

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

Fate, Lyman County

MED-Lake-638-000

2019

Lake Information

Name: Fate **Maximum Depth:** 19 Feet
County: Lyman **Mean Depth:** 9 Feet
Legal Description: T106-R77-S25
Surface Area: 116 Acres

Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	Jun 26, 2019	1 net-nights
boat shocker (night)	Oct 07, 2019	3600 seconds
fall night EF-WAE	Oct 07, 2019	3600 seconds
frame net (std 3/4 in)	Jun 26, 2019	5 net-nights
frame net (std 3/4 in)	Jun 27, 2019	5 net-nights

Common Fish Species Present

Walleye

Largemouth Bass

Black Crappie

Golden Shiner

Yellow Perch

Bluegill

Black Bullhead

Northern Pike

Green Sunfish

Sunfish Hybrid

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	Black Bullhead	19	18.0		61	19	0		106	2
	Black Crappie	38	38.0	0.0						
	Golden Shiner	137	137.0	0.0						
	Largemouth Bass	3	2.0		0		0		112	2
	Northern Pike	4	4.0		75		50		76	8
	Yellow Perch	134	124.0		8	4	1		94	1
boat shocker (night)	Largemouth Bass	49	39.0	19.6	77	10	41	12	109	2
frame net (std 3/4 in)	Black Bullhead	70	7.0	2.6	97		53	9	99	2
	Black Crappie	435	33.6	15.7	31	3	2	1	98	1
	Bluegill	473	47.3	21.4	99		4	1	111	1
	Golden Shiner	9	0.9	0.1						
	Green Sunfish	3	0.3	0.3	67		0		598	628
	Largemouth Bass	2	0.1	0.1	100		100		109	
	Northern Pike	1	0.1	0.1	0		0		85	
	Sunfish Hybrid	2	0.0	0.0						
	Yellow Perch	125	12.5	7.0	48	6	4	3	88	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.

Gear	Species	CPUE										Avg
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
AFS std gill net	Black Bullhead										18.0	18.00
	Black Crappie										38.0	38.00
	Golden Shiner										137.0	137.00
	Largemouth Bass										2.0	2.00
	Northern Pike										4.0	4.00
	Yellow Perch										124.0	124.00
boat shocker (night)	Largemouth Bass			43.0		22.0		68.0			39.0	43.00
	Walleye			0.0		7.0		6.0			0.0	3.25
frame net (std 3/4 in)	Black Bullhead		10.0			7.5	10.0	13.4			7.0	9.58
	Black Crappie		3.0			7.9	10.2	0.7			33.6	11.08
	Bluegill		1.8			0.7	8.2	9.5			47.3	13.50
	Golden Shiner		0.0			0.0	0.0	0.0			0.9	0.18
	Green Sunfish		0.0			0.0	0.0	0.1			0.3	0.08
	Largemouth Bass		0.0			0.5	0.3	0.1			0.1	0.20
	Northern Pike		2.6			0.9	0.5	0.2			0.1	0.86
	Sunfish Hybrid		0.0			0.0	0.0	0.0			0.0	0.00
	Walleye		0.0			0.4	0.5	0.0			0.0	0.18
	Yellow Perch		1.4			10.0	7.2	4.5			12.5	7.12
std exp gill net	Black Bullhead		35.0			28.5	49.5	195.5				77.13
	Black Crappie		0.0			9.5	6.5	0.0				4.00
	Bluegill		0.0			0.0	0.0	0.5				0.13
	Golden Shiner		0.0			0.0	0.0	0.0				0.00
	Largemouth Bass		0.0			0.0	0.5	0.0				0.13
	Northern Pike		17.5			0.0	0.5	0.5				4.63
	Walleye		0.0			3.5	5.5	6.0				3.75
	Yellow Perch		5.0			20.5	5.0	46.0				19.13

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												
			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019			
AFS std gill net	Black Bullhead	PSD												61	
		PSD-P												0	
		Wr												106	
	Largemouth Bass	PSD												0	
		PSD-P												0	
		Wr												112	
	Northern Pike	PSD												75	
		PSD-P												50	
		Wr												76	
	Yellow Perch	PSD												8	
		PSD-P												1	
		Wr												94	
	boat shocker (night)	Largemouth Bass	PSD			33			0		69				77
			PSD-P			14			0		6				41
			Wr			115			109		121				109
Walleye		PSD							100		25				
		PSD-P							0		0				
		Wr							91		88				
frame net (std 3/4 in)		Black Bullhead	PSD		33				40	13	40				97
			PSD-P		0				17	4	13				53
			Wr		86				96	83	91				99
	Black Crappie	PSD		73					48	32	57				31
		PSD-P		17					38	31	0				2
		Wr		101					116	97	106				98
	Bluegill	PSD		94					86	76	61				99
		PSD-P		44					0	9	13				4
		Wr		115					116	112	118				111
	Green Sunfish	PSD									0				67
		PSD-P									0				0
		Wr									121				598
	Largemouth Bass	PSD							20	0	100				100
		PSD-P							0	0	0				100

Gear	Species	Index	Year										
			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
frame net (std 3/4 in)	Largemouth Bass	Wr					126	112	104			109	
		PSD		77			100	100	100			0	
		PSD-P		31			44	60	100			0	
	Northern Pike	Wr		81			82	85	90				85
		PSD					25	60					
		PSD-P					0	0					
	Walleye	Wr					90	73					
		PSD											
		PSD-P											
	Yellow Perch	PSD		29			59	29	56				48
		PSD-P		0			7	0	0				4
		Wr		103			97	96	100				88
std exp gill net	Black Bullhead	PSD		21			25	0	40				
		PSD-P		0			5	0	0				
		Wr		98			93	87	94				
	Black Crappie	PSD					74	54	0				
		PSD-P					68	15	0				
		Wr					104	101					
	Bluegill	PSD							0				
		PSD-P							0				
		Wr							120				
	Largemouth Bass	PSD							0				
		PSD-P							0				
		Wr							110				
	Northern Pike	PSD		60					100	100			
		PSD-P		3					0	100			
		Wr		84					89	80			
	Walleye	PSD					14	73	58				
		PSD-P					0	0	8				
		Wr					94	79	85				
	Yellow Perch	PSD		0			27	0	23				
		PSD-P		0			0	0	0				
		Wr		109			102	111	97				

Back-Calculated Lengths

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

Species: Black Crappie

Year Class	Age	N	Mean back-calculated length (SE) at age																	
			1	2	3	4	5	6	7	8	9	10								
2018	1	3	91 (.4)																	
2017	2	3	75 (3.6)	129 (16.4)																
2016	3	20	78 (1.5)	130 (3.8)	184 (2.9)															
2015	4	10	79 (3.7)	157 (4)	203 (3.7)	227 (3.2)														
2014	5	2	75 (7)	135 (25.9)	186 (20.8)	218 (7.7)	236 (2.1)													
2013	6	1	90	160	198	245	258	269												
Weighted Mean		39	79	139	190	227	243	269												
Year Class	Age	N	11	12	13	14	15	16	17	18	19	20								
2018	1	3																		
2017	2	3																		
2016	3	20																		
2015	4	10																		
2014	5	2																		
2013	6	1																		
Weighted Mean		39																		

Species: Bluegill

Year Class	Age	Mean back-calculated length (SE) at age										
		N	1	2	3	4	5	6	7	8	9	10
2016	3	17	50 (1.7)	101 (3.4)	157 (2.6)							
2015	4	13	50 (2.1)	111 (3.7)	156 (3.4)	184 (2.3)						
Weighted Mean		30	50	105	157	184						
Year Class	Age	N	11	12	13	14	15	16	17	18	19	20
2016	3	17										
2015	4	13										
Weighted Mean		30										

Species: Largemouth Bass

Year Class	Age	N	Mean back-calculated length (SE) at age											
			1	2	3	4	5	6	7	8	9	10		
2018	1	4	104 (7)											
2017	2	9	80 (7)	145 (7.8)										
2016	3	7	91 (6.7)	160 (12.1)	230 (15.8)									
2015	4	9	88 (6.3)	180 (12.1)	259 (13)	321 (13.8)								
2014	5	14	85 (4.9)	154 (8.1)	228 (8.2)	296 (8.8)	345 (9.9)							
2013	6	4	83 (12.9)	144 (25.3)	205 (26.3)	271 (25.5)	347 (33.9)	399 (31.2)						
Weighted Mean		47	87	158	234	301	345	399						

Year Class	Age	N	11	12	13	14	15	16	17	18	19	20
2018	1	4										
2017	2	9										
2016	3	7										
2015	4	9										
2014	5	14										
2013	6	4										
Weighted Mean		47										

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	379	113 (32)	170 (42)	191 (250)	238 (42)	242 (10)	275 (3)				
2016	23	109 (16)	179 (2)	214 (5)							
2015	102	115 (1)	177 (69)	232 (1)	273 (11)	273 (2)	298 (20)				
2014	100	132 (62)		237 (10)	275 (6)	277 (12)	289 (10)				
2011	30		175 (2)	201 (23)	302 (2)	307 (2)		320 (1)			

Species: Bluegill

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2019	473			167 (271)	188 (202)						
2016	95	100 (25)	155 (21)	173 (24)	184 (12)	206 (11)	212 (2)				
2015	82	90 (2)	152 (55)	176 (16)	186 (4)	208 (5)					
2011	18	81 (1)		173 (2)	194 (4)	200 (8)	239 (2)	235 (1)			

Species: Largemouth Bass

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2019	49	187 (5)	193 (9)	267 (7)	362 (9)	391 (15)	439 (4)				
2016	76	206 (30)	321 (3)	347 (41)		426 (1)	452 (1)	476 (1)			
2014	34	208 (34)									
2012	43	224 (29)	233 (1)	339 (6)	340 (2)	428 (3)	453 (1)			482 (1)	

Species: Walleye

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2015	11			403 (9)		438 (2)					
2014	7		381 (2)	357 (5)							

Species: Yellow Perch

Mean Length (expanded sample number) at capture by age

Year	N	1	2	3	4	5	6	7	8	9	10+
2016	142	124 (93)	181 (42)	215 (7)							
2015	11	116 (1)	172 (10)								
2014	25	146 (16)	182 (7)	237 (2)							
2011	10		143 (9)	194 (1)							

Fish Condition

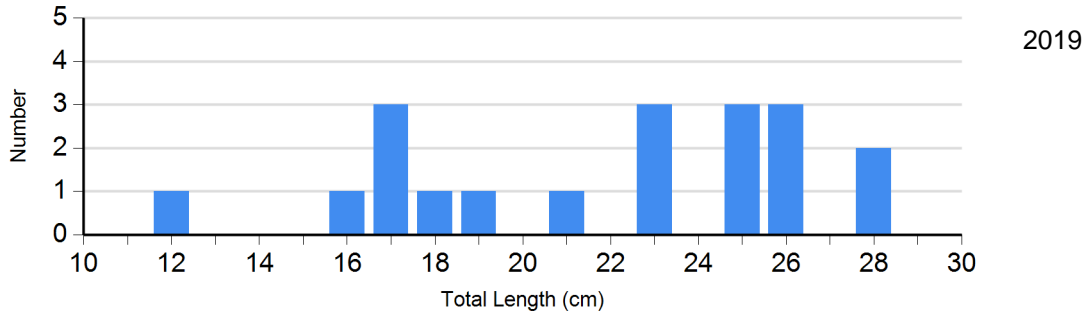
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

Species	Year	Length Groups							
		S-Q		Q-P		P-M		M	
		N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Black Bullhead Gill Net	2015	99	87 (0.8)	0		0		0	
	2016	234	95 (1.0)	157	93 (1.4)	0		0	
	2019	7	105 (3.4)	11	107 (2.3)	0		0	
Black Crappie Frame Net	2015	69	105 (0.7)	1	92	28	84 (0.9)	4	65 (11.3)
	2016	3	102 (7.0)	4	109 (10.1)	0		0	
	2019	231	100 (0.8)	99	94 (0.9)	6	87 (0.4)	0	
Bluegill Frame Net	2015	20	113 (2.8)	55	112 (1.5)	7	105 (4.9)	0	
	2016	37	117 (6.3)	46	122 (2.9)	12	111 (2.7)	0	
	2019	4	119	452	111 (0.8)	17	115 (2.9)	0	
Largemouth Bass Electro Fishing	2016	21	124 (1.4)	43	120 (1.1)	4	117 (4.0)	0	
	2019	9	108 (1.7)	14	107 (3.7)	16	111 (2.6)	0	
Northern Pike Gill Net	2015	0		1	89	0		0	
	2016	0		0		1	80	0	
	2019	1	91	1	84	2	65 (0.8)	0	
Walleye Gill Net	2015	3	72 (4.9)	8	82 (1.8)	0		0	
	2016	5	86 (1.5)	6	85 (1.7)	1	88	0	
Yellow Perch Gill Net	2015	10	111 (20.2)	0		0		0	
	2016	71	98 (1.0)	21	92 (1.6)	0		0	
	2019	114	95 (0.7)	9	90 (1.7)	1	85	0	

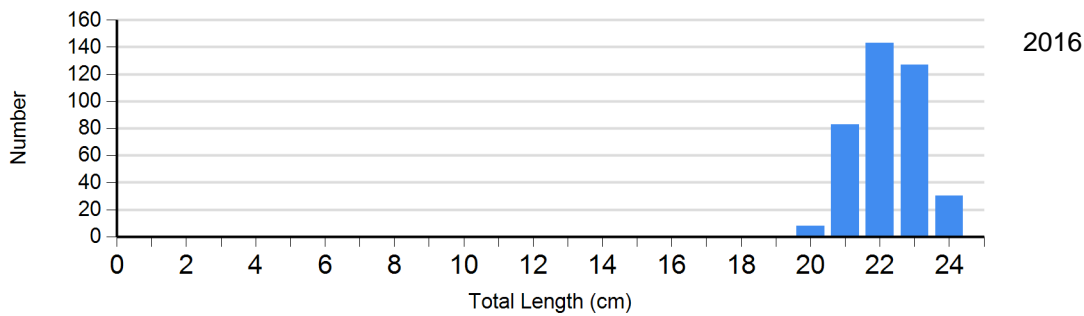
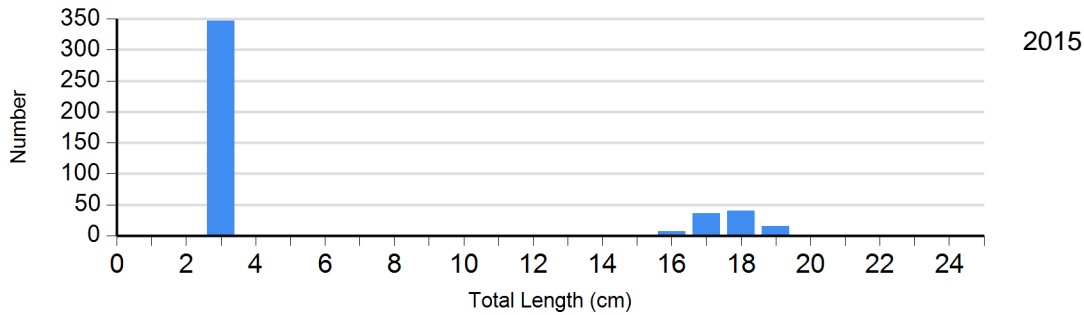
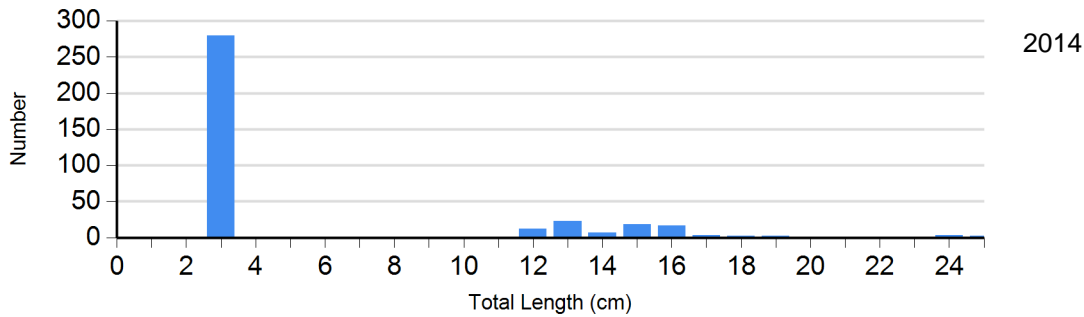
Length Frequency Distribution

Length frequency histogram of species sampled by year.

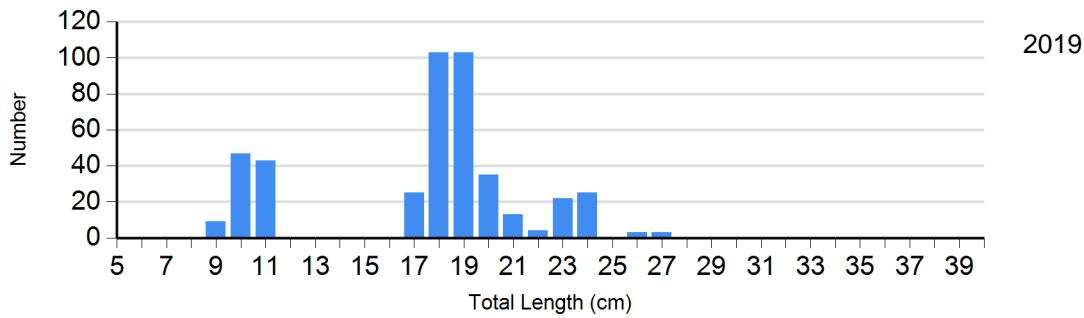
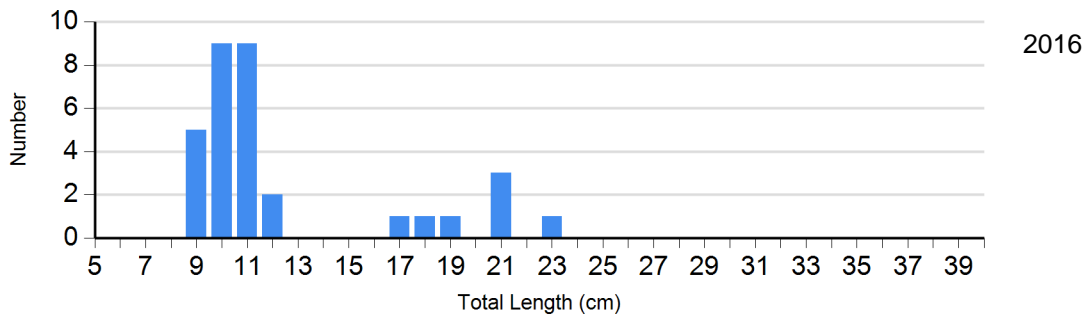
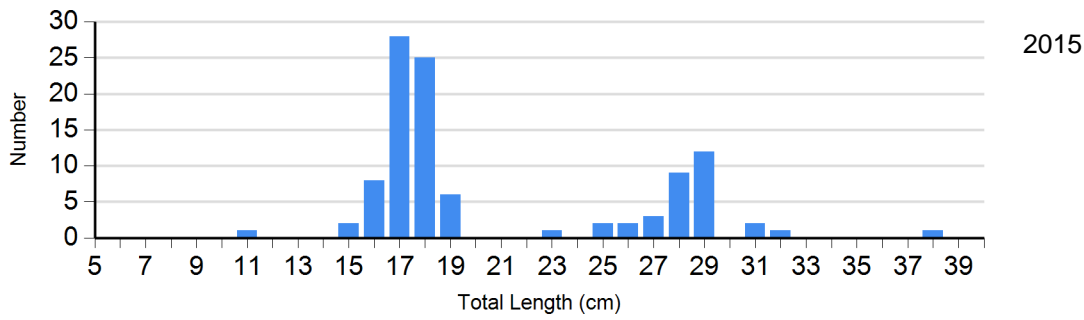
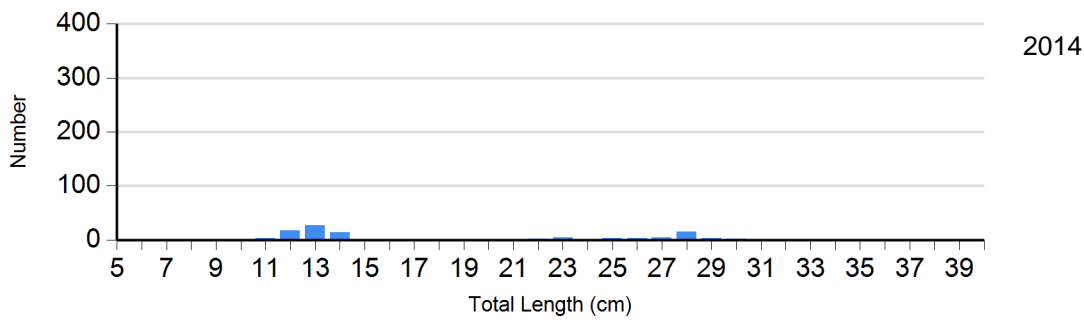
Species: Black Bullhead
Gear: AFS std gill net



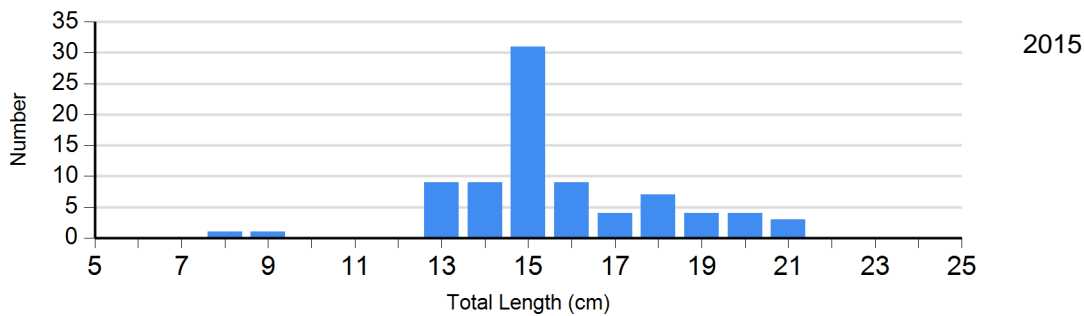
Species: Black Bullhead
Gear: std exp gill net

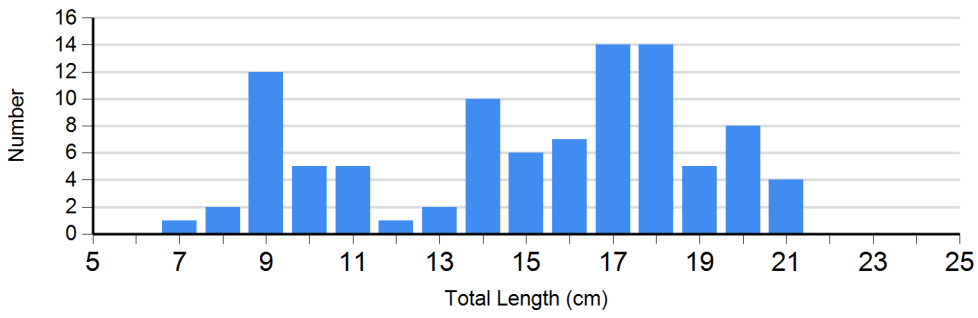


Species: Black Crappie
 Gear: frame net (std 3/4 in)

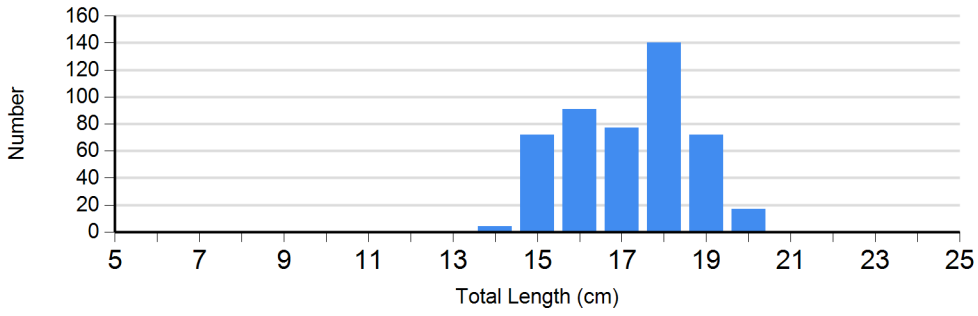


Species: Bluegill
 Gear: frame net (std 3/4 in)



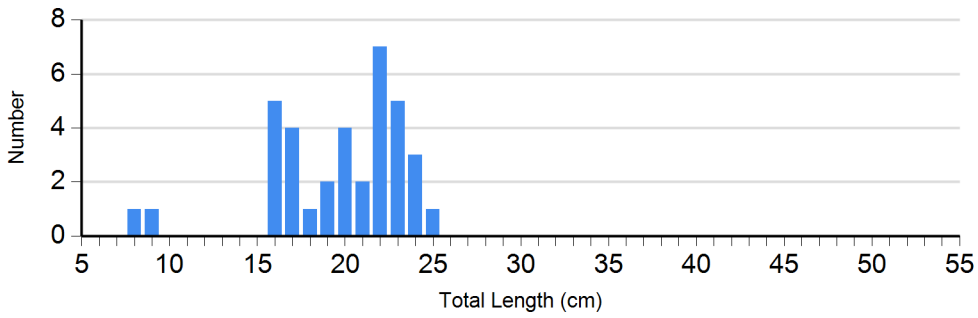


2016

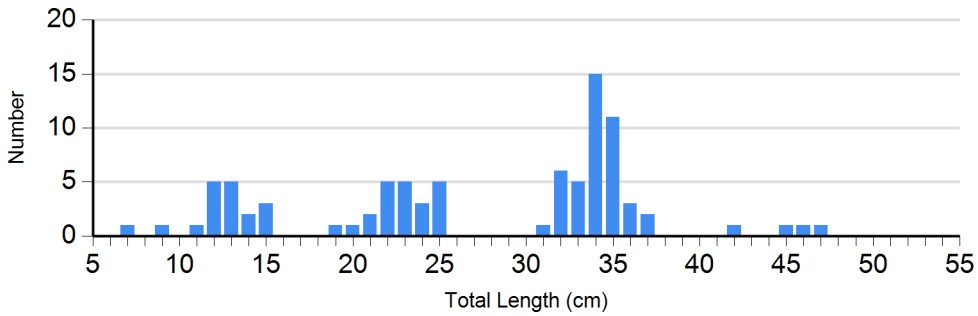


2019

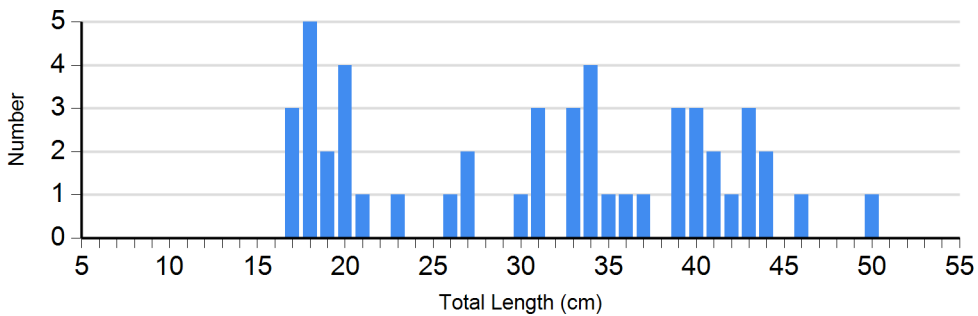
Species: Largemouth Bass
Gear: boat shocker (night)



2014

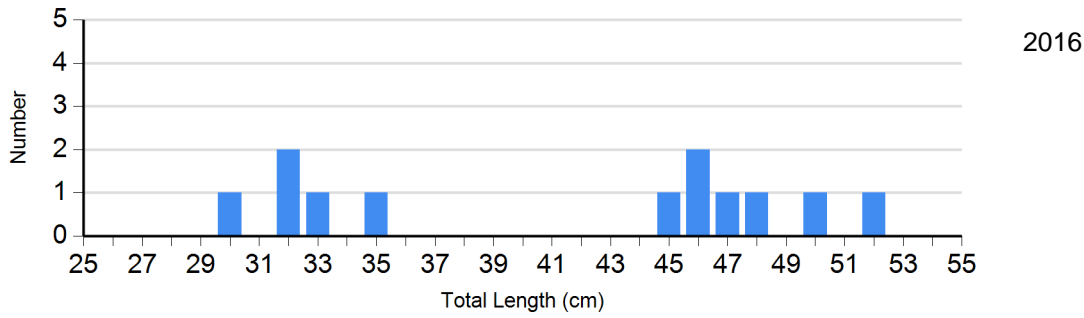
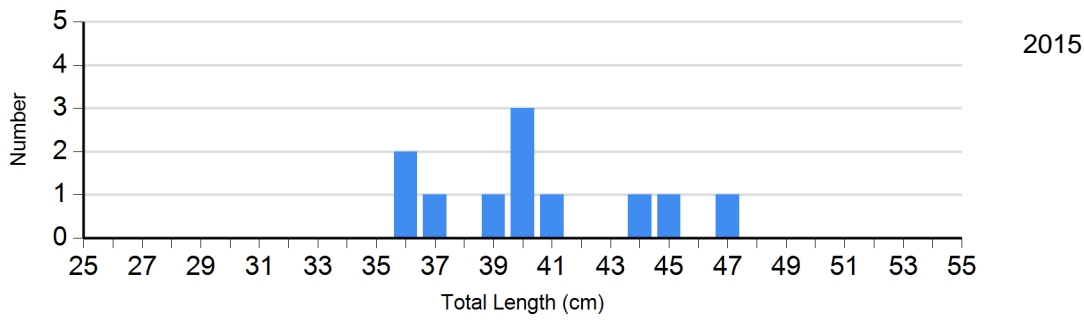


2016

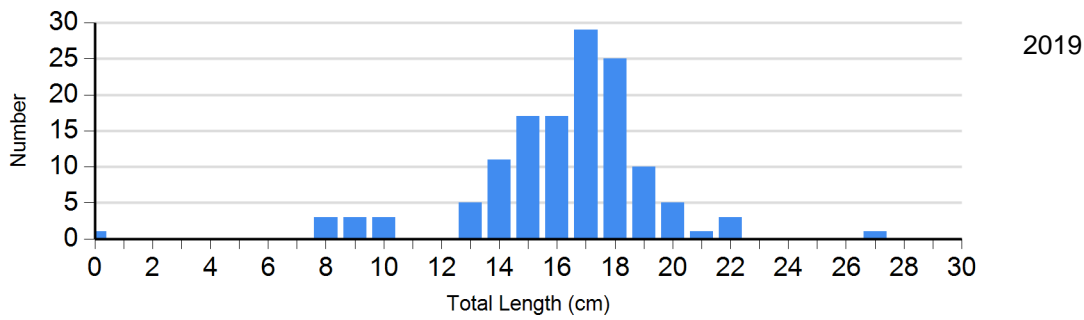


2019

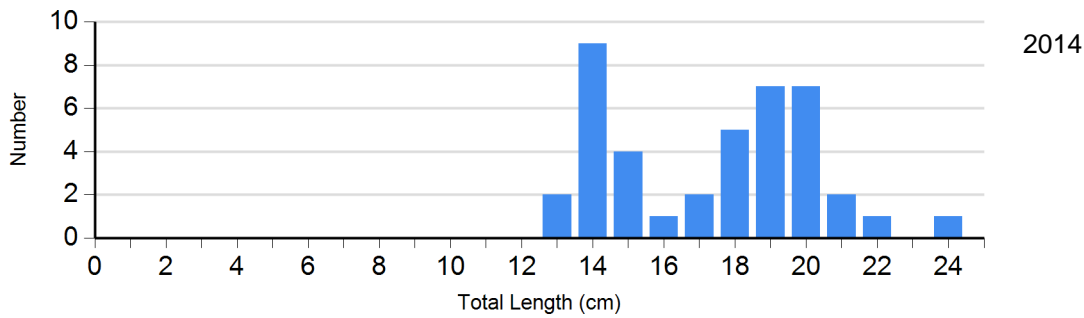
Species: Walleye
Gear: std exp gill net

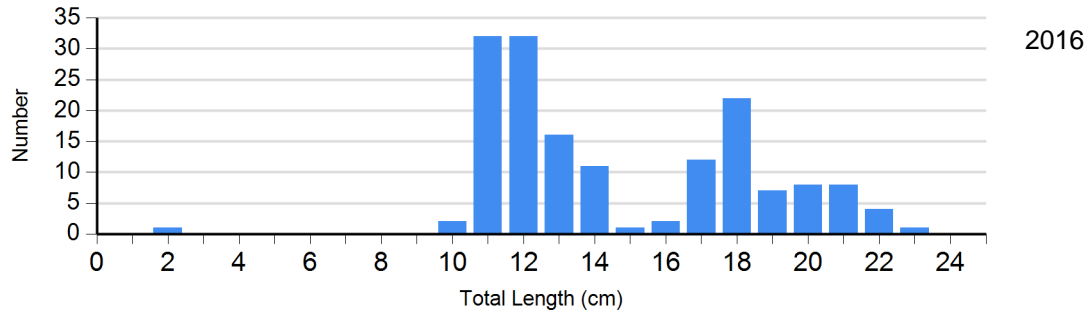
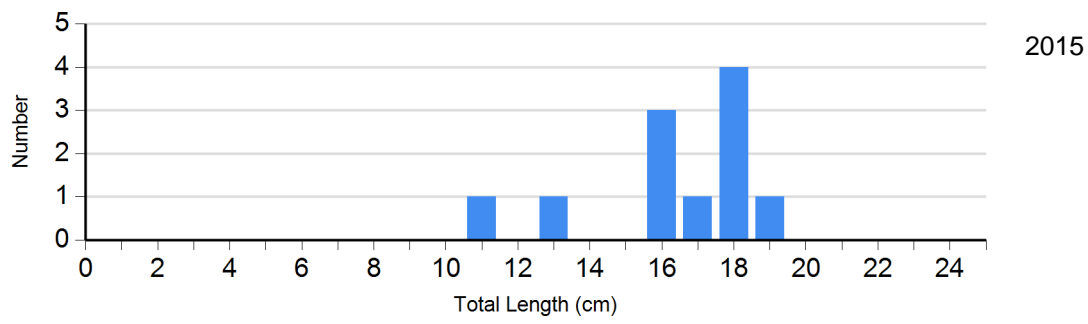


Species: Yellow Perch
Gear: AFS std gill net



Species: Yellow Perch
Gear: std exp gill net

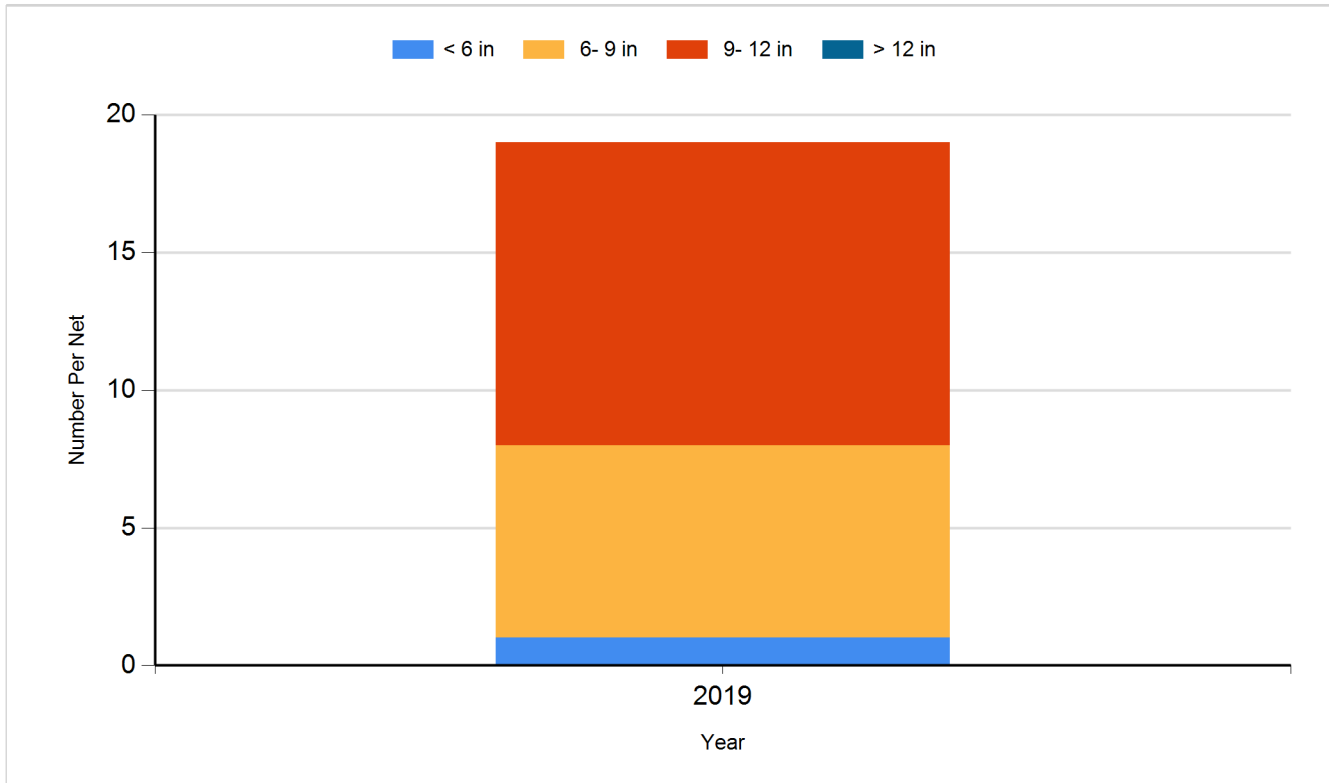




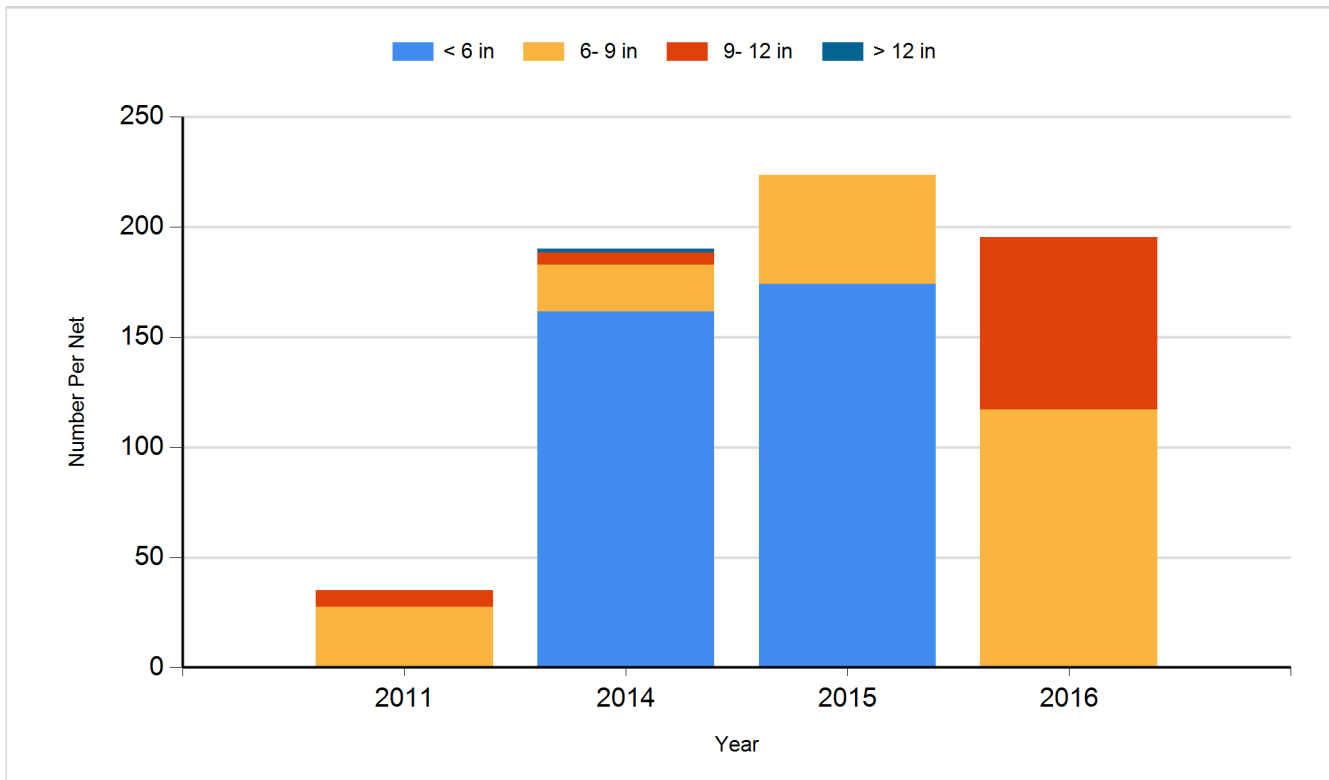
Historic Fish Sizes and Relative Abundance

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

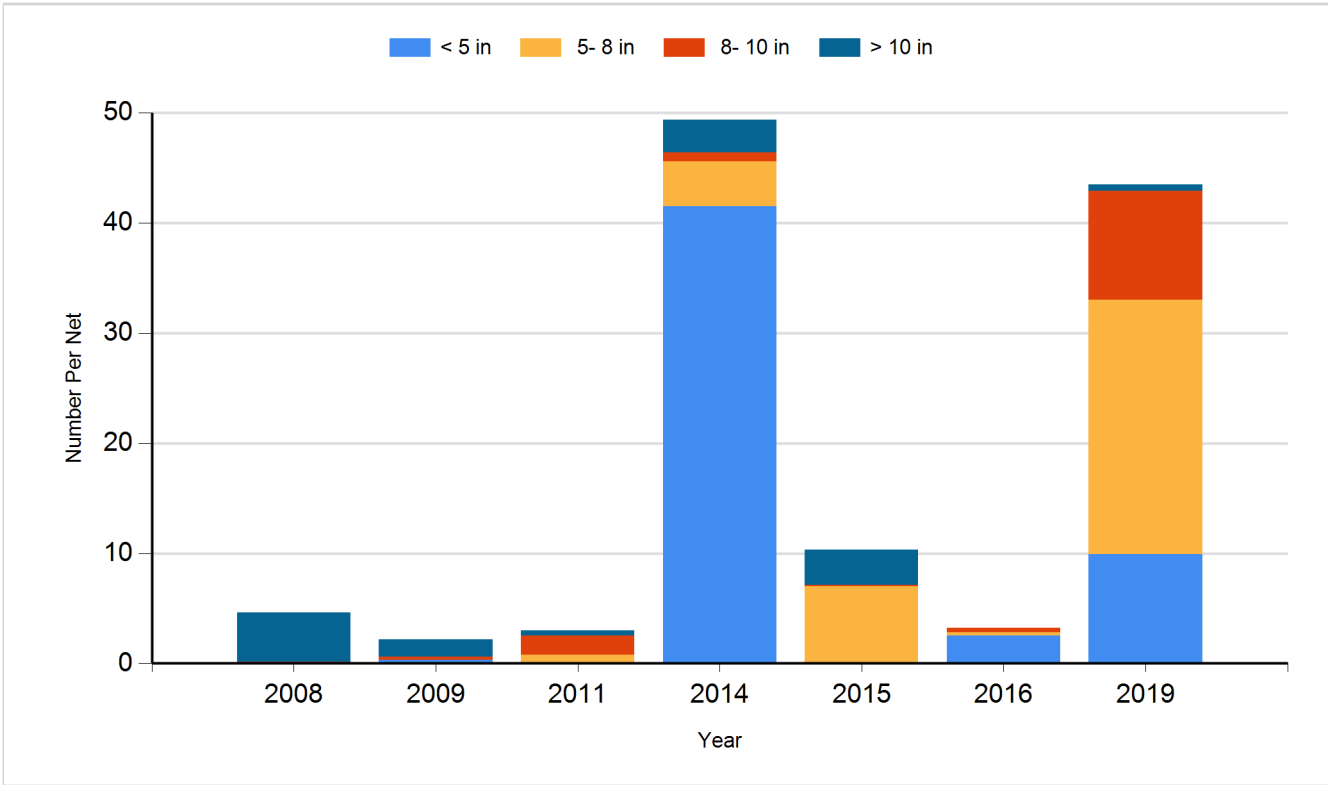
Species: Black Bullhead
Gear: AFS std gill net



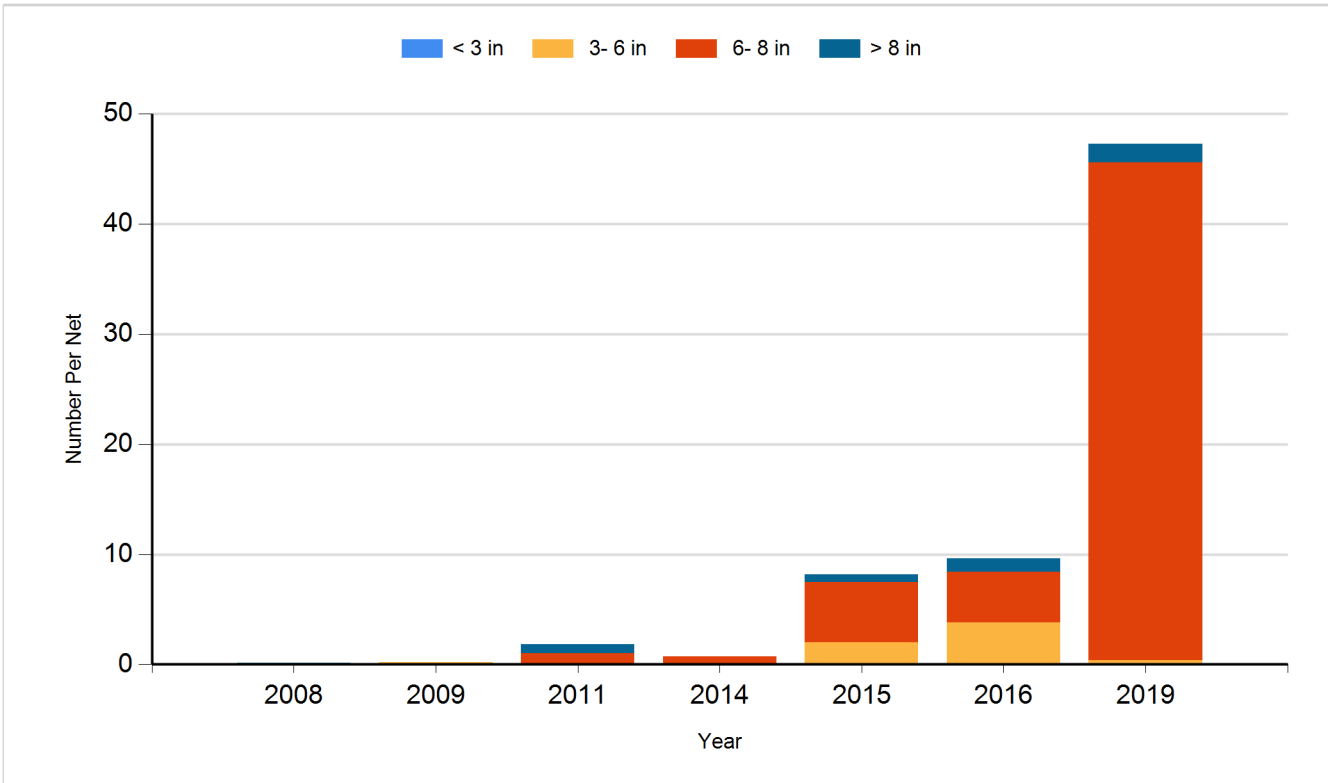
Species: Black Bullhead
Gear: std exp gill net



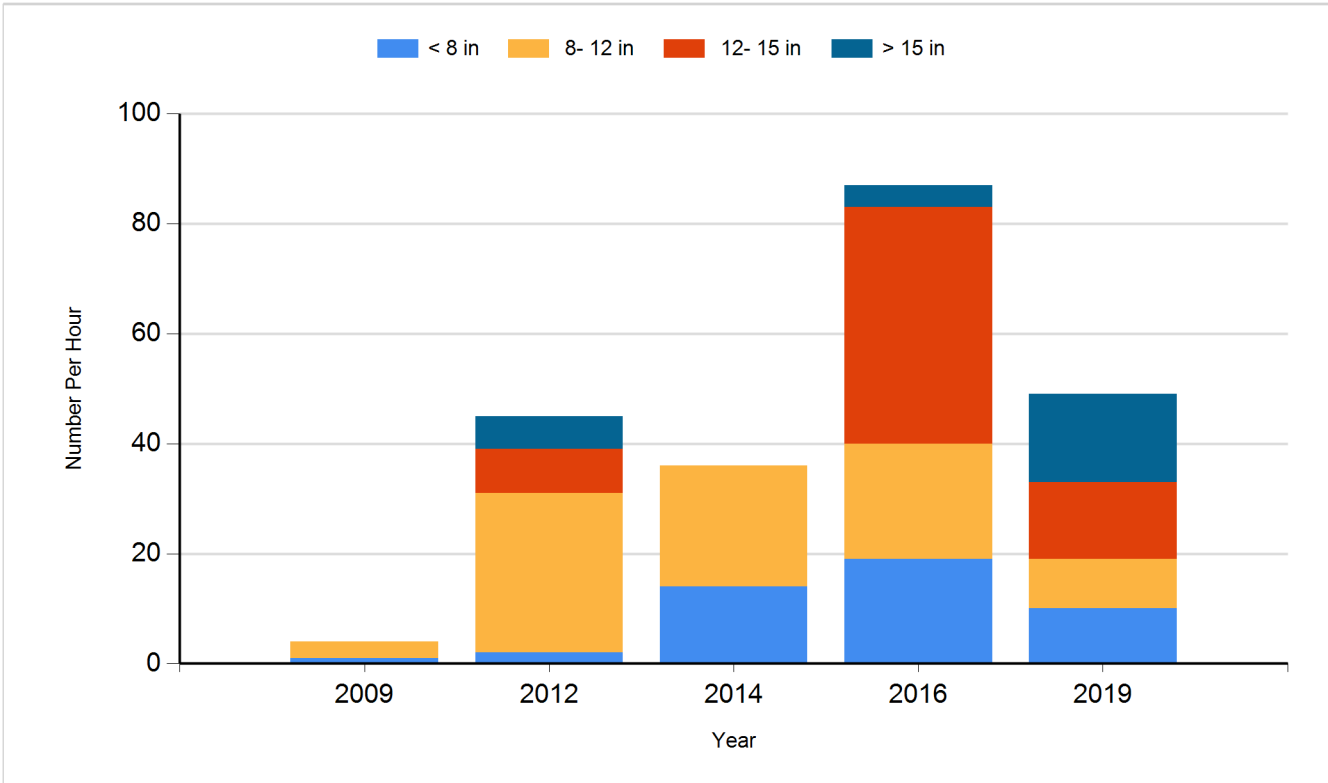
Species: Black Crappie
Gear: frame net (std 3/4 in)



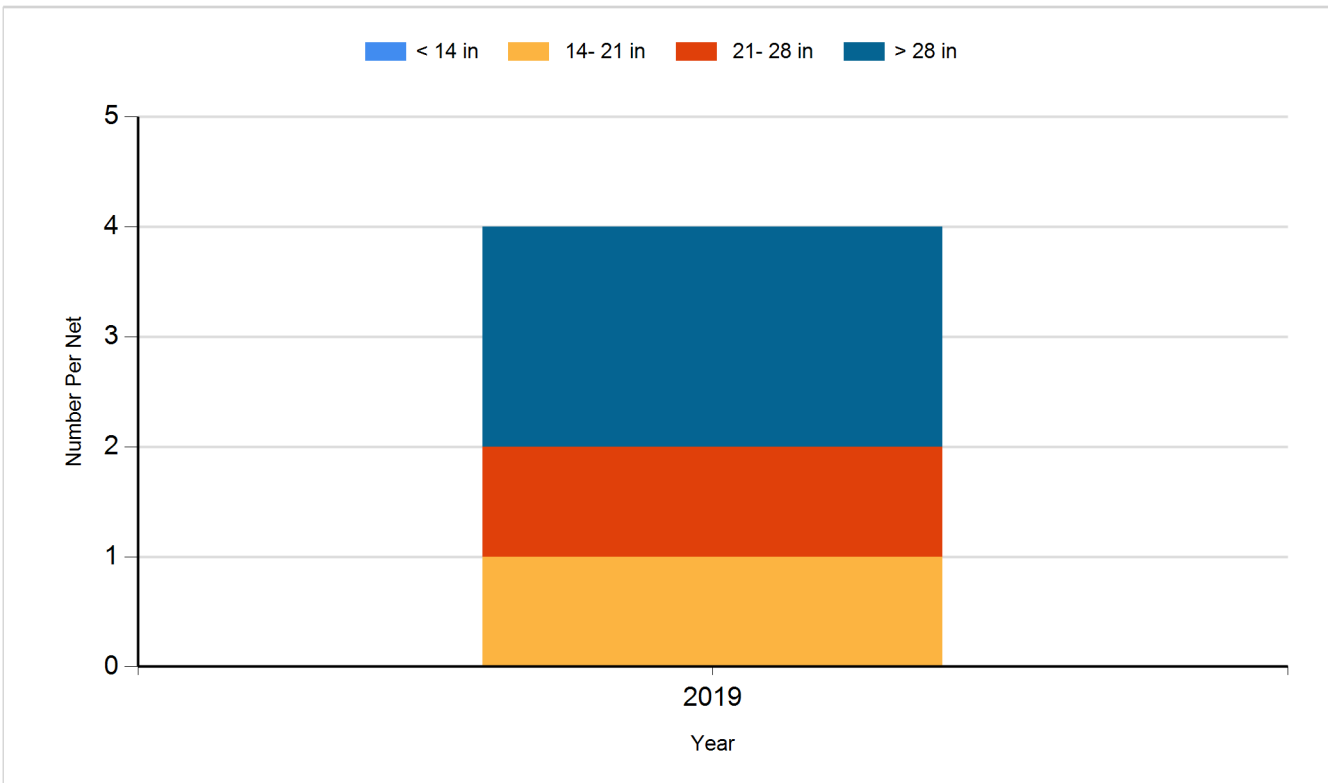
Species: Bluegill
Gear: frame net (std 3/4 in)



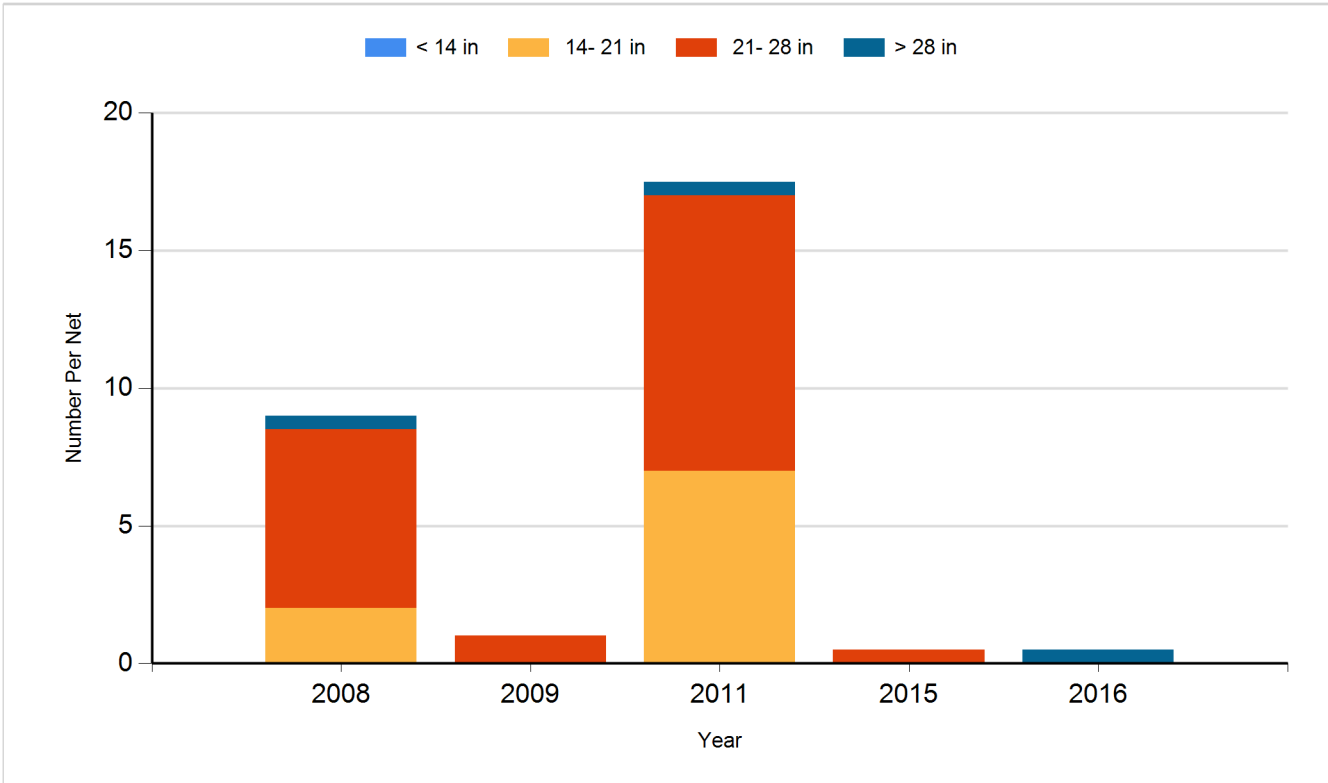
Species: Largemouth Bass
Gear: boat shocker (night)



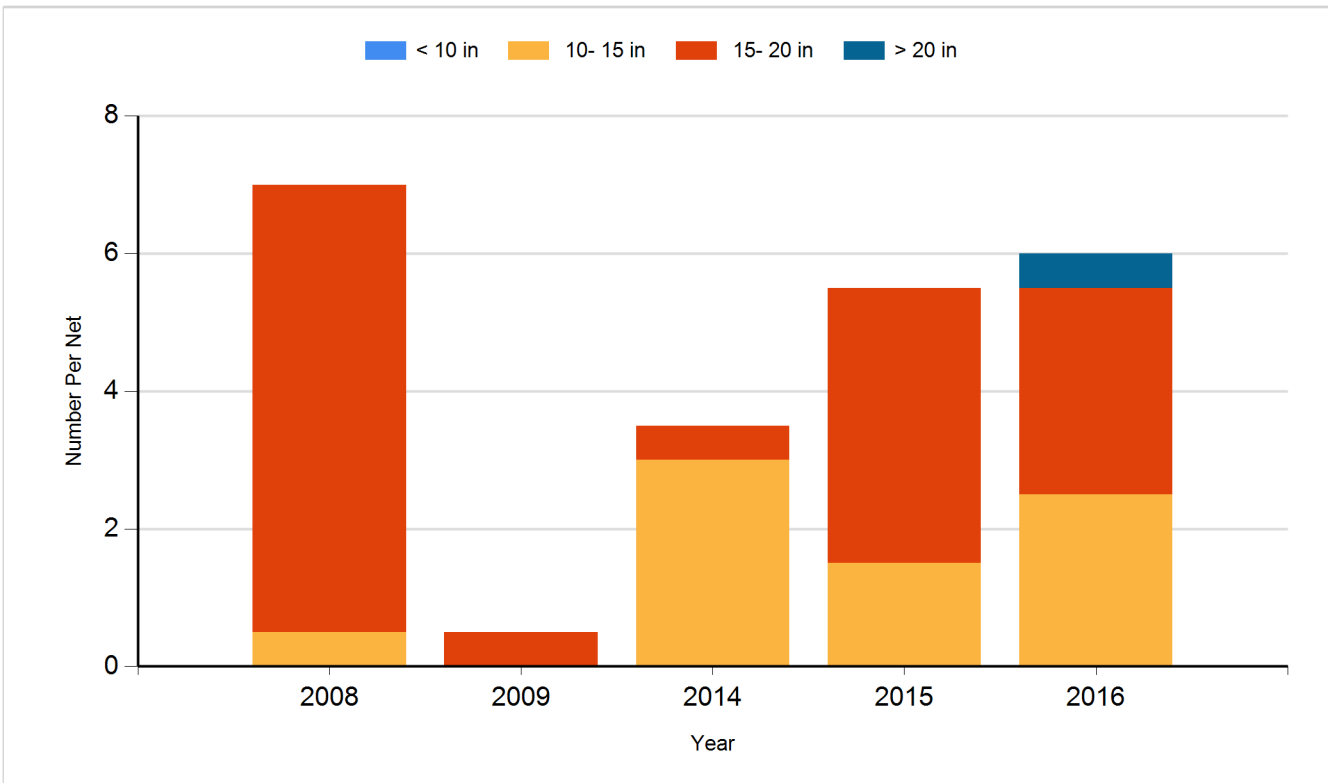
Species: Northern Pike
Gear: AFS std gill net



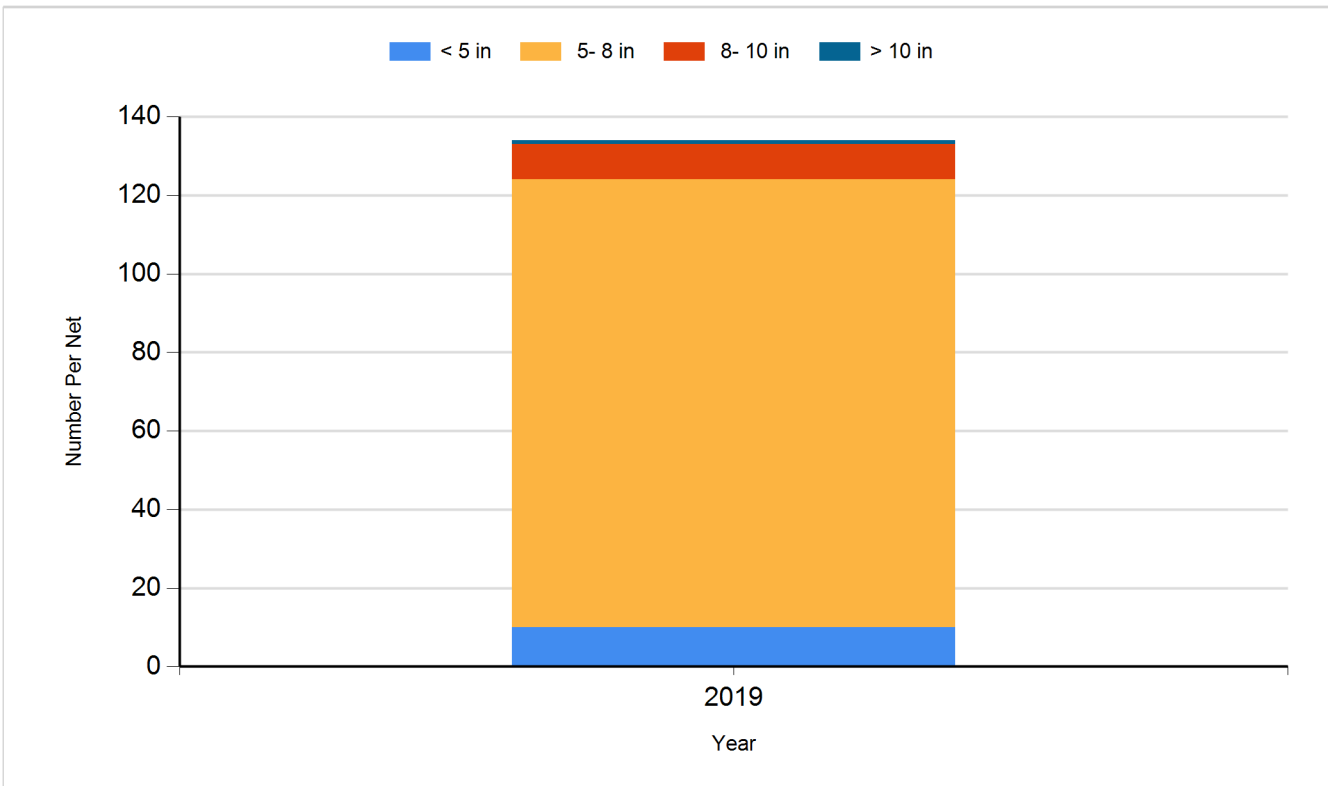
Species: Northern Pike
Gear: std exp gill net



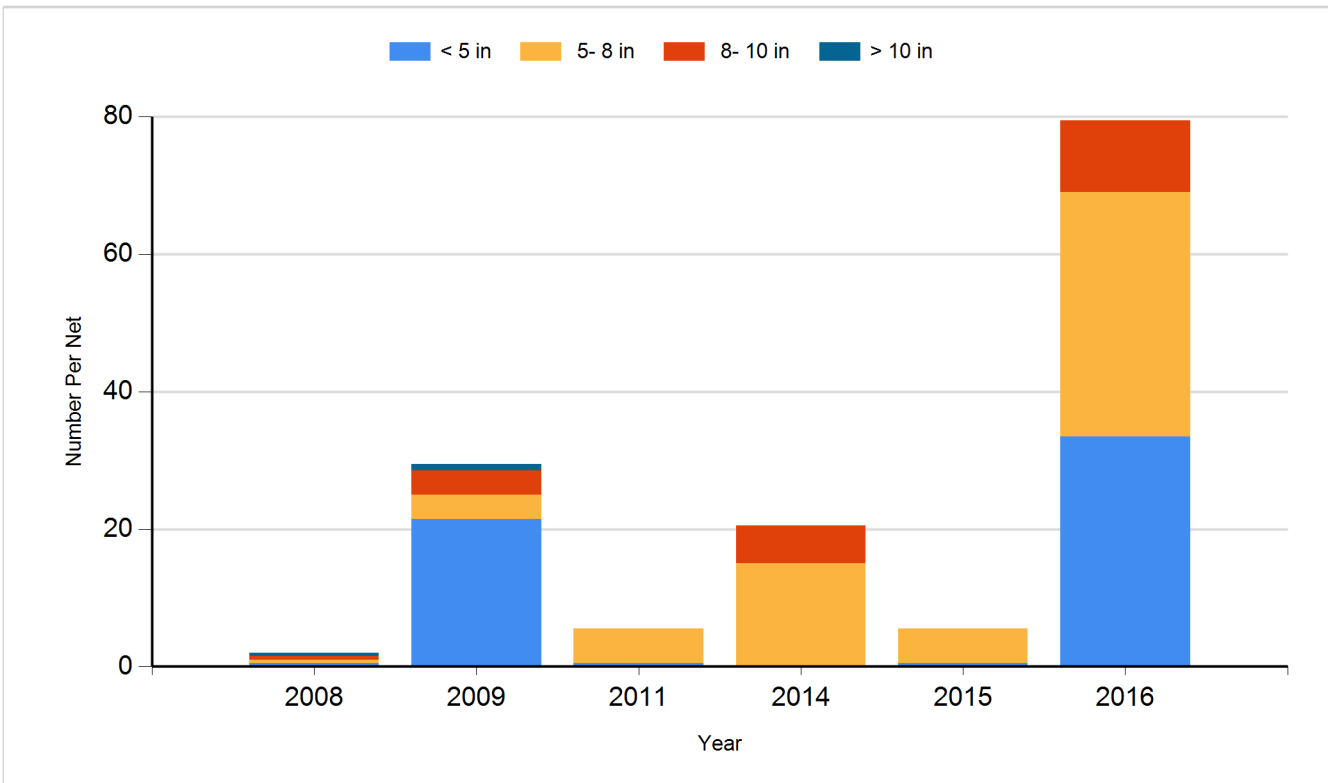
Species: Walleye
Gear: std exp gill net



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.

Year	Species	Size	Number
2009	Largemouth Bass	Fingerling	15,000
2010	Walleye	Small Fingerling	21,400
2011	Largemouth Bass	Fingerling	159
2011	Largemouth Bass	Juvenile	15
2012	Largemouth Bass	Juvenile	160
2012	Walleye	Large Fingerling	1,500
2014	Walleye	Large Fingerling	1,568
2017	Walleye	Large Fingerling	1,760
2018	Black Crappie	Adult	550
2019	Walleye	Small Fingerling	9,185