# SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
## Spring, Walworth County
### LLO-Lake-239-000
### 2021

## Lake Information

**Name:** Spring

**County:** Walworth

**Legal Description:** T122-R74-S6

**Surface Area:** 852 Acres

**Maximum Depth:** 9 Feet

**Mean Depth:** 6 Feet

## Surveys and Investigations

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

| Gear | Date | Effort |
|---|---|---|
| AFS std gill net | Jun 15, 2021 | 2 net-nights |
| fall night EF-WAE | Sep 30, 2021 | 3600 seconds |
| frame net (std 3/4 in) | Jun 15, 2021 | 6 net-nights |
| frame net (std 3/4 in) | Jun 16, 2021 | 6 net-nights |

## Common Fish Species Present

Yellow Perch

Walleye

Black Bullhead

Green Sunfish

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.
- s**td 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.

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

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

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.

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

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).

| | Stock | | Quality | | Preferred | | Memorable | | Trophy | |
|---|---|---|---|---|---|---|---|---|---|---|
| Species Name | (in) | (cm) | (in) | (cm) | (in) | (cm) | (in) | (cm) | (in) | (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**

| | | | Abundance | | Stock Density Indices | | | | Condition | |
|---|---|---|---|---|---|---|---|---|---|---|
| Gear | Species | Sample Size (n) | CPUE | CI-80 | PSD | CI-80 | PSD-P | CI-80 | Wr | CI-80 |
| AFS std gill net | Black Bullhead | 10 | 5.0 | 9.2 | 80 | | 10 | | 100 | 4 |
| | Northern Pike | 2 | 1.0 | 3.1 | 100 | | 100 | | 96 | 6 |
| | Walleye | 28 | 14.0 | 3.1 | 89 | | 32 | 14 | 103 | 9 |
| | Yellow Perch | 68 | 34.0 | 3.1 | 62 | 9 | 25 | 8 | 95 | 1 |
| frame net (std 3/4 in) | Black Bullhead | 806 | 66.3 | 14.4 | 97 | 1 | 1 | 1 | 118 | 13 |
| | Green Sunfish | 17 | 1.4 | 0.6 | 71 | | 0 | | 114 | 3 |
| | Northern Pike | 5 | 0.4 | 0.4 | 100 | | 0 | | 89 | 5 |
| | Walleye | 73 | 6.1 | 2.7 | 88 | 6 | 12 | 6 | 97 | 1 |
| | Yellow Perch | 198 | 16.5 | 4.4 | 75 | 4 | 8 | 3 | 91 | 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**

| | | CPUE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gear | Species | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | Avg |
| AFS std gill net | Black Bullhead | | | | | | | 0.0 | | 0.0 | 5.0 | 1.67 |
| | Northern Pike | | | | | | | 0.3 | | 0.0 | 1.0 | 0.43 |
| | Walleye | | | | | | | 29.7 | | 31.7 | 14.0 | 25.12 |
| | Yellow Perch | | | | | | | 4.7 | | 12.3 | 34.0 | 17.00 |
| fall night EF-WAE* | Walleye | | | | | | | | | | 161.0 | 161.00 |
| frame net (std 3/4 in) | Black Bullhead | | 1.0 | | 0.3 | | | 1.3 | | 2.2 | 66.3 | 14.22 |
| | Black Crappie | | 0.0 | | 0.0 | | | 0.0 | | 0.1 | 0.0 | 0.02 |
| | Green Sunfish | | 0.0 | | 0.0 | | | 0.0 | | 0.0 | 1.4 | 0.28 |
| | Northern Pike | | 0.0 | | 0.0 | | | 0.2 | | 0.6 | 0.4 | 0.24 |
| | Walleye | | 10.0 | | 9.8 | | | 45.8 | | 21.1 | 6.1 | 18.56 |
| | Yellow Perch | | 0.1 | | 0.5 | | | 0.6 | | 2.0 | 16.5 | 3.94 |
| std exp gill net | Walleye | | 50.0 | | 29.5 | | | | | | | 39.75 |

## 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.

| | | | Year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gear | Species | Index | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
| AFS std gill net | Black Bullhead | PSD | | | | | | | | | | 80 |
| | | PSD-P | | | | | | | | | | 10 |
| | | Wr | | | | | | | | | | 100 |
| | Northern Pike | PSD | | | | | | | 100 | | | 100 |
| | | PSD-P | | | | | | | 0 | | | 100 |
| | | Wr | | | | | | | 102 | | | 96 |
| | Walleye | PSD | | | | | | | 100 | | | 89 |
| | | PSD-P | | | | | | | 6 | | | 32 |
| | | Wr | | | | | | | 91 | | | 103 |
| | Yellow Perch | PSD | | | | | | | 100 | | 70 | 62 |
| | | PSD-P | | | | | | | 100 | | 19 | 25 |
| | | Wr | | | | | | | 115 | | 112 | 95 |
| frame net (std 3/4 in) | Black Bullhead | PSD | | 70 | | 67 | | | 94 | | 69 | 97 |
| | | PSD-P | | 0 | | 0 | | | 88 | | 8 | 1 |
| | | Wr | | 123 | | 104 | | | 98 | | 125 | 118 |
| | Green Sunfish | PSD | | | | | | | | | | 71 |
| | | PSD-P | | | | | | | | | | 0 |
| | | Wr | | | | | | | | | | 114 |
| | Northern Pike | PSD | | | | | | | 100 | | 14 | 100 |
| | | PSD-P | | | | | | | 0 | | 0 | 0 |
| | | Wr | | | | | | | 101 | | 98 | 89 |
| | Walleye | PSD | | 60 | | 100 | | | 100 | | 49 | 88 |
| | | PSD-P | | 0 | | 0 | | | 4 | | 30 | 12 |
| | | Wr | | 95 | | 81 | | | 92 | | 104 | 97 |
| | Yellow Perch | PSD | | 100 | | 100 | | | 100 | | 83 | 75 |
| | | PSD-P | | 0 | | 80 | | | 100 | | 63 | 8 |
| | | Wr | | 96 | | 87 | | | 113 | | 106 | 91 |
| std exp gill net | Walleye | PSD | | 58 | | 100 | | | | | | |
| | | PSD-P | | 0 | | 0 | | | | | | |
| | | Wr | | 97 | | 86 | | | | | | |

## Back-Calculated Lengths

Mean species back-calculated total length (mm) at age, standard error (SE), and sample size (N).

Species: Walleye

| Year Class | Age | N | Mean back-calculated length (SE) at age | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 2020 | 1 | 2 | 224 (11) | | | | | | | | | |
| 2020 | 1 | 8 | 240 (2.5) | | | | | | | | | |
| 2019 | 2 | 1 | 298 | 452 | | | | | | | | |
| 2018 | 3 | 5 | 235 (5.4) | 313 (6) | 375 (7.2) | | | | | | | |
| 2018 | 3 | 6 | 223 (9.1) | 299 (6.5) | 373 (7.3) | | | | | | | |
| 2017 | 4 | 7 | 252 (6.8) | 341 (7.5) | 390 (4.9) | 429 (2.7) | | | | | | |
| 2017 | 4 | 13 | 246 (5.8) | 332 (5.4) | 387 (5.8) | 424 (4.4) | | | | | | |
| 2014 | 7 | 3 | 259 (1.8) | 342 (8.1) | 380 (9.1) | 400 (8.6) | 420 (5.3) | 445 (3.2) | 460 (1.5) | | | |
| 2014 | 7 | 14 | 232 (6) | 307 (4.9) | 359 (4.4) | 394 (3.6) | 424 (4.2) | 450 (4.6) | 471 (5.8) | | | |
| 2011 | 10 | 8 | 219 (7.3) | 293 (9.8) | 356 (9.6) | 396 (8.8) | 427 (10.2) | 452 (9.9) | 474 (9.1) | 496 (10.6) | 513 (10.8) | 530 (11.3) |
| 2011 | 10 | 10 | 212 (8.7) | 295 (8.1) | 347 (7) | 388 (4.9) | 423 (5.1) | 449 (5.2) | 477 (7.2) | 501 (8.6) | 523 (9.6) | 543 (10.2) |
| Weighted Mean | | 77 | 234 | 315 | 369 | 405 | 424 | 450 | 472 | 499 | 519 | 537 |

| Year Class | Age | N | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2020 | 1 | 2 | | | | | | | | | | |
| 2020 | 1 | 8 | | | | | | | | | | |
| 2019 | 2 | 1 | | | | | | | | | | |
| 2018 | 3 | 5 | | | | | | | | | | |
| 2018 | 3 | 6 | | | | | | | | | | |
| 2017 | 4 | 7 | | | | | | | | | | |
| 2017 | 4 | 13 | | | | | | | | | | |
| 2014 | 7 | 3 | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | 7 | 14 | | | | | | | | | | |
| 2011 | 10 | 8 | | | | | | | | | | |
| 2011 | 10 | 10 | | | | | | | | | | |
| Weighted Mean | | 77 | | | | | | | | | | |

Species: Yellow Perch

| | | | Mean back-calculated length (SE) at age | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year Class | Age | N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 2019 | 2 | 1 | 116 | 150 | | | | | | | | |
| 2019 | 2 | 19 | 103 (1.9) | 164 (2.8) | | | | | | | | |
| 2018 | 3 | 1 | 111 | 151 | 204 | | | | | | | |
| 2018 | 3 | 9 | 110 (1.7) | 159 (2.5) | 196 (1.9) | | | | | | | |
| 2017 | 4 | 11 | 119 (2.1) | 159 (2.2) | 192 (2.7) | 219 (1.1) | | | | | | |
| 2016 | 5 | 2 | 115 (9.1) | 147 (5.4) | 192 (12.8) | 220 (22) | 246 (20.4) | | | | | |
| 2016 | 5 | 7 | 105 (2) | 152 (3.5) | 190 (5.3) | 223 (6.7) | 245 (8.6) | | | | | |
| 2015 | 6 | 1 | 105 | 139 | 181 | 222 | 236 | 247 | | | | |
| 2014 | 7 | 1 | 112 | 165 | 219 | 243 | 265 | 276 | 285 | | | |
| 2014 | 7 | 6 | 114 (1.3) | 174 (7.2) | 205 (6) | 233 (3.6) | 258 (3.6) | 273 (1.6) | 285 (1.8) | | | |
| 2013 | 8 | 2 | 121 (16.3) | 159 (15) | 191 (19.3) | 221 (25.1) | 259 (29) | 282 (25.4) | 297 (21.7) | 310 (26.9) | | |
| 2012 | 9 | 1 | 116 | 172 | 211 | 246 | 266 | 288 | 301 | 317 | 331 | |
| Weighted Mean | | 61 | 110 | 161 | 196 | 225 | 252 | 274 | 289 | 312 | 331 | |

| Year Class | Age | N | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2019 | 2 | 1 | | | | | | | | | | |
| 2019 | 2 | 19 | | | | | | | | | | |
| 2018 | 3 | 1 | | | | | | | | | | |
| 2018 | 3 | 9 | | | | | | | | | | |
| 2017 | 4 | 11 | | | | | | | | | | |

| | | |
|---|---|---|
| 2016 | 5 | 2 |
| 2016 | 5 | 7 |
| 2015 | 6 | 1 |
| 2014 | 7 | 1 |
| 2014 | 7 | 6 |
| 2013 | 8 | 2 |
| 2012 | 9 | 1 |
| Weighted Mean | | 61 |

## Length at Capture

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

Species: Walleye

| | | Mean Length (expanded sample number) at capture by age | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ |
| 2021 | 28 | 263 (2) | 473 (1) | 393 (5) | 443 (7) | | | 470 (3) | | | 551 (10) |
| 2018 | 89 | | | | 435 (72) | | | 491 (18) | | | |
| 2015 | 100 | 191 (41) | | | 431 (59) | | | | | | |

Species: Yellow Perch

| | | Mean Length (expanded sample number) at capture by age | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | N | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ |
| 2021 | 68 | | 177 (23) | 205 (11) | 227 (14) | 251 (8) | 255 (1) | 288 (7) | 315 (2) | 338 (1) | |
| 2020 | 42 | 135 (13) | 144 (2) | 217 (9) | 237 (12) | | | 300 (3) | | 299 (2) | 340 (1) |
| 2018 | 14 | | | | | | 282 (4) | 307 (6) | 294 (4) | | |

## Fish Condition

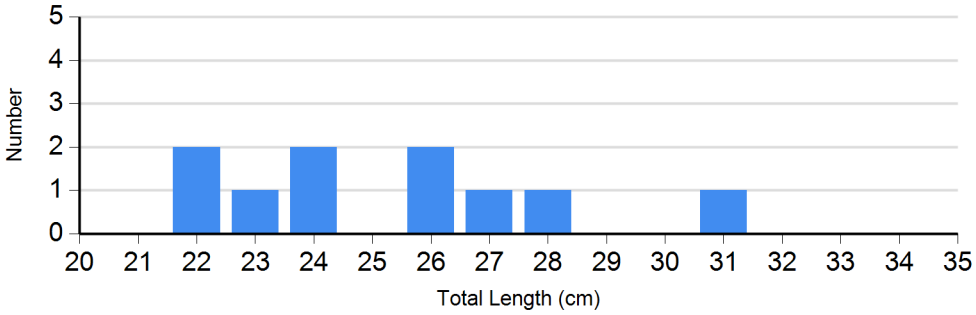
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

| | | Length Groups | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | S-Q | | Q-P | | P-M | | M | |
| Species | Year | N | Wr (SE) | N | Wr (SE) | N | Wr (SE) | N | Wr (SE) |
| Black Bullhead<br>Gill Net | 2021 | 2 | 93<br>(0.7) | 7 | 102<br>(3.8) | 1 | 93 | 0 | |
| Northern Pike<br>Gill Net | 2018 | 0 | | 1 | 102 | 0 | | 0 | |
| | 2021 | 0 | | 0 | | 2 | 96<br>(4.3) | 0 | |
| Walleye<br>Gill Net | 2018 | 0 | | 84 | 91<br>(0.7) | 5 | 85<br>(3.1) | 0 | |
| | 2021 | 3 | 158<br>(67.1) | 16 | 98<br>(1.7) | 9 | 95<br>(3.3) | 0 | |
| Yellow Perch<br>Gill Net | 2018 | 0 | | 0 | | 6 | 116<br>(3.1) | 8 | 114<br>(2.2) |
| | 2020 | 11 | 111<br>(1.9) | 19 | 112<br>(2.1) | 4 | 120<br>(3.7) | 3 | 109<br>(4.9) |
| | 2021 | 26 | 97<br>(1.2) | 25 | 95<br>(1.3) | 15 | 91<br>(2.0) | 2 | 93<br>(1.7) |

## Length Frequency Distribution

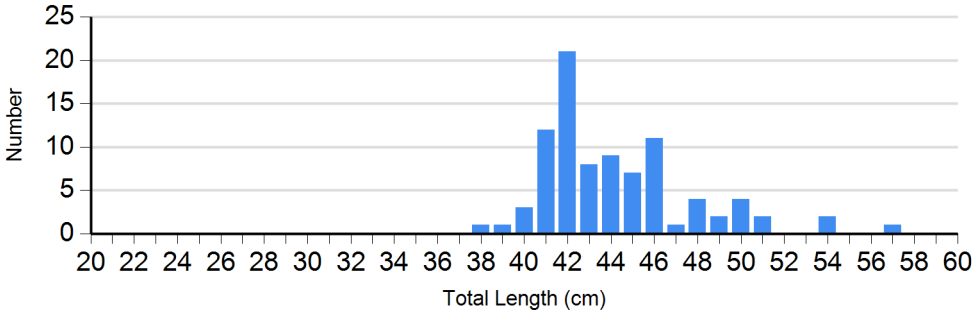
Length frequency histogram of species sampled by year.

Species: Black Bullhead
Gear: AFS std gill net

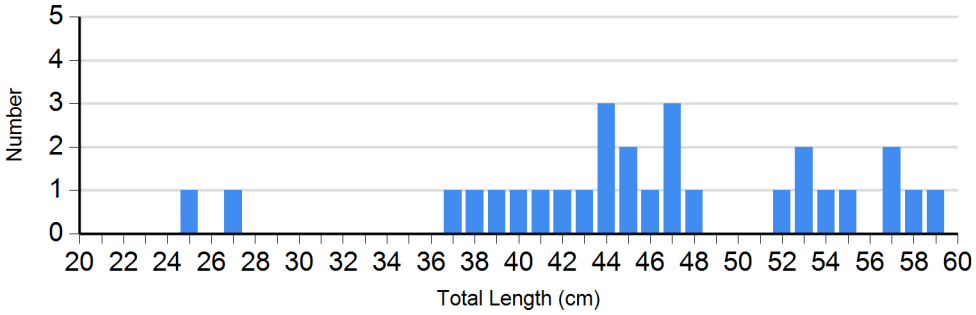



2021

Species: Walleye
Gear: AFS std gill net

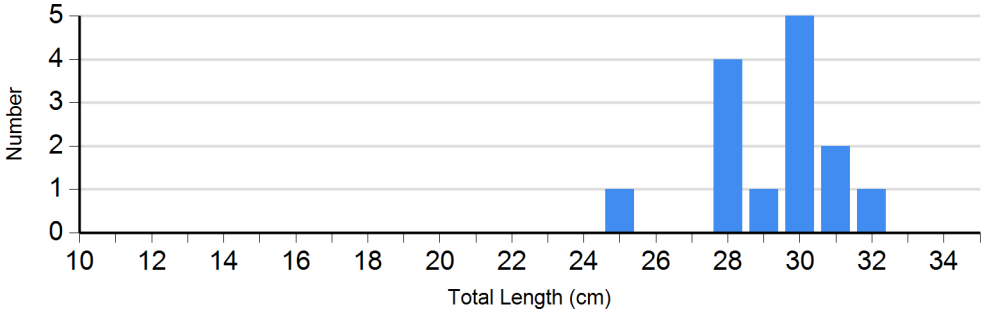



2018

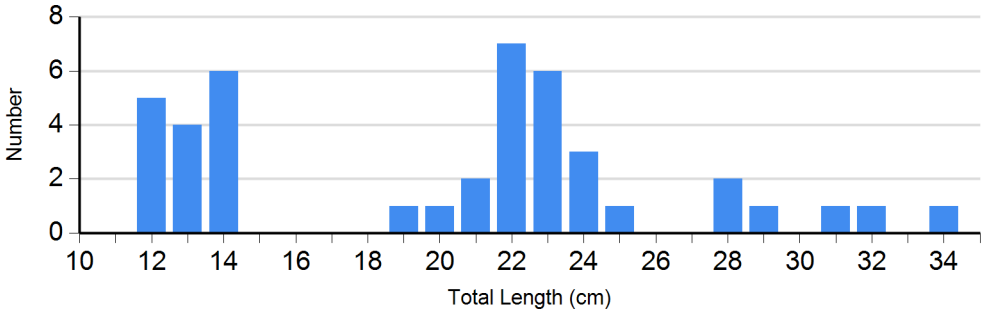



2021

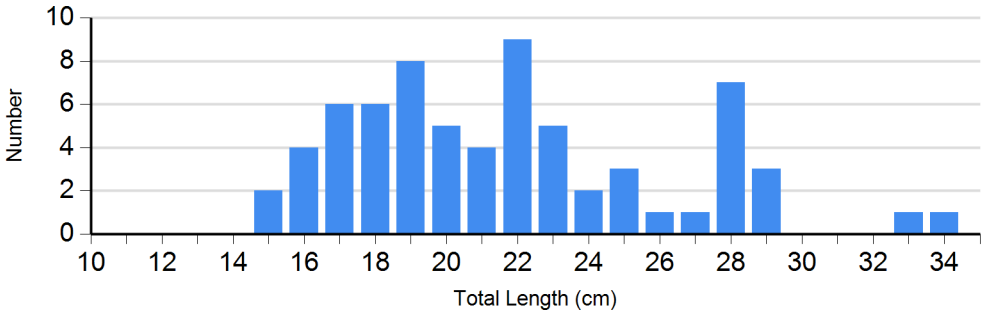
Species: Yellow Perch
Gear: AFS std gill net




2018


Number
8
6
4
2
0
10
12
14
16
18
20
22
24
26
28
30
32
34
Total Length (cm)

2020

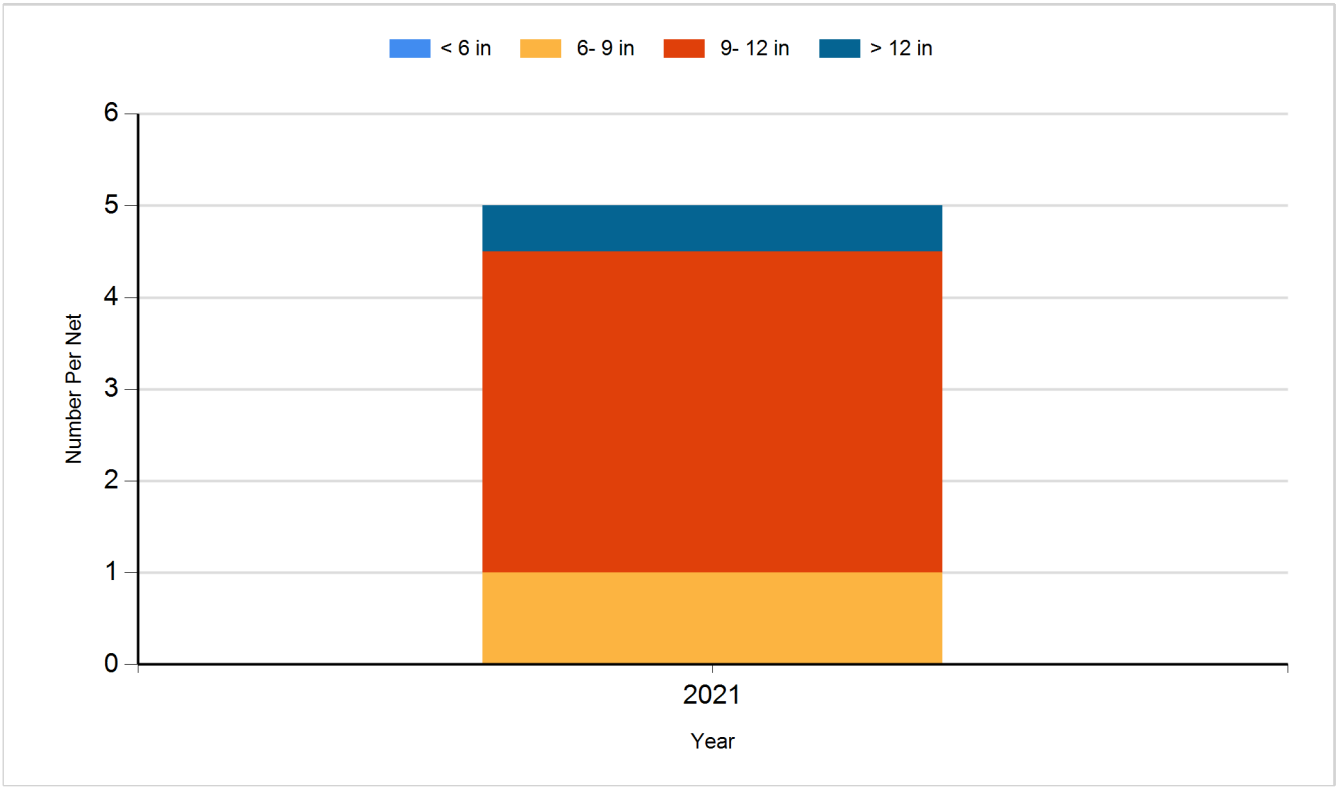

Number
10
8
6
4
2
0
10
12
14
16
18
20
22
24
26
28
30
32
34
Total Length (cm)

2021

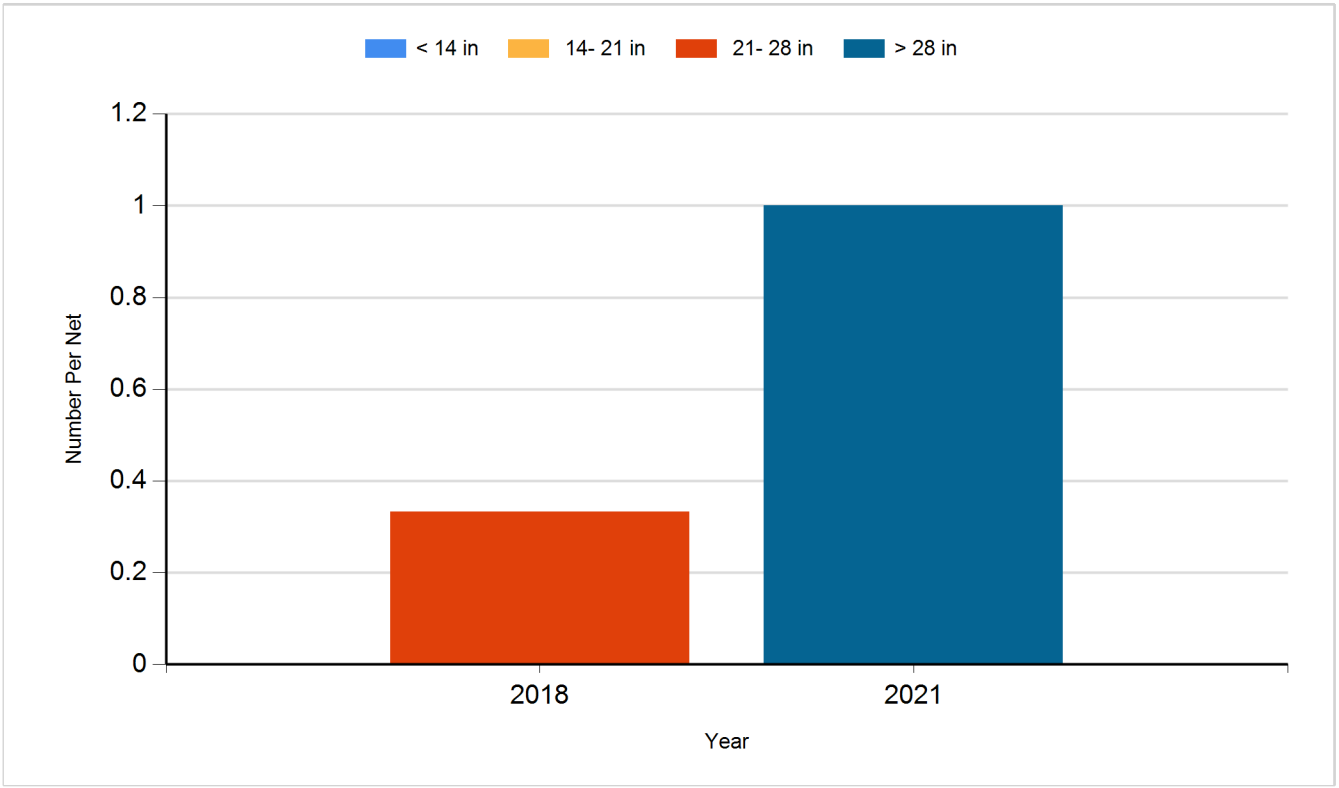
## Historic Fish Sizes and Relative Abundance

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

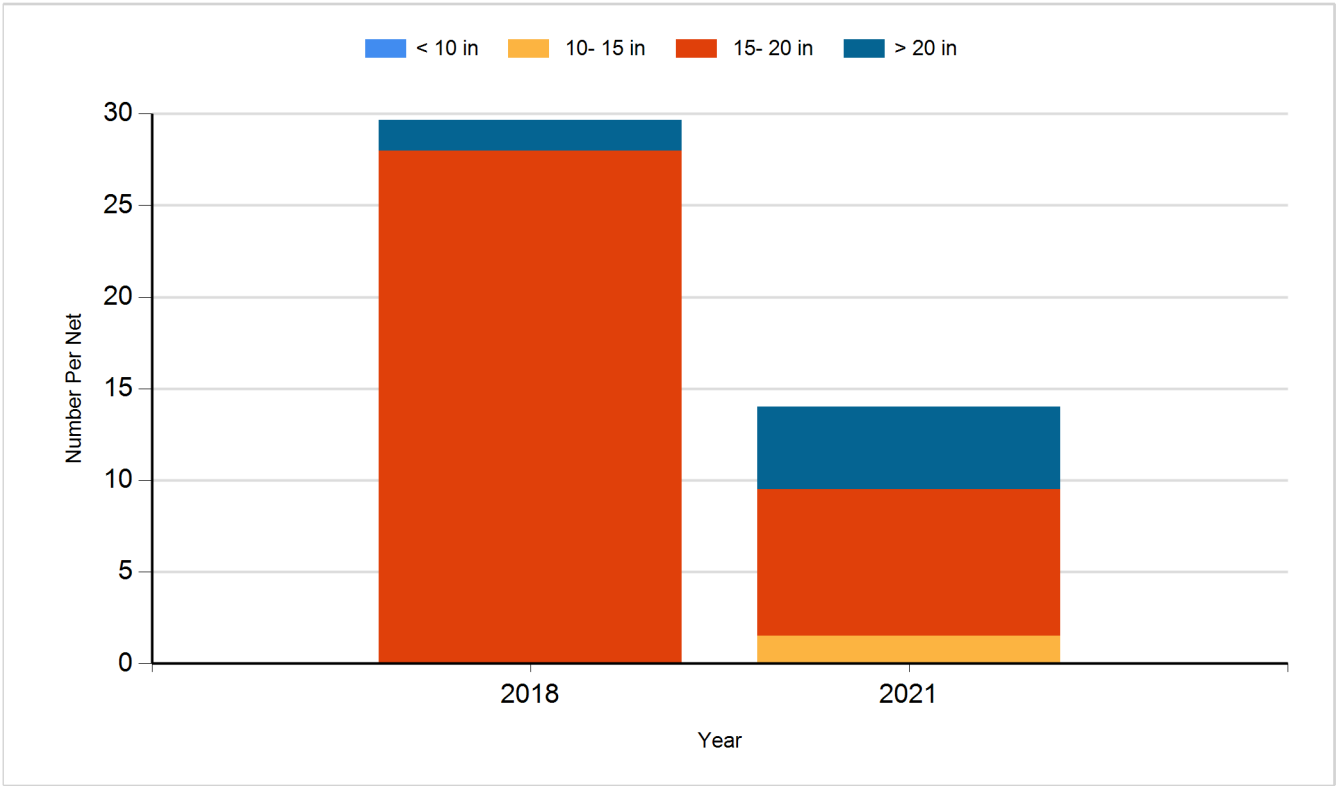
Species: Black Bullhead
Gear: AFS std gill net



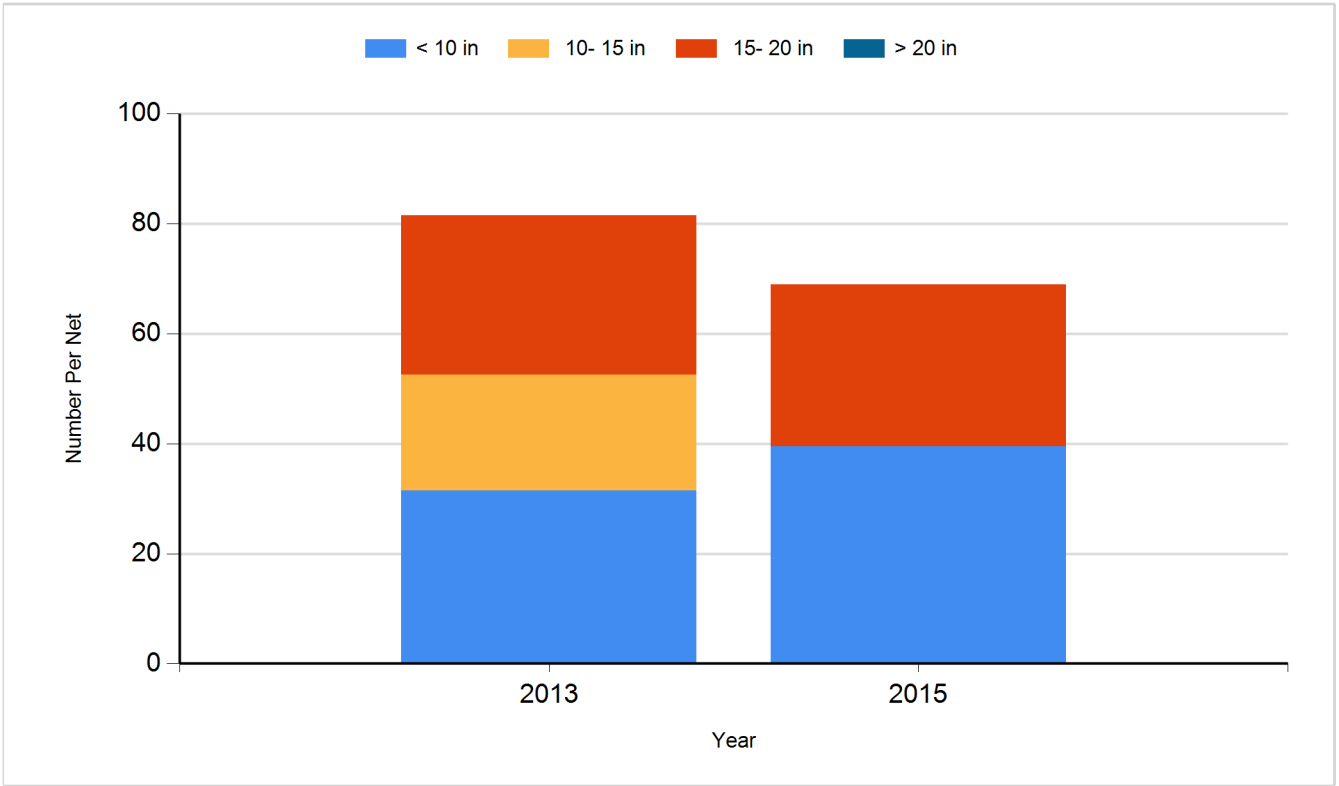

Species: Northern Pike
Gear: AFS std gill net



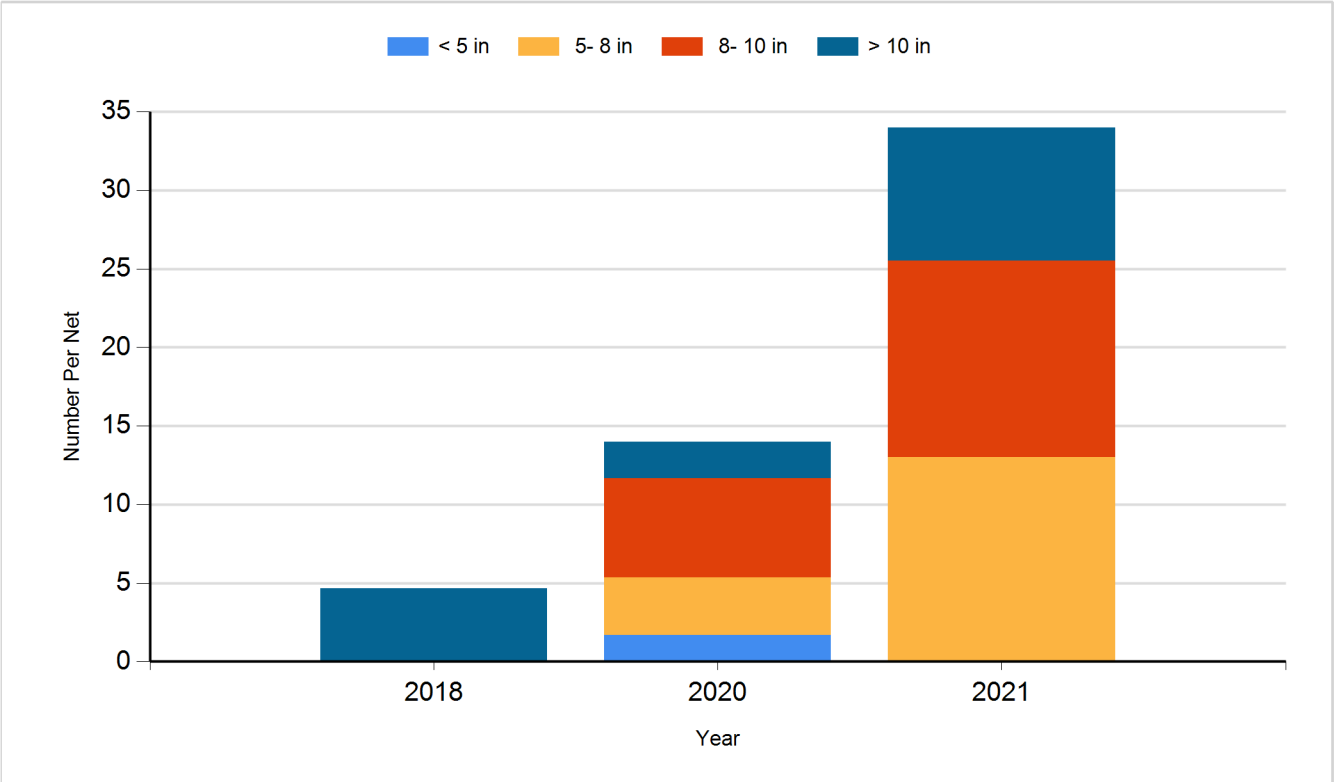
Species: Walleye
Gear: AFS std gill net




Species: Walleye
Gear: std exp gill net



Species: Yellow Perch
Gear: AFS std gill net



## Fish Stocking

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

| Year | Species | Size | Number |
|---|---|---|---|
| 2011 | Walleye | Small Fingerling | 78,000 |
| 2012 | Yellow Perch | Adult | 300 |
| 2014 | Walleye | Fry | 750,000 |
| 2015 | Yellow Perch | Fingerling | 6,600 |
| 2018 | Walleye | Fry | 720,000 |
| 2021 | Walleye | Fry | 400,000 |