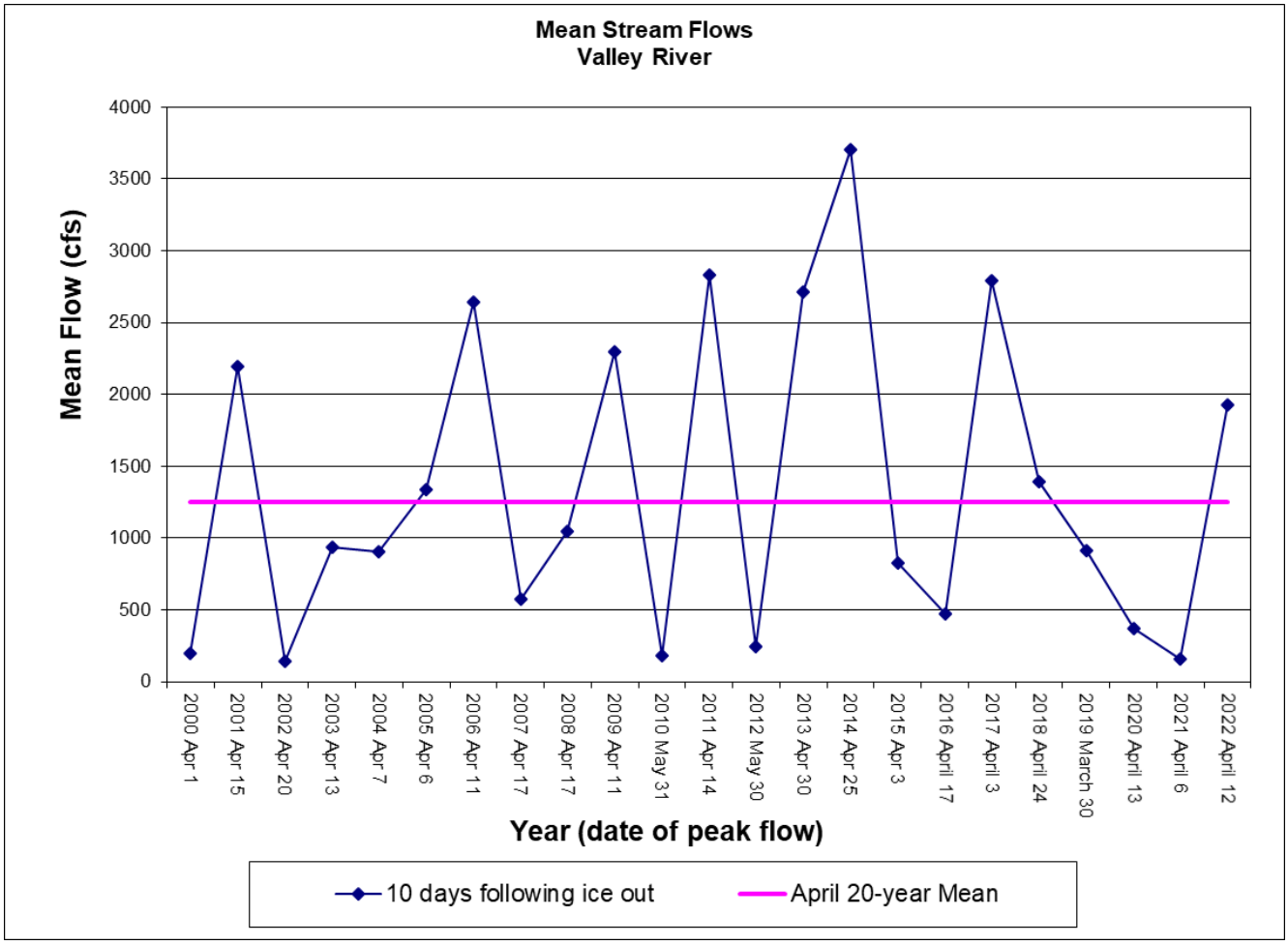

Figure 13: Mean spring stream flows in Valley River from 2000 to 2022.

Conclusions:

There are a number of indicators that are used to determine the status and health of fish stocks in provincial waters. These include, but are not restricted to, age structure (i.e. variation in year class strength, mean age), mortality rates, mean age of the commercial catch, age of maturity, and catch per unit effort.

Based on 2022 index netting results, the population was composed of a wide range of age groups (17), similar to the last five years, which is an indicator of stable stock status.

Based on 2022 stock monitoring results, the annual mortality rate of female walleye ages 10 to 14 was 36.2%. This mortality rate is within recently published sustainable exploitation rates (Lester et al. 2014). In 2022, annual mortality rate decreased slightly compared to the 2015-21 estimate of annual mortality for female walleye (ages 9 to 18) which was 38.5%. There is a broad range of spawning aged females in the Dauphin Lake walleye population that support sufficient walleye recruitment and provide for long-term sustainability.

Catch per unit effort (CPUE) has been at a high level in recent years. The number of mature female walleye went up in 2022 with 51.6 fish per 100 yards. A stable or increasing catch per unit effort suggests that the population is stable or expanding while a decreasing catch per unit effort suggests that the stock is in decline.

To ensure accurate and up-to-date information is collected, Manitoba Natural Resources and Northern Development will continue to refine approaches to enhance monitoring activities.

The Department will continue to undertake annual stock monitoring activities on Dauphin Lake and continue to explore opportunities to enhance assessment efforts. This may include index gill netting, beach seining for age-0 walleye monitoring, and spring spawning monitoring activities.