Wisconsin DNR Lake Superior Spring Lake Trout Assessment Report 2019

Dray D. Carl

October 14, 2019

Introduction

Lake Trout (Salvelinus namaycush) populations in Lake Superior declined drastically during the 1950's due to the combined effects of overfishing and predation by invasive Sea Lamprey (Petromyzon marinus). By the early 1960's, spawning activity had ceased at nearly all traditional spawning sites in the Apostle Islands. Recovery of Lean Lake Trout was spurred by conservative fishing regulations, established fish refuges, supplemental stocking, and control of Sea Lamprey and is now seen as one of the best examples of native species restoration in the Great Lakes. After a long period of rehabilitation, management agencies are now focused on maintaining sustainable rates of harvest for both commercial and recreational fisheries. Information provided by long-term data series is critical for making responsible management decisions. Thus, the primary objective of the Spring Lake Trout Assessment is to monitor Lake Trout population dynamics (e.g., relative abundance, size, age, etc.). This dataset serves as one of the primary inputs for a statistical catch-at-age (SCAA) model, which is used by state, tribal, and federal biologists to determine recommended Lake Trout harvest quotas.

In addition, Lake Whitefish (Coregonus clupeaformis) is the main target species of the commercial fishery in Wisconsin waters of Lake Superior. Relative abundance of Lake Whitefish has increased substantially since the 1980's and 1990's and has also recently started contributing to a popular recreational fishery in Chequamegon Bay and the Apostle Islands. This survey and dataset serves as one tool we use to monitor Lake Whitefish population dynamics and assess the current status of the fishery.

Methods

The Spring Lake Trout Assessment consists of 31 fixed sampling stations in WI-2 (i.e., waters east of Bark Point) and 16 stations in WI-1 (i.e., waters west of Bark Point; Figure 1). This assessment follows protocols guided by the Lake Superior Technical Committee (LSTC) to ensure standardized sampling among all agencies around the lake. Stations in WI-2 are sampled with 823 m gill nets, while stations in WI-1 are sampled with 274 m gill nets. Gill nets are constructed of 114 mm (stretch mesh) multifilament nylon and set on the bottom for one night (24 hr). All sampling is done aboard the R/V Hack Noyes. Biological information is collected from fish using standardized protocols. Otoliths were taken from a subsample of fish and were aged with the crack-and-burn method. Lake Trout otoliths from 2019 are still being processed and aged. This assessment is primarily focused on Lean Lake

Trout, but information related to Lake Whitefish population dynamics is also reported. Analyses were conducted using the program R.

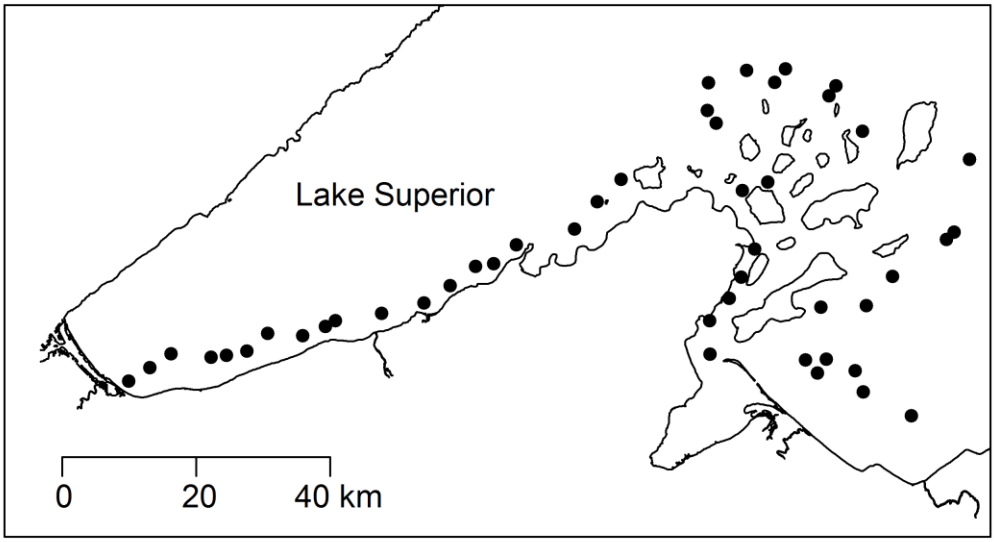

Figure 1. Map of western Lake Superior and the sampling stations for the Wisconsin DNR Spring Lake Trout Assessment.

Results

Lake Trout

During the 2019 spring assessment, 634 Lake Trout were caught in WI-2 (Figure 2) and 95.3% were native (i.e., naturally produced). Estimates of geometric mean catch-per-unit-effort (CPE) of native Lake Trout in WI-2 suggest that the number of fish vulnerable to the sampling gear has increased since a low in 2013 (Figure 3). The CPE estimate for WI-2 in 2019 rebounded from a slight decline in 2018, which may be attributed to higher mortality rates in previous years or sampling bias. Hatchery Lake Trout CPE in WI-2 has decreased significantly since the 1980's and 1990's after the cessation of Lake Trout stocking in WI-2. While sea lamprey wounding rates have been relatively stable and below target during recent years (Figure 4) the wounding rates of Lake Trout greater than 735 mm (28.9 inches; Table 2) are still above the target of 5 wounds per 100 Lake Trout. The median size of Lake Trout plateaued in 2019 after having increased for 3 consecutive years (2016-18), likely due to the fact that the large 2007 and 2008 year-classes have been fully recruited to the fishery for a few years and, therefore, subject to more sources of mortality (Figure 5). Given that the large 2007 and 2008 Lake Trout year-classes have become increasingly vulnerable to fishing pressure, it will be important to monitor mortality rates closely in the

coming years. Growth rates of Lake Trout in WI-2 has decreased slightly since 1981; however, current growth rates are comparable to growth rates since 2005 (Figure 6).

A total of 261 Lake Trout were caught in WI-1 during the 2019 assessment and 62.5% were native (Figure 7). Geometric mean CPE of native Lake Trout in WI-1 has been relatively stable since 2002 and showed a slight increase in 2019 compared to 2017 and 2018 (Figure 8). Geometric mean CPE of hatchery lake trout has been relatively stable since 2012. Sea Lamprey wounding rates have been increasing since 2015, and wounding in 2019 was nearly double the target of 5 wounds per 100 Lake Trout (Figure 4). Sea Lamprey wounding was above target for all Lake Trout above 530 mm (21 inches; Table 1). Median size of Lake Trout may have plateaued in 2019 in WI-1 (Figure 5), which is likely the result of the same strong year-classes that were described for WI-2. Before claiming full rehabilitation of Lake Trout in WI-1, it will be important to pay close attention to population dynamics in the coming years.

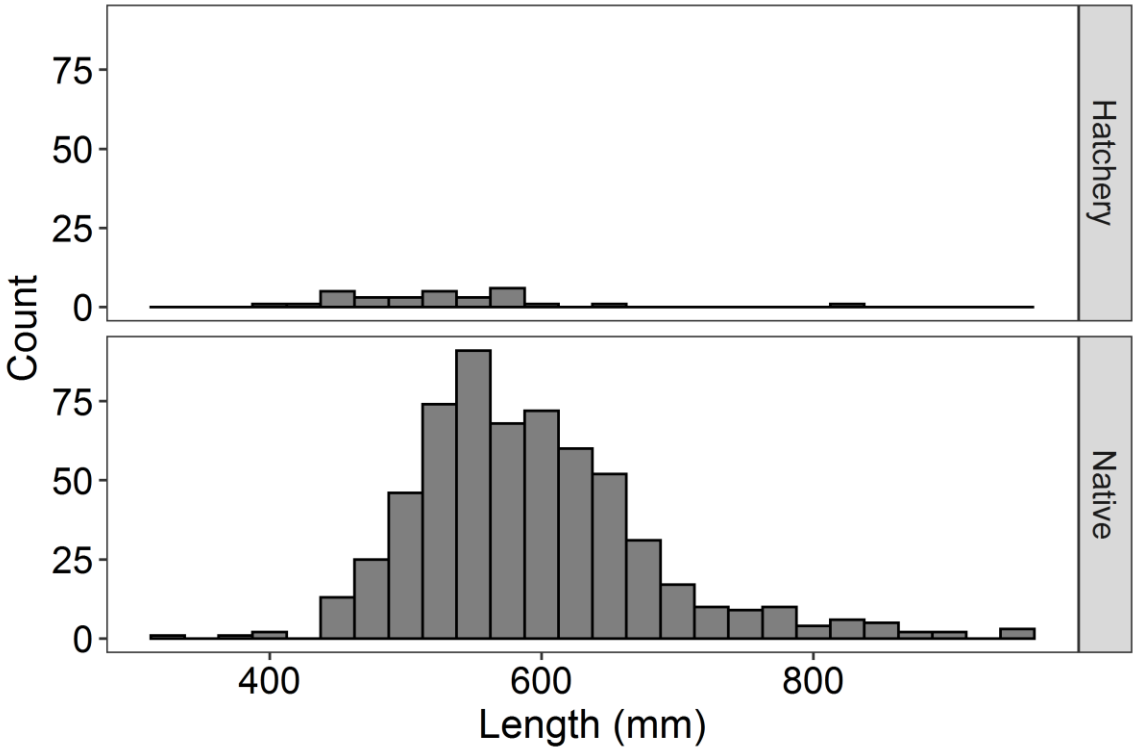

Figure 2. Length distribution of native and hatchery Lake Trout caught in WI-2 during the 2019 Spring Lake Trout Assessment.

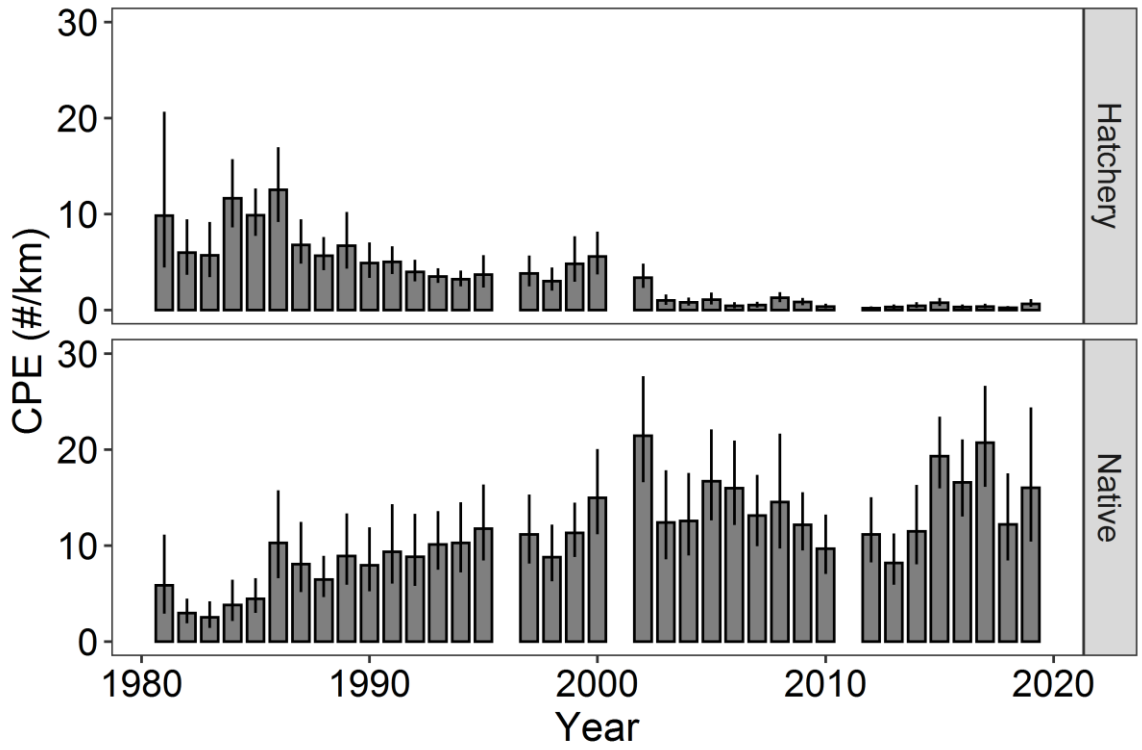

Figure 3. Geometric mean catch-per-unit-effort of native and hatchery Lake Trout in WI-2, 1981-2019. Spring Lake Trout Assessments were not conducted in 1996, 2001, or 2011. Error bars represent 95% confidence intervals.

Table 1. Sea Lamprey Scars (total A1-A3) by Lake Trout Size class from WI-1 . Lake Trout value represents the number of Lake Trout examined for scars.

sizeclass	Scars	Lake.Trout	Wounds.per.100
<17 in	0	4	0.00
17-20.9 in	0	57	0.00
21-24.9 in	11	84	13.10
25-28.9 in	8	84	9.52
>28.9 in	5	32	15.62

Table 2. Sea Lamprey Scars (total A1-A3) by Lake Trout Size class from WI-2 . Lake Trout value represents the number of Lake Trout examined for scars.

sizeclass	Scars	Lake.Trout	Wounds.per.100
<17 in	0	6	0.00
17-20.9 in	0	151	0.00
21-24.9 in	10	318	3.14
25-28.9 in	5	115	4.35
>28.9 in	3	44	6.82

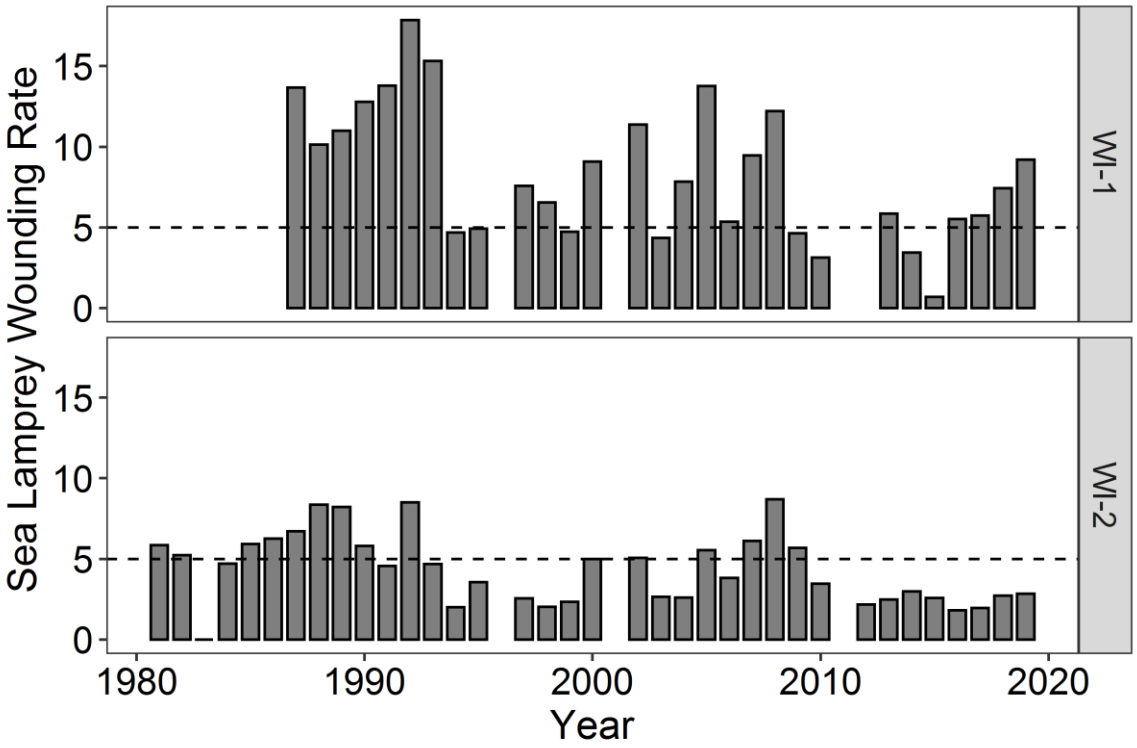

Figure 4. Time series of Sea Lamprey wounding (i.e., scars / 100 Lake Trout) in WI-1 and WI-2, 1981-2019. Horizontal dashed line indicates the target wounding rate established by Lake Superior Technical Committee.

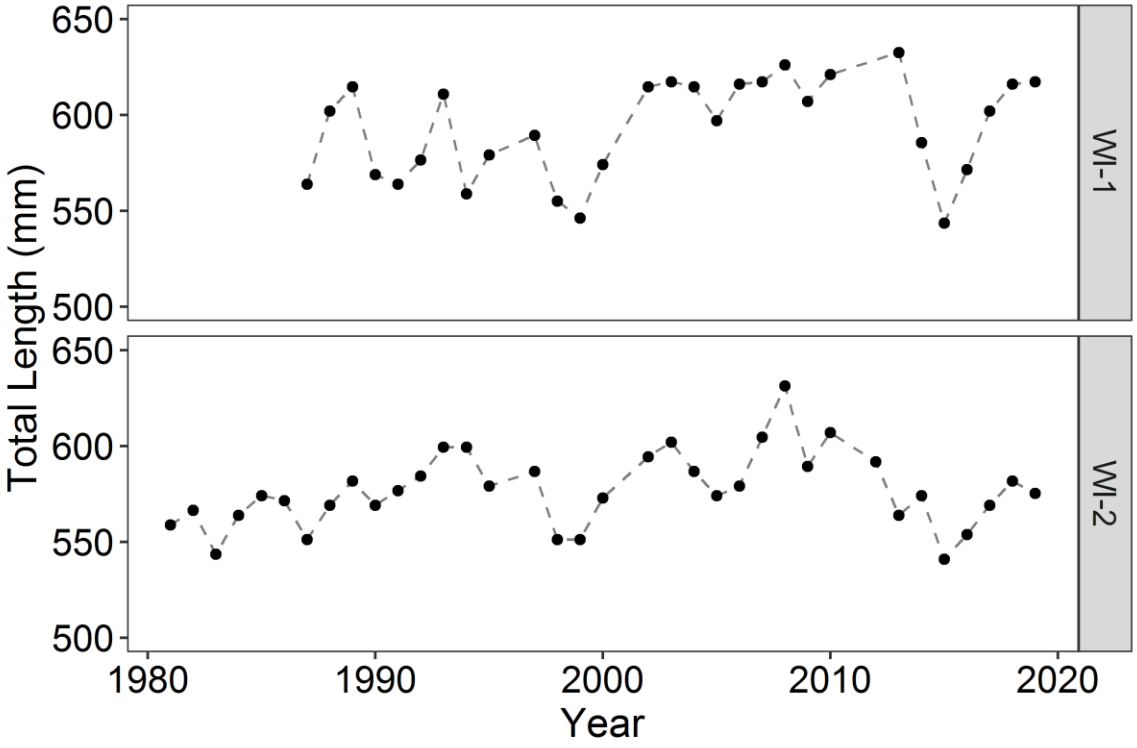

Figure 5. Median length of Lake Trout caught in WI-1 and WI-2, 1981-2019.

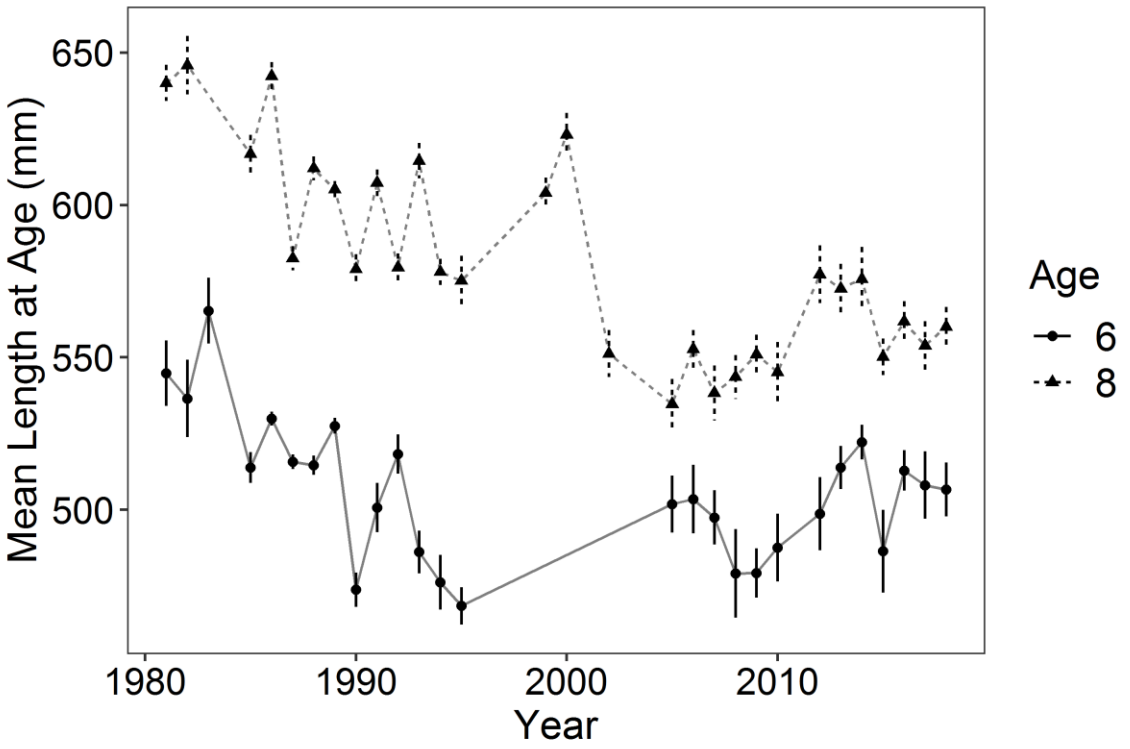

Figure 6. Lake Trout mean length at ages 6 and 8 caught in WI-2 during the Spring Lake Trout Assessment, 1981-2018 . Minimum sample size (N) of 10 fish per age category. Bars represent +/- one standard error.

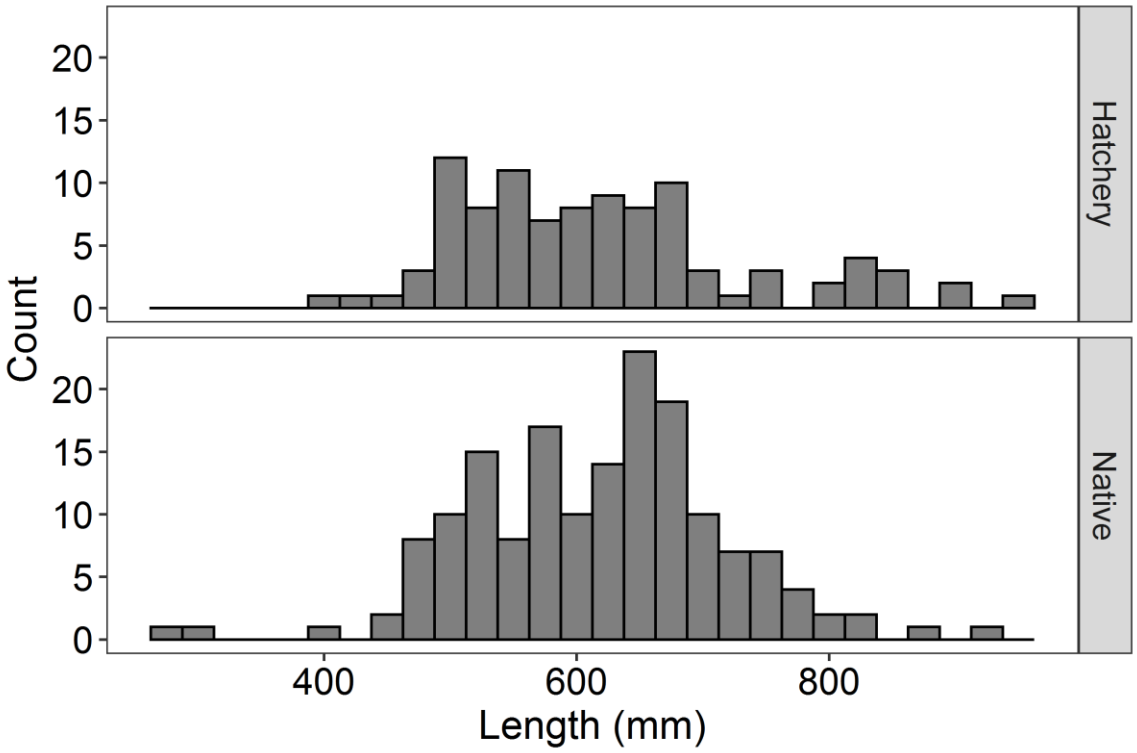

Figure 7. Length distribution of native and hatchery Lake Trout caught in WI-1 during the 2019 Spring Lake Trout Assessment.

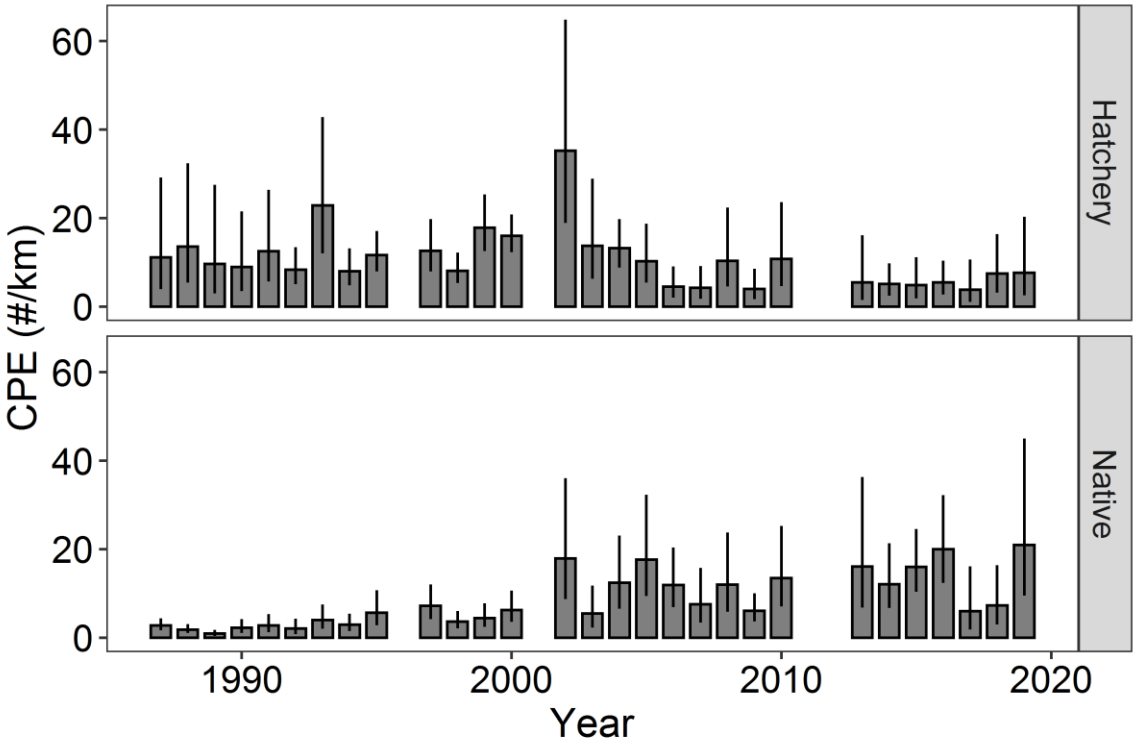

Figure 8. Geometric mean catch-per-unit-effort of native and hatchery Lake Trout in WI-1, 1987-2019. Spring Lake Trout Assessments were not conducted in 1996, 2001, or 2011. WI-1 was not sampled in 2012. Error bars represent 95% confidence intervals.

Lake Whitefish

During the 2019 survey, 262 Lake Whitefish were caught in WI-2 and 52 were caught in WI-1 (Figure 9). Most of the Lake Whitefish caught in WI-2 were less than 500 mm. Compared to WI-2, a greater portion of the population in WI-1 consisted of large individuals (Figure 9), due to faster growth rates in WI-1. The statistical error associated with estimates of Lake Whitefish geometric mean CPE (Figure 10) was greater than that for Lake Trout because a majority of the fish were caught at a limited number of stations. Despite the uncertainty, current estimates of geometric mean CPE in WI-1 appear to be highest recorded in the spring survey. Geometric mean CPE in WI-2 has been variable year-to-year, but generally higher than the 1980's and 1990's; CPE in 2019 was lower than 2018, but still higher than 2015-2017. Lake Whitefish growth has decreased since 2002, but may have leveled off since 2013 (Figure 11). Lake Whitefish population dynamics should continue to be monitored extensively in the wake of high commercial fishing pressure, additional October Whitefish season, and increasing popularity in the sport fishery.

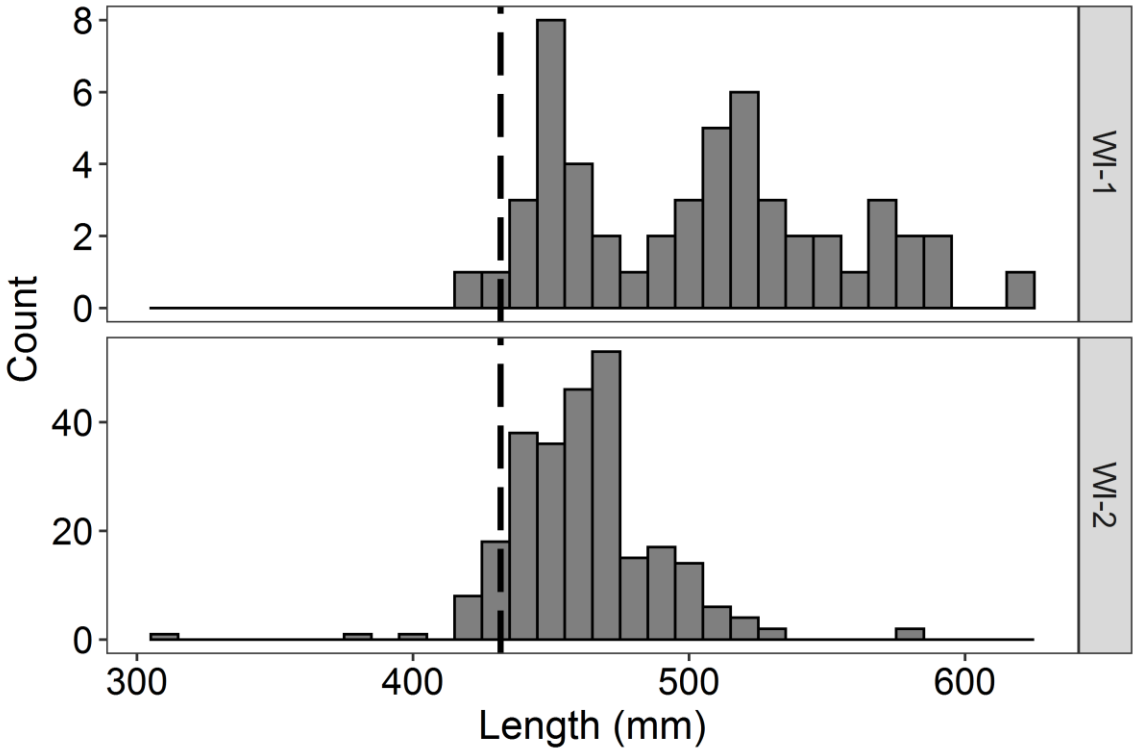

Figure 9. Length distribution of Lake Whitefish caught in WI-1 and WI-2 during the 2019 Spring Lake Trout Assessment. Vertical dashed line represents 17 inches, which is the minimum size of Whitefish that can be harvested by commercial fishers.

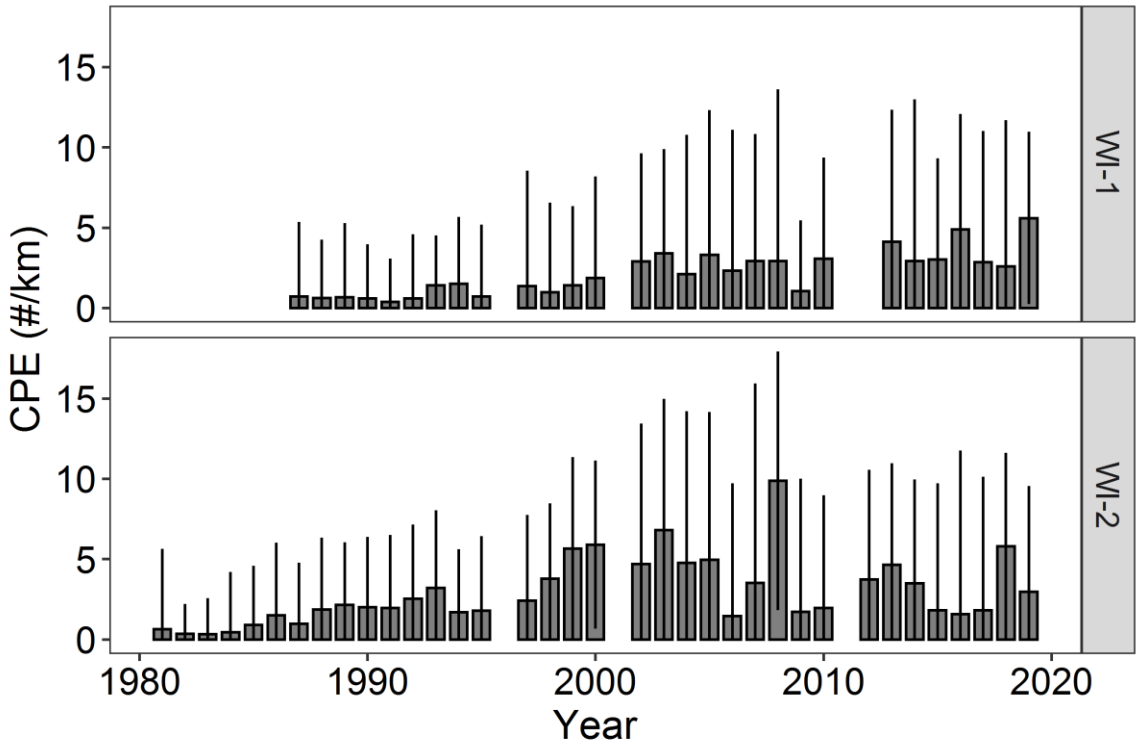

Figure 10. Geometric mean catch-per-unit-effort of Lake Whitefish caught in WI-1 and WI-2, 1981-2019. Spring Lake Trout Assessments were not conducted in 1996, 2001, or 2011. WI-1 was not sampled in 2012. Error bars represent one standard deviation.

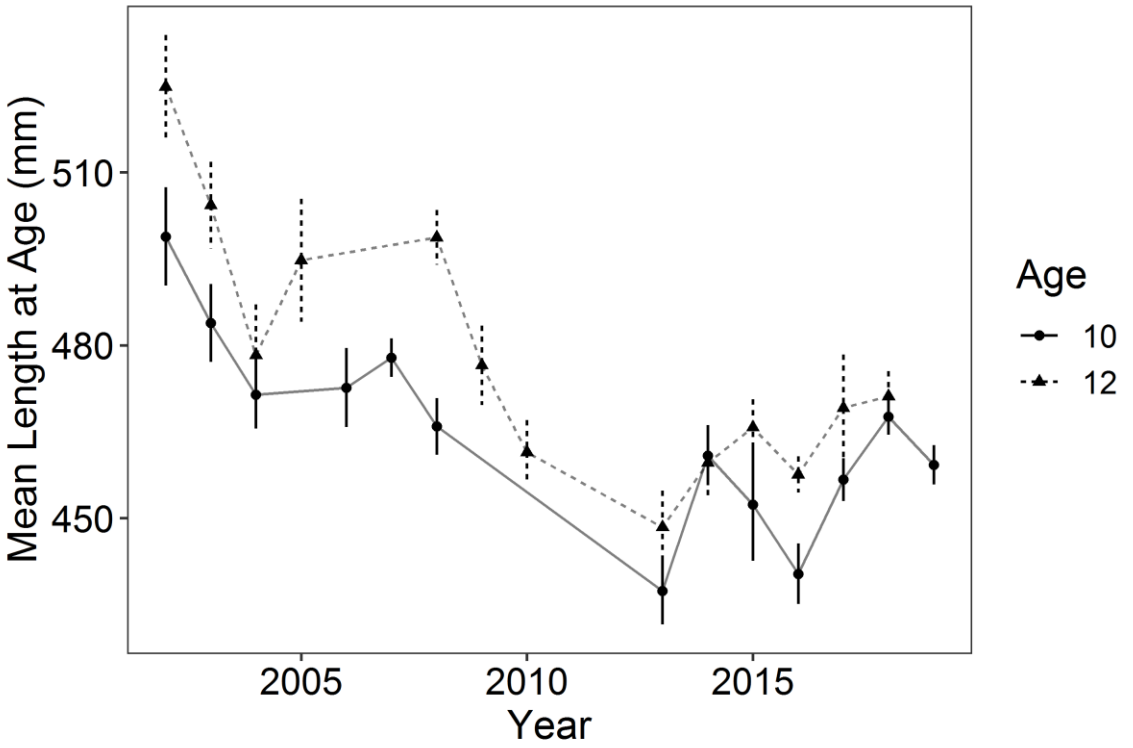

Figure 11. Lake Whitefish mean length at ages 10 and 12 caught in WI-2 during the Spring Lake Trout Assessment, 2002-2019 . Minimum sample size (N) of 10 fish per age category. Bars represent +/- one standard error.