

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

Spirit, Kingsbury County

LKT-Lake-95-801

2021

Lake Information

Name: Spirit **Maximum Depth:** 11 Feet
County: Kingsbury **Mean Depth:** 9 Feet
Legal Description: T112-R57-Sec. 13, 24-25 and
T112- R56- Sec. 18-19, 30
Surface Area: 1,245 Acres

Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	Aug 12, 2021	6 net-nights

Common Fish Species Present

Yellow Perch

Walleye

Black Bullhead

White Sucker

Common Carp

Northern Pike

Bigmouth Buffalo

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.

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

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.

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

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

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.

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

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		Quality		Preferred		Memorable		Trophy	
	(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**

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	Bigmouth Buffalo	3	0.0	0.0	0		0			
	Black Bullhead	83	13.8	11.1	57	8	8	5		
	Common Carp	20	3.3	1.7	35	17	10			
	Northern Pike	9	1.5	1.4	67		11		78	4
	Walleye	20	3.3	1.2	90		10		81	2
	White Sucker	31	5.2	1.3	97		77	12		
	Yellow Perch	90	15.0	3.5	13	5	8	4	96	2

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

Gear	Species	CPUE										Avg
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
AFS std gill net	Bigmouth Buffalo						0.0	0.0	0.7		0.0	0.18
	Black Bullhead						0.3	2.7	1.7		13.8	4.63
	Common Carp						1.0	0.2	1.0		3.3	1.38
	Northern Pike						1.8	0.3	2.8		1.5	1.60
	Walleye						1.2	7.8	7.2		3.3	4.88
	White Sucker						4.3	2.3	0.7		5.2	3.13
	Yellow Perch						18.2	29.5	29.8		15.0	23.13
frame net (std 3/4 in)	Bigmouth Buffalo	0.0	0.2									0.10
	Black Bullhead	1.4	34.0									17.70
	Common Carp	5.0	8.6									6.80
	Northern Pike	10.8	2.4									6.60
	Walleye	9.8	10.8									10.30
	White Sucker	1.2	3.8									2.50
	Yellow Perch	0.4	1.6									1.00
std exp gill net	Black Bullhead	1.3	1.3	13.7	10.7	1.3						5.66
	Common Carp	0.7	1.3	1.3	0.7	1.0						1.00
	Northern Pike	4.0	1.0	0.7	3.0	1.7						2.08
	Walleye	19.3	12.7	8.7	1.3	6.0						9.60
	White Sucker	3.0	8.7	3.0	6.3	6.0						5.40
	Yellow Perch	12.7	43.0	17.3	46.7	19.3						27.80

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	Year									
			2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
AFS std gill net	Bigmouth Buffalo	PSD							0	0		0
		PSD-P							0	0		0
	Black Bullhead	PSD						100	81	30		57
		PSD-P						100	6	0		8
	Common Carp	PSD						100	100	67		35
		PSD-P						83	100	0		10
	Northern Pike	PSD						100	100	35		67
		PSD-P						27	50	6		11
		Wr						73	85	93		78
	Walleye	PSD						29	15	81		90
		PSD-P						0	2	5		10
		Wr						73	88	93		81
	White Sucker	PSD						100	100	100		97
		PSD-P						100	100	50		77
	Yellow Perch	PSD						61	66	48		13
		PSD-P						49	44	27		8
		Wr						114	101	105		96
	frame net (std 3/4 in)	Bigmouth Buffalo	PSD		100							
PSD-P				100								
Wr				80								
Black Bullhead		PSD	43	35								
		PSD-P	29	12								
		Wr	87	68								
Common Carp		PSD	100	100								
		PSD-P	76	91								
		Wr	92	86								
Northern Pike		PSD	70	75								
		PSD-P	4	25								
		Wr	78	63								
Walleye		PSD	10	30								
		PSD-P	0	0								
		Wr	85	74								
White Sucker		PSD	100	100								

Gear	Species	Index	Year									
			2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
frame net (std 3/4 in)	White Sucker	PSD-P	100	100								
		Wr	99	81								
	Yellow Perch	PSD	50	63								
		PSD-P	50	63								
		Wr	102	81								
	std exp gill net	Black Bullhead	PSD	50	25	5	81	100				
PSD-P			25	0	2	0	0					
Wr			86	82								
Common Carp		PSD	100	100	100	100	100					
		PSD-P	100	75	100	100	100					
		Wr	98	89								
Northern Pike		PSD	50	67	100	33	100					
		PSD-P	0	33	0	0	0					
		Wr	73	63	104	79	83					
Walleye		PSD	9	29	96	100	0					
		PSD-P	0	0	0	0	0					
		Wr	83	77	92	87	86					
White Sucker		PSD	100	100	89	100	100					
		PSD-P	100	100	78	95	100					
		Wr	101	91								
Yellow Perch		PSD	82	57	4	78	76					
		PSD-P	76	20	4	6	62					
		Wr	106	86	116	107	110					

Fish Condition

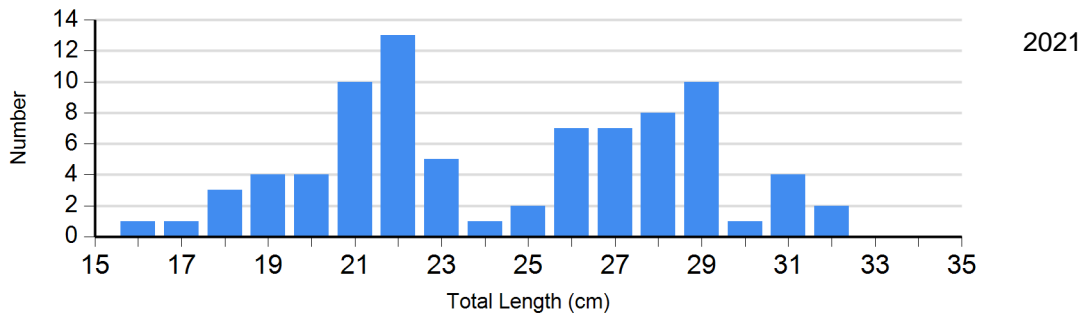
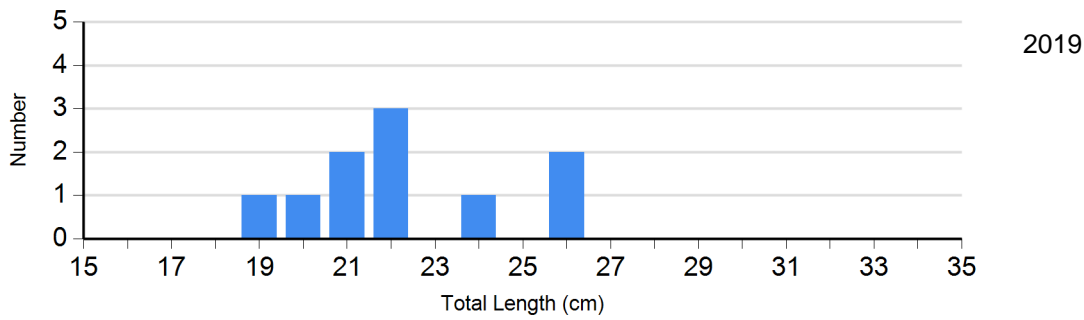
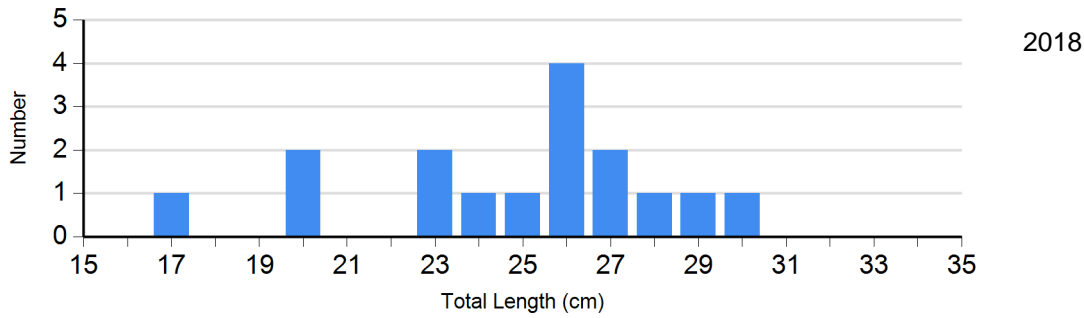
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

Species	Year	Length Groups							
		S-Q		Q-P		P-M		M	
		N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Northern Pike Gill Net	2017	0		8	71 (1.6)	1	68	2	81 (3.5)
	2018	0		1	93	1	76	0	
	2019	11	92 (2.0)	5	96 (3.2)	1	85	0	
	2021	3	87 (2.0)	5	75 (2.7)	1	62	0	
Walleye Gill Net	2017	5	72 (12.2)	2	77 (0.6)	0		0	
	2018	40	88 (0.8)	6	88 (1.7)	1	98	0	
	2019	8	90 (3.1)	33	94 (0.9)	2	101 (0.9)	0	
	2021	2	83 (5.2)	16	82 (1.6)	2	76 (4.9)	0	
Yellow Perch Gill Net	2017	43	119 (1.4)	13	111 (2.6)	41	112 (1.2)	12	110 (2.4)
	2018	61	108 (1.4)	39	100 (1.4)	57	100 (0.9)	20	98 (1.0)
	2019	93	104 (0.9)	37	105 (1.5)	43	105 (1.7)	6	
	2021	78	96 (1.5)	5	100 (1.9)	5	90 (15.6)	2	95 (8.2)

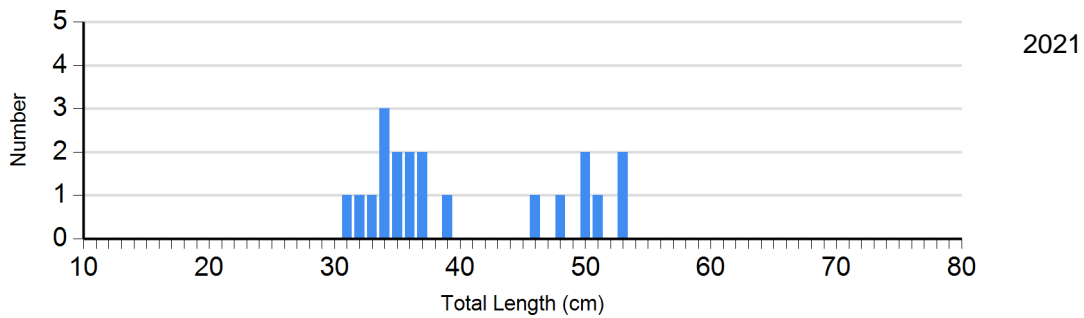
Length Frequency Distribution

Length frequency histogram of species sampled by year.

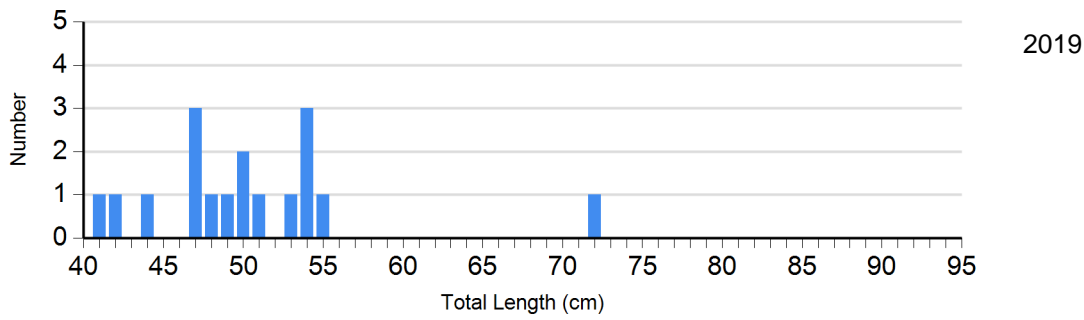
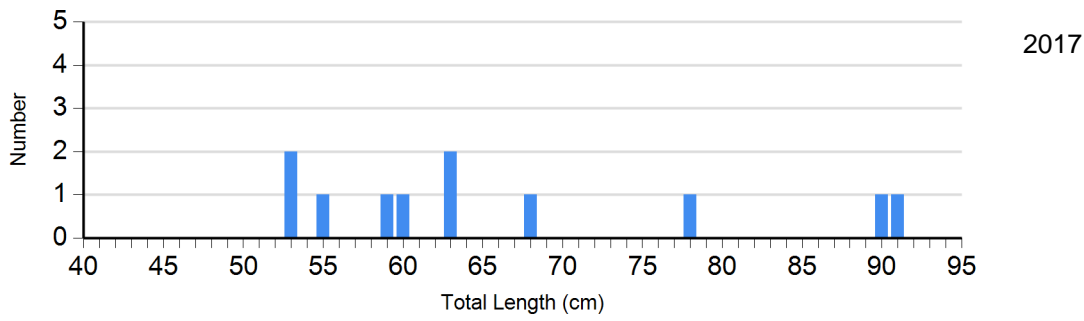
Species: Black Bullhead
Gear: AFS std gill net



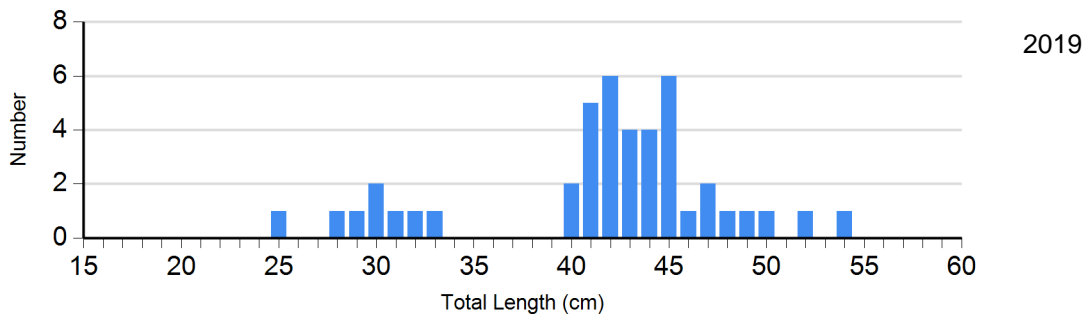
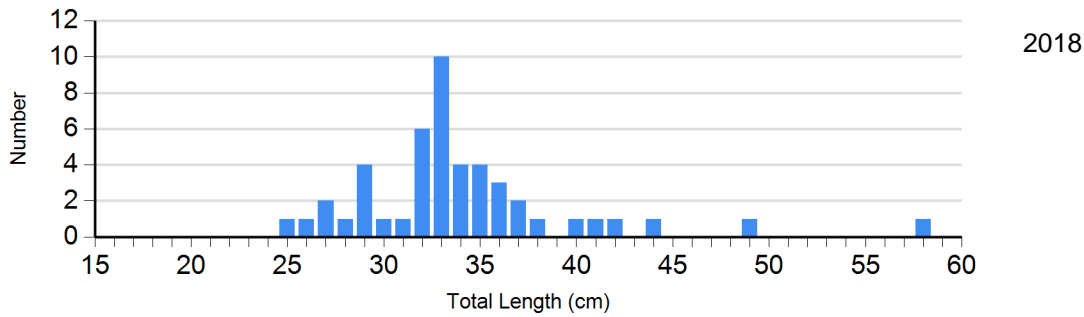
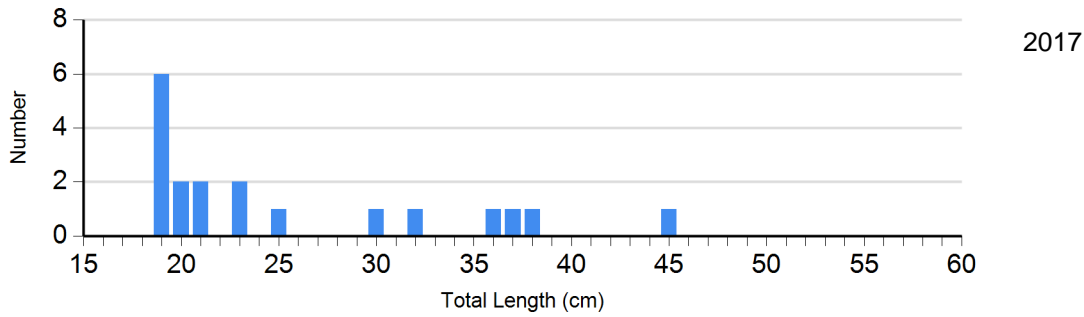
Species: Common Carp
Gear: AFS std gill net

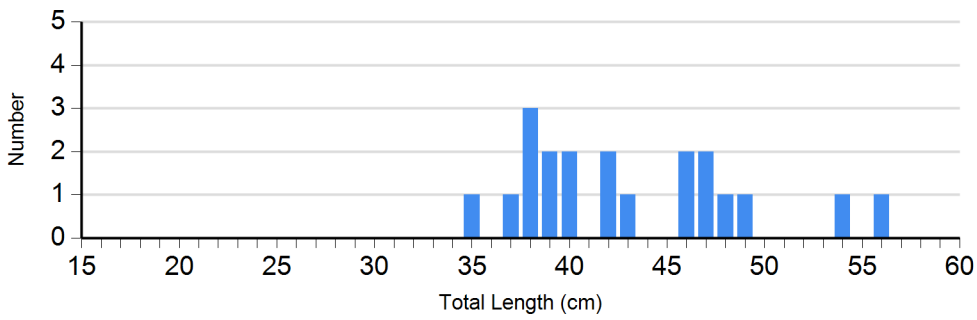


Species: Northern Pike
 Gear: AFS std gill net

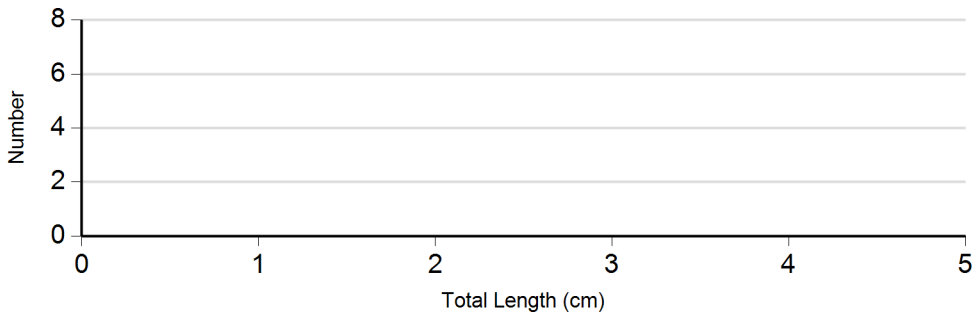


Species: Walleye
 Gear: AFS std gill net

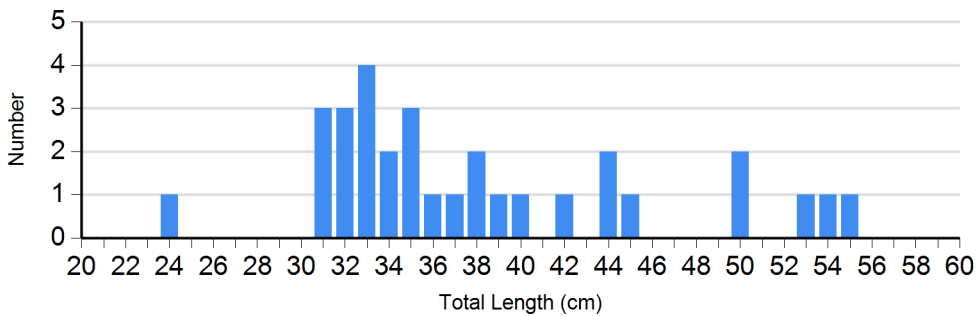
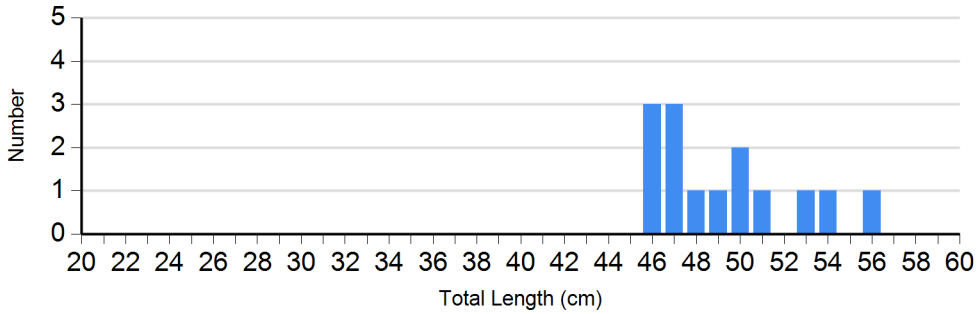
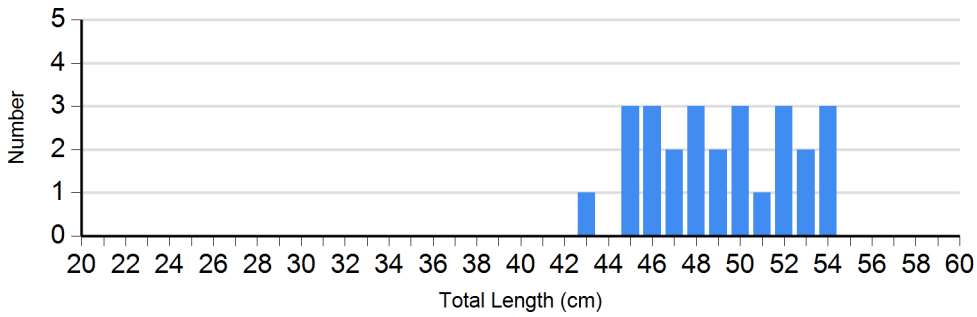




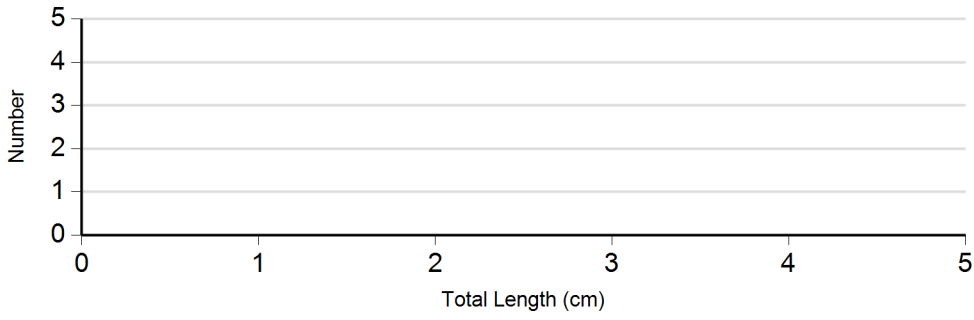
Species: Walleye
Gear: std exp gill net



Species: White Sucker
Gear: AFS std gill net

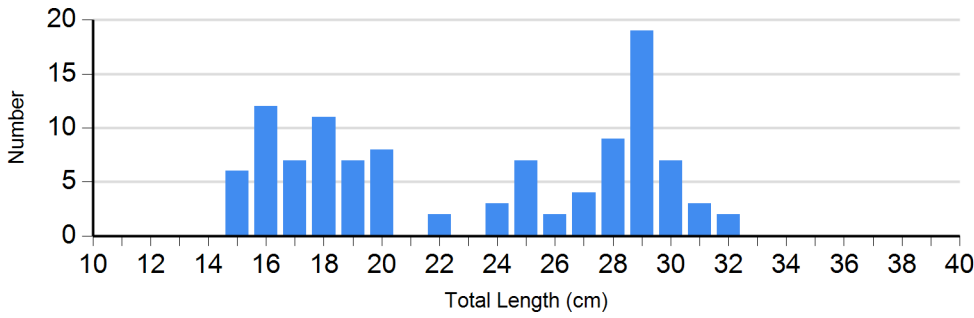


Species: White Sucker
Gear: std exp gill net

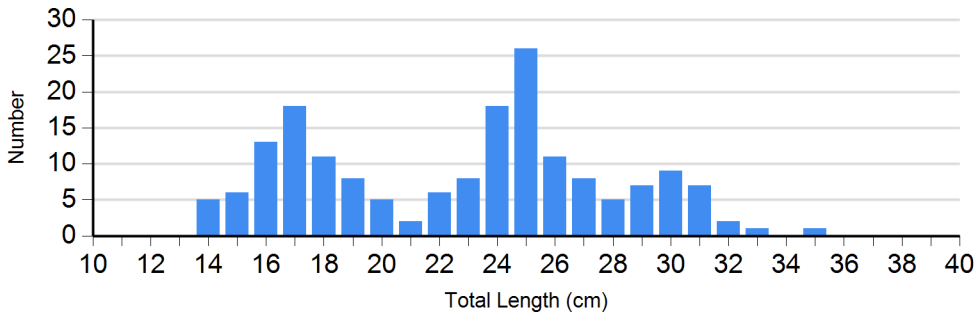


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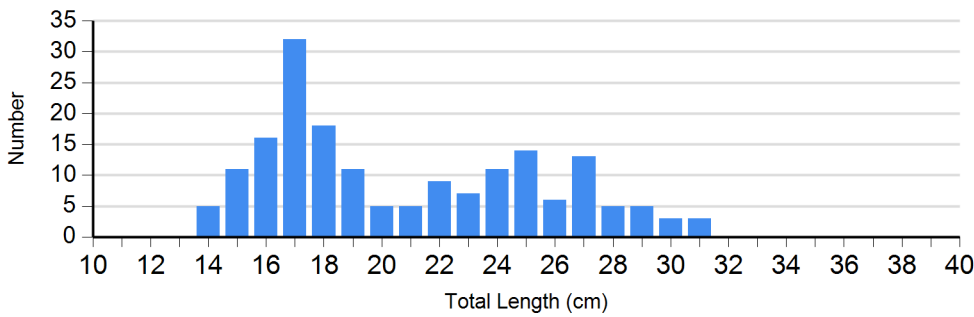
Species: Yellow Perch
Gear: AFS std gill net



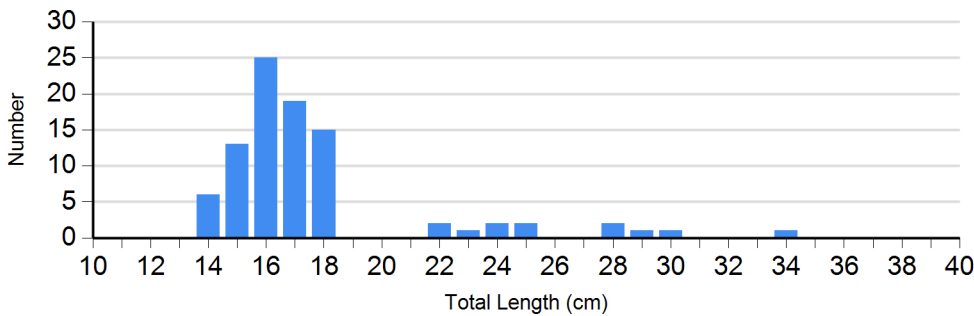
2017



2018

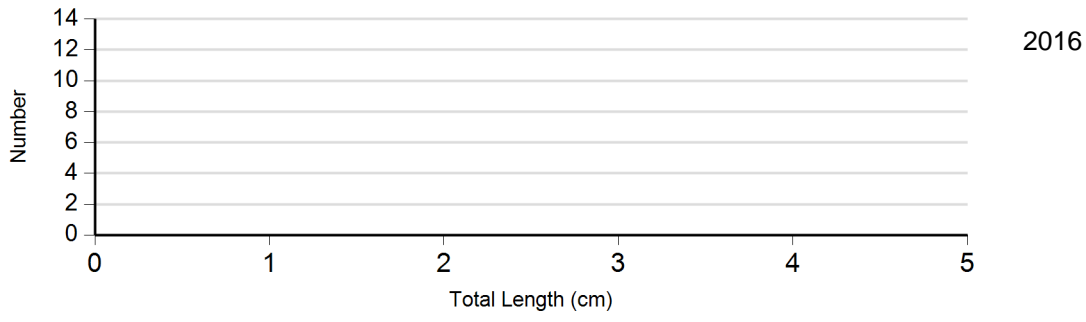


2019



2021

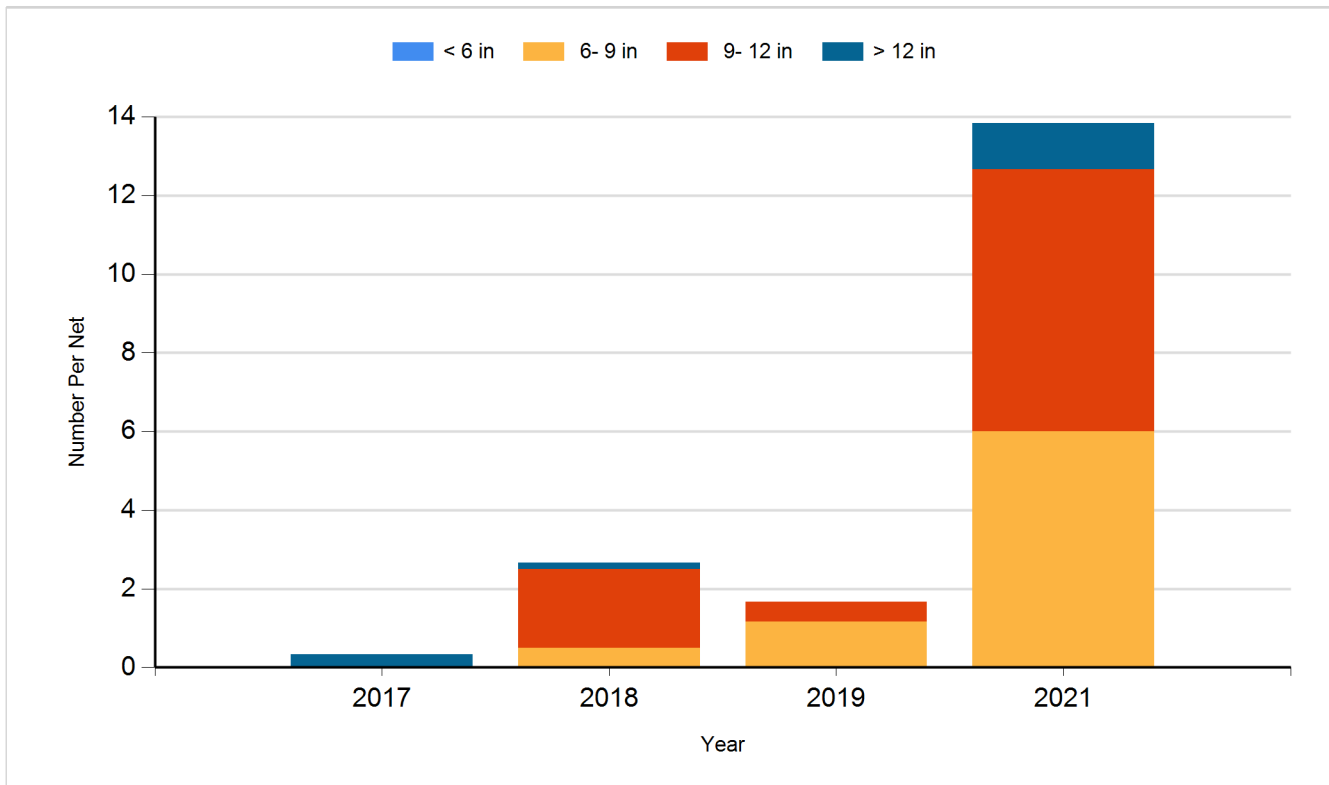
Species: Yellow Perch
Gear: std exp gill net



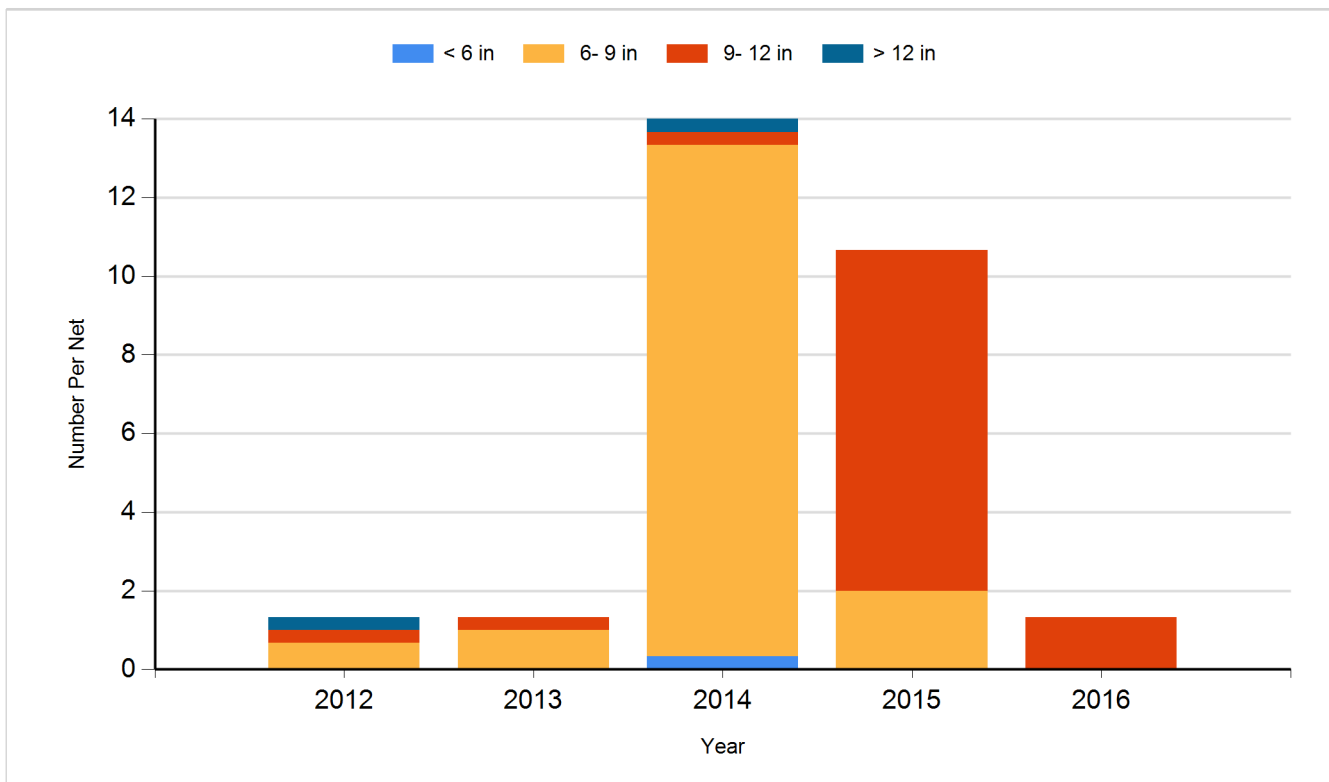
Historic Fish Sizes and Relative Abundance

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

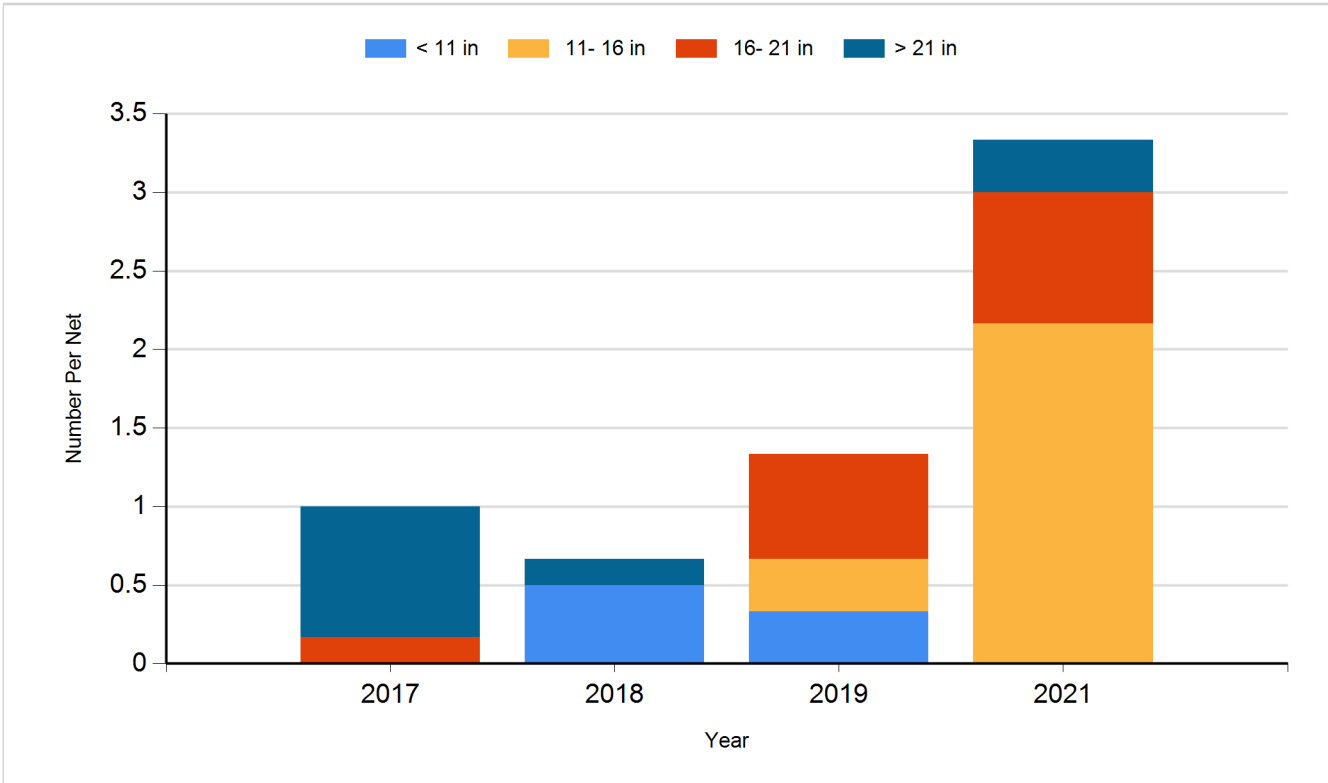
Species: Black Bullhead
Gear: AFS std gill net



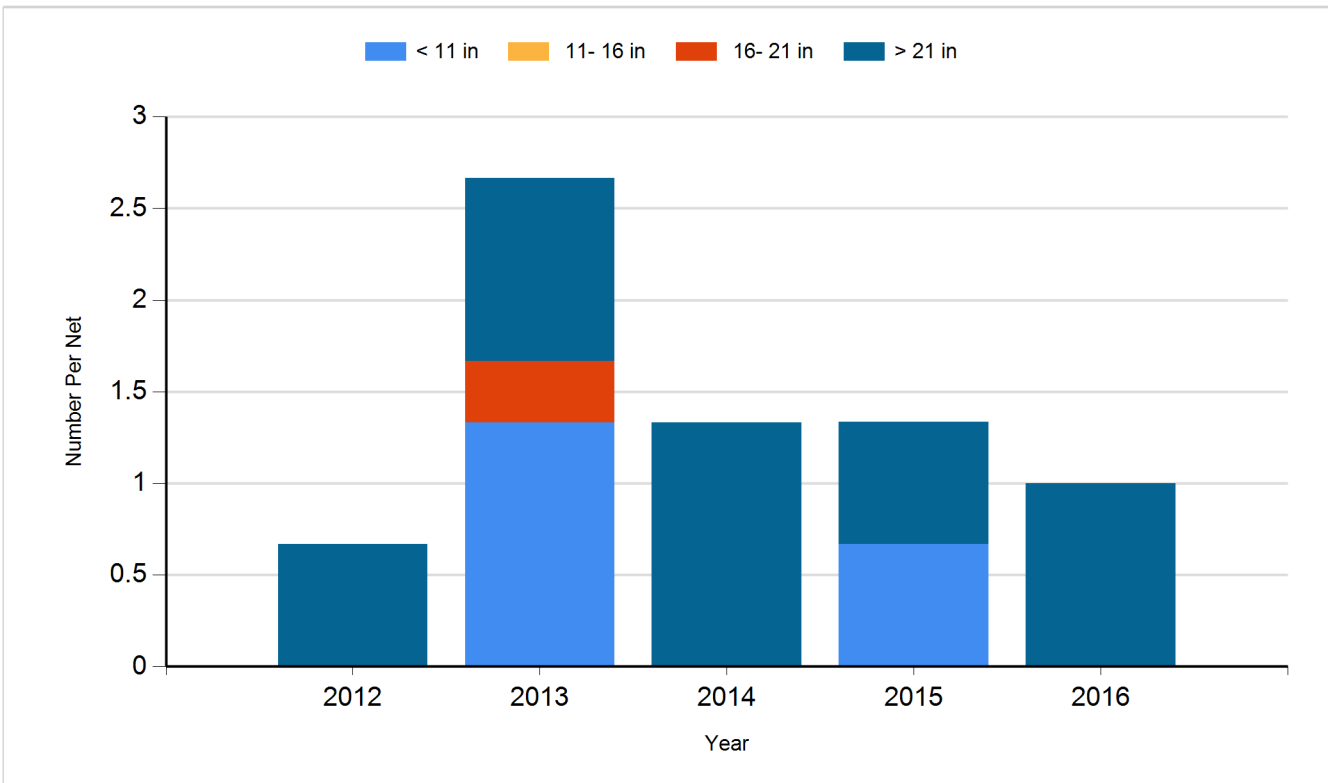
Species: Black Bullhead
Gear: std exp gill net



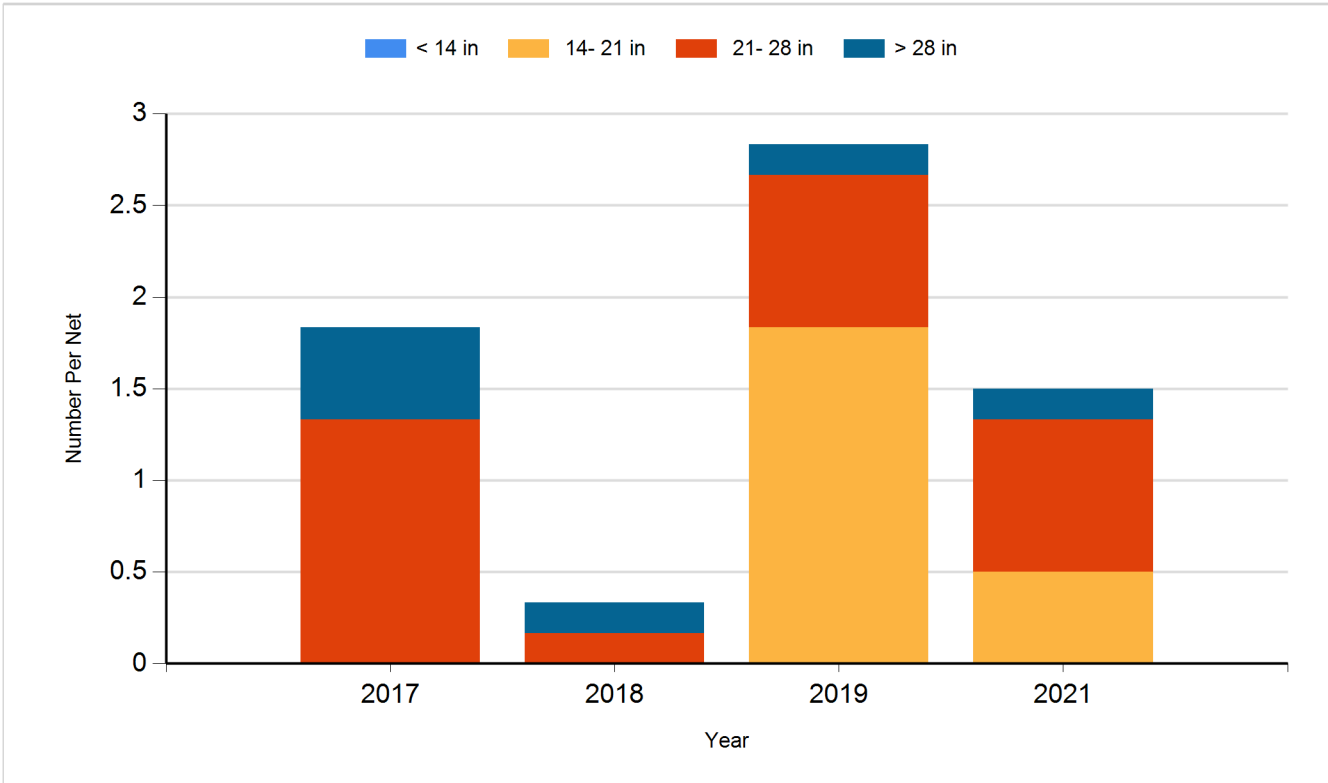
Species: Common Carp
Gear: AFS std gill net



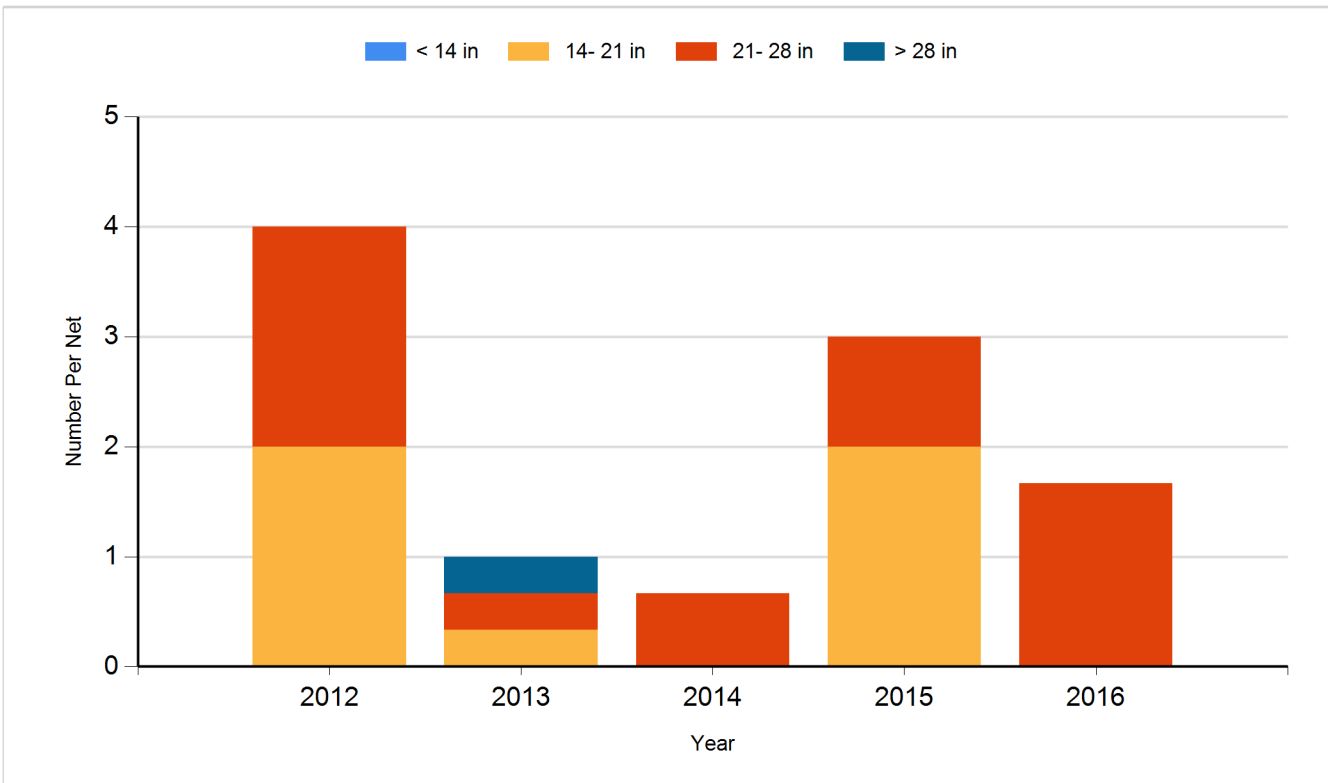
Species: Common Carp
Gear: std exp gill net



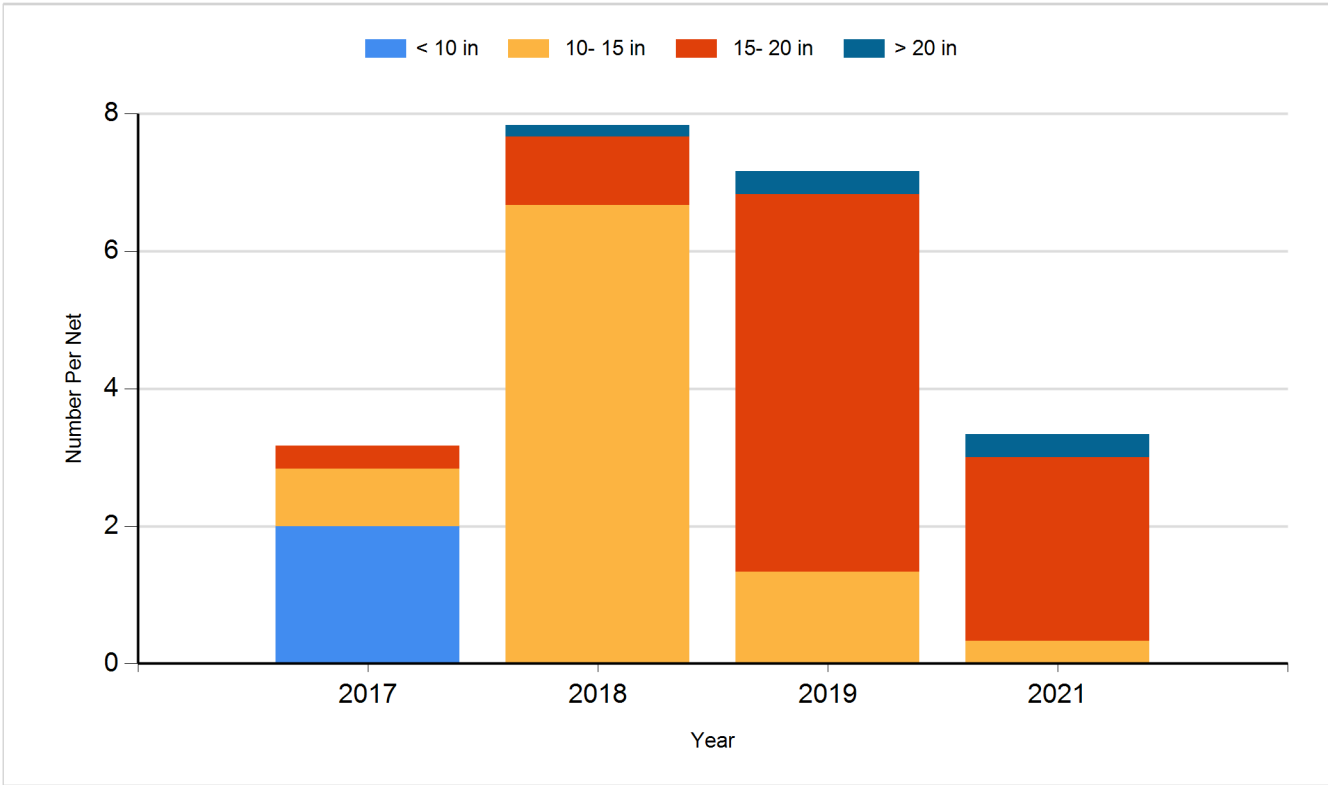
Species: Northern Pike
Gear: AFS std gill net



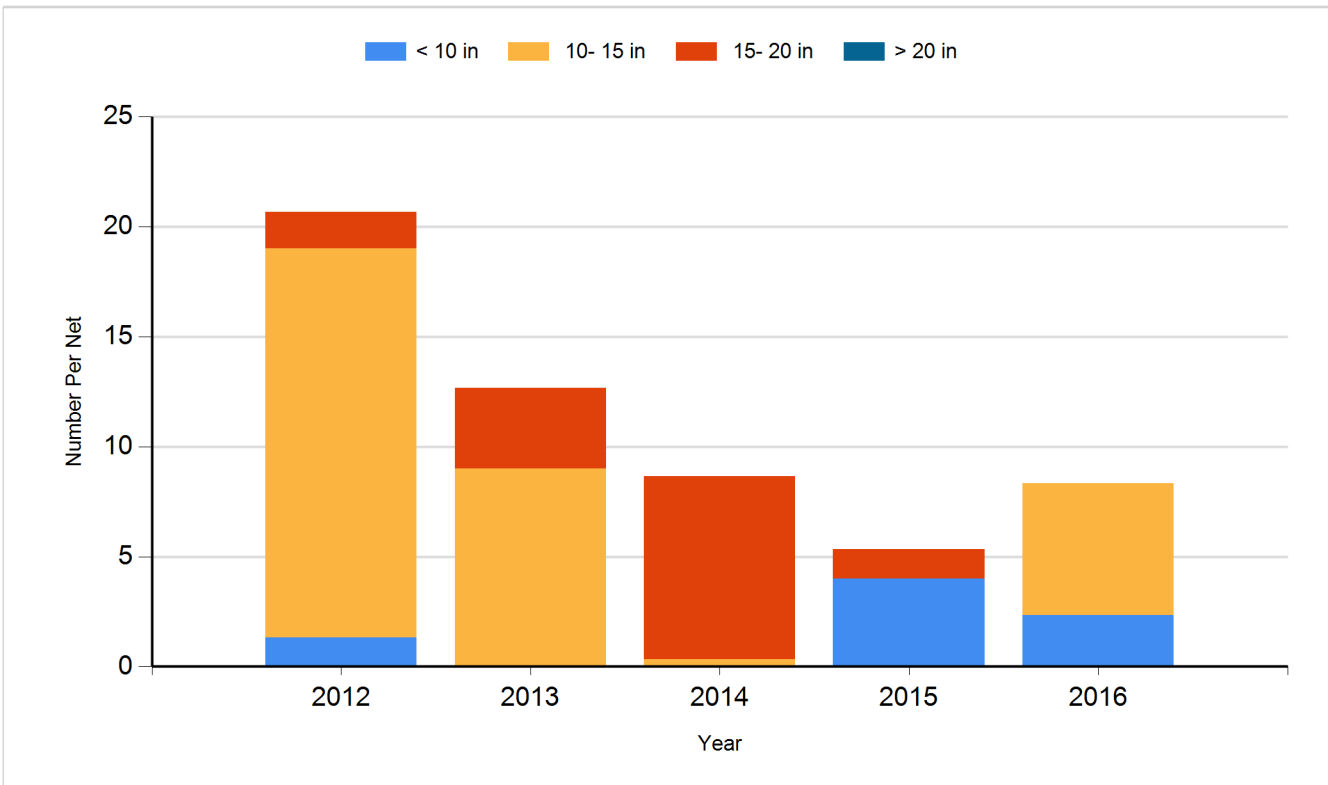
Species: Northern Pike
Gear: std exp gill net



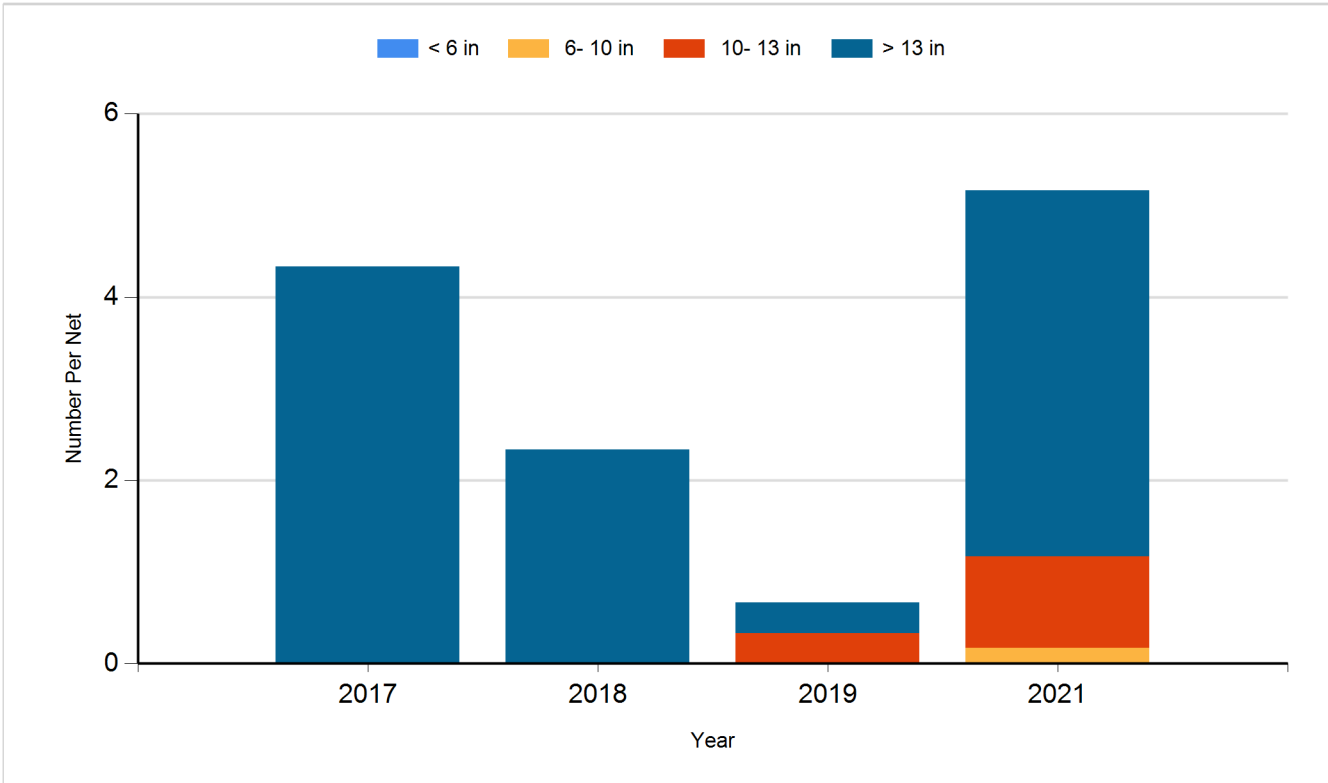
Species: Walleye
Gear: AFS std gill net



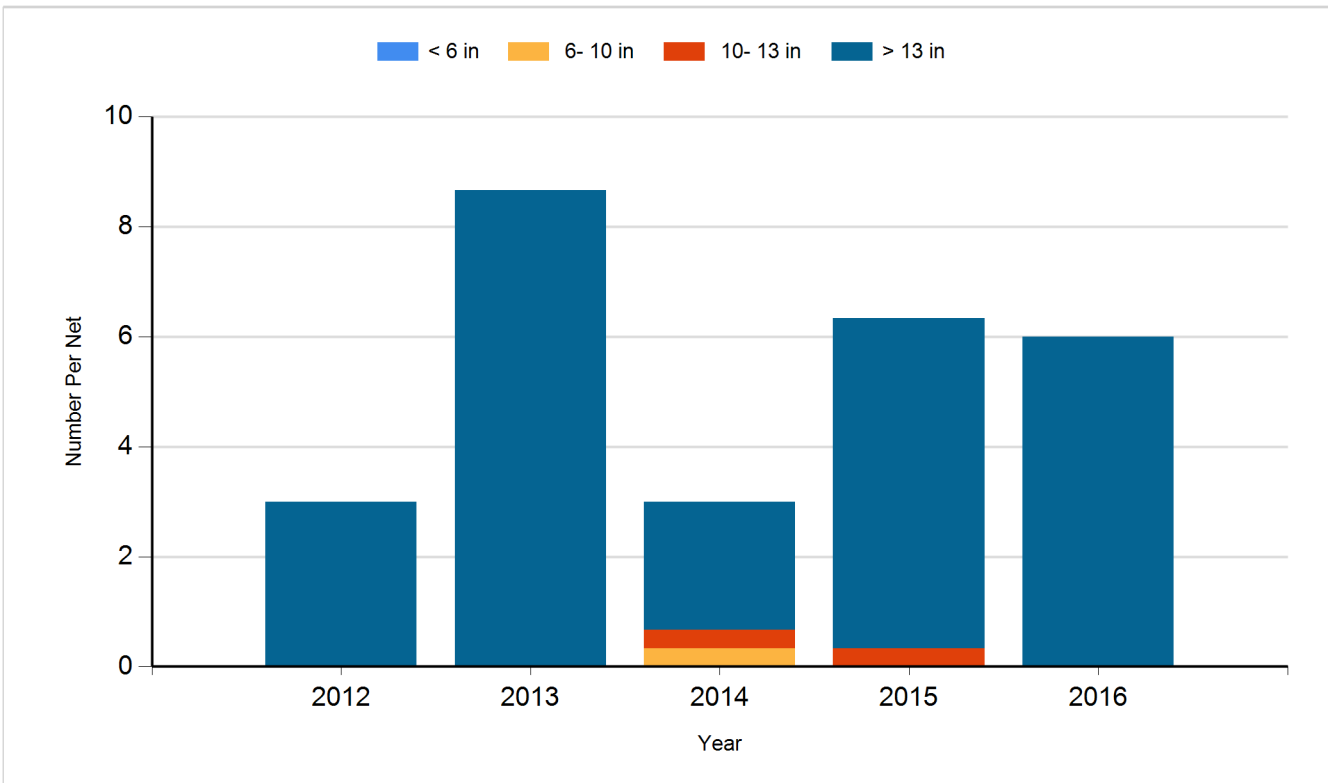
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Gear: std exp gill net



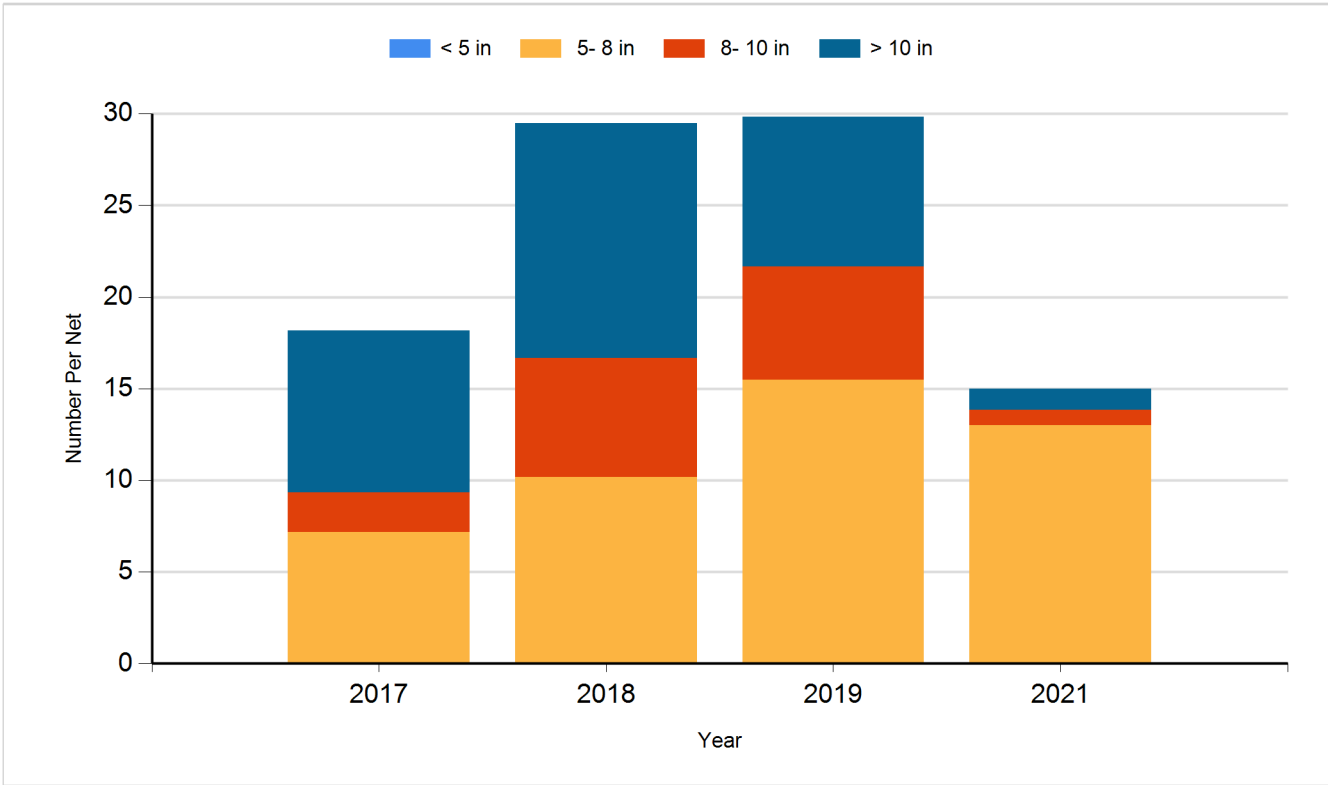
Species: White Sucker
Gear: AFS std gill net



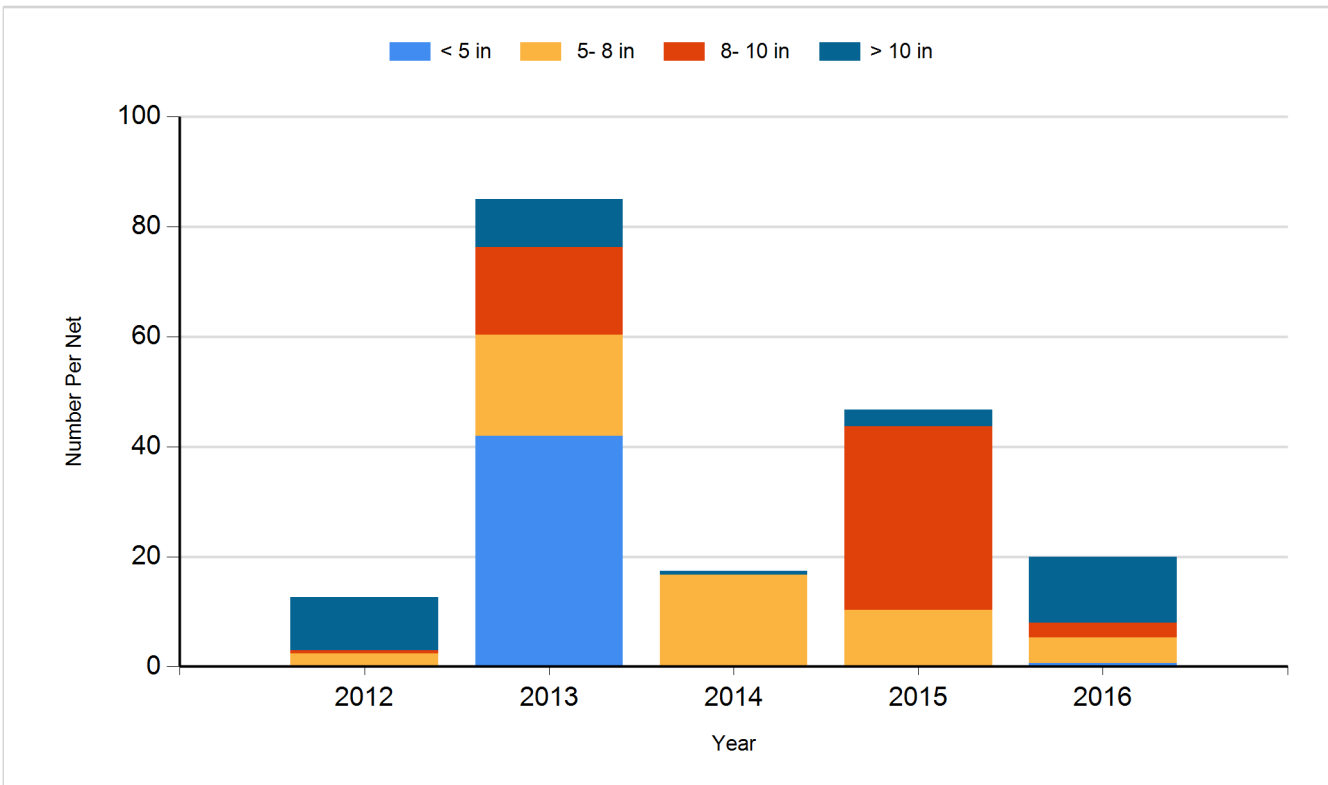
Species: White Sucker
Gear: std exp gill net



Species: Yellow Perch
Gear: AFS std gill net



Species: Yellow Perch
Gear: std exp gill net



Fish Stocking

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

Year	Species	Size	Number
2021	Walleye	Fry	300,000