STATUS OF SEA LAMPREY CONTROL IN LAKE SUPERIOR – SPRING 2022

Adult Sea Lamprey:

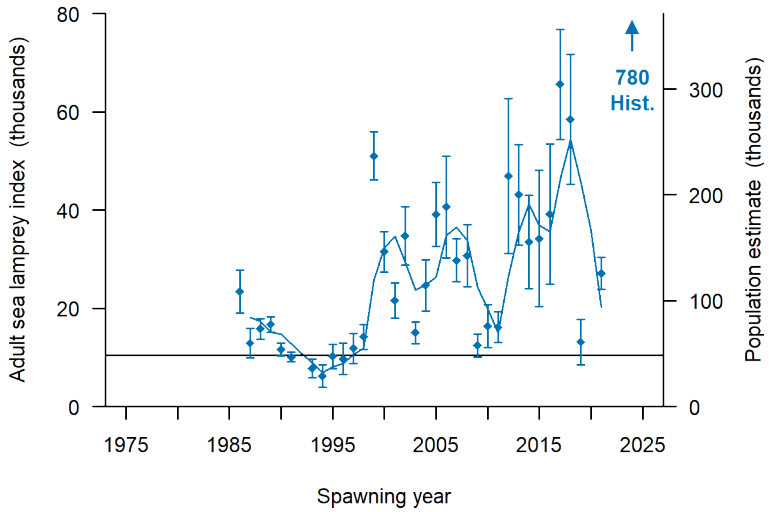

Figure 1. Index estimates with 95% confidence intervals (vertical bars) of adult sea lampreys, including historic pre-control abundance (as a population estimate) and the three-year moving average (line). The population estimate scale (right vertical axis) is based on the index-to-PE conversion factor of 4.64. The adult index in 2021 was 27,000 with 95% confidence interval (24,000-30,000). The three-year (2019-2021) average of 20,000 was above the target of 10,000. The index target was estimated as the mean of indices during a period with acceptable marking rates (1994-1998).

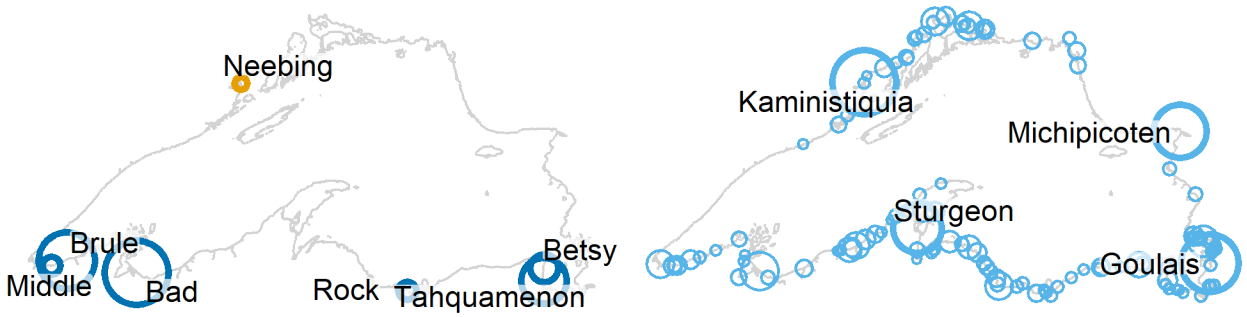

Figure 2. LEFT: Estimated index of adult sea lampreys during the spring spawning migration, 2021. Circle size corresponds to estimated number of adults from mark-recapture studies (blue) and model predictions (orange). All index streams are labelled. RIGHT: Maximum estimated number of larval sea lampreys in each stream surveyed during 1995-2012. Tributaries composing over half of the estimated maximum lake-wide larval population are identified (Kaministiquia 6,600,000; Goulais 5,000,000; Michipicoten 4,100,000; Sturgeon 3,300,000).

- The 3-year (2019-2021) average adult index estimate is above the target and the adult index has been holding steady over the past five years.
- Mark-recapture estimates were generated for six of the seven index streams and the seventh estimate was modeled.
- 30 years of adult indices in Lake Superior were highly correlated with environmental factors hypothesized to influence sea lamprey catchability and natural mortality.
- Climate change has been hypothesized to benefit sea lamprey production in Lake Superior; discussions are ongoing to assess the affects of climate change and how to mitigate any increase in sea lamprey production.
- Discussions are ongoing regarding the descrepancy between adult index values and increased lampricide treatment, and the role of climate change.
- The St. Louis River could become a concern due to habitat restoration and environmental clean up.

Lake Trout Marking and Relative Abundance:

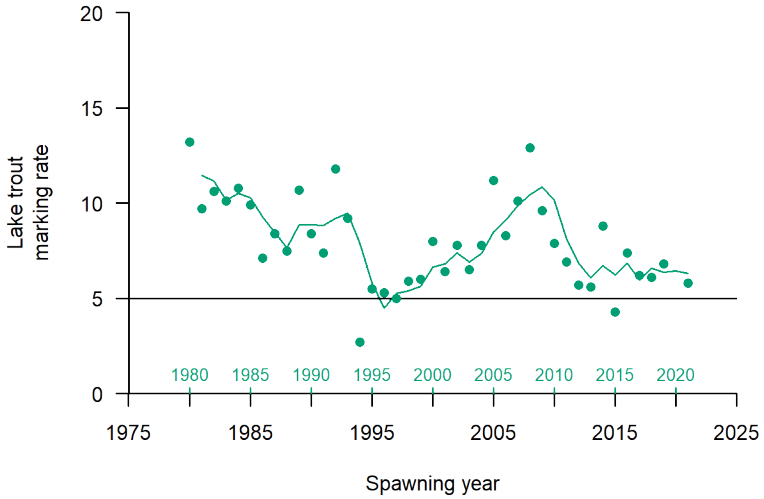

Figure 3. Number of A1-A3 marks per 100 lake trout > 532 mm from standardized assessments plotted against the sea lamprey spawning year, including the three-year moving average (line). The three-year (spawning years 2019-2021) average marking rate of 6.3 was above the target of 5 A1-A3 marks per 100 lake trout > 532 mm (horizontal line). A second x-axis shows the year the lake trout were surveyed.

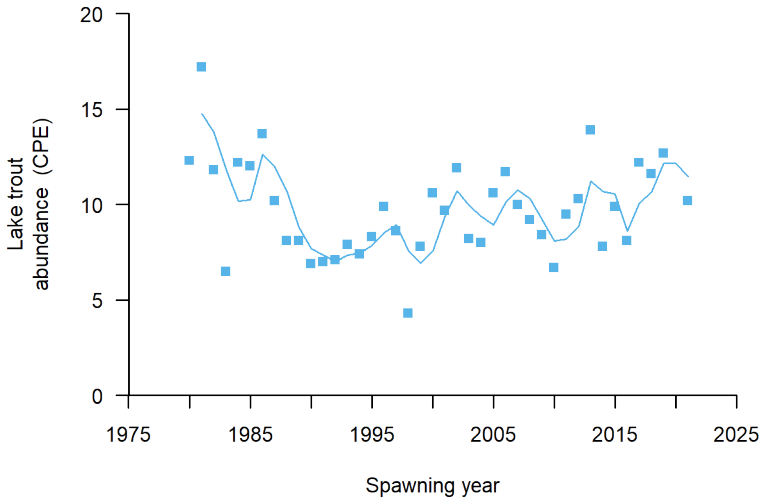

Figure 4. Lake trout relative abundance (May assessments using 4.5 inch gillnets) plotted against sea lamprey spawning year, including the three-year moving average (line). CPE = fish/km/net night of lean lake trout > 532 mm (21") total length.

- The 3-year average marking rate is above target and marking rates have been steady over the past five years.
- Marking is currently highest in some of the Michigan portions of the lake, but marking has declined in Minnesota waters during recent years.
- Catch-at-age modeling in some Michigan waters shows that sea lamprey mortality exceeds the mortality caused by the fishery (fishing mortality is low, however, in Michigan waters).
- Lake trout relative abundance has been holding steady over the past five years.
- The FishLamp wokgroup is working to provide clarity to the often murky relationship between sea lamprey abundance, laket trout abundance, and sea lamprey marking rate on lake trout.

Lampricide Control - Adults vs. Field Days, TFM, and Bayluscide:

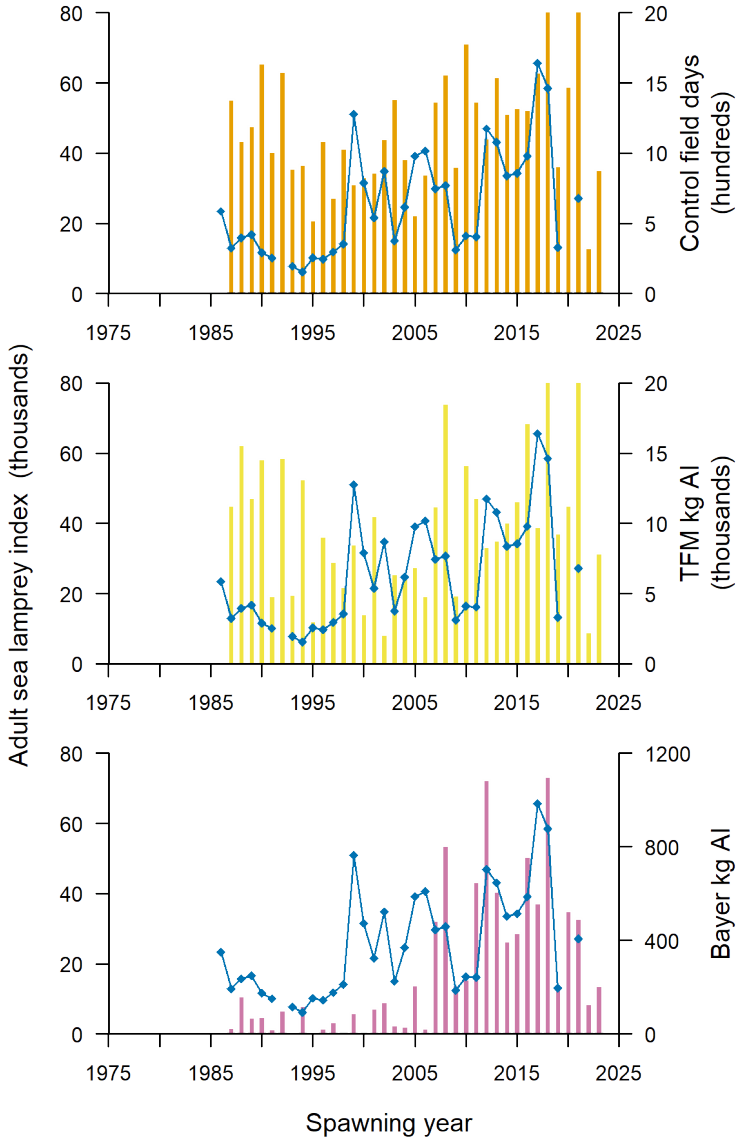

Figure 5. Index of adult sea lampreys (blue lines) and number of control field days (orange bars), TFM used (kg active ingredient; yellow bars), and Bayluscide used (kg active ingredient; purple bars). Field days, TFM, and Bayluscide are offset by 2 years (e.g., field days, TFM, and Bayluscide applied during 1985 is plotted on the 1987 spawning year, when the treatment effect would first be observed in adult sea lamprey populations).

- 2021 lampricide treatments are ongoing. Ten tributaries were treated with TFM and three lentic areas were treated with granular Bayluscide during 2020 (2022 sea lamprey spawning year).
- Forty-five tributaries were treated with TFM during during 2019, 10 during 2020, and 16 during 2021 (2021 to 2023 sea lamprey spawning years).
- Sixteen lentic areas were treated with granular Bayluscide during 2019, three during 2020, and seven during 2021 (2021 to 2023 sea lamprey spawning years).
- Targeted treatment efforts focusing on Lake Superior occurred during 2016 and 2019 (2018 and 2021 sea lamprey spawning years).
- In general, the increase in control effort that began in 2000 (2002 sea lamprey spawning year) and then again in 2006 (2008 sea lamprey spawning year) correlates with the marking rate on lake trout, but not the adult sea lamprey index.