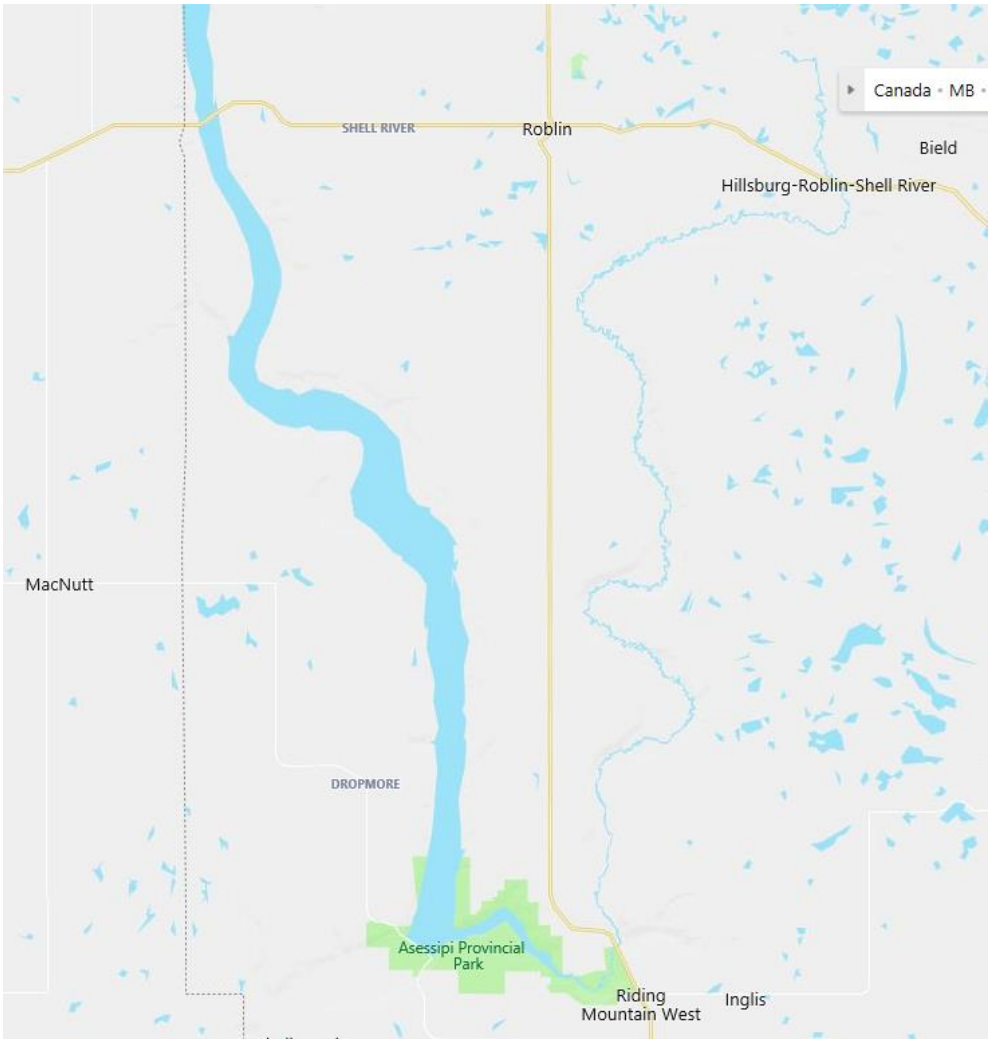
# Fisheries Branch Report

2022

# Lake of the Prairies Summary Report




Natural Resources and Northern Development
2022

Manitoba

# Location

Lake of the Prairies is a large recreationally fished reservoir in the western portion of Manitoba along PR 83 and PR 5 and located approximately 12 kilometres west of Roblin, MB (see *Figure 1*).

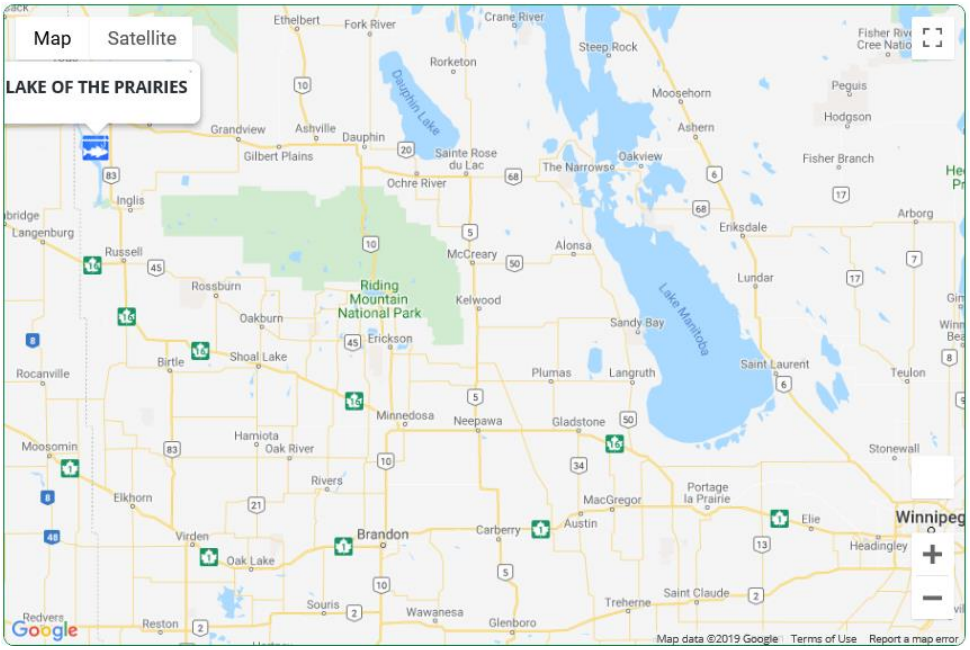



**Figure 1**: Location of Lake of the Prairies.

The Manitoba portion of the lake is approximately 40 kilometres long orientated from northwest to southeast. The net set location depths ranged from 1.8 meters to 11 meters with an average depth of 3.9 meters.

Lake of the Prairies is part of the Assiniboine River system where it begins in Manitoba after going through the Shellmouth Dam. Lake of the Prairies has been developed with cottages, campgrounds, Asessippi Provincial Park, and has multiple boat launches.

# Fish Species

The recreational fishery is based primarily on Walleye (*Sander vitreus*). The remaining species harvested or present in the lake include Northern Pike (*Esox lucius*); Yellow Perch (*Perca flavescens*); White Sucker (*Catostomus commersoni*); Silver Redhorse (*Moxostoma anisurum*); Shorthead Redhorse (*Moxostoma macrolepidotum*); Golden Redhorse (*Moxostoma erythrurum*); Cisco (*Coregonus artedi*); Mooneye (*Hiodon tergisus*); Quillback (*Carpiodes cyprinus*); Rock Bass (*Ambloplites rupestris*); and Common Carp (*Cyprinus carpio*).

# History of the Fishery

A “no harvest” slot limit on Walleye between 55 centimetres (cm) and 70 cm (27.6 inches) was introduced in 1988 to conserve Walleye harvest and protect larger spawning stock. In 1999, the protected slot size was expanded to include all Walleye between 45 cm and 70 cm had to be released, and anglers must use barbless hooks.

Conservation measures for Northern Pike on Lake of the Prairies and its tributaries were implemented in 2006 to preserve a healthy adult pike population by restricting harvest of all pike over 75 cm.

Current (as of spring 2023) angling regulations for Lake of the Prairies and its tributaries, including the Shell River west of PTH 83, state that all Walleye over 45 cm must be released, with a possession limit of 4. All Northern Pike over 75 cm must be released, with a possession limit of 4.

## Stocking

Lake of the Prairies has been stocked since the early 1970's, including a variety of species as follows:

**Table 1:** History of stocking efforts in Lake of the Prairies.

| Year | Species | Number | Size |
|---|---|---|---|
| **2016** | WALLEYE | 193 | Adult (>30 cm) |
| **2011** | YELLOW PERCH | 5,000 | Adult (>30 cm) |
| **2010** | YELLOW PERCH | 35,000 | Adult (>30 cm) |
| **2009** | YELLOW PERCH | 40,000 | Adult (>30 cm) |
| **2009** | WALLEYE | 20 | Adult (>30 cm) |
| **2008** | YELLOW PERCH | 60,000 | Adult (>30 cm) |
| **2007** | YELLOW PERCH | 35 | Adult (>30 cm) |
| **2004** | YELLOW PERCH | 60,000 | Adult (>30 cm) |
| **2002** | WALLEYE | 300,000 | Fry |
| **1999** | WALLEYE | 200,000 | Fry |
| **1997** | WALLEYE | 300,000 | Fry |
| **1996** | WALLEYE | 300,000 | Fry |
| **1995** | WALLEYE | 200,000 | Fry |
| **1994** | WALLEYE | 400,000 | Fry |
| **1986** | WALLEYE | 4,500,000 | Fry |
| **1985** | WALLEYE | 5,000,000 | Fry |
| **1983** | MUSKELLUNGE | 50,000 | Fry |
| **1982** | MUSKELLUNGE | 50,000 | 0 |
| **1981** | MUSKELLUNGE | 95,000 | Fry |
| **1980** | WALLEYE | 1,000,000 | Fry |
| **1979** | MUSKELLUNGE | 50,000 | Fry |
| **1976** | WALLEYE | 300,000 | Fry |
| **1973** | WALLEYE | 500,000 | Fry |
| **1971** | YELLOW PERCH | 5,000 | 0 |
| **1971** | SMALLMOUTH BASS | 5,000 | Fingerling |
| **1970** | WALLEYE | 1,000,000 | Fry |

# Stock Assessment

## Annual Index Gill Netting

Fisheries staff conduct periodic index gill net surveys to assess the status of the Walleye stock and greater fish community in Lake of the Prairies. Figure 2 shows the catch composition from index gill net surveys in 2013-2021. Walleye were the dominant species in the catch in all years, with a decline in percent composition of the catch in 2021.

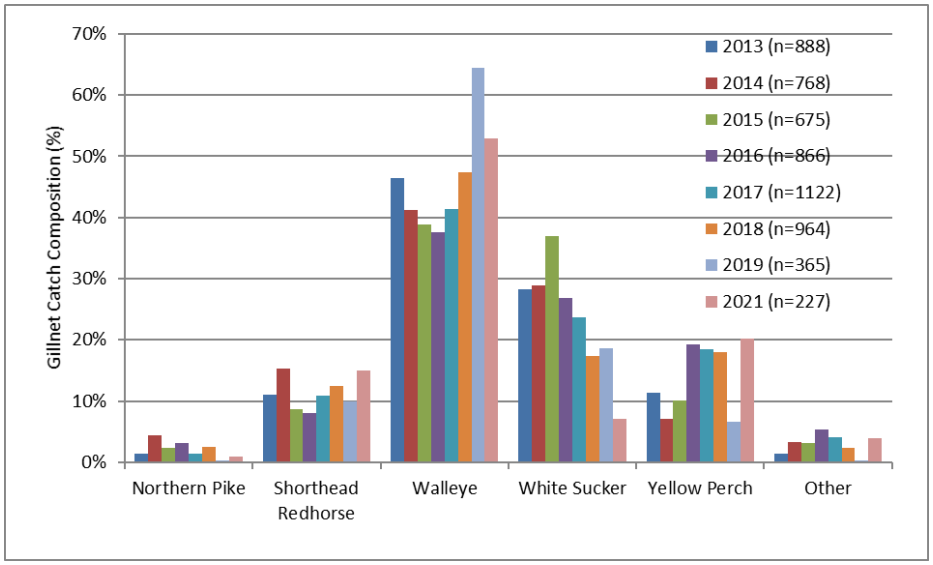



**Figure 2:** Catch composition of species from index gill net surveys from 2013 to 2021. (Other species include carp, Silver Redhorse, Golden Redhorse, Mooneye, Rock Bass, and Quillback)

A total of 12 Walleye age classes were caught during 2021, ranging in age from 1 to 16 years. The age class frequency of the Walleye population is somewhat fragmented with either poor year classes or possible out-migration of fish during low water conditions. The 2018-year class seems to be quite strong, representing 42.5% of the Walleye catch (see Figure 3). The number of age groups in the Walleye population in Lake of the Prairies (more than 8 age classes) is one indicator of a stable stock (Sullivan 2003). Figures 4 and 5 shows the Walleye age class abundance from 1997 to 2019 assessments.

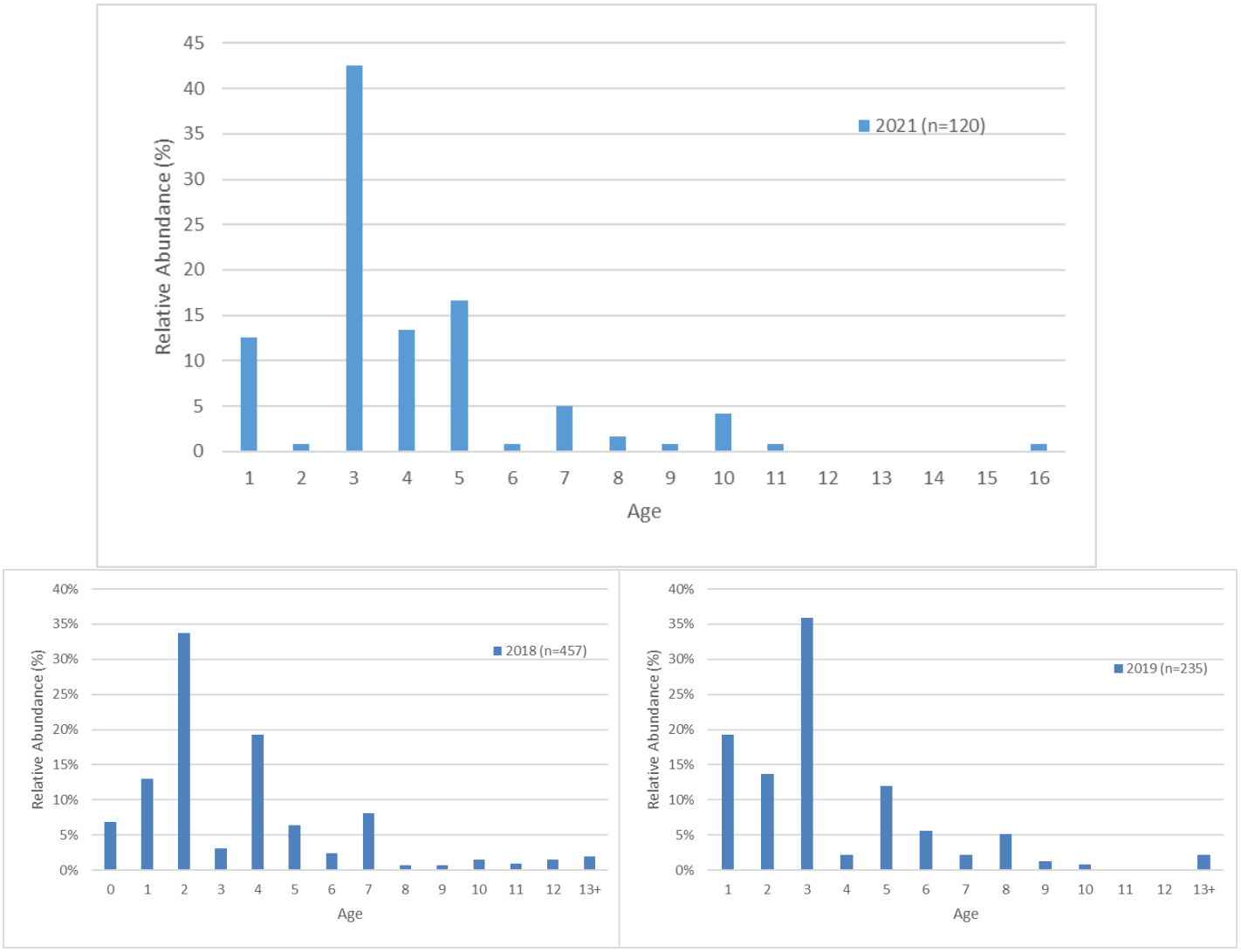



**Figure 3**: Relative abundance of Walleye age classes from 2018 - 2021 index gillnet surveys.

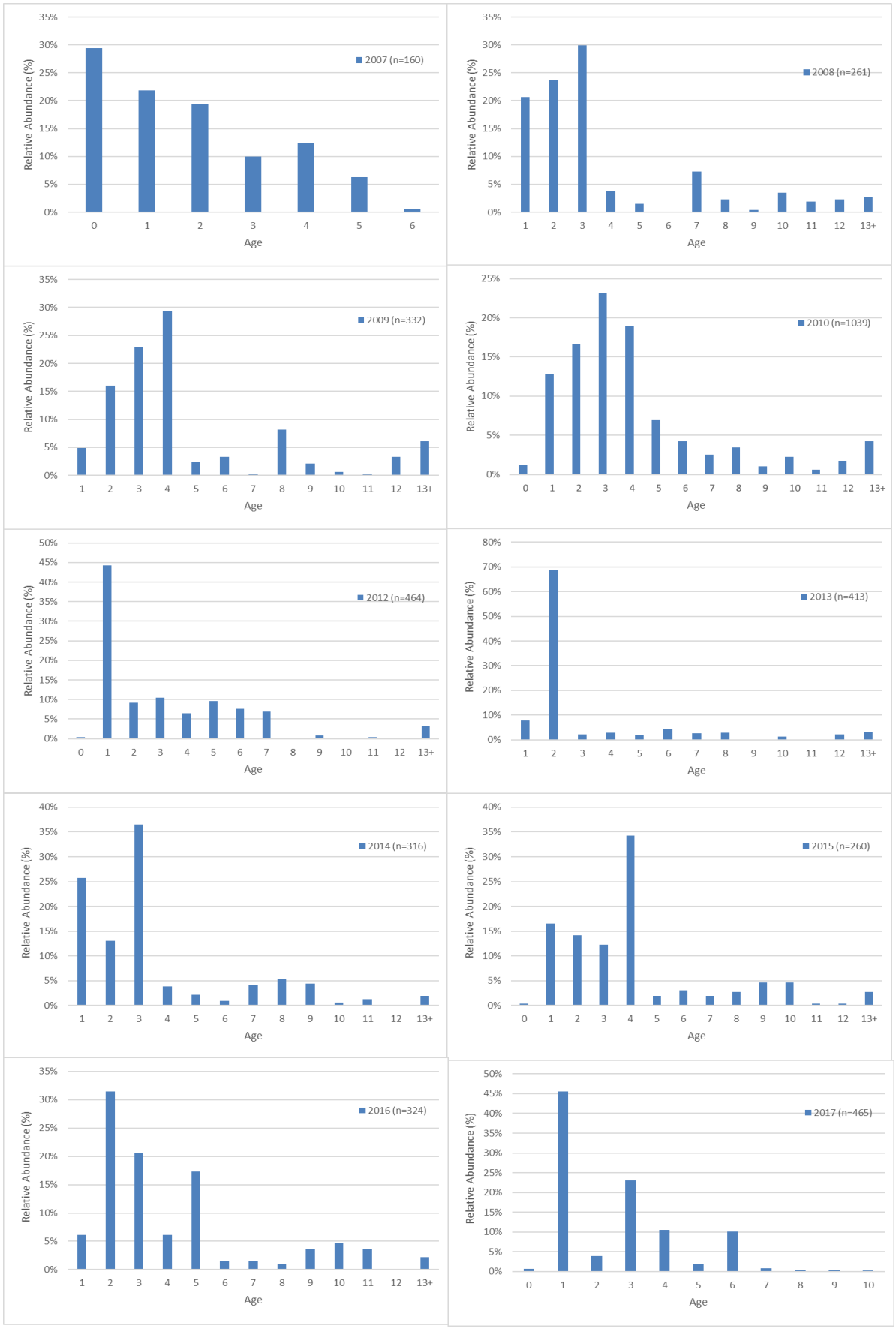



**Figure 4**: Relative abundance of Walleye age classes from index gillnet surveys from 2007 to 2017.

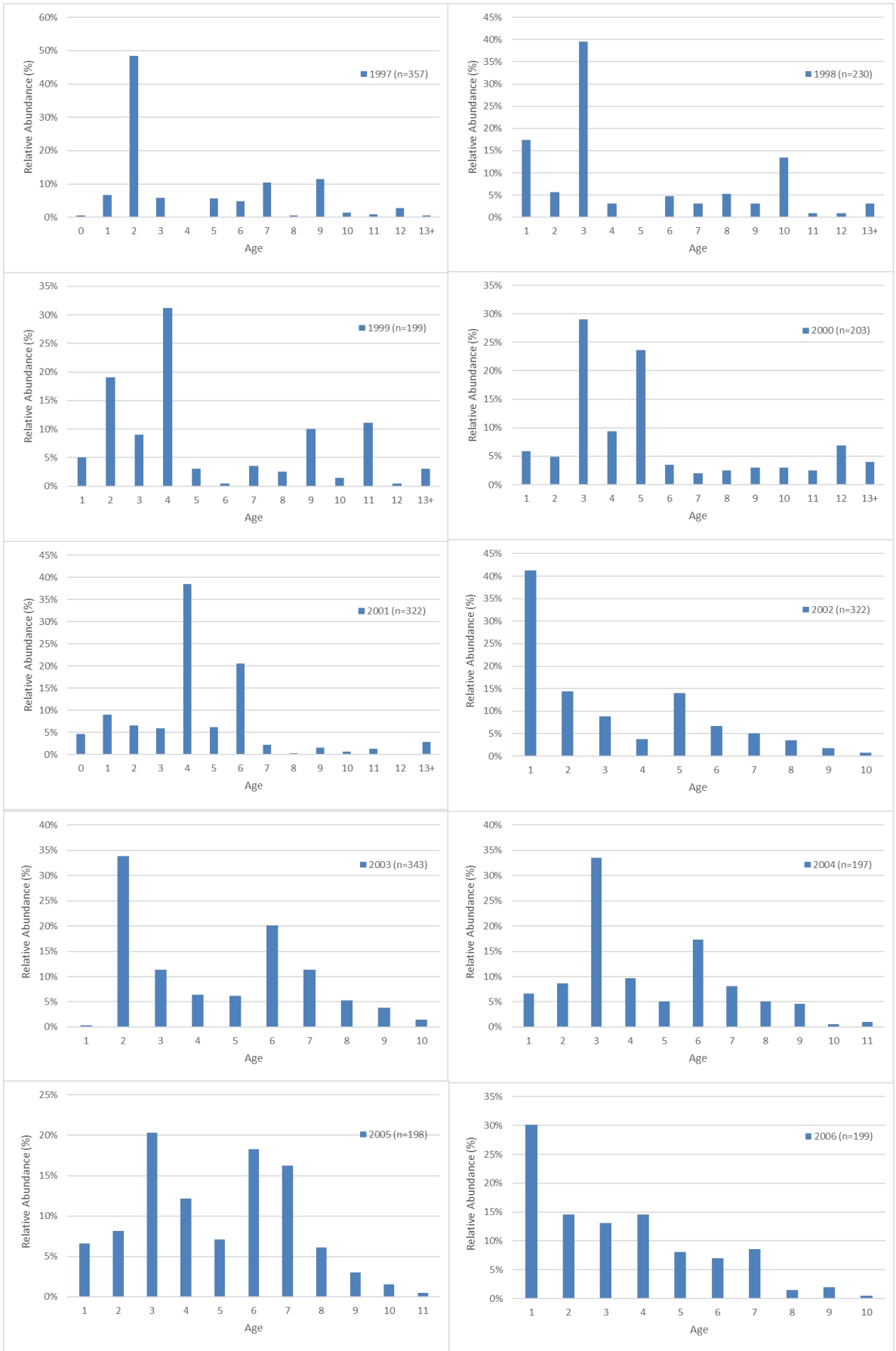



**Figure 5**. Relative abundance of Walleye age classes from index gillnet survey from 1997 to 2006.

In 2021, the mean age of Walleye captured in the stock monitoring program increased from 3.62 (in 2019) to 4.03 years of age (Figure 6). For early growth (ages 1 to 7), using omega (ω = Linf*k), Lake of the Prairies Walleye grow faster than expected, based on growing degree days (GDD from Environment Canada - Canadian Climate Normals 1971-2000).

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 2021, mean age of mature female Walleye was 5.625 years old. Mature female Walleye ranging in age from 3 to 14 represented 26% of Walleye caught in index gill nets. This suggests a reasonable proportion of prime spawners in the Lake of the Prairies Walleye population, which is important for recruitment.

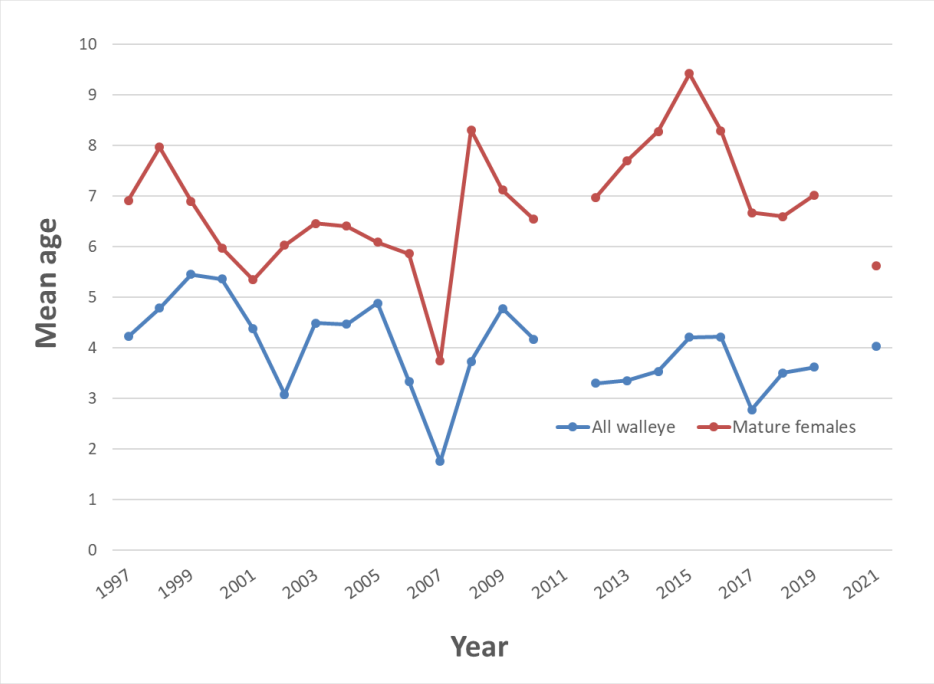



**Figure 6**: Mean age of Walleye (sexes combined and mature females only) from 1997 to 2021.

Biologically, mature female fish are considered to be more important than mature male fish for the production of future year classes. The relative abundance of mature female Walleye decreased in 2021 (Figure 7).

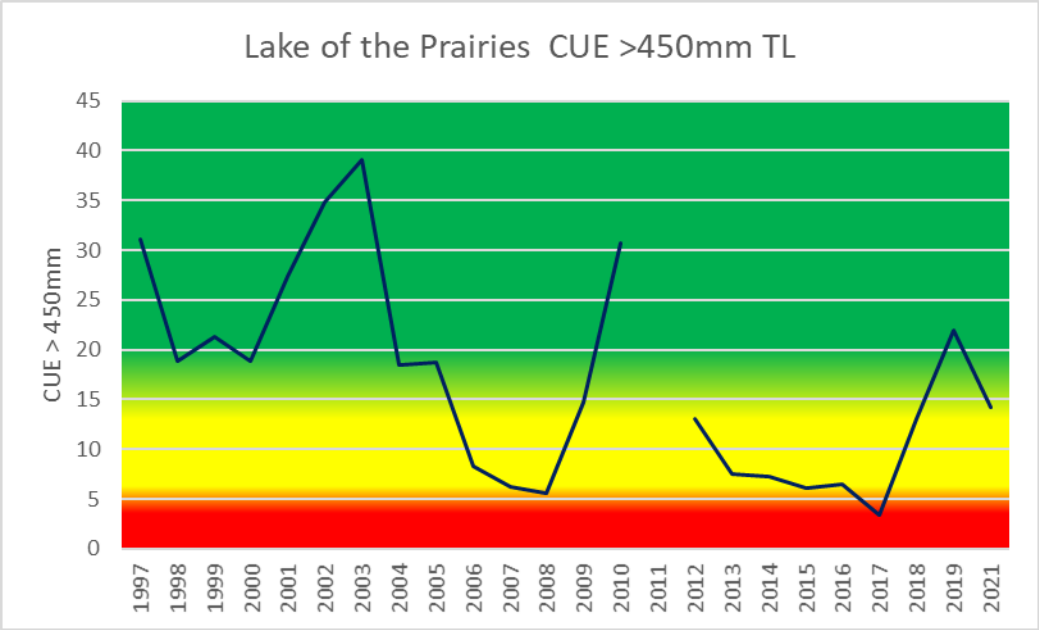



**Figure 7**: Spawning stock biomass of mature female Walleye caught during annual monitoring 1997 to 2021.

The age-at-maturity of female Walleye generally decreased from 1998 to 2010 and has since had an upward trend from 2012 to 2019 (Figure 8). Female age-at-maturity in 2021 (3.75 years) was down from 2019 (6 years). Age-at-maturity is influenced by the strength of year classes ages 4, 5, and 6. In 2021, age-at-maturity of female Walleye (3.75 years) was lower than a published threshold of 5.1 years, based on growing season length (Gangl and Pereira 2003). Exceeding a threshold of a biological performance indicator is considered a positive indicator of stock status.

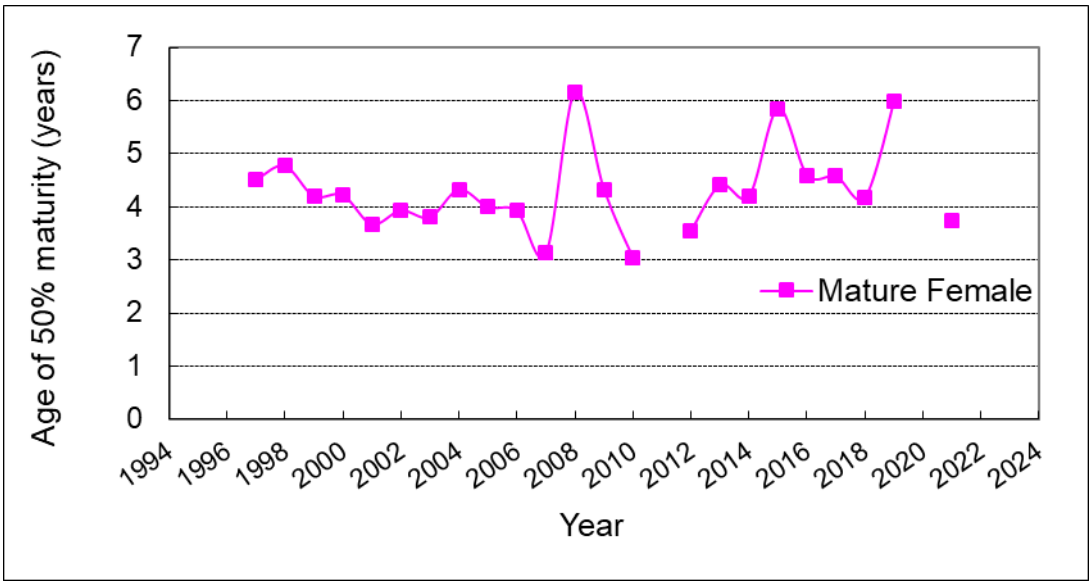



**Figure 8**: Age of 50% maturity of Walleye (females only) from annual monitoring in Lake of the Prairies, 1997 to 2021.

Based on 2021 stock monitoring results, the annual mortality rate of female Walleye ages 5 to 10 was 21.6%. This mortality rate is within recently published sustainable exploitation rates (Lester et al. 2014). In 2019, annual mortality rate increased compared to the 2018 estimate of annual mortality for female Walleye (ages 4 to 13) which was 17.4%. The harvest of the Walleye population is within a reasonable range.

Relative abundance of all Walleye from index netting generally exhibited an increasing trend since the mid 1990's but has shown occasional declines based on variable recruitment and harvest rates over the years (Figure 9).

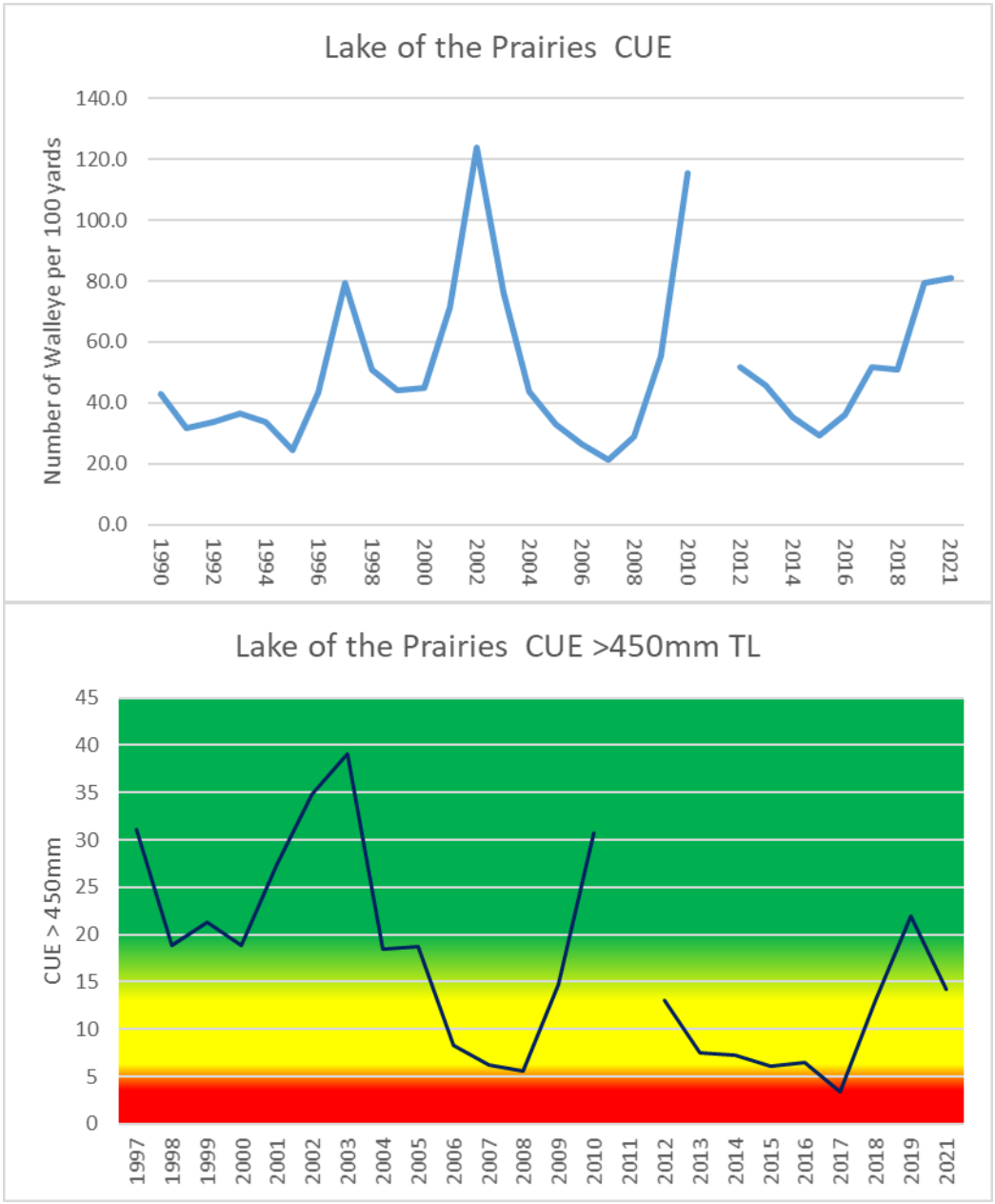



**Figure 9**: Catch-per-unit-effort (CUE) of all Walleye caught and CUE of those greater than 45 cm during annual monitoring, 1990 to 2021 and 1997 to 2021.

When taking into account relative weight indices, Walleye are still healthy for their weight (Wr > 0.75). Figure 12 illustrates the Von Bertalanffy growth function for 1997, 2012, and 2019, which seems to show that young Walleye grow quickly and reach a maximum total length at age 9-10 compared to decades prior where max length was reached at 6-7 years. When comparing to CUE estimates it is presumed that given higher Walleye populations in the late 90's, especially for Walleye >45cm, that growth was being stunted by physiological compensation functions. In recent years there has been more young age classes present, which may get harvested shortly after maturity or leave the system and provides more opportunity for those older fish remaining to reach larger sizes at age.

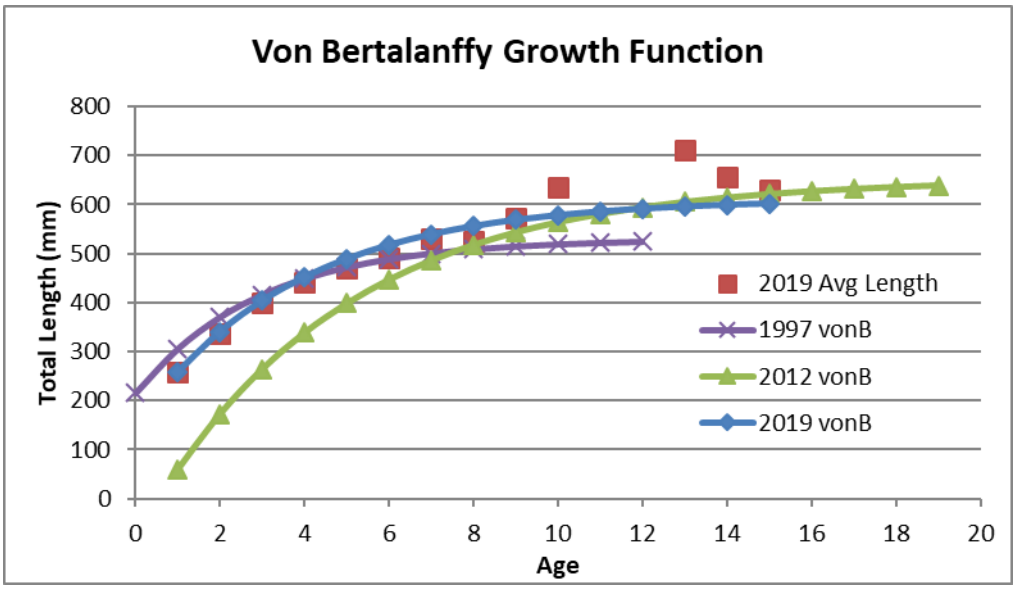



**Figure 10**: Von Bertalanffy growth function of Walleye age at total length from Lake of the Prairies, 1997, 2012, and 2019.

**References:**

Gangl, R.S. and Pereira, D.L., 2003. Biological performance indicators for evaluating exploitation of Minnesota's large-lake Walleye fisheries. N. Am. J. Fish. Manag. 23,1303-1311.

Lester, N.P., Shuter, B.J., Venturelli, P. and Nadeau, D. 2014. Life history plasticity and sustainable exploitation: A theory of growth compensation applied to Walleye management. Ecological Applications 24:38–54.

Sullivan, M.G., 2003. Active management of Walleye fisheries in Alberta: Dilemmas of managing recovering fisheries. N. Am. J. Fish. Manag. 23, 1343-1358.

Venturelli, P.A., C.A. Murphy, B.J. Shuter, T.A. Johnson, P.J. van Coeverden de Groot, P.T. Boag, J.M. Casselman. R. Montgomerie, M.D. Wiegand, and W.C. Leggett. 2010. Maternal influences on population dymanics: evidence from an exploited freshwater fish. Ecology 9: 2003-2012.