

# SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

Richmond, Brown County

UJA-Lake-831-800

2023

## Lake Information

<b>Name:</b>	Richmond	<b>Maximum Depth:</b>	23 Feet
<b>County:</b>	Brown	<b>Mean Depth:</b>	8 Feet
<b>Surface Area:</b>	741 Acres		

## Surveys and Investigations

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

Gear	Date	Effort
fall night EF-WAE	Oct 24, 2023	2400 seconds

## **Common Fish Species Present**

Walleye

Largemouth Bass

Bluegill

Black Crappie

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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.

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

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



## 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	
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023		
AFS std frame net	Black Bullhead			85.5	196.0								140.75
	Black Crappie			9.8	2.2								6.00
	Bluegill			4.8	10.6								7.70
	Channel Catfish			0.5	0.7								0.60
	Common Carp			1.0	0.4								0.70
	Northern Pike			0.3	0.4								0.35
	Walleye			2.4	1.4								1.90
	White Bass			6.4	6.7								6.55
	White Sucker			0.4	0.3								0.35
Yellow Perch			0.3	0.0								0.15	
AFS std gill net	Black Bullhead			42.5	28.8	16.2	14.0	26.9		6.0			22.40
	Black Crappie			0.6	0.1	0.2	1.3	0.3		0.1			0.43
	Bluegill			0.1	0.3	0.6	0.2	0.1		0.0			0.22
	Channel Catfish			2.2	0.9	0.4	1.3	0.4		0.0			0.87
	Common Carp			2.3	1.1	4.1	4.0	6.2		0.8			3.08
	Northern Pike			0.1	0.2	0.1	0.4	0.0		0.9			0.28
	Walleye			2.4	0.2	1.1	4.3	1.0		1.3			1.72
	White Bass			2.8	1.0	0.3	0.4	0.0		0.2			0.78
	White Sucker			0.0	0.1	0.0	0.1	0.3		0.0			0.08
Yellow Perch			1.8	8.3	5.0	15.8	18.9		1.0			8.47	
boat shocker (night)	Walleye*			10.5	36.0								23.25
fall night EF-WAE*	Walleye					109.0	112.5	3.0	70.8	209.1	1.5		84.32
frame net (std 3/4 in)	Black Bullhead	99.2	65.2			36.4	68.9	4.1		32.7			51.08
	Black Crappie	14.3	9.4			6.1	31.7	7.6		17.1			14.37
	Bluegill	33.6	17.9			36.5	20.0	9.3		3.7			20.17
	Channel Catfish	0.4	0.7			0.1	1.3	0.7		0.1			0.55
	Common Carp	0.8	0.6			0.7	1.1	2.8		0.8			1.13
	Green Sunfish	0.0	0.1			0.7	0.1	0.0		0.4			0.22
	Northern Pike	0.2	0.7			0.4	0.3	0.2		0.1			0.32
	Sunfish Hybrid	0.0	0.0			0.4	0.1	0.1		0.7			0.22
	Walleye	2.2	3.3			0.4	1.5	0.7		1.3			1.57
	Western Painted Turtle	0.0	0.0			0.0	0.0	0.0		0.0			0.00

		CPUE										
Gear	Species	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Avg
frame net (std 3/4 in)	White Bass	2.7	3.7			0.3	4.2	3.1		1.9		2.65
	White Sucker	0.0	0.2			0.3	0.2	0.1		0.3		0.18
	Yellow Perch	1.9	0.9			9.5	47.3	21.7		1.2		13.75
std exp gill net	Black Bullhead	90.7	51.6									71.15
	Black Crappie	0.7	1.0									0.85
	Bluegill	0.2	0.0									0.10
	Channel Catfish	0.2	0.2									0.20
	Common Carp	0.8	1.4									1.10
	Northern Pike	0.5	0.4									0.45
	Walleye	1.8	7.2									4.50
	White Bass	0.2	0.2									0.20
	White Sucker	0.3	0.2									0.25
	Yellow Perch	11.3	8.8									10.05

## 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									
			2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
AFS std frame net	Black Crappie	PSD			84	82						
		PSD-P			24	26						
		Wr			107	102						
	Bluegill	PSD			97	91						
		PSD-P			38	15						
		Wr			119	121						
	Walleye	PSD			16	28						
		PSD-P			2	12						
		Wr			83	79						
AFS std gill net	Black Crappie	PSD			57	100	0	6	75		100	
		PSD-P			29	100	0	6	0		0	
		Wr			112	100	132	115	109		106	
	Bluegill	PSD			100	100	14	100	100			
		PSD-P			0	67	14	0	0			
		Wr			140	132	125	116	119			
	Walleye	PSD			52	0	15	29	42		93	
		PSD-P			3	0	8	2	17		7	
		Wr			87	83	95	86	82		99	
boat shocker (night)	Walleye	PSD			0	0						
		PSD-P			0	0						
		Wr			94	94						
frame net (std 3/4 in)	Black Crappie	PSD	85	96			32	14	58		93	
		PSD-P	0	5			7	3	1		28	
		Wr	99	100			123	110	104		99	
	Bluegill	PSD	99	96			50	60	95		68	
		PSD-P	35	65			7	2	4		38	
		Wr	111	113			115	111	112		114	
	Walleye	PSD	8	5			14	7	8		74	
		PSD-P	0	0			14	0	8		0	
		Wr	85	90			93	86	74		90	
std exp gill net	Black Crappie	PSD	100	60								



Gear	Species	Index	Year									
			2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
std exp gill net	Black Crappie	PSD-P	0	40								
		Wr	103	121								
	Bluegill	PSD	100									
		PSD-P	0									
		Wr	117									
	Walleye	PSD	27	17								
		PSD-P	0	0								
		Wr	84	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+
2022	296	108 (4)	184 (24)	221 (30)	244 (217)	242 (15)			277 (6)		
2020	136	145 (1)	201 (133)	239 (1)					293 (1)		
2019	563	162 (493)	218 (51)	257 (8)	267 (12)						
2018	109	169 (74)	222 (11)	241 (18)	269 (2)	264 (1)			275 (3)		
2017	39		195 (10)	225 (11)	240 (2)		251 (11)	258 (6)			
2016	176	157 (17)	203 (46)	228 (8)	250 (7)	247 (76)	244 (20)			234 (3)	
2015	168	136 (4)	201 (6)	234 (19)	231 (114)	242 (26)					
2014	257		143 (1)	184 (1)	205 (151)	221 (81)	218 (24)				

Species: Bluegill

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2022	66		145 (38)		202 (12)	213 (15)	222 (1)				
2020	167		162 (58)	185 (107)	206 (2)						
2019	360	105 (59)	153 (264)	182 (32)	205 (5)						
2018	657	121 (291)	160 (290)	198 (43)	211 (25)	217 (4)			233 (4)		
2017	190	111 (15)	166 (91)	191 (64)	208 (10)	227 (2)	217 (2)	213 (6)			
2016	87		163 (24)	183 (36)	220 (4)	223 (18)	220 (4)	232 (2)			
2015	322	98 (8)	162 (56)	182 (14)	206 (160)	219 (24)	218 (20)	216 (41)			
2014	605	95 (1)	149 (8)	183 (170)	196 (271)	201 (115)	221 (40)			241 (1)	

Species: Walleye

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2022	15			389 (11)	477 (2)	519 (2)					
2020	21	231 (9)	297 (7)	488 (4)	552 (1)						
2019	52	294 (37)	419 (9)	462 (4)				482 (1)		574 (1)	

Mean Length (expanded sample number) at capture by age

Year	N	1	2	3	4	5	6	7	8	9	10+
2018	13	305 (10)	376 (2)					571 (1)			
2017	3	217 (1)		282 (1)	378 (1)						
2016	31		272 (10)	348 (7)	411 (4)	435 (9)	531 (1)				
2015	51	234 (21)	300 (14)	335 (6)	348 (6)	410 (3)		489 (1)			
2014	16	211 (4)	253 (1)	304 (8)	396 (1)	366 (1)	406 (1)				

## **Fish Condition**

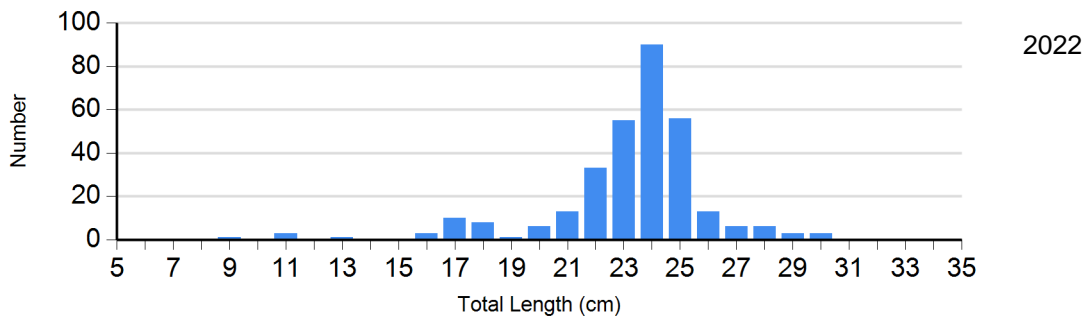
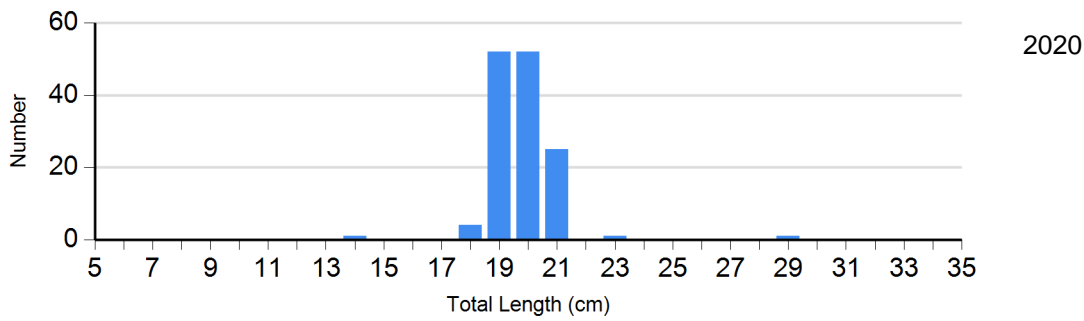
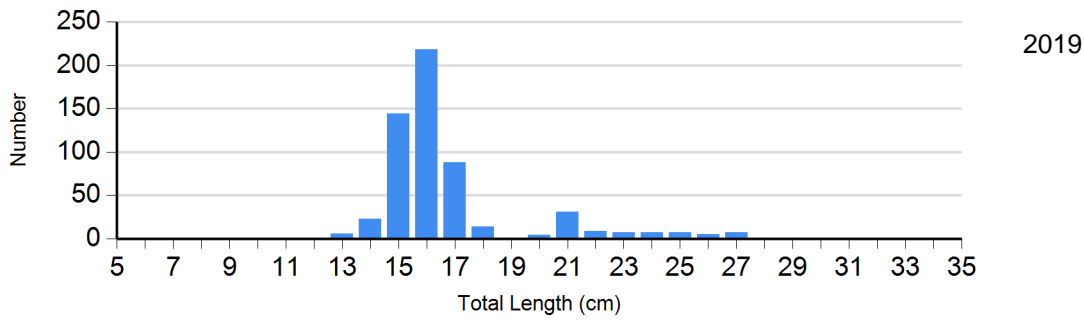
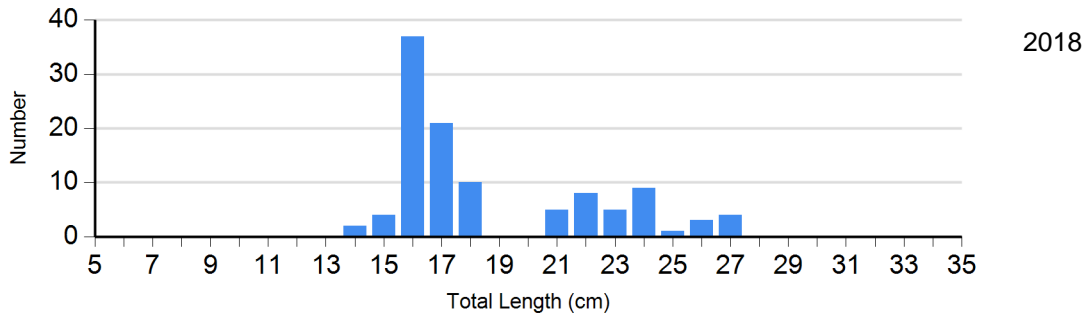
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

Species	Year	Length Groups							
		S-Q		Q-P		P-M		M	
		N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Black Crappie Frame Net	2019	493	112 (0.4)	58	104 (1.0)	19	101 (1.5)	0	
	2020	57	106 (2.5)	78	103 (0.6)	1	87	0	
	2022	23	115 (2.1)	197	98 (0.5)	84	97 (0.9)	3	
Bluegill Frame Net	2019	143	113 (0.9)	210	110 (0.6)	7	103 (3.5)	0	
	2020	8	114 (2.5)	153	112 (1.0)	6	112 (5.0)	0	
	2022	21	115 (3.6)	20	113 (3.9)	25	115 (2.0)	0	
Walleye Gill Net	2019	37	83 (0.7)	14	94 (2.0)	1	90	0	
	2020	7	78 (1.4)	3	86 (2.7)	2	87 (4.1)	0	
	2022	1	227	13	90 (1.0)	1	89	0	

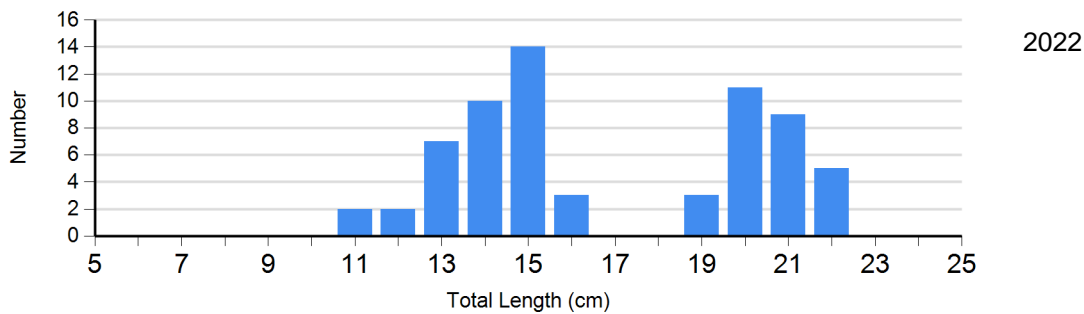
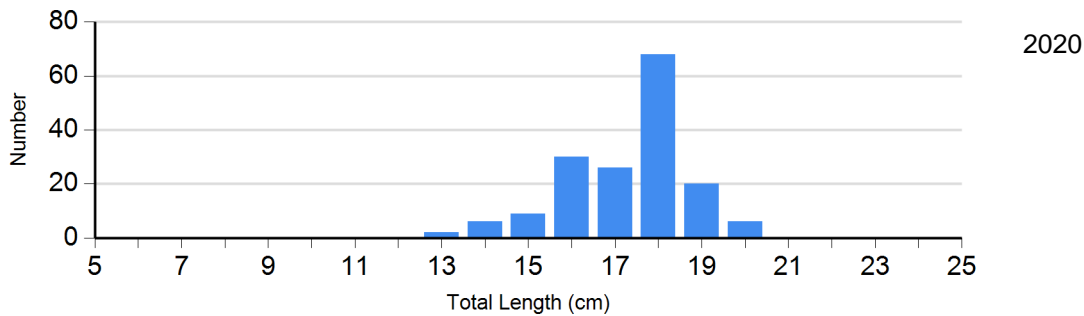
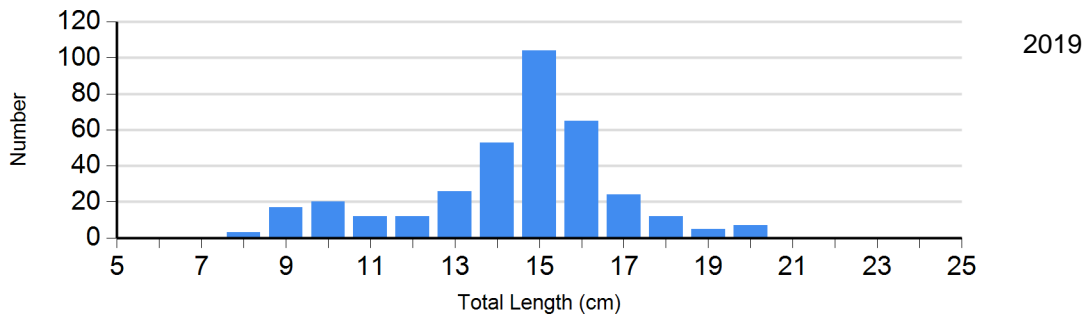
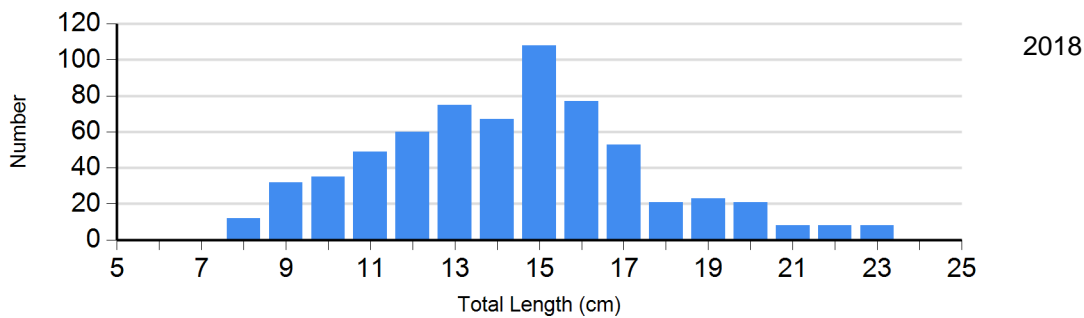
## Length Frequency Distribution

Length frequency histogram of species sampled by year.

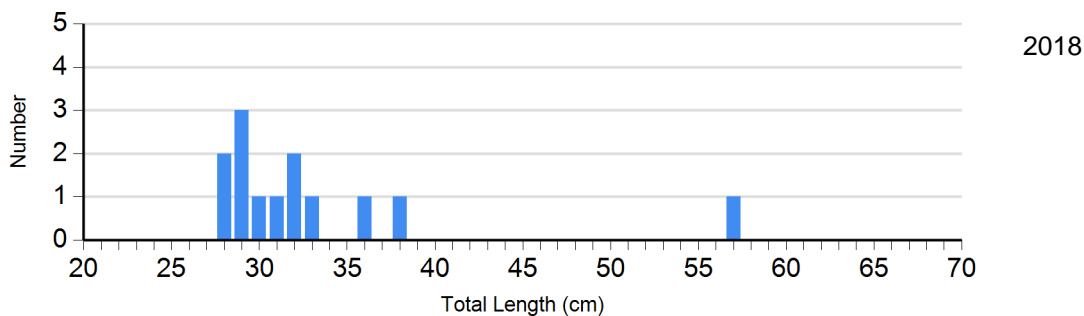
Species: Black Crappie  
Gear: frame net (std 3/4 in)

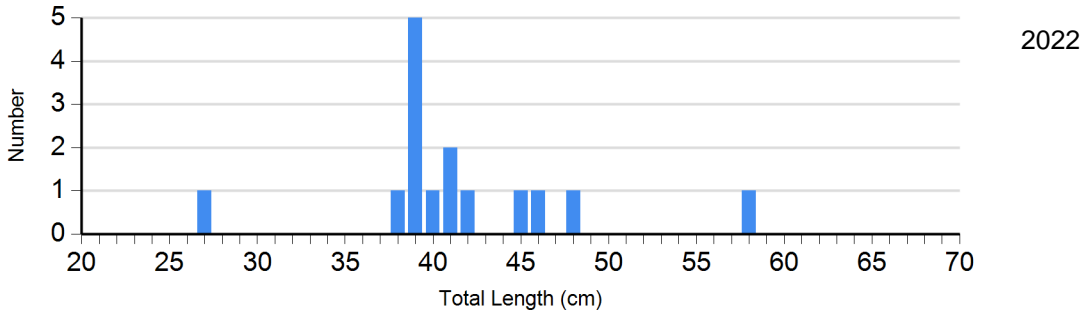
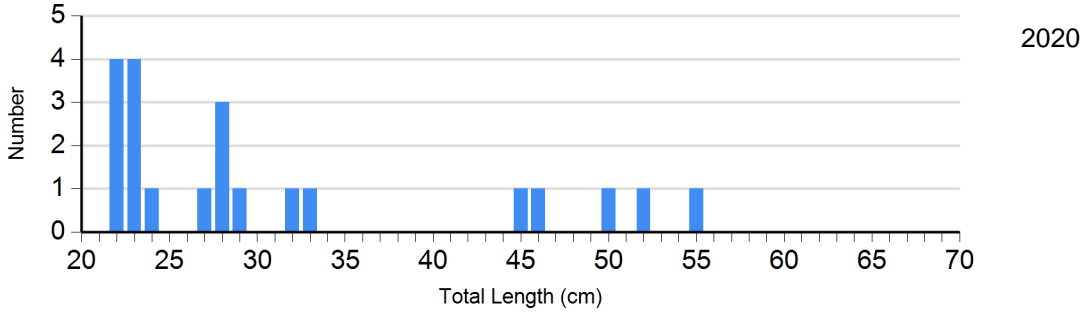
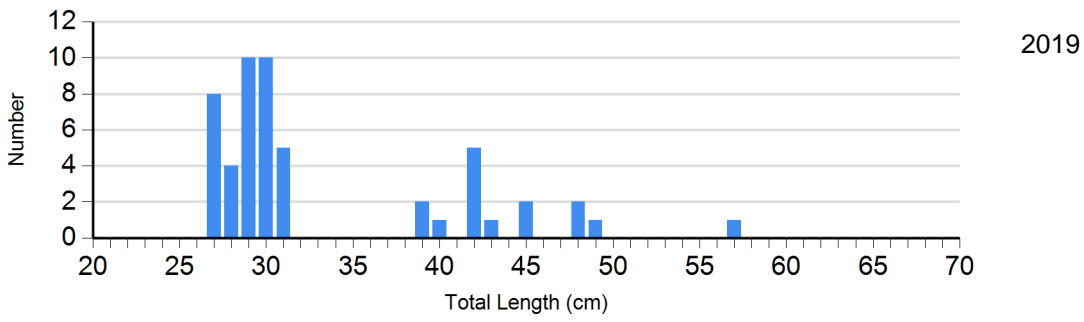


Species: Bluegill  
 Gear: frame net (std 3/4 in)



Species: Walleye  
 Gear: AFS std gill net

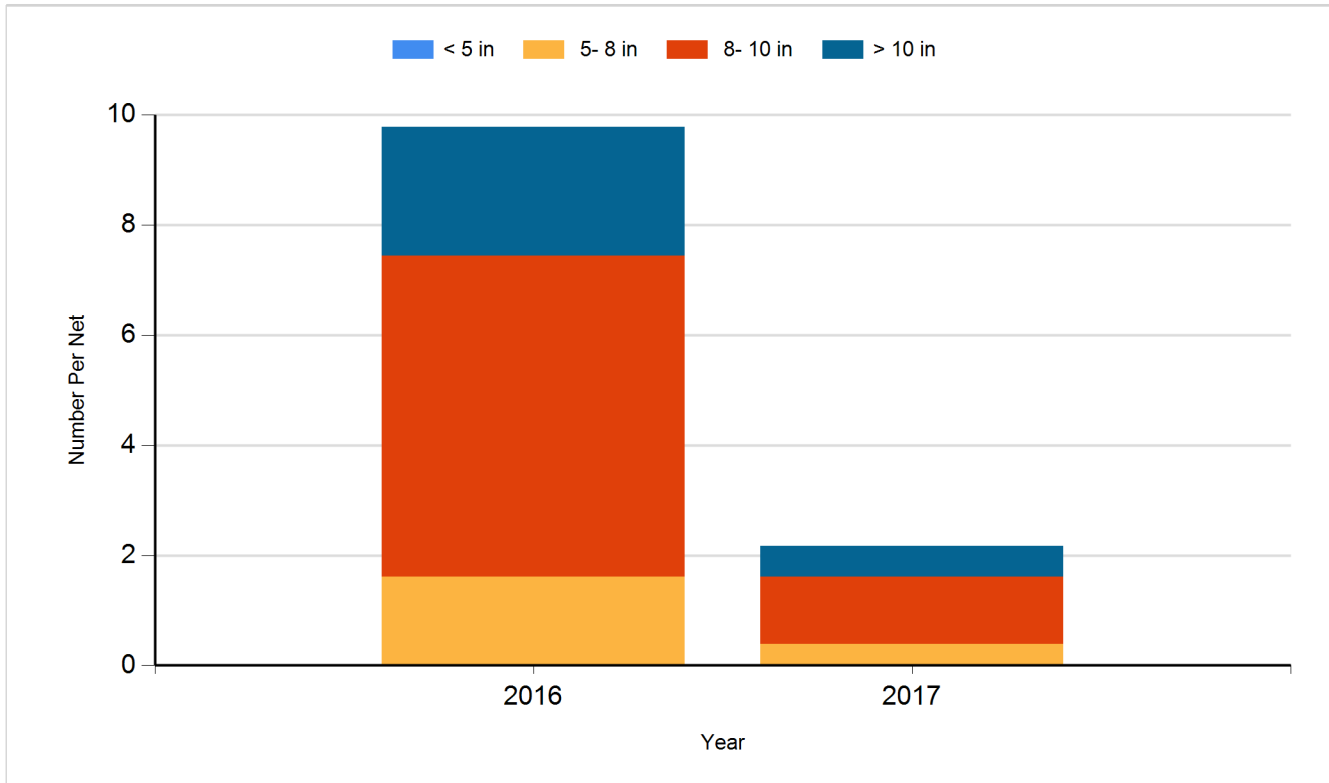




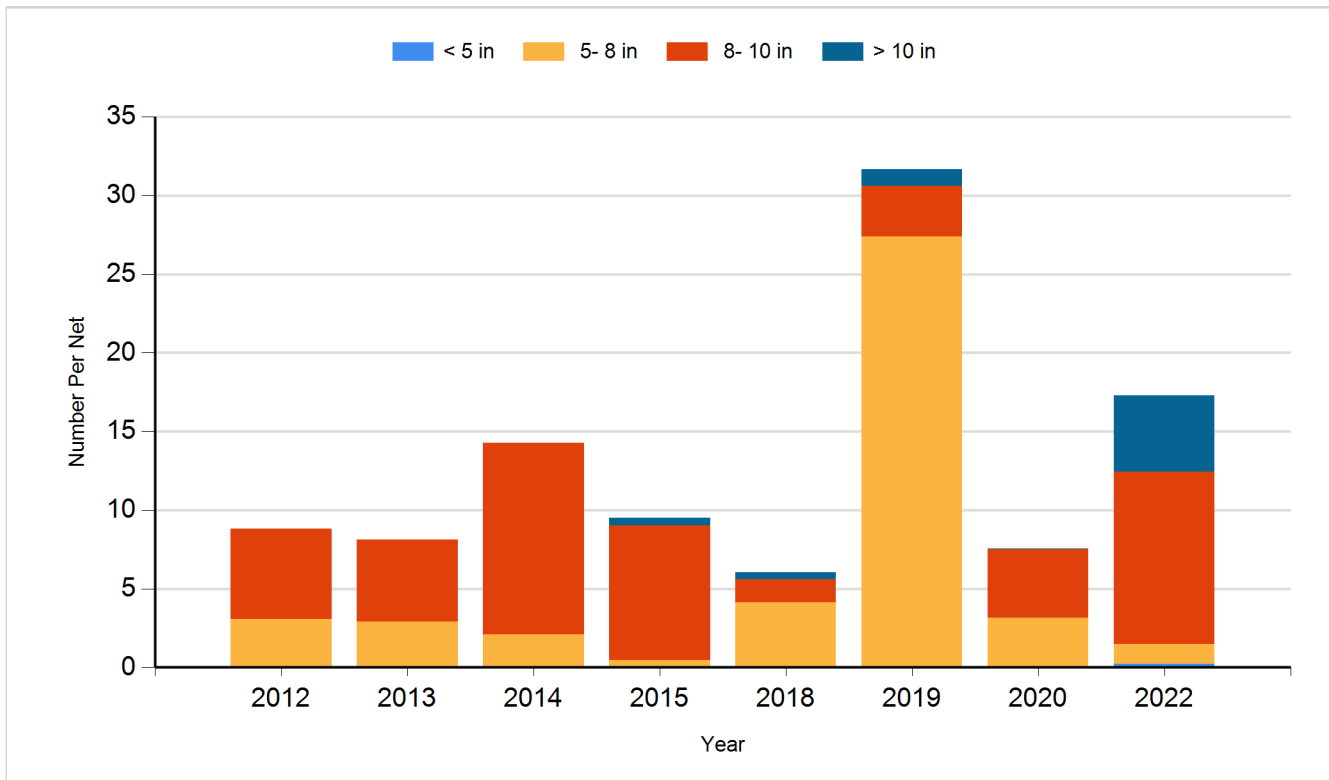
## Historic Fish Sizes and Relative Abundance

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

Species: Black Crappie  
Gear: AFS std frame net

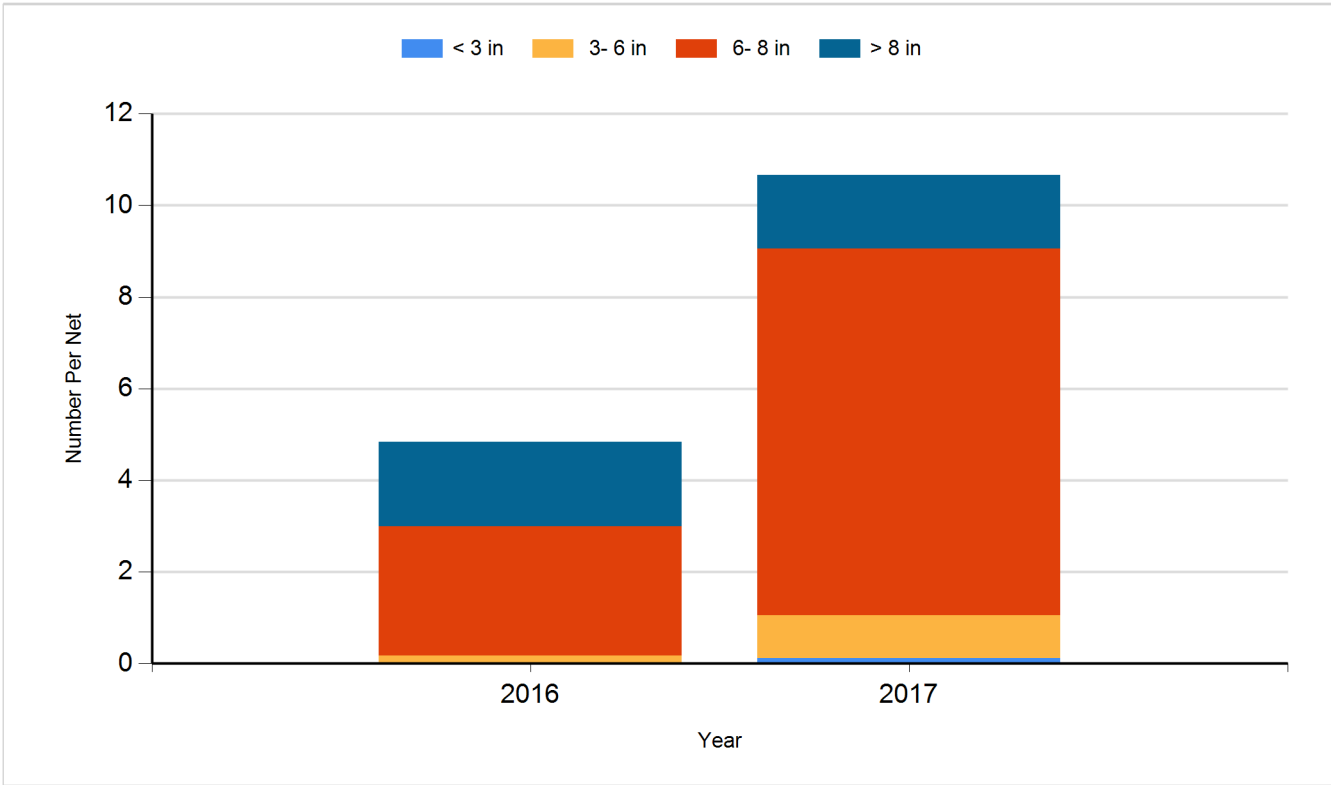


Species: Black Crappie  
Gear: frame net (std 3/4 in)

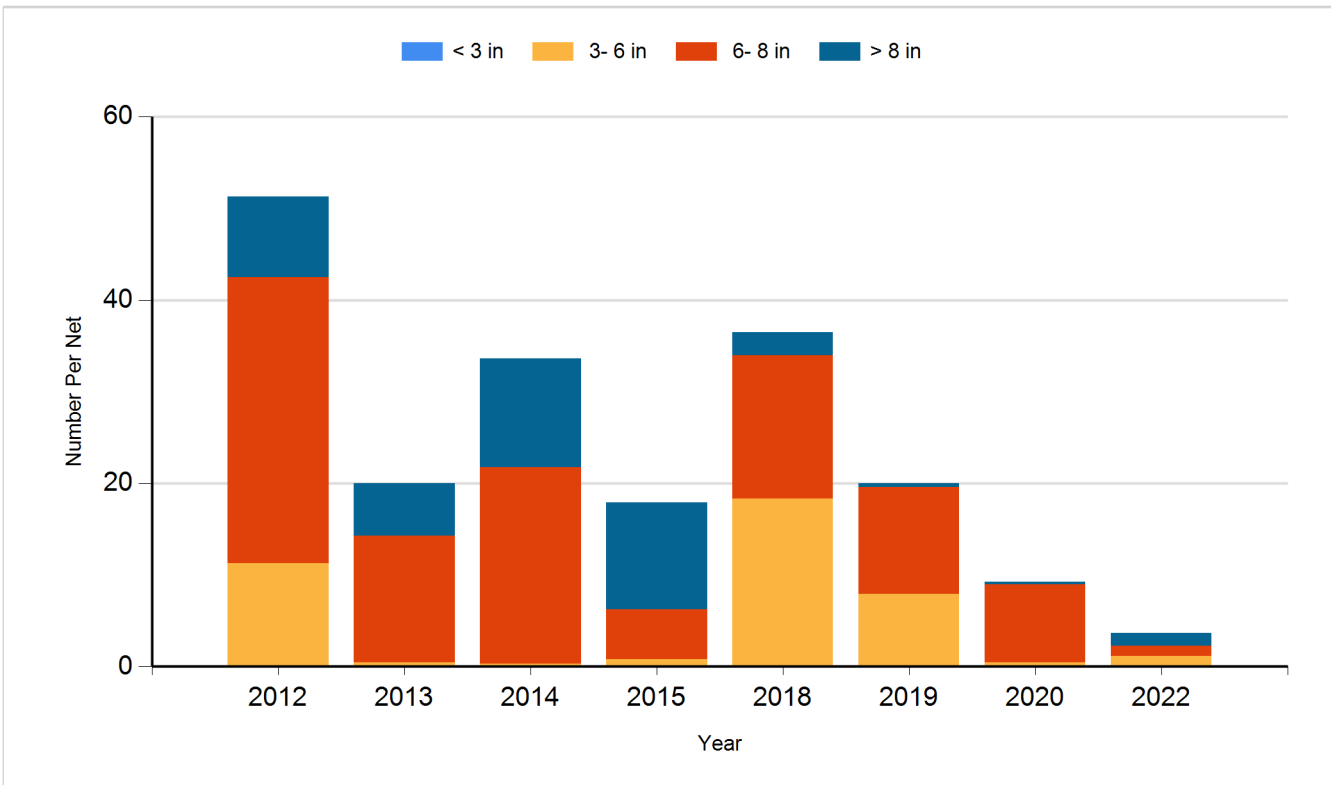




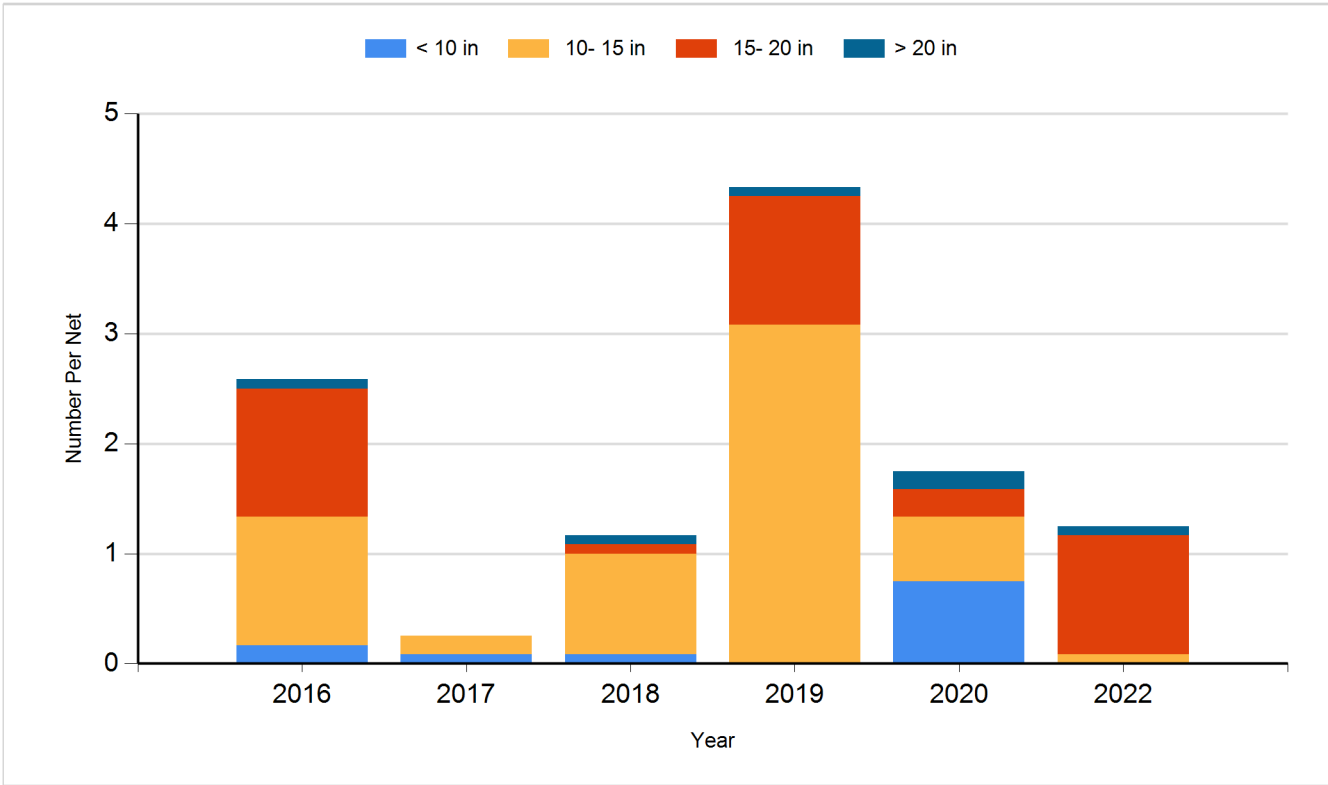
Species: Bluegill  
Gear: AFS std frame net



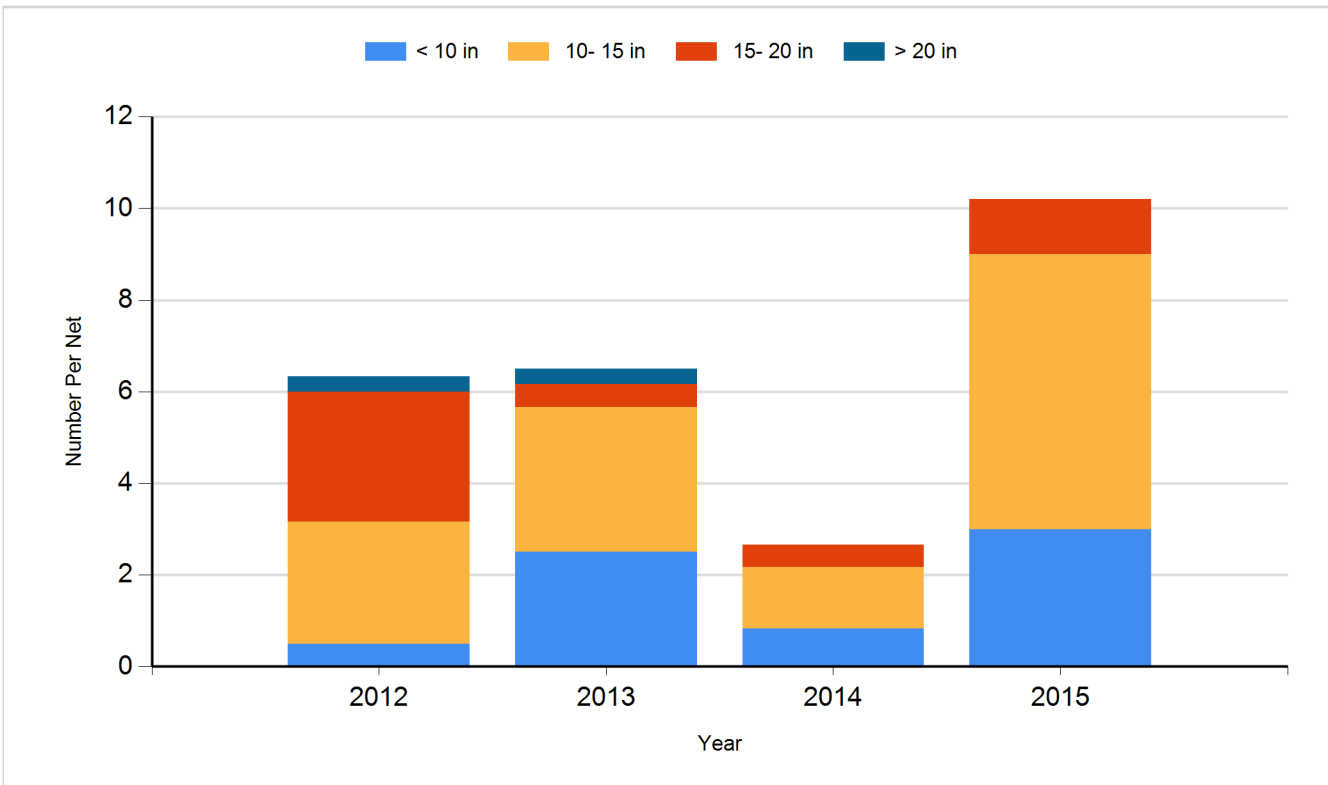
Species: Bluegill  
Gear: frame net (std 3/4 in)



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
2012	Walleye	Large Fingerling	10,173
2013	Walleye	Large Fingerling	27,344
2014	Walleye	Large Fingerling	18,420
2016	Saugeye	Large Fingerling	6,030
2017	Saugeye	Small Fingerling	60,320
2018	Saugeye	Small Fingerling	62,640
2019	Saugeye	Small Fingerling	62,350
2021	Saugeye	Juvenile	63,700
2022	Saugeye	Juvenile	63,080
2023	Saugeye	Juvenile	62,832