

# SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

Cottonwood, Sully County

LLO-Lake-2428-000

2021

## Lake Information

<b>Name:</b>	Cottonwood	<b>Maximum Depth:</b>	18 Feet
<b>County:</b>	Sully	<b>Mean Depth:</b>	9 Feet
<b>Legal Description:</b>	T116-R75-S20	<b>OHWM Elevation:</b>	1,804
<b>Surface Area:</b>	574 Acres	<b>Outlet Elevation:</b>	1,804

## Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	May 24, 2021	4 net-nights
fall night EF-WAE	Sep 15, 2021	3600 seconds
frame net (std 3/4 in)	May 24, 2021	5 net-nights
frame net (std 3/4 in)	May 25, 2021	6 net-nights

## **Common Fish Species Present**

Walleye

Black Crappie

Black Bullhead

Common Carp

Yellow Perch

Northern Pike

Smallmouth Bass

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## 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.

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

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		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	Black Bullhead	3	0.8	0.8	0		0		64	6
	Black Crappie	9	1.8	1.4	0		0		97	3
	Common Carp	49	8.5	1.1	65	13	50	13	87	2
	Northern Pike	20	5.0	1.9	100		10		94	2
	Smallmouth Bass	3	0.8	0.4	67		0		98	7
	Walleye	11	2.8	2.5	100		0		90	3
	Yellow Perch	30	7.5	2.5	43	14	20	12	84	2
frame net (std 3/4 in)	Black Bullhead	700	62.5	29.2	30	2	6	1	80	1
	Black Crappie	1258	114.4	37.5	58	2	55	2	97	2
	Common Carp	59	1.4	0.4	13		13		91	1
	Northern Pike	2	0.2	0.2	50		0		85	
	Smallmouth Bass	17	1.5	0.7	6		6		88	4
	Walleye	11	1.0	0.4	100		0		89	2
	Yellow Perch	11	1.0	0.7	73		55		74	3

## 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 frame net	Black Bullhead						8.0						8.00
	Black Crappie						59.8						59.80
	Common Carp						0.3						0.30
	Northern Pike						0.1						0.10
	Smallmouth Bass						0.9						0.90
	Walleye						1.6						1.60
	White Crappie						0.2						0.20
AFS std gill net	Black Bullhead						5.6		1.4		0.8		2.60
	Black Crappie						2.5		0.0		1.8		1.43
	Common Carp						16.4		3.4		8.5		9.43
	Northern Pike						0.0		0.0		5.0		1.67
	Smallmouth Bass						0.0		0.0		0.8		0.27
	Walleye						1.1		0.3		2.8		1.40
	Yellow Perch						1.9		2.3		7.5		3.90
fall night EF-WAE*	Smallmouth Bass										3.0		3.00
	Walleye										10.0		10.00
frame net (std 3/4 in)	Black Bullhead		8.7						18.3		62.5		29.83
	Black Crappie		5.5						6.9		114.4		42.27
	Common Carp		4.1						2.3		1.4		2.60
	Northern Pike		1.5						0.0		0.2		0.57
	Smallmouth Bass		0.9						0.3		1.5		0.90
	Walleye		8.5						0.2		1.0		3.23
	White Sucker		0.2						0.1		0.0		0.10
Yellow Perch		2.5						0.0		1.0		1.17	
std exp gill net	Black Bullhead		11.3										11.30
	Common Carp		16.5										16.50
	Northern Pike		2.0										2.00
	Walleye		7.8										7.80
	Yellow Perch		7.8										7.80

## 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 frame net	Black Bullhead	PSD							100							
		PSD-P							2							
		Wr							84							
	Black Crappie	PSD								91						
		PSD-P								10						
		Wr								102						
	Common Carp	PSD								100						
		PSD-P								75						
		Wr								91						
	Northern Pike	PSD								100						
		PSD-P								100						
		Wr								80						
	Smallmouth Bass	PSD								0						
		PSD-P								0						
		Wr								84						
	Walleye	PSD								89						
		PSD-P								11						
		Wr								64						
AFS std gill net	Black Bullhead	PSD							100		45				0	
		PSD-P							16		27				0	
		Wr							84		104				64	
	Black Crappie	PSD								75						0
		PSD-P								0						0
		Wr								95						97
	Common Carp	PSD								96		100				65
		PSD-P								19		52				50
		Wr								91		91				87
	Northern Pike	PSD														100
		PSD-P														10
		Wr														94
	Smallmouth Bass	PSD														67
		PSD-P														0
		Wr														98

Gear	Species	Index	Year											
			2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
AFS std gill net	Walleye	PSD							100	0		100		
		PSD-P							11	0		0		
		Wr							78	95		90		
	Yellow Perch	PSD							93	78		43		
		PSD-P							47	39		20		
		Wr							91	109		84		
frame net (std 3/4 in)	Black Bullhead	PSD		15							21		30	
		PSD-P		2							8		6	
		Wr		84							95		80	
	Black Crappie	PSD		45								100		58
		PSD-P		14								23		55
		Wr		109								103		97
	Common Carp	PSD		35								100		13
		PSD-P		4								67		13
		Wr		92								87		91
	Northern Pike	PSD		83										50
		PSD-P		6										0
		Wr		84										85
	Smallmouth Bass	PSD		18								67		6
		PSD-P		0								0		6
		Wr		88								96		88
	Walleye	PSD		28								100		100
		PSD-P		0								50		0
		Wr		71								94		89
	Yellow Perch	PSD		100										73
		PSD-P		20										55
		Wr		93										74
	std exp gill net	Black Bullhead	PSD		2									
			PSD-P		0									
			Wr		91									
Common Carp		PSD		9										
		PSD-P		2										
		Wr		94										
Northern Pike		PSD		88										
		PSD-P		0										
		Wr		84										



Gear	Species	Index	Year									
			2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
std exp gill net	Walleye	PSD		45								
		PSD-P		0								
		Wr		75								
	Yellow Perch	PSD		94								
		PSD-P		6								
		Wr		93								

## Length at Capture

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

Species: Black Crappie

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2019	83			216 (2)	225 (17)	244 (60)	245 (4)				
2017	707		199 (56)	216 (513)	230 (88)	275 (34)	314 (6)	321 (11)			
2013	132		178 (53)	195 (35)	244 (24)	252 (16)	256 (5)				

Species: Walleye

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2019	3	229 (1)	218 (1)	314 (1)							
2017	2							496 (2)			
2013	66		312 (38)	399 (10)	448 (18)						

Species: Yellow Perch

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2019	18	167 (3)	221 (7)	238 (4)	273 (3)		273 (1)				
2013	62		185 (4)	238 (56)		291 (2)					

## **Fish Condition**

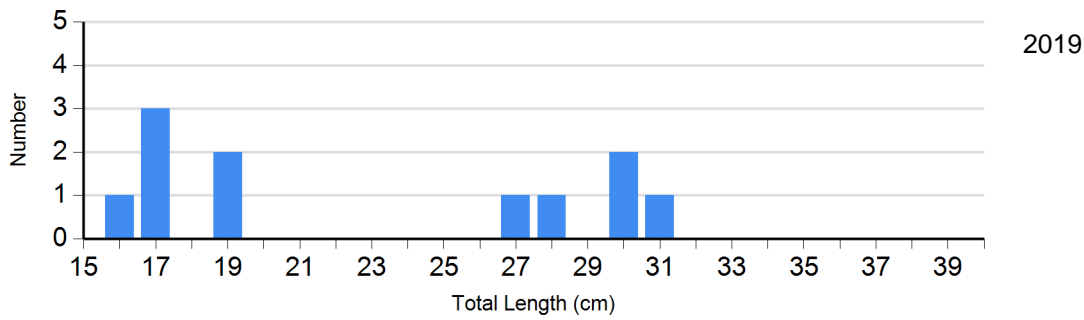
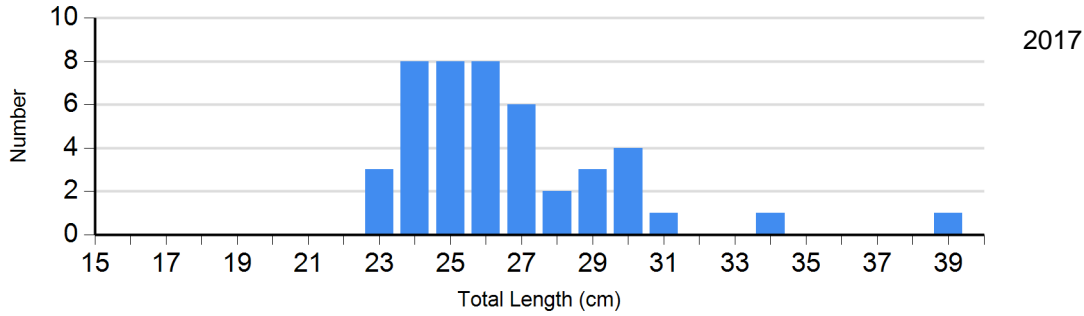
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

Species	Year	Length Groups							
		S-Q		Q-P		P-M		M	
		N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Black Bullhead Gill Net	2017	0		38	87 (1.2)	6	79 (3.4)	1	38
	2019	6	107 (9.0)	2	114 (3.5)	3	92 (9.6)	0	
	2021	3	64 (4.9)	0		0		0	
Black Crappie Frame Net	2017	62	106 (4.3)	587	104 (1.0)	47	90 (1.9)	22	95 (6.8)
	2019	0		64	104 (1.4)	19	100 (3.4)	0	
	2021	527	142 (8.2)	43	107 (2.3)	458	94 (0.7)	230	93 (0.7)
Common Carp Gill Net	2017	5	109 (15.0)	101	91 (0.6)	24	88 (1.3)	1	
	2019	0		13	91 (1.8)	14	90 (1.9)	0	
	2021	12	92 (0.9)	5	86 (1.9)	16	86 (2.2)	1	55
Northern Pike Gill Net	2021	0		18	93 (1.4)	2	96 (12.1)	0	
Walleye Gill Net	2017	0		8	78 (0.2)	1		0	
	2019	2	95 (11.8)	0		0		0	
	2021	0		11	90 (2.4)	0		0	
Yellow Perch Gill Net	2017	1	94	7	92 (0.8)	7	89 (1.6)	0	
	2019	4	162 (25.9)	7	96 (4.3)	7	92 (2.2)	0	
	2021	17	88 (1.4)	7	83 (1.0)	6	74 (3.8)	0	

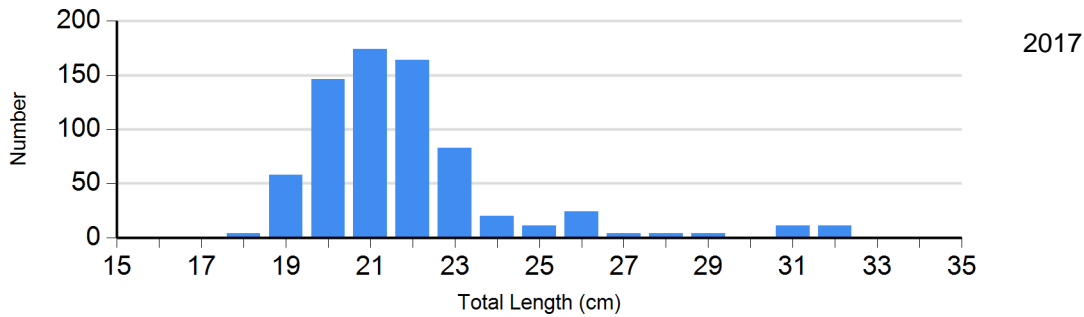
## Length Frequency Distribution

Length frequency histogram of species sampled by year.

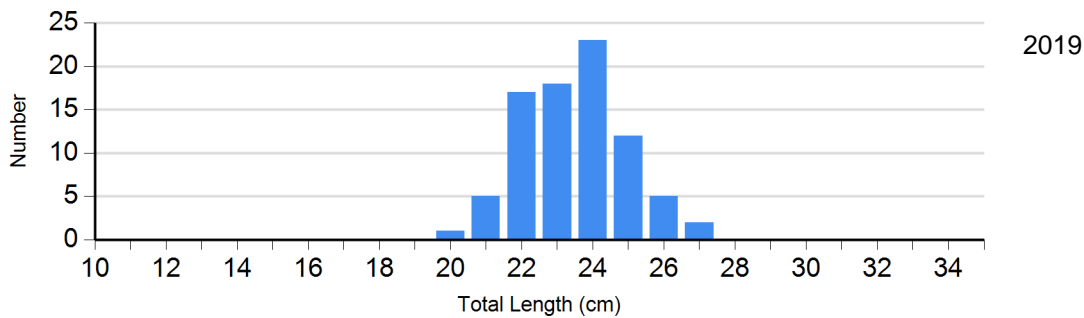
Species: Black Bullhead  
Gear: AFS std gill net

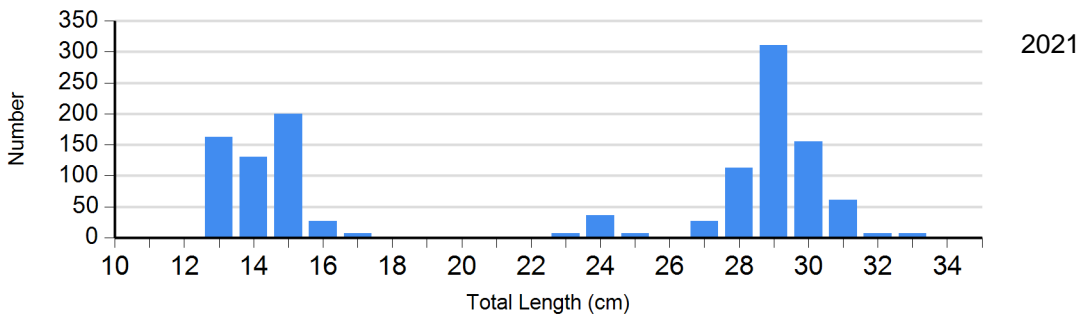


Species: Black Crappie  
Gear: AFS std frame net

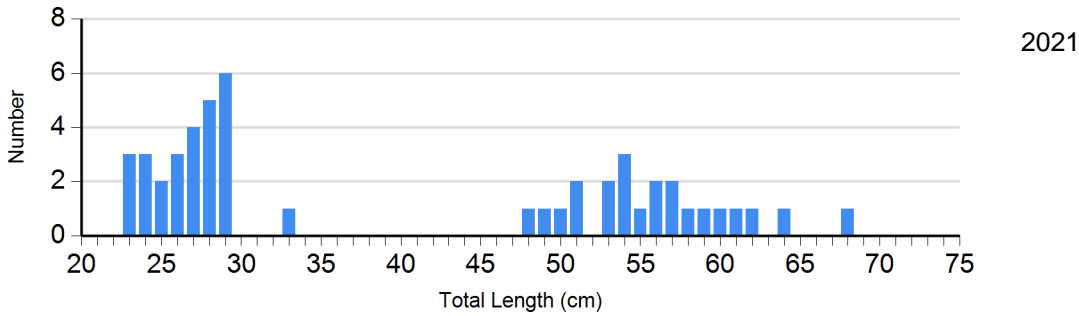
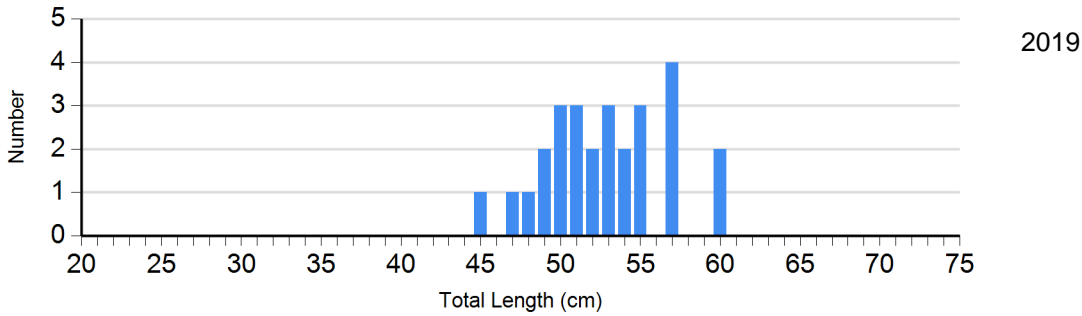
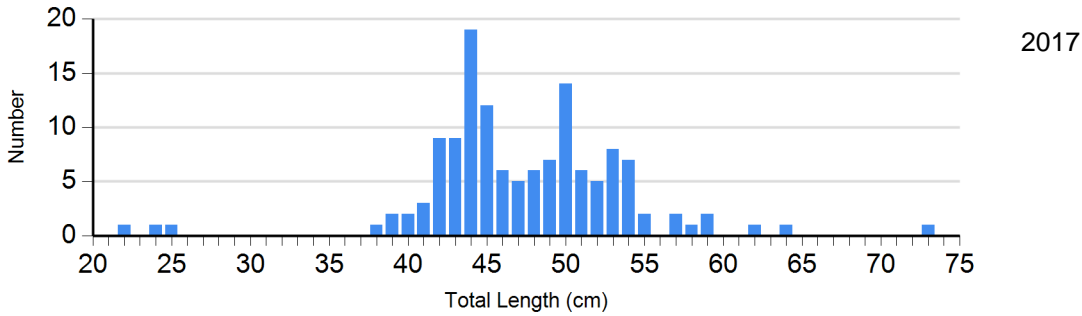


Species: Black Crappie  
Gear: frame net (std 3/4 in)

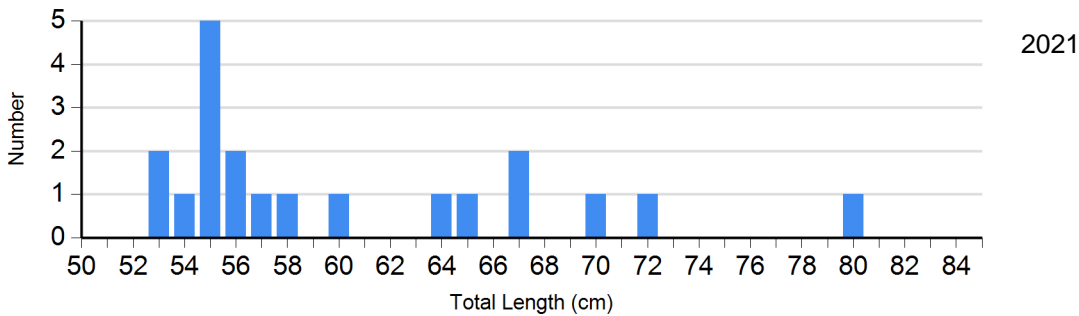




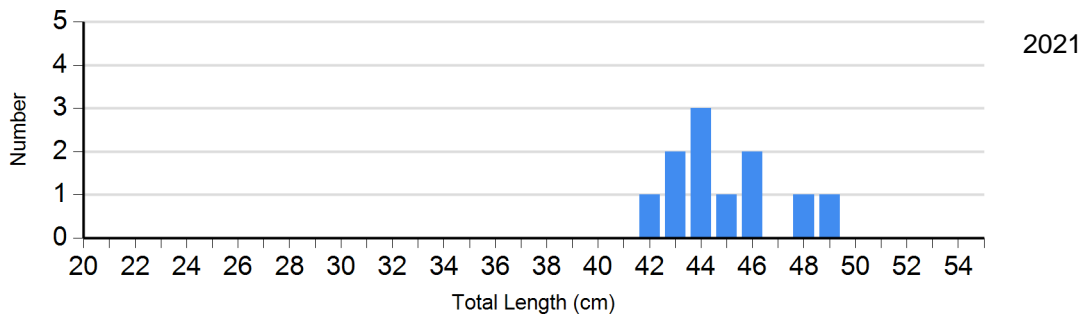
Species: Common Carp  
Gear: AFS std gill net



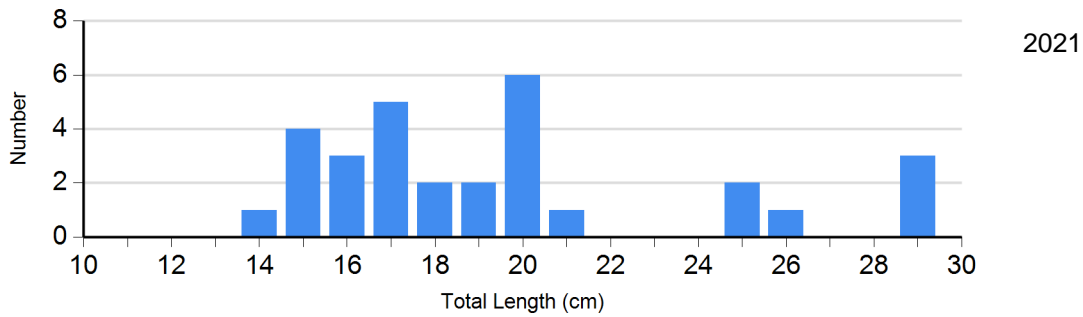
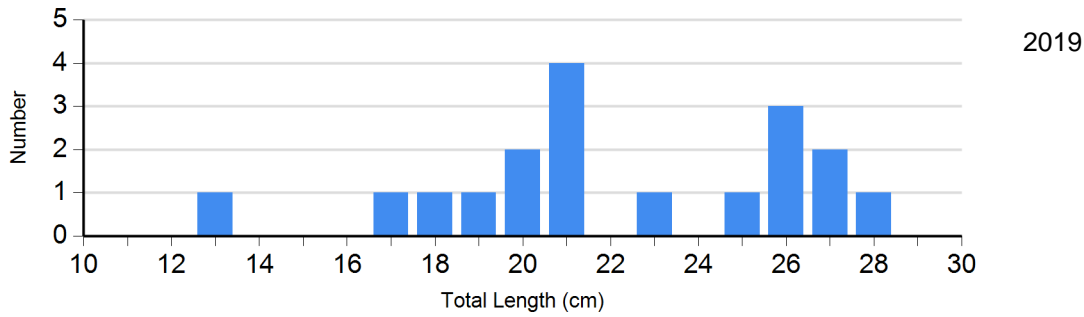
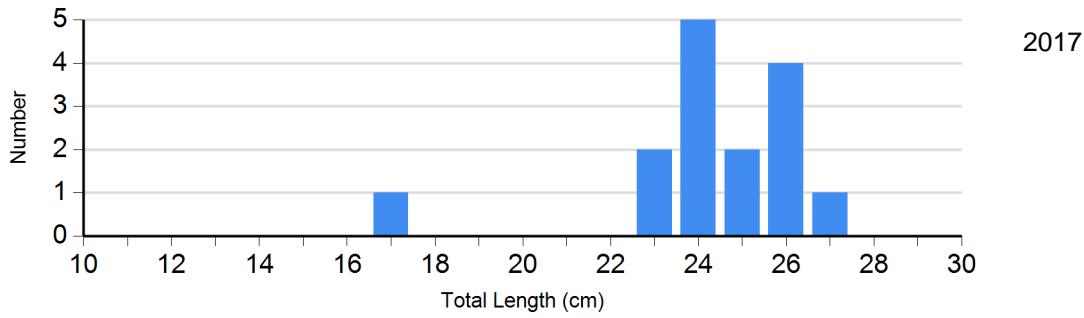
Species: Northern Pike  
Gear: AFS std gill net



Species: Walleye  
Gear: AFS std gill net



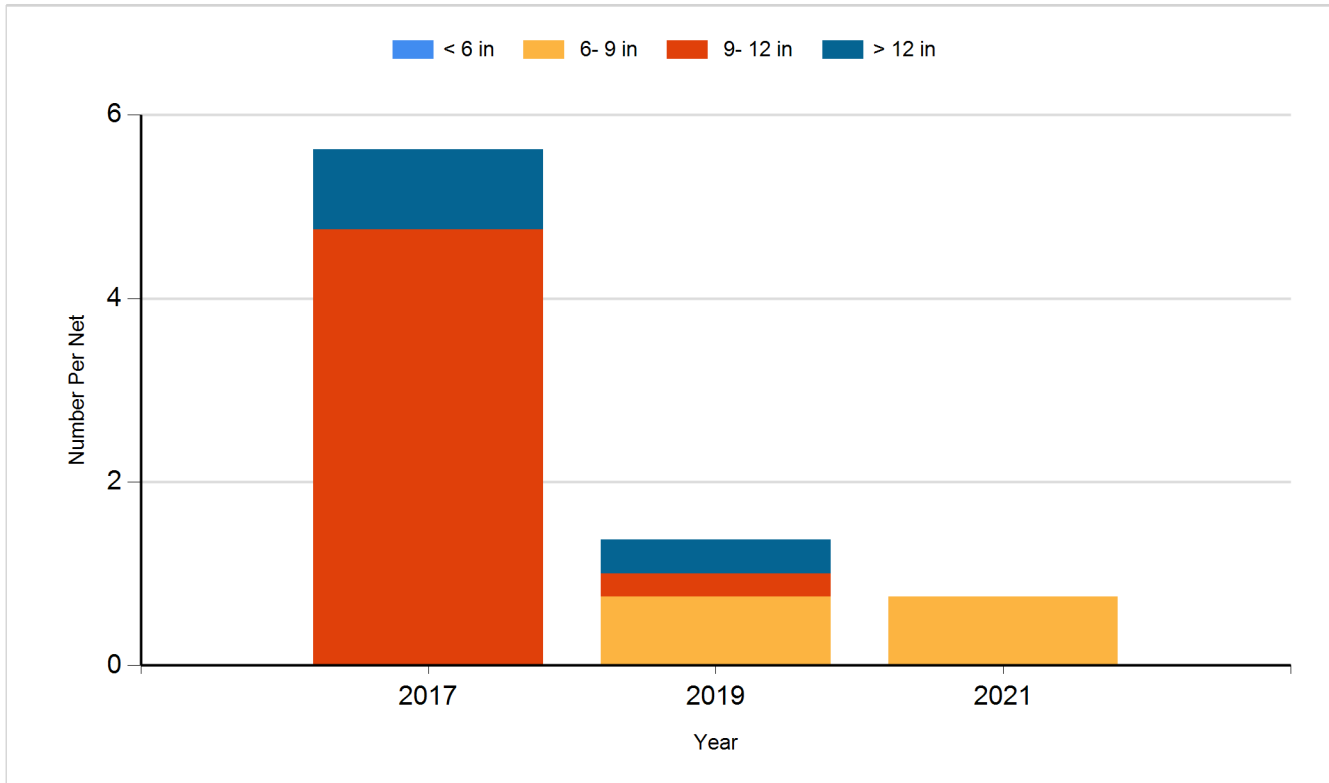
Species: Yellow Perch  
Gear: AFS std gill net



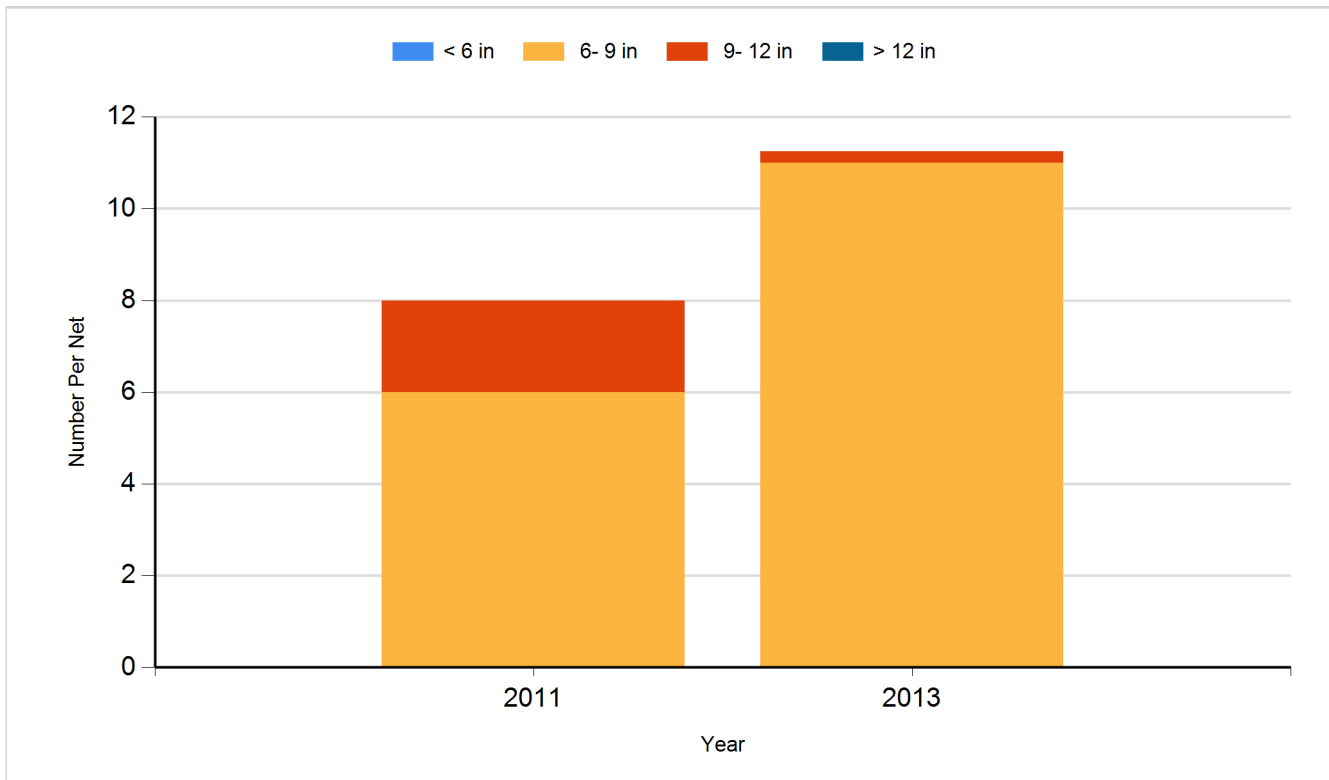
## Historic Fish Sizes and Relative Abundance

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

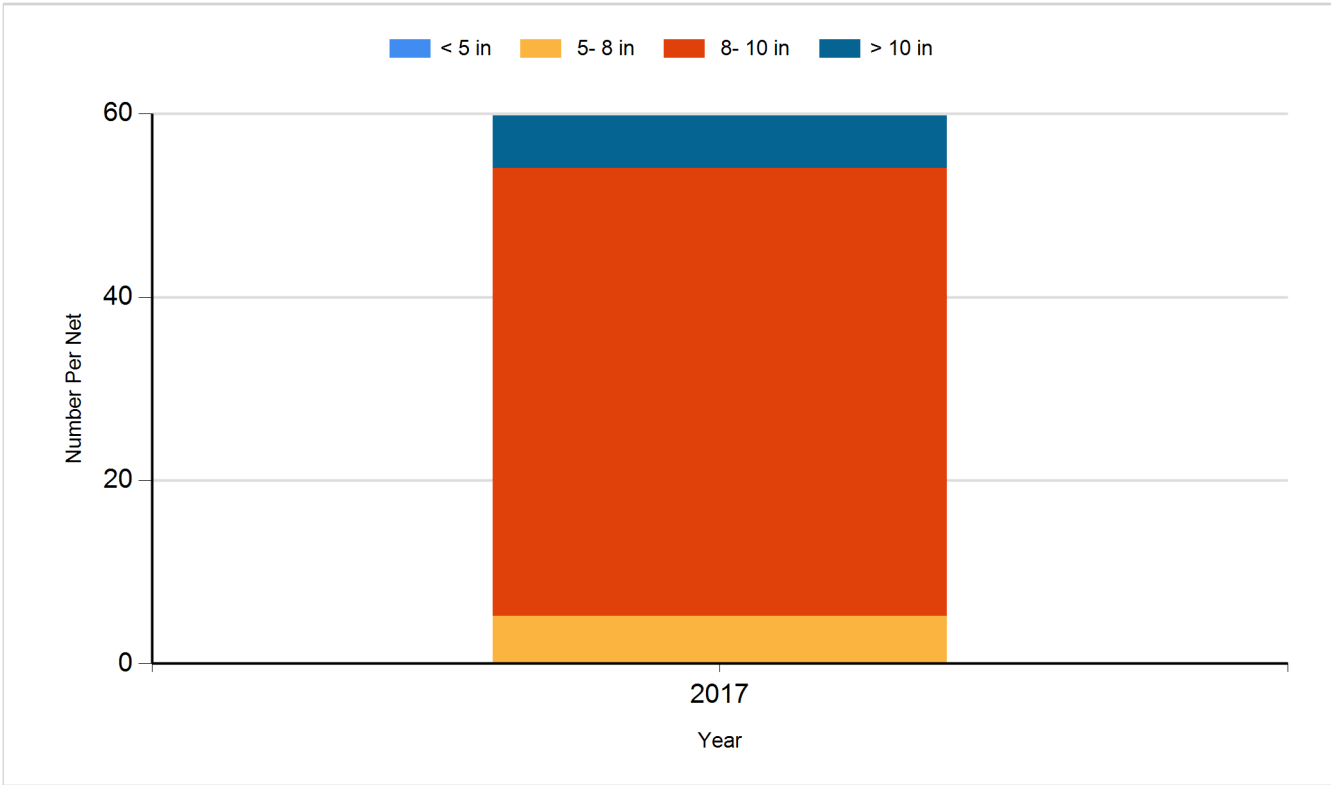
Species: Black Bullhead  
Gear: AFS std gill net



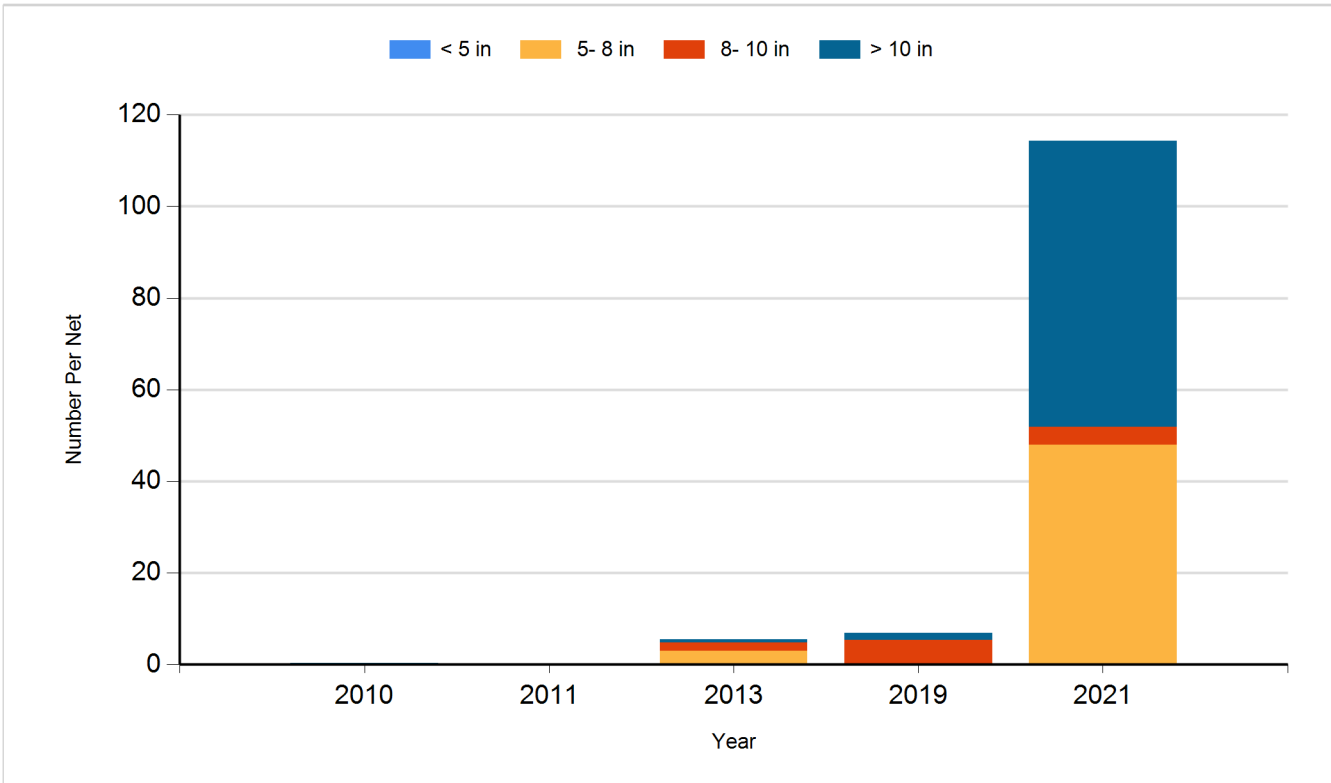
Species: Black Bullhead  
Gear: std exp gill net



Species: Black Crappie  
Gear: AFS std frame net

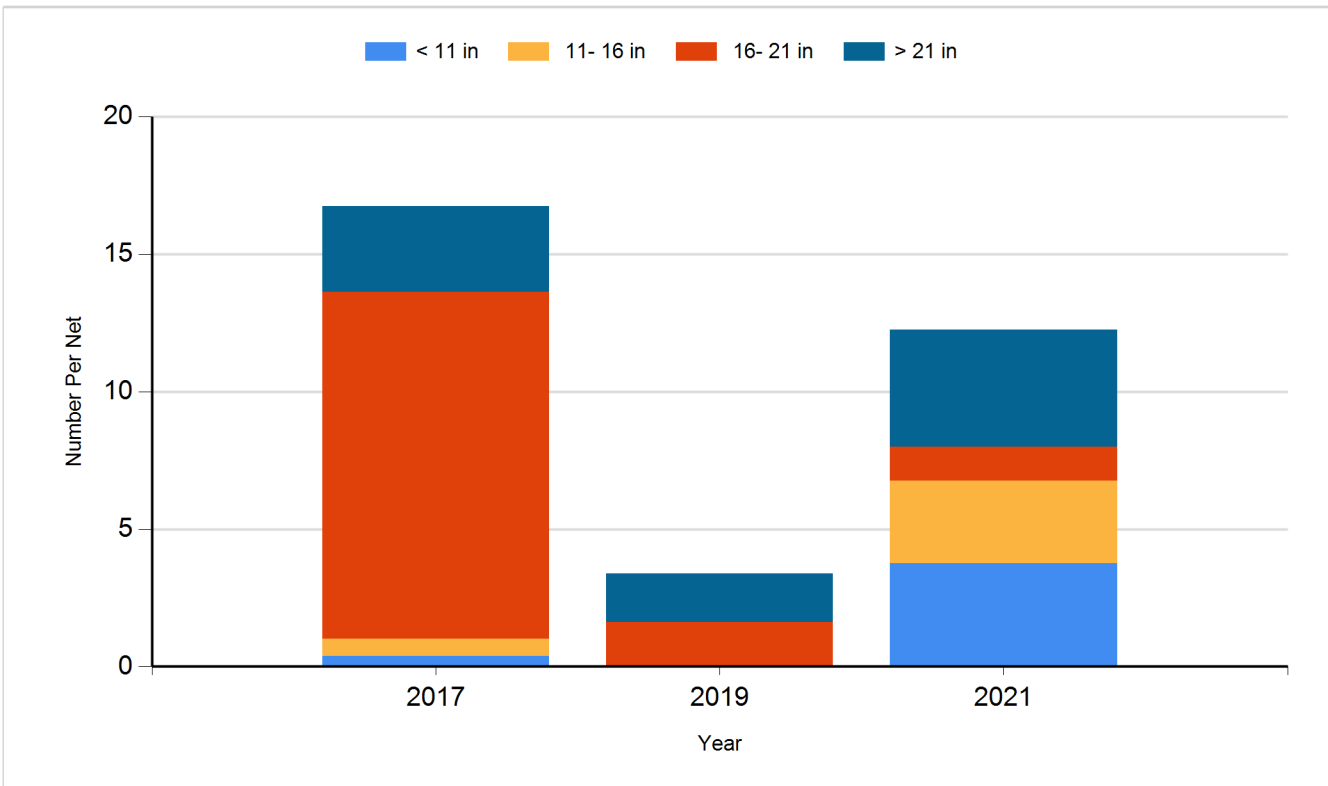


Species: Black Crappie  
Gear: frame net (std 3/4 in)

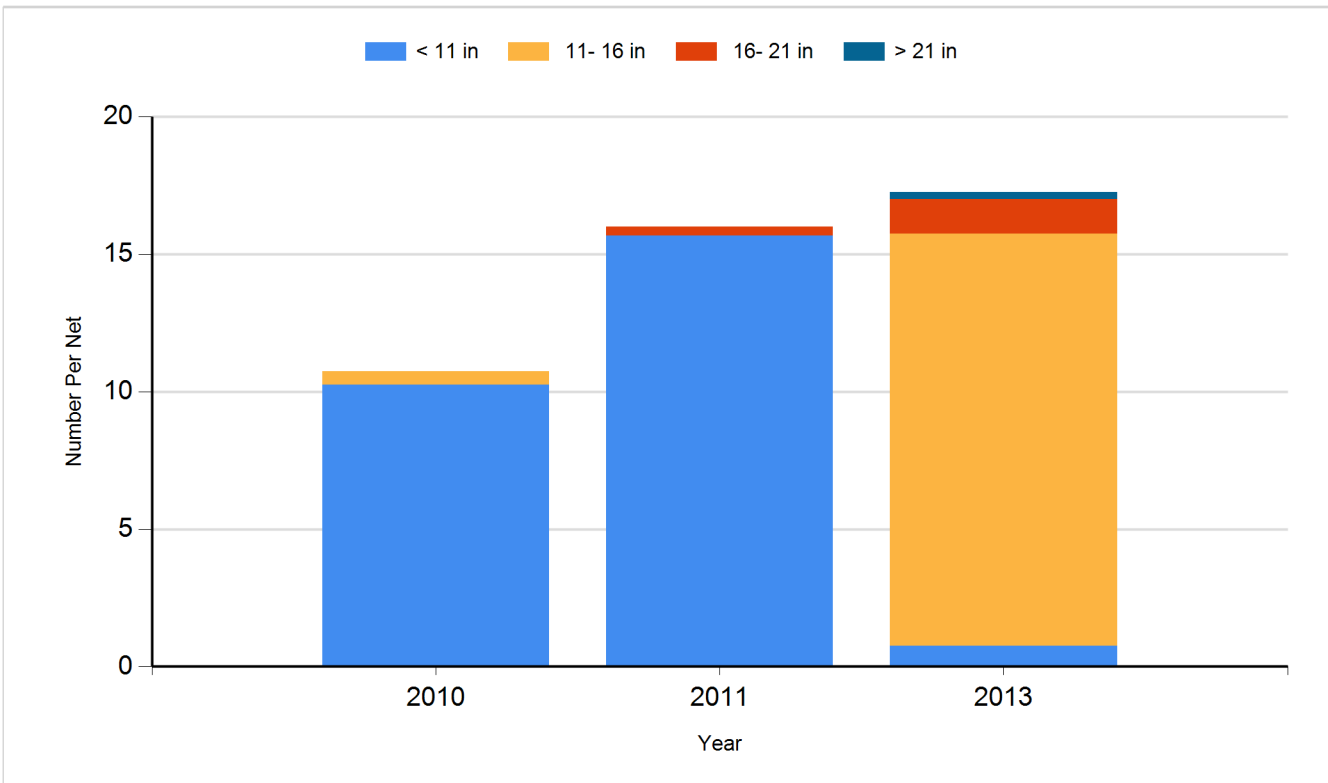




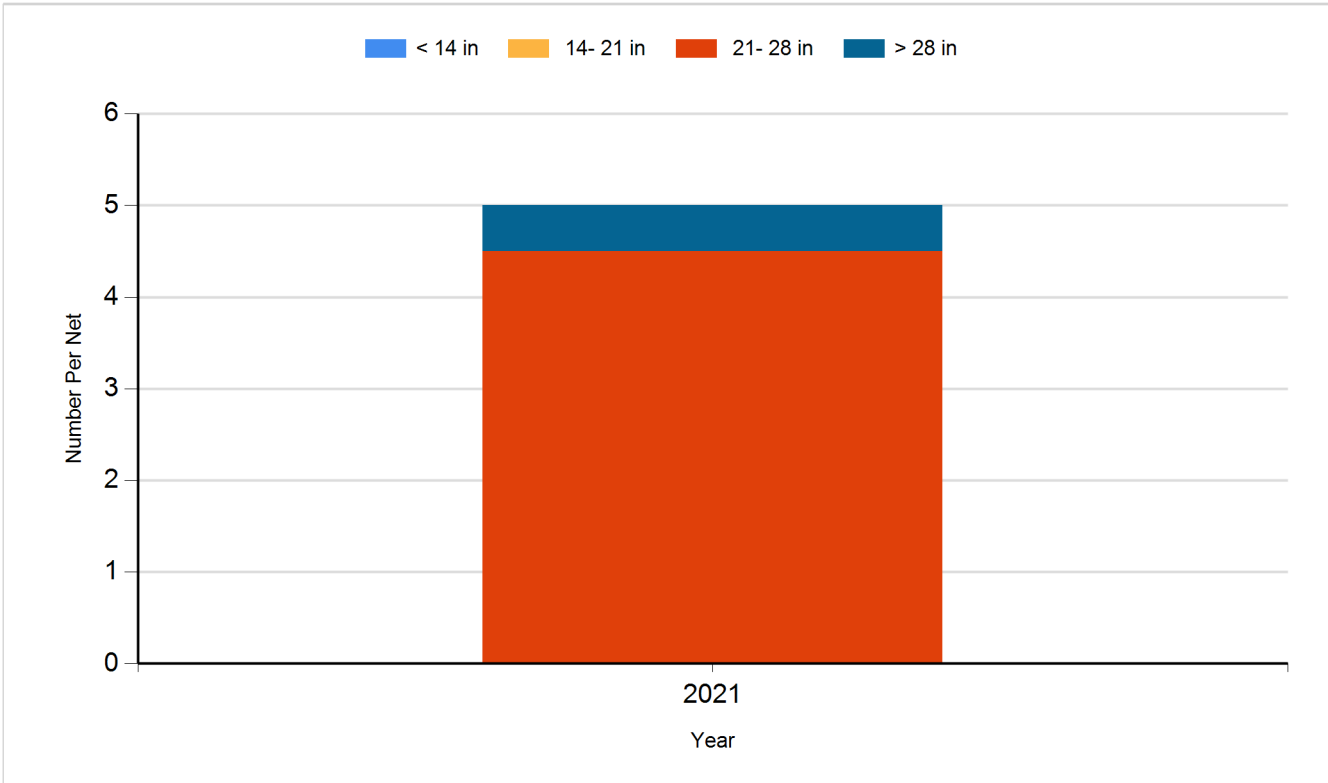
Species: Common Carp  
Gear: AFS std gill net



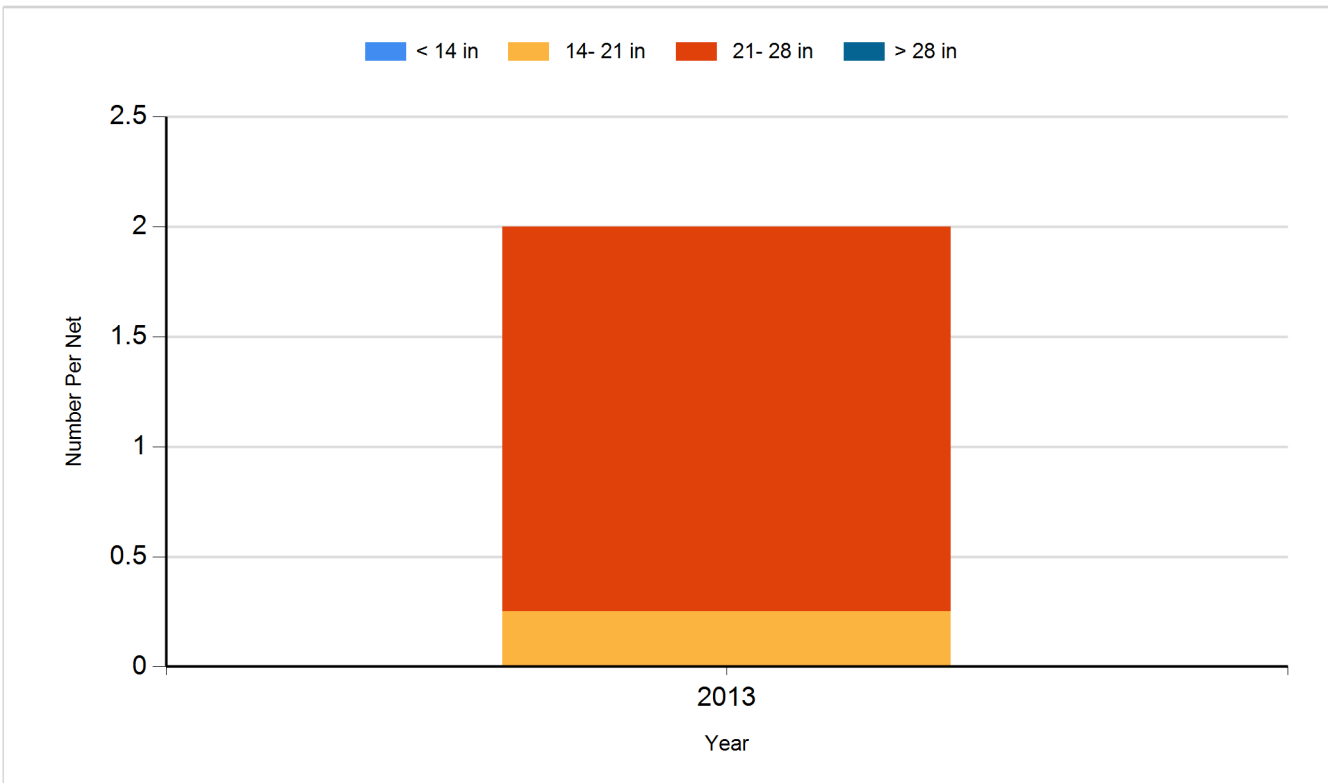
Species: Common Carp  
Gear: std exp gill net



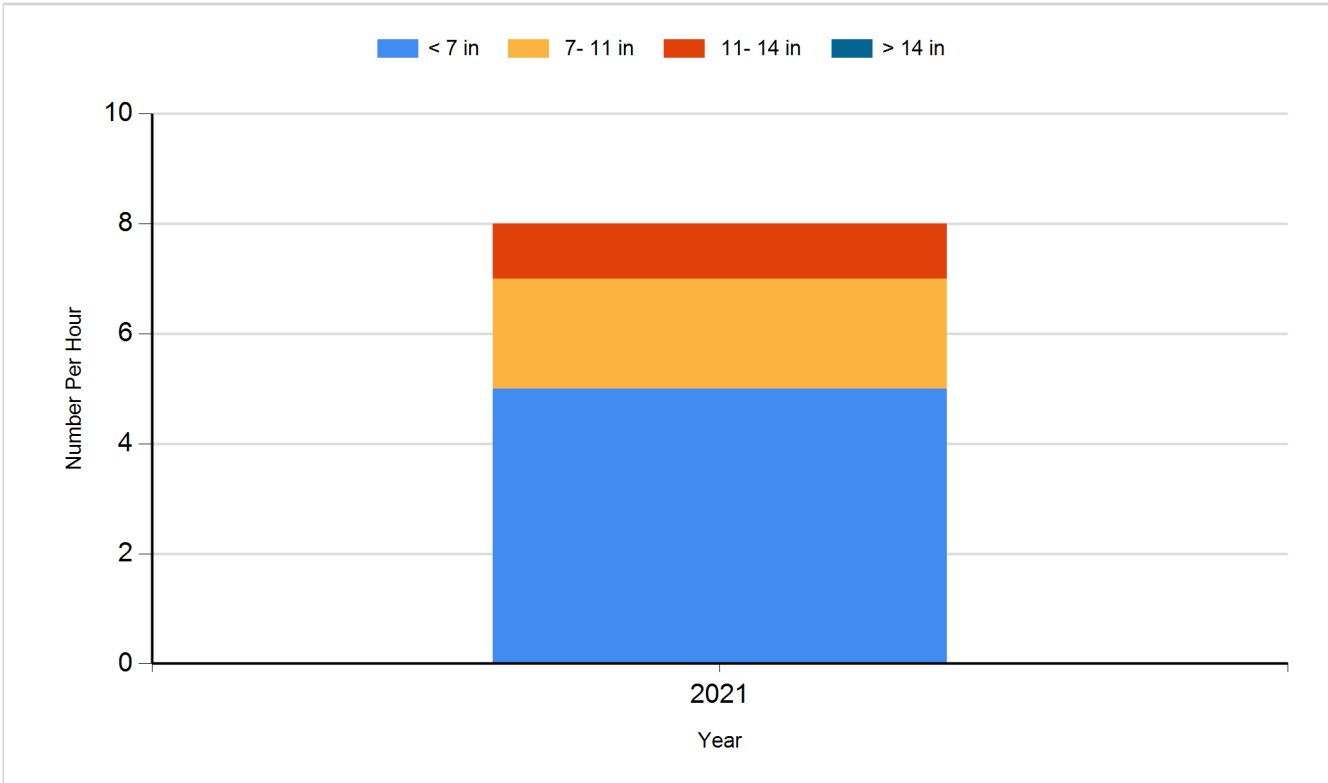
Species: Northern Pike  
Gear: AFS std gill net



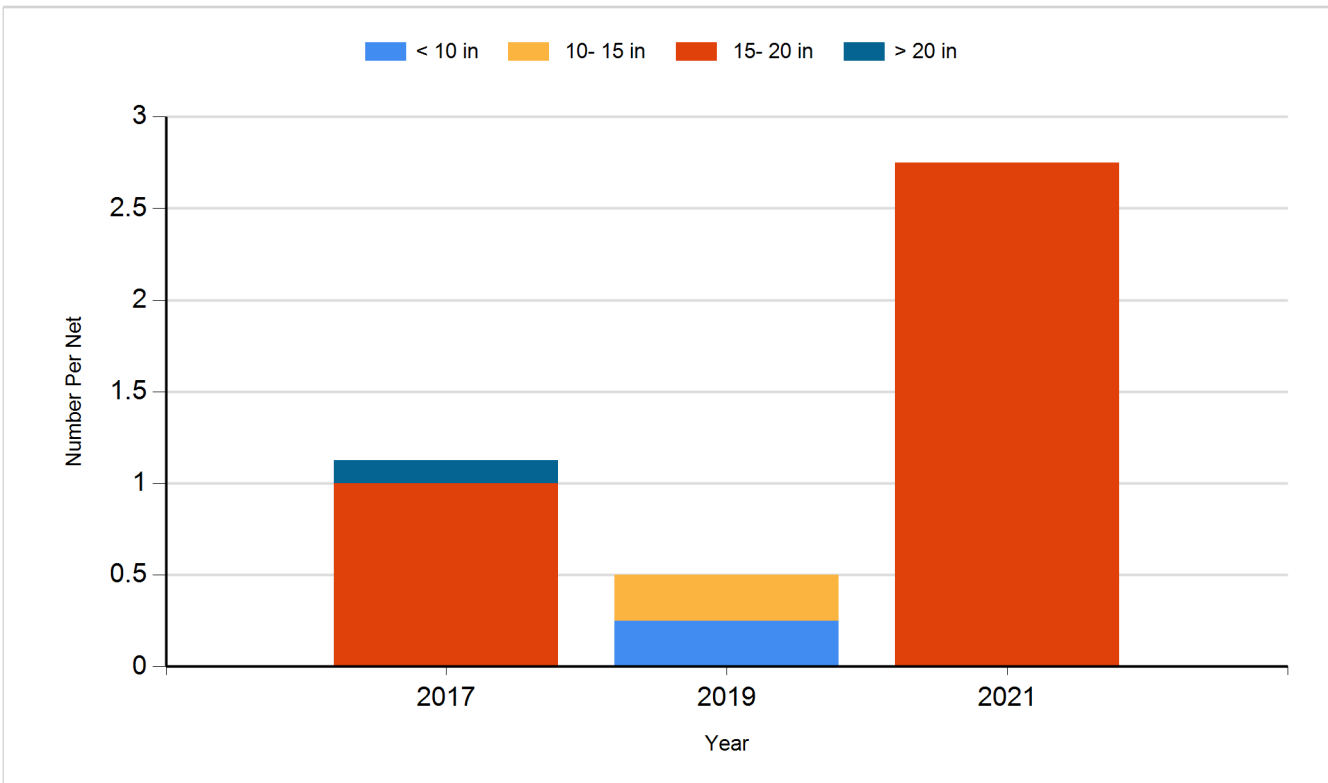
Species: Northern Pike  
Gear: std exp gill net



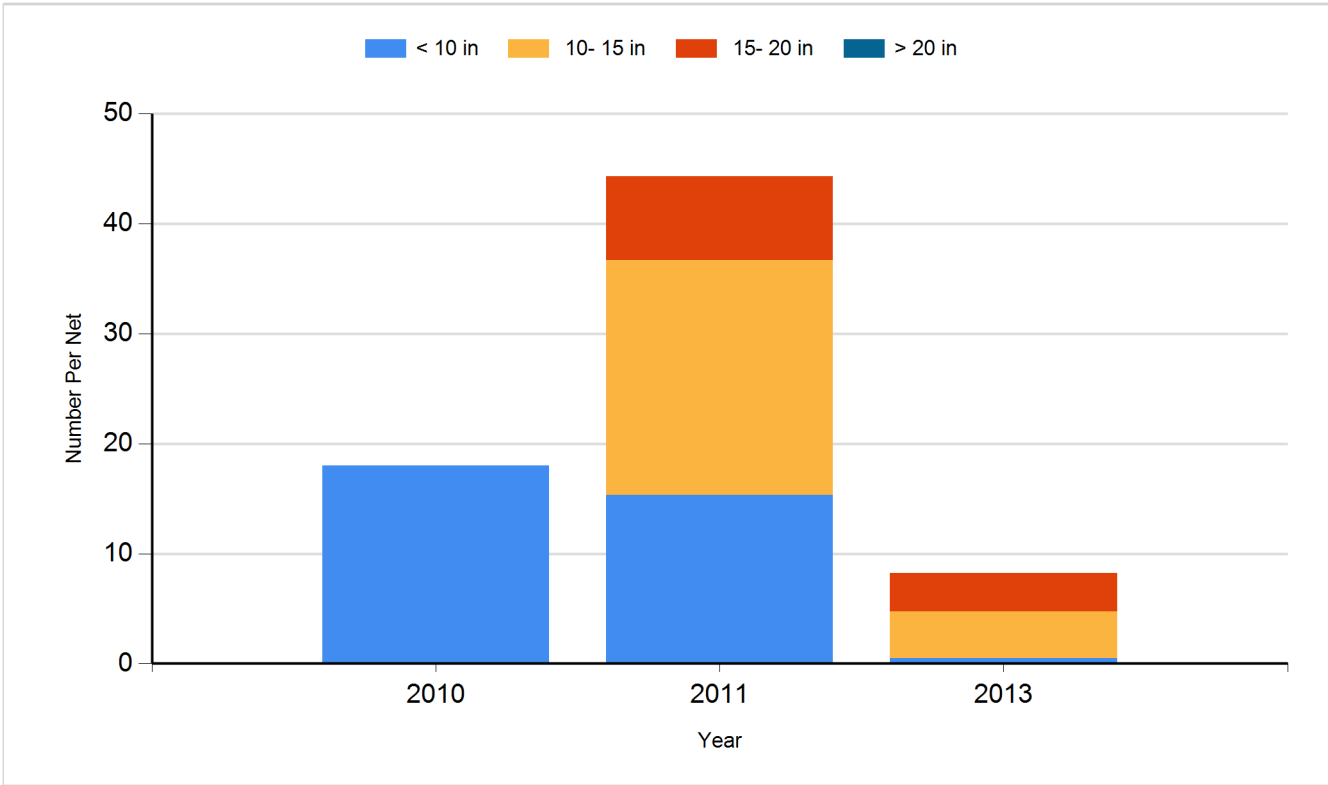
Species: Smallmouth Bass  
Gear: fall night EF-WAE



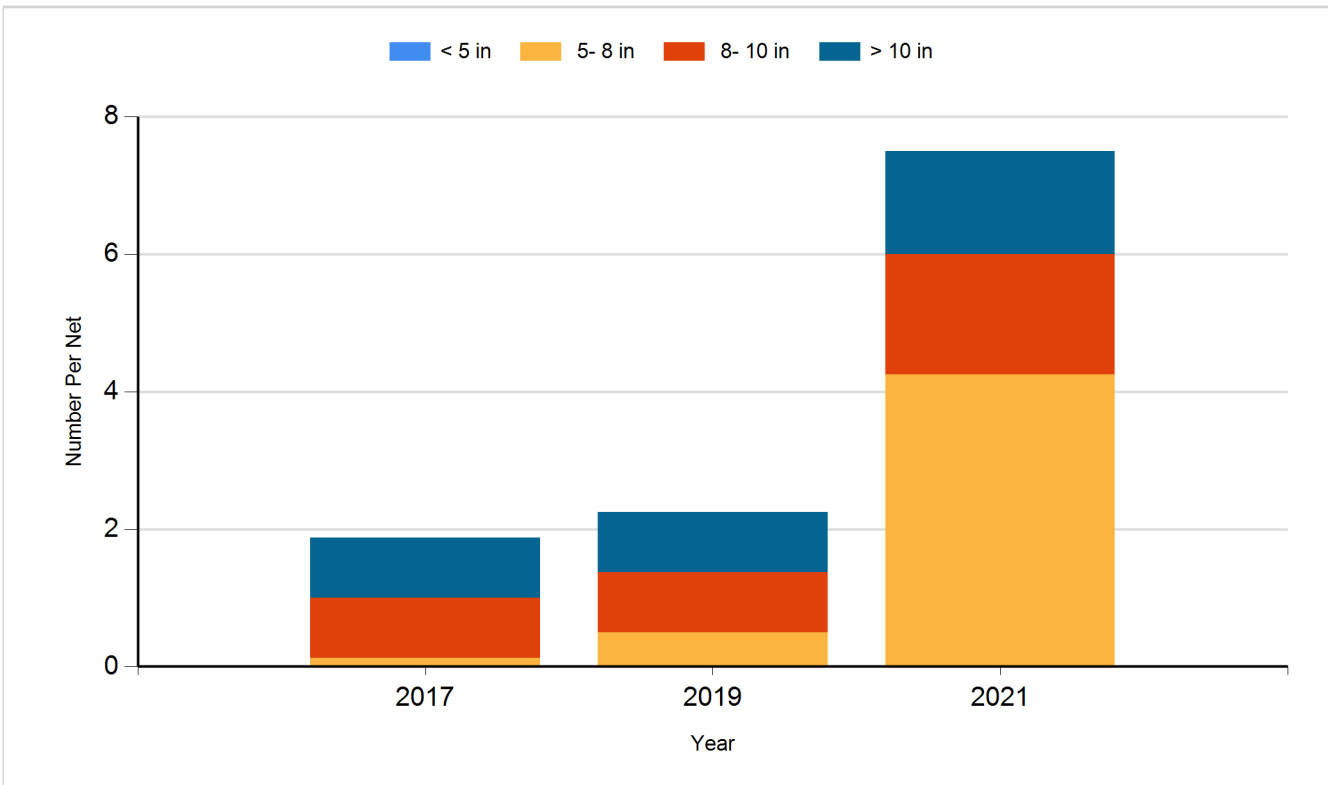
Species: Walleye  
Gear: AFS std gill net



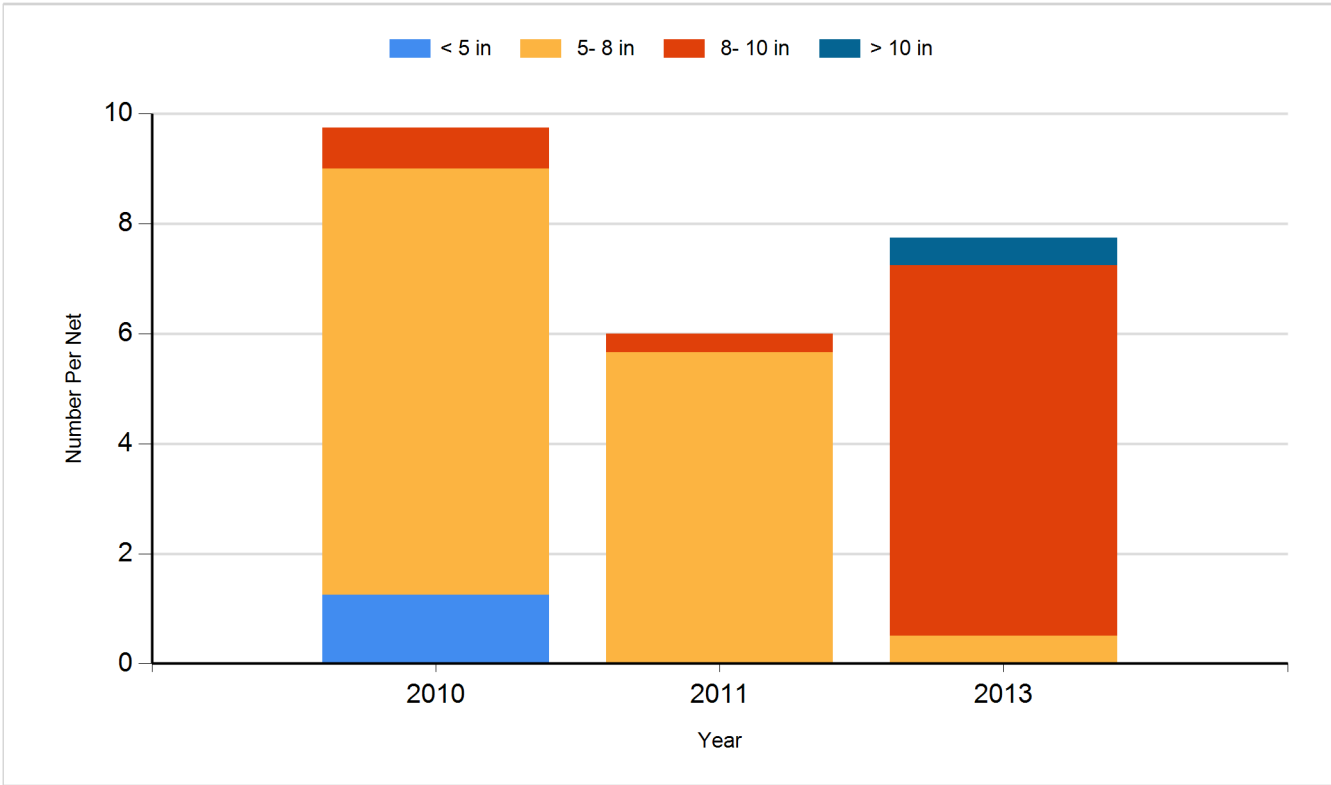
Species: Walleye  
Gear: std exp gill net



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.

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Year	Species	Size	Number
2010	Walleye	Small Fingerling	45,260
2011	Walleye	Small Fingerling	44,660
2011	Yellow Perch	Adult	736
2012	Smallmouth Bass	Juvenile	250
2015	Walleye	Small Fingerling	45,500
2015	White Crappie	Adult	167
2016	Black Crappie	Adult	105
2016	White Crappie	Adult	106
2017	Walleye	Large Fingerling	4,800
2017	Yellow Perch	Adult	2,100
2018	Yellow Perch	Adult	2,550
2021	Walleye	Juvenile	50,160

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