<h1 style="text-align:center">Elm Lake Survey Summary</h1>

Elm Lake, located 9.0 miles west and 1 mile north of Frederick, is managed as a black crappie and walleye fishery; however, other fish species (e.g., channel catfish, northern pike) are present and contribute to the fishery.

- **Black crappie.** Black crappie populations are assessed using frame nets in northeast South Dakota; no frame nets were used during the 2019 Elm Lake survey.

- **Channel catfish.** Fewer channel catfish were sampled in 2019 than 2018. In 2019, eight individuals ranging from 16.3 to 25.6 inches were caught, which resulted in a mean CPUE of 0.7/gill net. While not abundant, the opportunity exists for anglers to catch the channel catfish from Elm Lake.

- **Walleye.** Walleye (includes saugeye) numbers were lower in 2019 than 2018.  At 1.1/gill net, relative abundance was considered low. Those sampled ranged in length from 7.9 to 14.2 inches with 6 year classes (2013 - 2018) represented, each by 7 or fewer individuals. Although not abundant, cohorts that coincide with recent saugeye stockings (2016 – 2018) were present. Growth appears to be slow with mean length at capture values at age 3 of <12.0 inches in surveys conducted in 2018 and 2019.

For more detailed results see the computer generated South Dakota Statewide Fisheries Survey for Elm (Brown; below).

# SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
## Elm, Brown County
## ELM-Lake-5-800
## 2019

## Lake Information

**Name:**          Elm

**County:**        Brown

**Surface Area:**  1,221 Acres

**Maximum Depth:**  34 Feet

**Mean Depth:**     18 Feet

## Surveys and Investigations

Survey methods used by gear type, date, and effort.

| Gear | Date | Effort |
|------|------|--------|
| AFS std gill net | Aug 06, 2019 | 6 net-nights |
| AFS std gill net | Aug 07, 2019 | 6 net-nights |
| fall night EF-WAE | Oct 07, 2019 | 2400 seconds |

## **Common Fish Species Present**

Walleye

Black Crappie

Common Carp

Black Bullhead

White Sucker

Channel Catfish

Yellow Perch

Northern Pike

## Terminology

Catch per unit effort (**CPUE**) refers to the relative abundance of a species. It is defined as the number of fish captured per unit of effort (i.e., number of fish captured per net-night or number of fish captured per hour electrofishing). In this report CPUE is typically given for only stock-length fish (see length categories table for stock lengths).

A statewide effort to help make netting efforts comparable to all waters sampled across the state, occurred in 2017, with a switch to American Fisheries Society gill nets. Past gill netting efforts were completed with different style/types of nets and are not comparable side by side.

- **AFS std gill net** – 80 ft experimental gill net containing eight panels (10 ft each) of varying monofilament meshes of 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25 and 2.50 inches.

- **std experimental gill net for non-Missouri River waters** - 150 ft experimental gill net containing six panels (25 ft each) of varying monofilament meshes of 0.5, 0.75, 1.00, 1.25, 1.50 and 2.00 inches.

- **std experimental gill net for Missouri River reservoirs** – 300 ft experimental gill net containing six panels (50 ft each) of varying multifilament meshes of 0.5, 0.75, 1.00, 1.25, 1.50 and 2.00 inches.

$$CPUE = \frac{number\ of\ fish}{effort}$$

Population size structure is quantified using the indices proportional size distribution of quality-length fish (**PSD**) and proportional size distribution of preferred-length fish (**PSD-P**). These indices indicate the proportion of stock-length fish that are equal to or greater than a given length. Minimum lengths for stock, quality and preferred length fish are given in the length categories table.

$$PSD = \left(\frac{number\ of\ fish \geq quality\ length}{number\ of\ fish \geq stock\ length}\right) \times 100$$

$$PSD - P = \left(\frac{number\ of\ fish \geq preferred\ length}{number\ of\ fish \geq stock\ length}\right) \times 100$$

Relative weight (**Wr**) is used to quantify fish plumpness. Relative weight is the ratio of what a fish weighs (W) compared to a length-specific standard weight (Ws) multiplied by 100. Relative weight values of 95-105 are commonly cited as optimum values, but values in the 80s are common during summer sampling in South Dakota.

$$Wr = \left(\frac{W}{Ws}\right) \times 100$$

Confidence intervals (**CI**) are provided for many of the estimates calculated in this report. The confidence interval provides a range in which the true mean is expected to fall. For example, with an 80% CI we are 80% confident that the interval contains the true value.

Length categories include stock (**S**), quality (**Q**), preferred (**P**), memorable (**M**) and trophy (**T**). Length categories for most species have been defined based on a percentage of the world record length for that species. Some species mentioned in this report do not have defined length categories. Length categories for species used in this report are provided in the following table. Measurements are the minimum total length for each category and are reported in inches (in) and centimeters (cm).

| Species Name | Stock (in) | Stock (cm) | Quality (in) | Quality (cm) | Preferred (in) | Preferred (cm) | Memorable (in) | Memorable (cm) | Trophy (in) | Trophy (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| Black Bullhead | 6 | 15 | 9 | 23 | 12 | 30 | 15 | 38 | 18 | 46 |
| Black Crappie | 5 | 13 | 8 | 20 | 10 | 25 | 12 | 30 | 15 | 38 |
| Bluegill | 3 | 8 | 6 | 15 | 8 | 20 | 10 | 25 | 12 | 30 |
| Brown Trout | 8 | 20 | 12 | 30 | 16 | 40 | 20 | 50 | 18 | 46 |
| Channel Catfish | 11 | 28 | 16 | 41 | 24 | 61 | 28 | 71 | 36 | 91 |
| Freshwater Drum | 8 | 20 | 12 | 30 | 15 | 38 | 20 | 51 | 25 | 63 |
| Lake Trout | 12 | 30 | 20 | 50 | 26 | 65 | 31 | 80 | 39 | 100 |
| Largemouth Bass | 8 | 20 | 12 | 30 | 15 | 38 | 20 | 51 | 25 | 63 |
| Muskellunge | 20 | 51 | 30 | 76 | 38 | 97 | 42 | 107 | 50 | 127 |
| Northern Pike | 14 | 35 | 21 | 53 | 28 | 71 | 34 | 86 | 44 | 112 |
| Pumpkinseed | 3 | 8 | 6 | 15 | 8 | 20 | 10 | 25 | 12 | 30 |
| Rainbow Trout | 10 | 25 | 16 | 40 | 20 | 50 | 26 | 65 | 31 | 80 |
| Rudd | 6 | 15 | 10 | 25 | 12 | 30 | 15 | 38 | 19 | 48 |
| Sauger | 8 | 20 | 12 | 30 | 15 | 38 | 20 | 51 | 25 | 63 |
| Smallmouth Bass | 7 | 18 | 11 | 28 | 14 | 35 | 17 | 43 | 20 | 51 |
| Walleye | 10 | 25 | 15 | 38 | 20 | 51 | 25 | 63 | 30 | 76 |
| White Bass | 6 | 15 | 9 | 23 | 12 | 30 | 15 | 38 | 18 | 46 |
| White Crappie | 5 | 13 | 8 | 20 | 10 | 25 | 12 | 30 | 15 | 38 |
| Yellow Bullhead | 4 | 10 | 7 | 18 | 9 | 23 | 11 | 28 | 14 | 36 |
| Yellow Perch | 5 | 13 | 8 | 20 | 10 | 25 | 12 | 30 | 15 | 38 |

## Catch Summary of Stock Length Fish

Catch per unit effort (CPUE), proportional size distribution (PSD), proportional size distribution of preferred length fish (PSD-P), and relative weight (Wr) for species sampled in survey with 80% confidence interval (CI-80).
**\* Methods/Species that ignore stock length**

| Gear | Species | Sample Size (n)* | Abundance | | Stock Density Indices | | | | Condition | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | CPUE | CI-80 | PSD | CI-80 | PSD-P | CI-80 | Wr | CI-80 |
| AFS std gill net | Black Bullhead | 23 | 1.9 | 0.6 | 100 | | 0 | | 82 | 3 |
| | Black Crappie | 2 | 0.2 | 0.2 | 50 | | 50 | | 116 | 20 |
| | Channel Catfish | 8 | 0.7 | 0.5 | 100 | | 13 | | 102 | 4 |
| | Common Carp | 38 | 3.2 | 0.8 | 100 | | 3 | | 86 | 1 |
| | Northern Pike | 2 | 0.2 | 0.2 | 100 | | 0 | | 80 | 5 |
| | Walleye | 20 | 1.1 | 0.5 | 0 | | 0 | | 83 | 2 |
| | White Sucker | 12 | 1.0 | 0.4 | 100 | | 100 | | 94 | 1 |
| | Yellow Perch | 5 | 0.4 | 0.3 | 0 | | 0 | | 102 | 4 |
| fall night EF-WAE* | Walleye | 102 | 153.0 | 41.0 | | | | | 90 | 1 |

# 10-Year Catch Per Unit Effort by Gear and Species

Catch per unit effort (CPUE) and average (Avg) of species across 10 years using different gear types.
**\* Methods/Species that ignore stock length; \*\*AFS standard gill nets used in 2016**

| | | CPUE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gear | Species | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Avg |
| AFS std gill net | Black Bullhead | | | | | | | 32.1 | | 10.8 | 1.9 | 14.9 |
| | Black Crappie | | | | | | | 0.8 | | 0.8 | 0.2 | 0.6 |
| | Channel Catfish | | | | | | | 1.6 | | 3.3 | 0.7 | 1.9 |
| | Common Carp | | | | | | | 3.5 | | 3.5 | 3.2 | 3.4 |
| | Northern Pike | | | | | | | 0.7 | | 0.1 | 0.2 | 0.3 |
| | Walleye | | | | | | | 1.0 | | 3.3 | 1.1 | 1.8 |
| | White Sucker | | | | | | | 2.9 | | 3.1 | 1.0 | 2.3 |
| | Yellow Perch | | | | | | | 0.4 | | 0.6 | 0.4 | 0.5 |
| fall night EF-WAE* | Walleye | | | | | | | 117.5 | 109.5 | 114.0 | 153.0 | 123.5 |
| frame net (std 3/4 in)** | Black Bullhead | 113.1 | | 1,255.8 | | 333.4 | | 181.2 | | | | 470.9 |
| | Black Crappie | 7.3 | | 11.4 | | 3.2 | | 10.0 | | | | 8.0 |
| | Bluegill | 4.2 | | 0.0 | | 0.0 | | 0.0 | | | | 1.1 |
| | Channel Catfish | 0.0 | | 4.4 | | 5.6 | | 1.6 | | | | 2.9 |
| | Common Carp | 1.7 | | 0.1 | | 0.1 | | 9.3 | | | | 2.8 |
| | Northern Pike | 1.8 | | 2.6 | | 0.2 | | 0.8 | | | | 1.4 |
| | Orangespotted Sunfish* | 0.2 | | 0.0 | | 0.0 | | 0.0 | | | | 0.1 |
| | Walleye | 0.4 | | 4.1 | | 0.2 | | 0.3 | | | | 1.3 |
| | White Sucker | 0.8 | | 0.9 | | 0.3 | | 0.2 | | | | 0.6 |
| | Yellow Perch | 3.8 | | 0.6 | | 0.3 | | 0.0 | | | | 1.2 |
| std exp gill net | Black Bullhead | 11.8 | | 281.8 | | 166.8 | | | | | | 153.5 |
| | Black Crappie | 0.8 | | 0.2 | | 3.5 | | | | | | 1.5 |
| | Channel Catfish | 0.0 | | 0.3 | | 1.0 | | | | | | 0.4 |
| | Common Carp | 0.1 | | 0.0 | | 0.3 | | | | | | 0.1 |
| | Northern Pike | 1.3 | | 0.8 | | 1.3 | | | | | | 1.1 |
| | Orangespotted Sunfish* | 0.2 | | 0.0 | | 0.0 | | | | | | 0.1 |
| | Walleye | 1.0 | | 4.2 | | 1.7 | | | | | | 2.3 |
| | White Sucker | 3.3 | | 6.3 | | 2.2 | | | | | | 3.9 |
| | Yellow Perch | 1.0 | | 7.8 | | 1.2 | | | | | | 3.3 |

# 10-Year Size Structure and Condition Statistics by Gear and Species

Species proportional size distribution (PSD), proportional size distribution of preferred length fish (PSD-P), and relative weight (Wr) collected by different gear types across 10 years.

| Gear | Species | Index | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|------|---------|-------|------|------|------|------|------|------|------|------|------|------|
| AFS std gill net | Walleye | PSD | | | | | | | 100 | | 10 | 0 |
| | | PSD-P | | | | | | | 75 | | 10 | 0 |
| | | Wr | | | | | | | 88 | | 82 | 83 |
| | | | | | | | | | | | | |
| std exp gill net | Walleye | PSD | 89 | | 44 | | 90 | | | | | |
| | | PSD-P | 28 | | 4 | | 0 | | | | | |
| | | Wr | 94 | | 84 | | 98 | | | | | |

# Length at Capture

Mean length at capture by age across years sampled, sample size (N).

Species: Walleye

| Year | N | Mean Length (expanded sample number) at capture by age | | | | | | | | | |
|------|---|------|------|------|------|------|------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ |
| 2019 | 20 | 214 (6) | 242 (1) | 292 (3) | 275 (2) | 340 (7) | 364 (1) | | | | |
| 2018 | 46 | 230 (6) | 280 (6) | 277 (4) | 322 (26) | | | | 531 (1) | 539 (3) | |
| 2016 | 29 | 196 (1) | 214 (16) | 392 (1) | | | 591 (1) | 547 (10) | | | |
| 2014 | 13 | 243 (3) | | 405 (5) | 507 (1) | 460 (4) | | | | | |
| 2012 | 28 | 211 (2) | 222 (1) | 350 (23) | 537 (1) | | 492 (1) | | | | |
| 2010 | 38 | 191 (20) | 378 (4) | 418 (3) | 489 (4) | 521 (2) | 545 (3) | | | | 604 (2) |

## Fish Condition

Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).
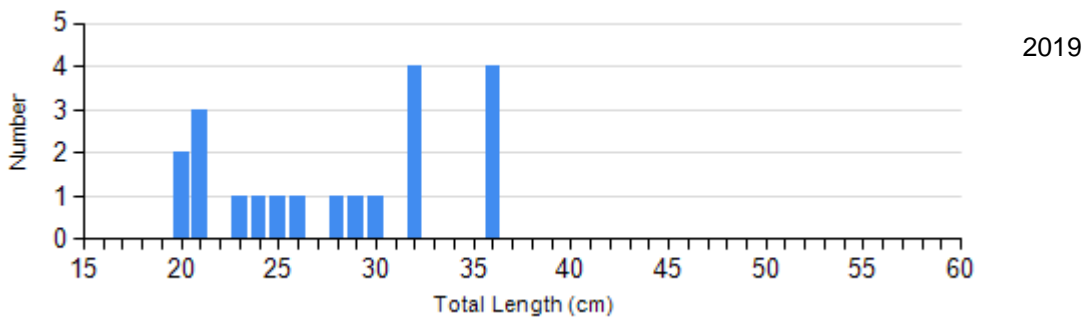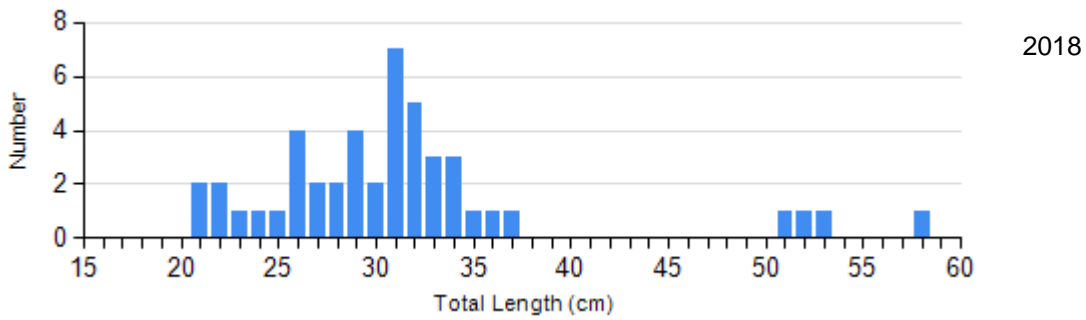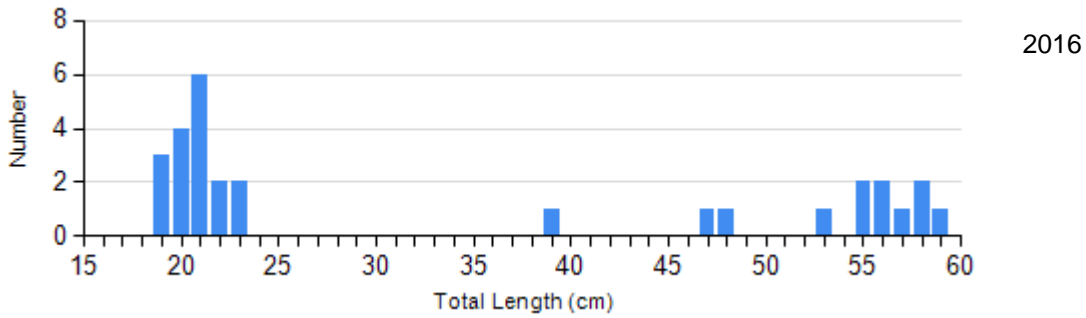
| Species | Year | | Length Groups | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | S-Q | | Q-P | | P-M | | M | |
| | | N | Wr (SE) | N | Wr (SE) | N | Wr (SE) | N | Wr (SE) |
| Walleye Gill Net | 2016 | 0 | | 3 | 82 (4.1) | 9 | 90 (1.7) | 0 | |
| | 2018 | 36 | 82 (0.8) | 0 | | 4 | 87 (1.8) | 0 | |
| | 2019 | 13 | 83 (1.5) | 0 | | 0 | | 0 | |

# Length Frequency Distribution

Length frequency histogram of species sampled by year.
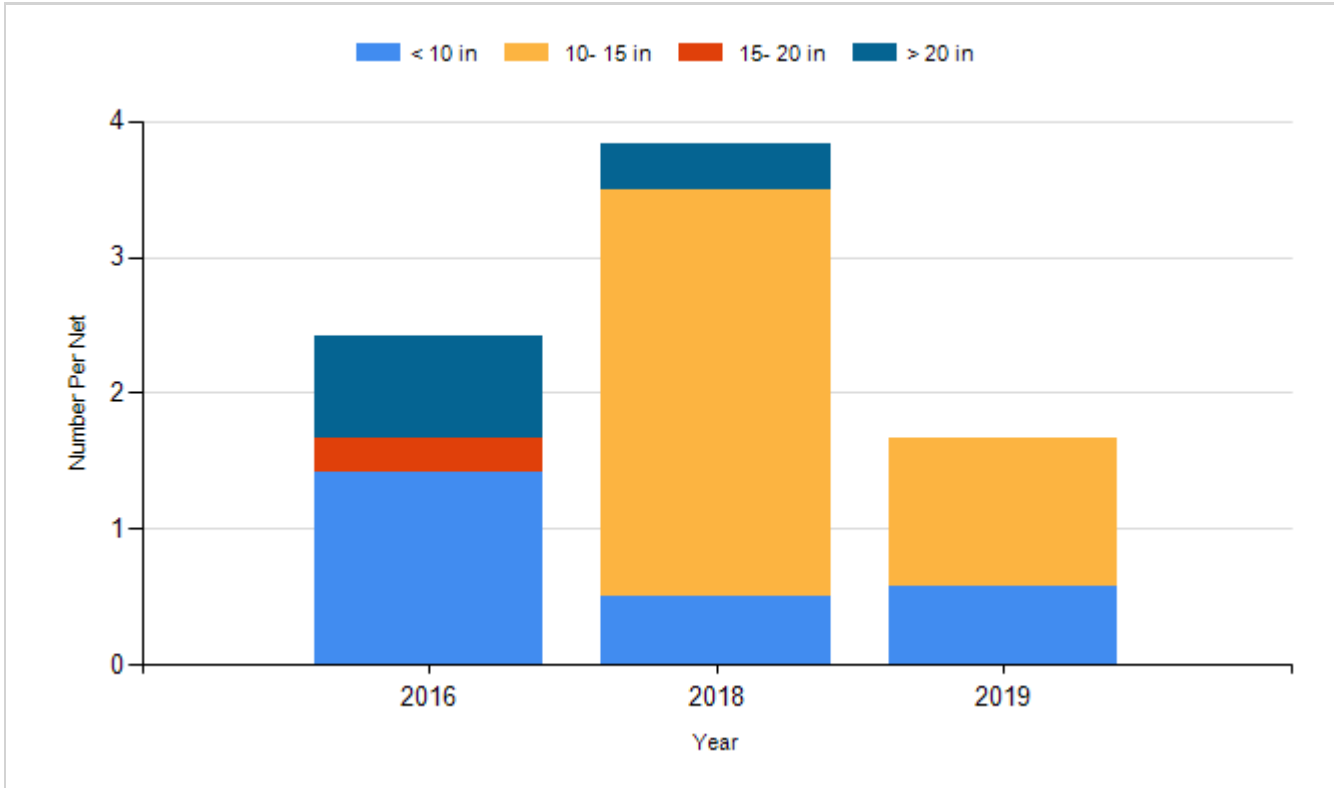
Species: Walleye
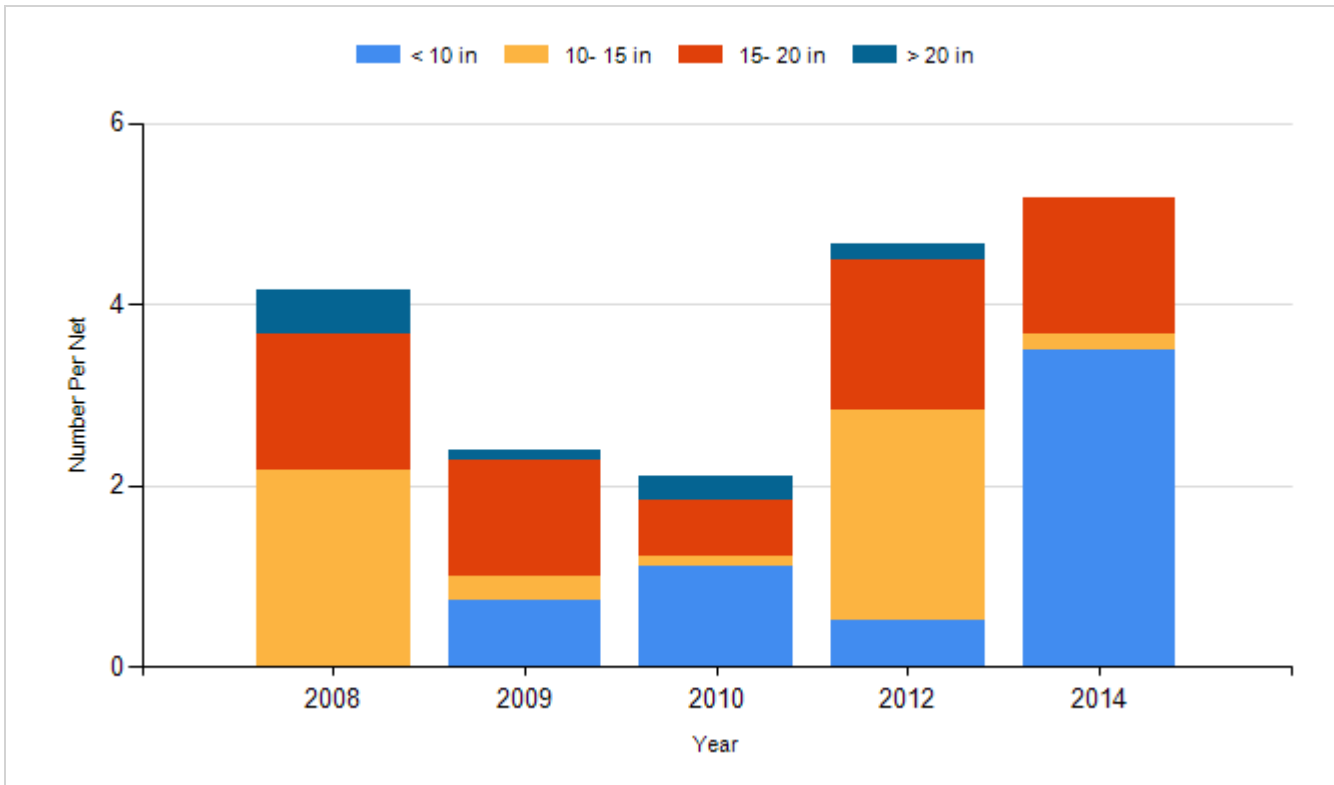Gear: AFS std gill net

2016

2018

2019

# Historic Fish Sizes and Relative Abundance

Size distribution per net by color for species sampled by year.

Species: Walleye
Gear: AFS std gill net



Species: Walleye
Gear: std exp gill net

## Fish Stocking

Number of fish stocked by year, species, and size.

| Year | Species | Size | Number |
|------|---------|------|-------:|
| 2008 | Walleye | Small Fingerling | 121,460 |
| 2009 | Walleye | Small Fingerling | 121,260 |
| 2010 | Walleye | Small Fingerling | 122,820 |
| 2011 | Walleye | Small Fingerling | 121,860 |
| 2012 | Walleye | Small Fingerling | 119,050 |
| 2013 | Walleye | Large | 1,976 |
| 2013 | Walleye | Large Fingerling | 26,619 |
| 2014 | Walleye | Small Fingerling | 121,350 |
| 2015 | Walleye | Small Fingerling | 122,290 |
| 2016 | Saugeye | Small Fingerling | 121,080 |
| 2017 | Saugeye | Small Fingerling | 91,520 |
| 2018 | Saugeye | Small Fingerling | 91,120 |
| 2019 | Saugeye | Small Fingerling | 92,075 |