SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Stockade, Custer County
MCS-Lake-12-000
2019

Lake Information

Name: Stockade

County: Custer

Surface Area: 129 Acres

Surveys and Investigations

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

Gear	Date	Effort
boat shocker (night)	Jun 10, 2019	3600 seconds

Common Fish Species Present

Smallmouth Bass

Northern Pike

Largemouth Bass

Bluegill

Yellow Perch

Walleye

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
boat shocker (night)	Largemouth Bass	147	134.0	35.5	66	6	16	5	105	2
	Smallmouth Bass	31	26.0	14.4	73	14	35	15	90	2
	Walleye*	4	4.0	5.9	0		0		104	4

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.

		CPUE										
Gear	Species	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Avg
AFS std frame net	Black Bullhead								0.0			0.00
	Black Crappie								0.0			0.00
	White Sucker								0.0			0.00
AFS std gill net	Black Bullhead									38.5		38.50
	Bluegill									1.5		1.50
	Channel Catfish									0.3		0.30
	Golden Shiner									0.0		0.00
	Northern Pike									1.8		1.80
	Smallmouth Bass									0.3		0.30
	White Sucker									0.3		0.30
	Yellow Perch									2.5		2.50
boat shocker (night)	Largemouth Bass	67.7	97.6	171.0	36.0	121.0	84.0	68.0	66.9	105.0	134.0	95.12
	Smallmouth Bass	6.1	6.0	20.0	4.0	12.0	0.0	9.0	13.7	7.0	26.0	10.38
	Walleye	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.40
frame net (std 3/4 in)	Black Bullhead	0.3	0.0	1.1	0.3	0.9	471.1			91.4		80.73
	Black Crappie	8.1	0.9	1.6	0.4	1.6	5.3			2.5		2.91
	Bluegill	58.4	2.8	3.1	4.6	3.5	12.8			9.1		13.47
	Bluegill X Gr. Sunfish Hybrid	0.0	0.0	0.0	0.0	0.0	0.1			0.0		0.01
	Golden Shiner	0.0	0.0	0.0	0.0	0.0	0.0			0.0		0.00
	Largemouth Bass	0.0	0.0	0.0	0.0	0.0	0.1			0.0		0.01
	Northern Pike	0.6	0.9	0.3	0.9	1.5	0.6			0.8		0.80
	Smallmouth Bass	0.1	0.0	0.0	0.0	0.0	0.4			0.6		0.16
	White Sucker	0.3	0.4	0.0	0.0	0.3	0.1			0.1		0.17
	Yellow Perch	20.4	35.6	67.9	48.0	197.5	3.0			21.0		56.20
std exp gill net	Black Bullhead	1.0	0.0	0.0	1.0	0.5	41.0	53.5				13.86
	Black Crappie	4.0	3.5	6.5	8.5	10.5	0.5	0.0				4.79
	Bluegill	0.5	0.0	2.5	6.5	2.0	1.5	1.0				2.00
	Golden Shiner	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.00
	Largemouth Bass	0.0	0.0	0.5	0.0	0.0	0.5	1.0				0.29
	Northern Pike	0.5	2.5	0.5	1.0	4.5	5.5	4.5				2.71
	Smallmouth Bass	0.5	0.0	0.0	0.0	0.5	0.0	0.0				0.14
	White Sucker	1.5	0.5	1.0	0.0	1.0	0.5	1.0				0.79
	Yellow Perch	22.0	138.5	160.0	218.5	91.0	61.5	63.5				107.86

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	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AFS std gill net	Bluegill	PSD									100	
		PSD-P									33	
		Wr									109	
	Northern Pike	PSD									86	
		PSD-P									29	
		Wr									95	
	Smallmouth Bass	PSD									100	
		PSD-P									100	
		Wr									77	
	Yellow Perch	PSD									60	
		PSD-P									10	
		Wr									84	
boat shocker (night)	Largemouth Bass	PSD	73	77	76	72	46	46	72	78	65	66
		PSD-P	24	22	12	22	10	18	47	19	11	16
		Wr	98	106	115	111	105	125	75	111	103	105
	Smallmouth Bass	PSD	33	83	70	100	42	0	33	56	71	73
		PSD-P	0	67	30	50	8	0	22	19	14	35
		Wr	100	105	99	64	97		66	100	93	90
	Walleye	PSD										0
		PSD-P										0
		Wr										104
frame net (std 3/4 in)	Bluegill	PSD	93	55	80	86	79	93			44	
		PSD-P	2	5	16	19	21	23			16	
		Wr	115	109	129	122	121	111			103	
	Largemouth Bass	PSD						100				
		PSD-P						0				
		Wr						110				
	Northern Pike	PSD	60	100	50	71	67	40			50	
		PSD-P	40	43	50	57	50	0			17	
		Wr	103	95	96	98	92	81			96	
	Smallmouth Bass	PSD	100					67			80	
		PSD-P	100					33			20	

			Year									
Gear	Species	Index	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
frame net (std 3/4 in)	Smallmouth Bass	Wr						95			90	
	Yellow Perch	PSD	50	52	76	99	97	92			89	
		PSD-P	1	1	3	26	42	42			4	
		Wr	91	95	93	96	89	78			76	
std exp gill net	Bluegill	PSD	100		100	100	100	100	50			
		PSD-P	0		0	62	100	100	50			
		Wr	113		121	113	98	102	123			
	Largemouth Bass	PSD			100			100	100			
		PSD-P			0			0	100			
		Wr			122			131	99			
	Northern Pike	PSD	100	100	0	100	89	64	78			
		PSD-P	100	20	0	0	44	9	0			
		Wr	104	96	98	88	98	90	95			
	Smallmouth Bass	PSD	100				100					
		PSD-P	0				100					
		Wr	96				90					
	Yellow Perch	PSD	48	65	74	76	85	62	60			
		PSD-P	0	2	9	30	21	15	5			
		Wr	98	99	100	95	98	89	90			

Length at Capture

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

Species: Bluegill

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2015	100		140 (2)	178 (42)	192 (45)	210 (13)	215 (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+
2016	71	366 (71)									
2014	116			228 (38)	255 (30)	322 (7)	351 (24)	375 (13)	360 (4)	365 (2)	
2012	164		180 (10)	179 (25)	244 (21)	313 (36)	334 (30)	343 (22)	354 (24)		
2011	67			182 (2)	225 (3)	295 (17)	342 (30)	384 (10)	345 (3)	354 (2)	

Species: Smallmouth Bass

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2016	9	302 (9)									
2014	11			211 (6)	292 (2)		376 (3)				

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	127			187 (39)	206 (52)	220 (20)	237 (3)		245 (4)	234 (2)	250 (5)
2014	181		177 (18)	210 (73)	243 (3)	236 (5)	243 (27)	245 (24)	241 (35)		
2013	437		193 (134)	228 (25)	230 (29)	242 (68)	247 (102)	243 (17)	254 (55)	265 (8)	
2012	292	142 (29)	185 (24)	204 (23)	234 (11)	227 (103)	239 (55)	233 (49)			
2011	277		158 (9)	186 (25)	205 (111)	217 (49)	217 (84)				
2010	43			155 (6)	180 (10)	207 (21)	211 (8)				

Fish Condition

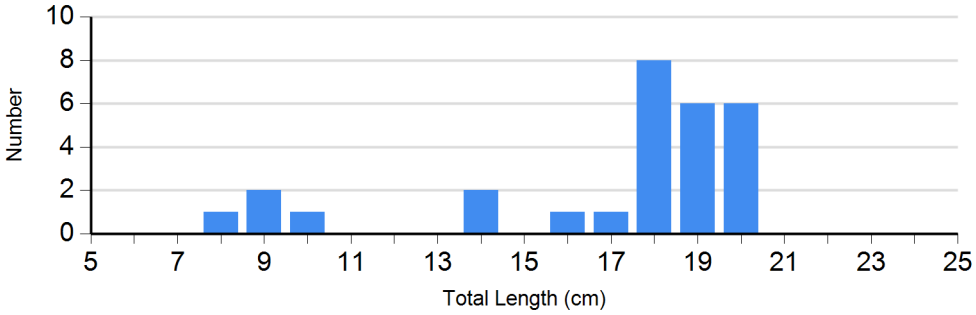
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Bluegill Frame Net	2015	7	170 (60.2)	72	109 (1.8)	23	102 (1.2)	0	
	2018	41	106 (1.3)	20	102 (1.0)	12	95 (2.0)	0	
Largemouth Bass Electro Fishing	2015	15	142 (39.8)	8	107 (2.7)	5	103 (5.5)	0	
	2016	19	106 (2.3)	17	84 (7.2)	26	53 (3.6)	6	52 (1.4)
	2017	17	110 (3.3)	46	114 (6.2)	15	105 (4.8)	0	
	2018	37	105 (1.7)	56	101 (1.1)	12	112 (3.4)	0	
	2019	46	104 (1.4)	67	104 (2.7)	21	110 (3.4)	0	
Northern Pike Gill Net	2015	4	88 (2.5)	6	90 (3.6)	1	94	0	
	2016	2	95 (0.0)	7	94 (3.6)	0		0	
	2018	1	95	4	93 (1.4)	2	99 (9.0)	0	
Smallmouth Bass Electro Fishing	2015	0		0		0		0	
	2016	6	82 (8.3)	1	38	1	14	1	
	2017	7	102 (2.8)	6	100 (4.0)	1	88	2	94 (0.2)
	2018	2	99 (0.8)	4	94 (2.9)	1	79	0	
	2019	7	89 (2.7)	10	88 (2.6)	8	93 (3.9)	1	84
Yellow Perch Gill Net	2015	47	91 (0.8)	57	88 (0.9)	19	86 (1.4)	0	
	2016	51	96 (0.8)	70	86 (0.9)	6	77 (3.6)	0	
	2018	4	94 (1.4)	5	79 (2.7)	1	76	0	

Length Frequency Distribution

Length frequency histogram of species sampled by year.

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



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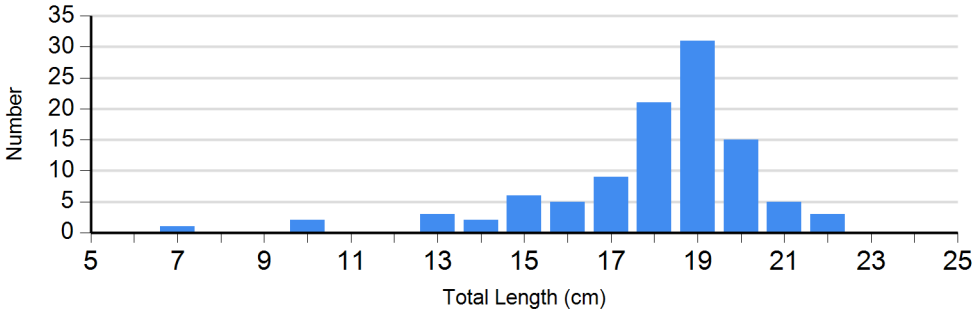

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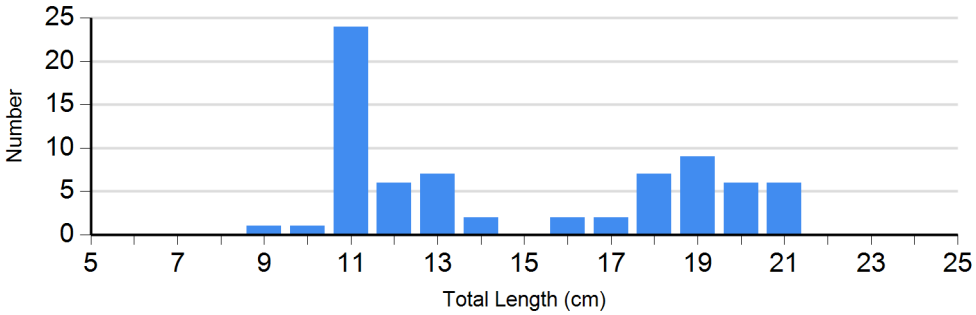
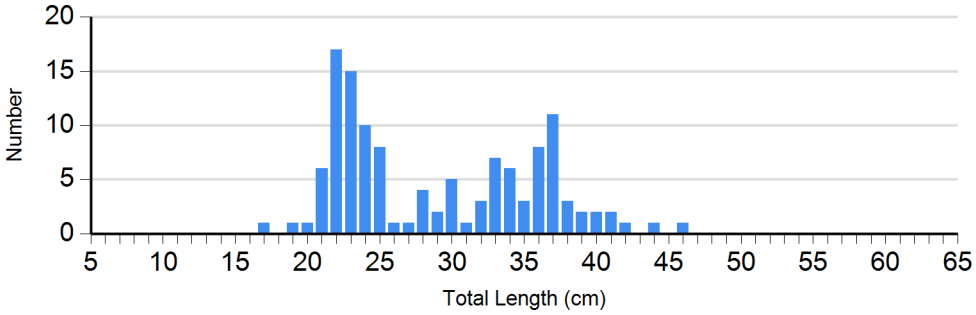


2018

Species: Largemouth Bass
Gear: boat shocker (night)



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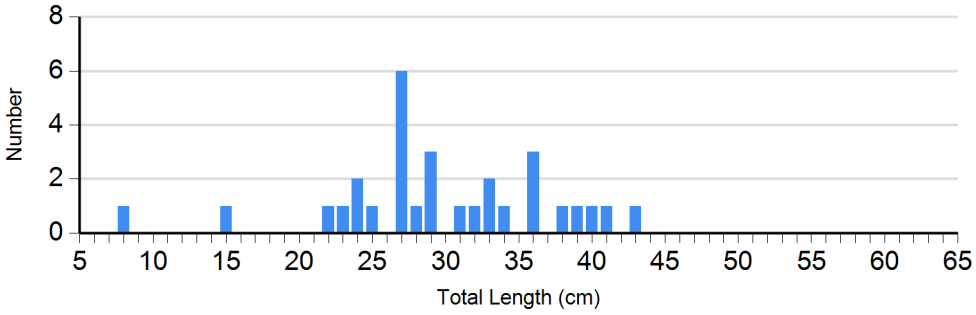

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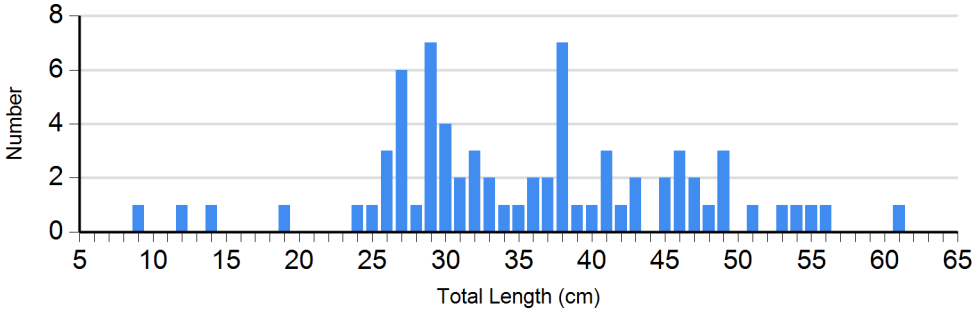

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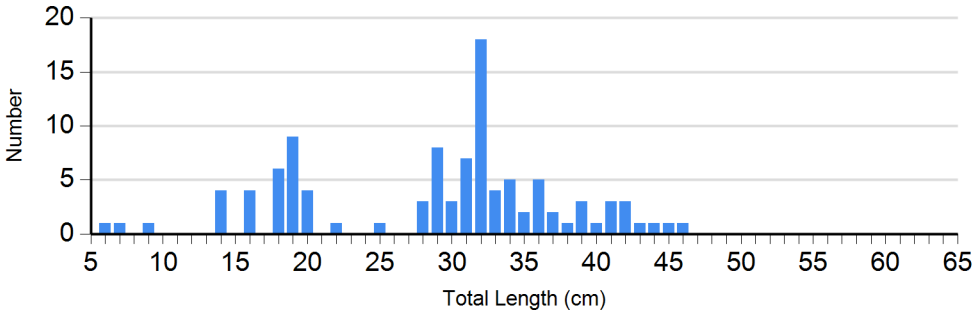

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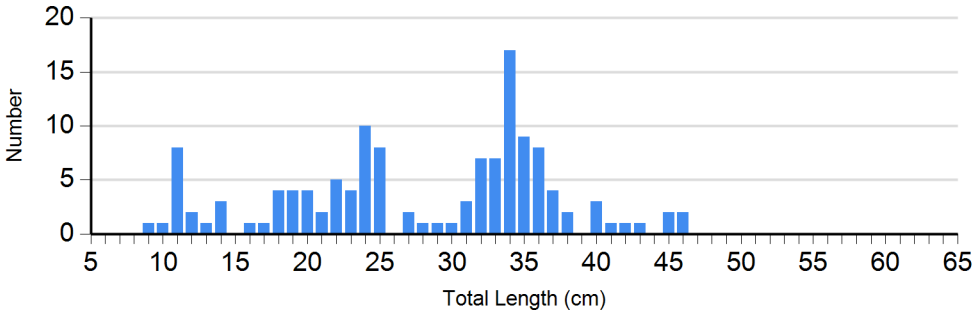

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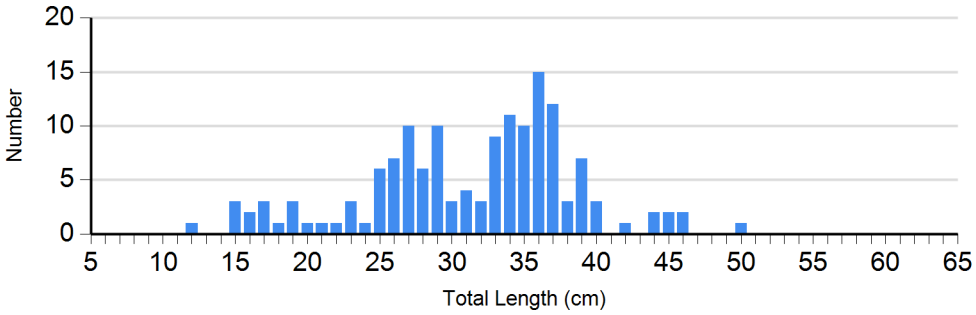
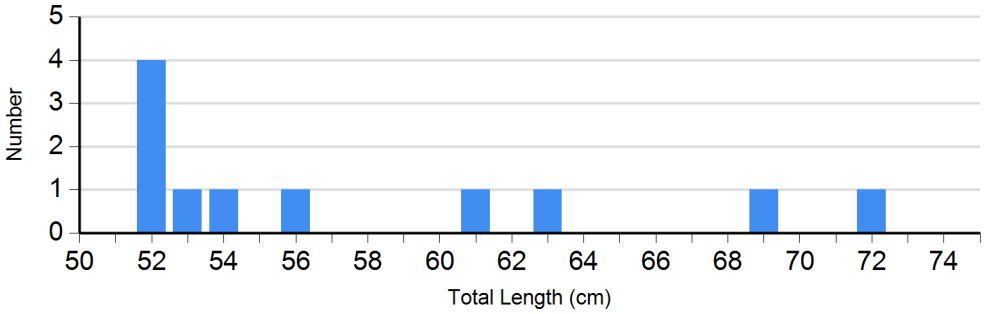


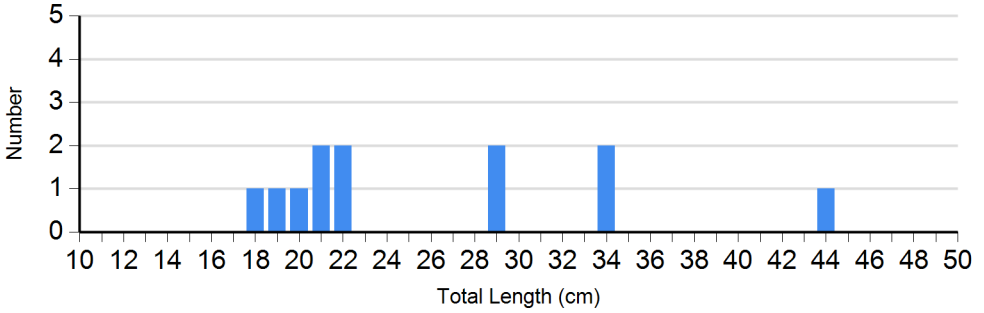
2019

Species: Northern Pike
Gear: std exp gill net



2015

Species: Smallmouth Bass
Gear: boat shocker (night)



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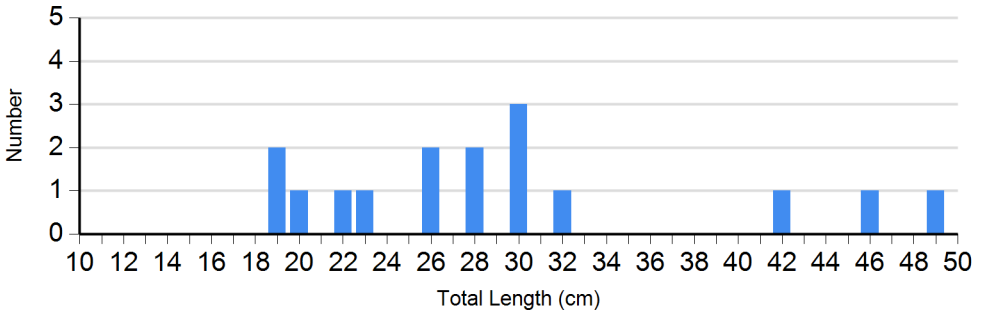

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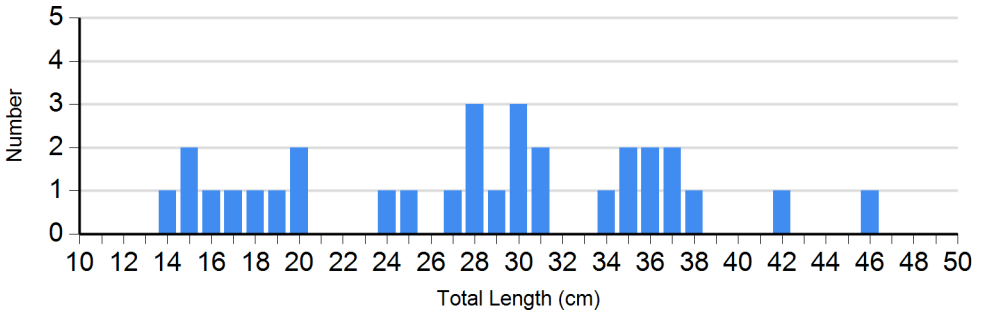
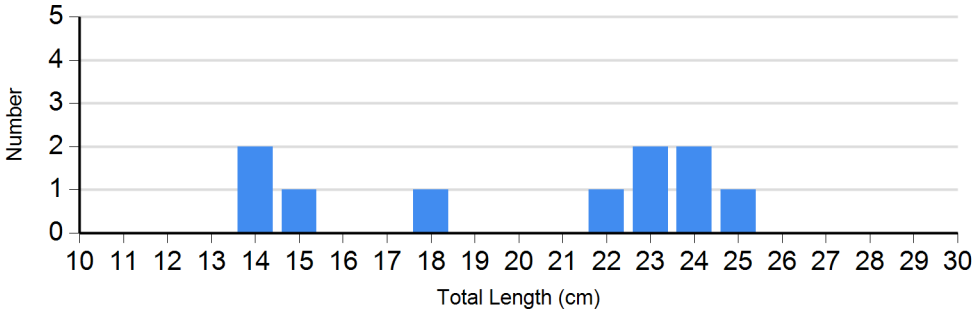


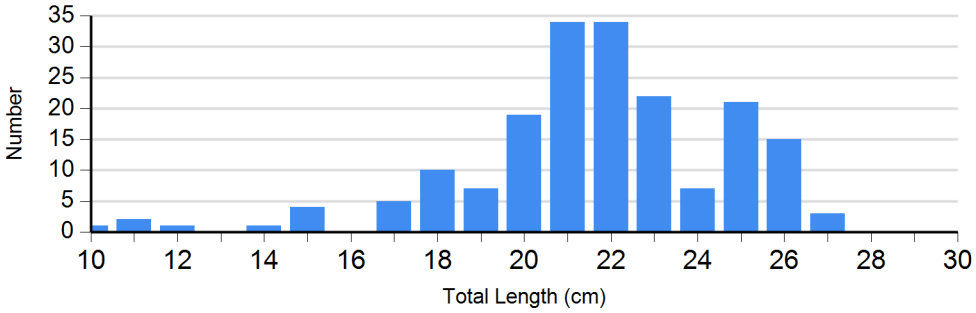
2019

Species: Yellow Perch
Gear: AFS std gill net



2018

Species: Yellow Perch
Gear: std exp gill net



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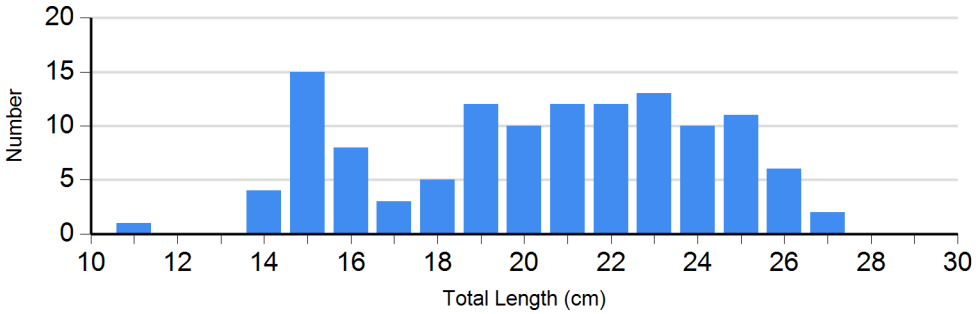

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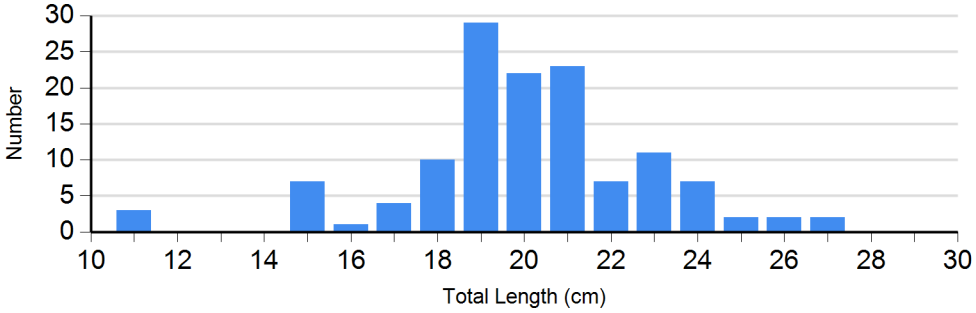
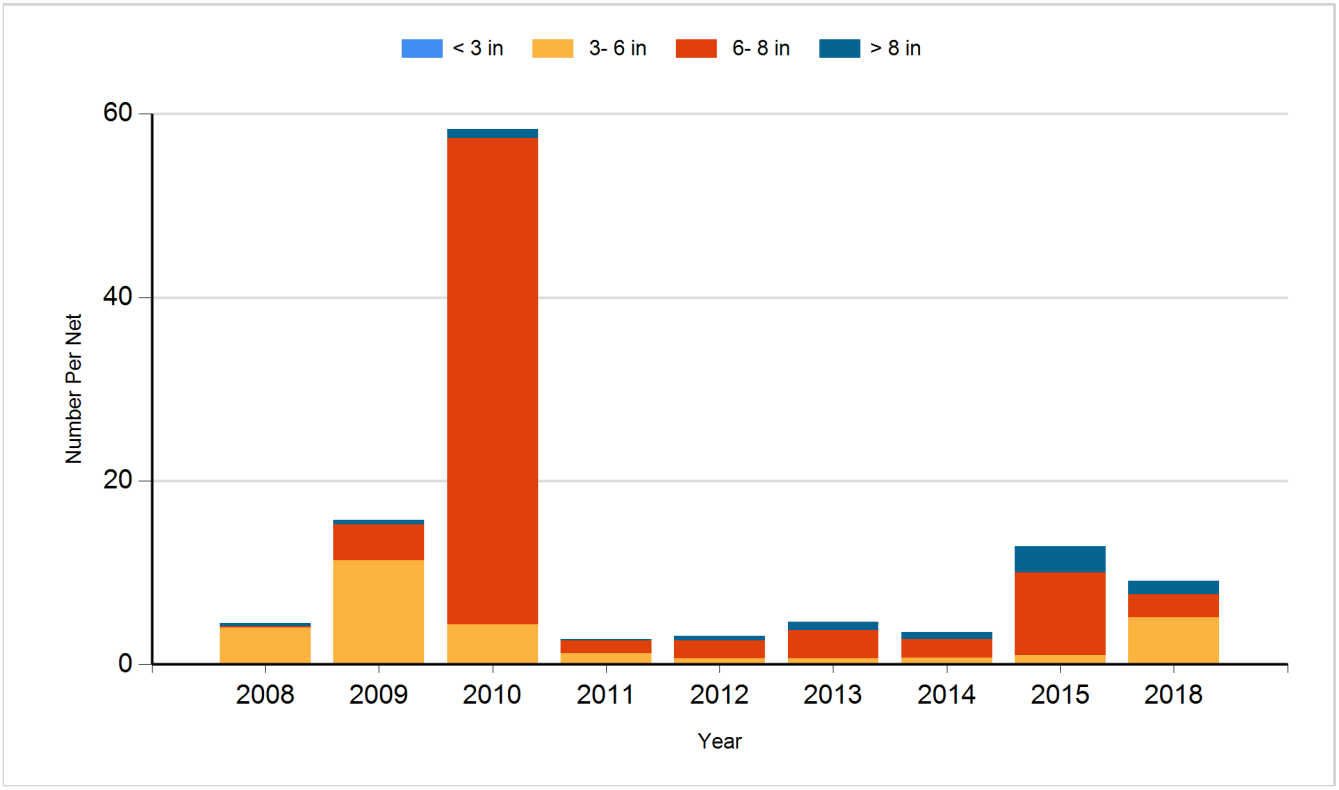


2016

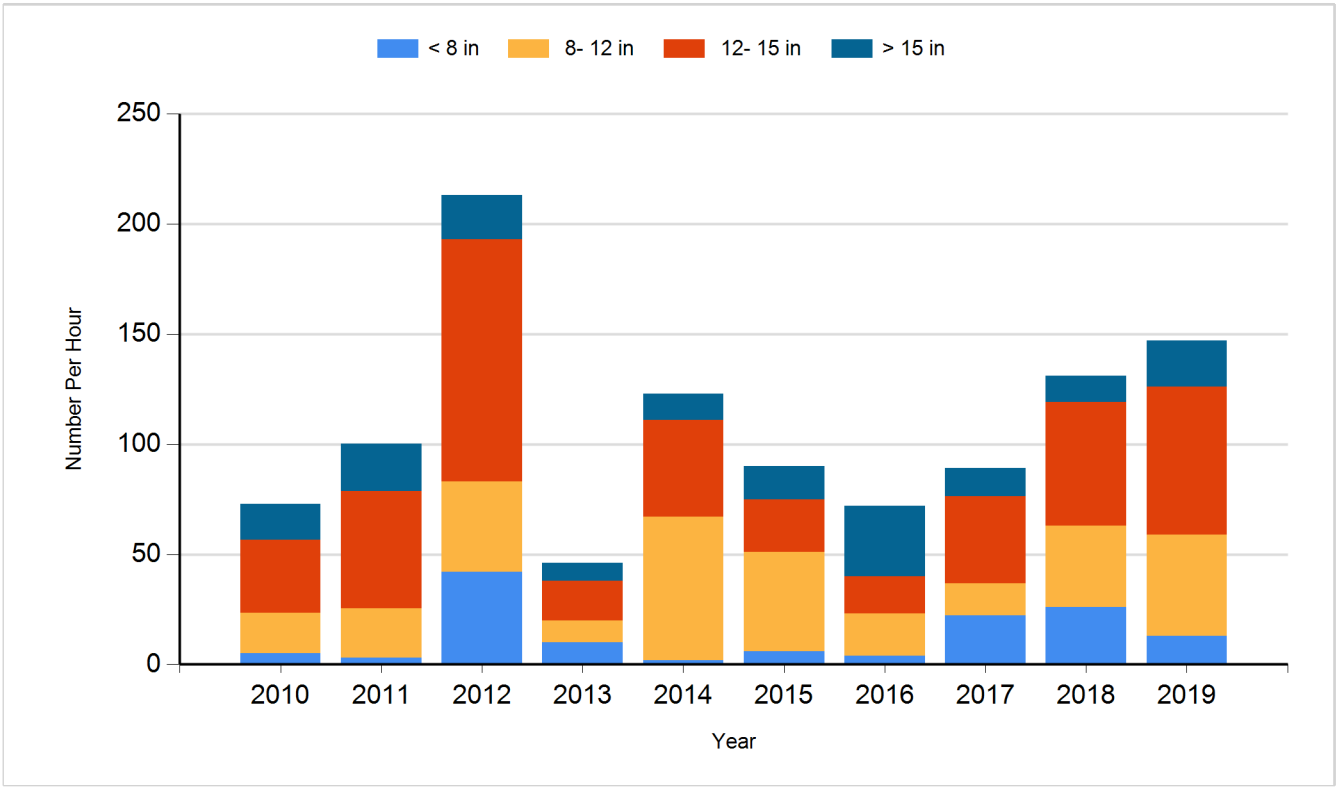
Historic Fish Sizes and Relative Abundance

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

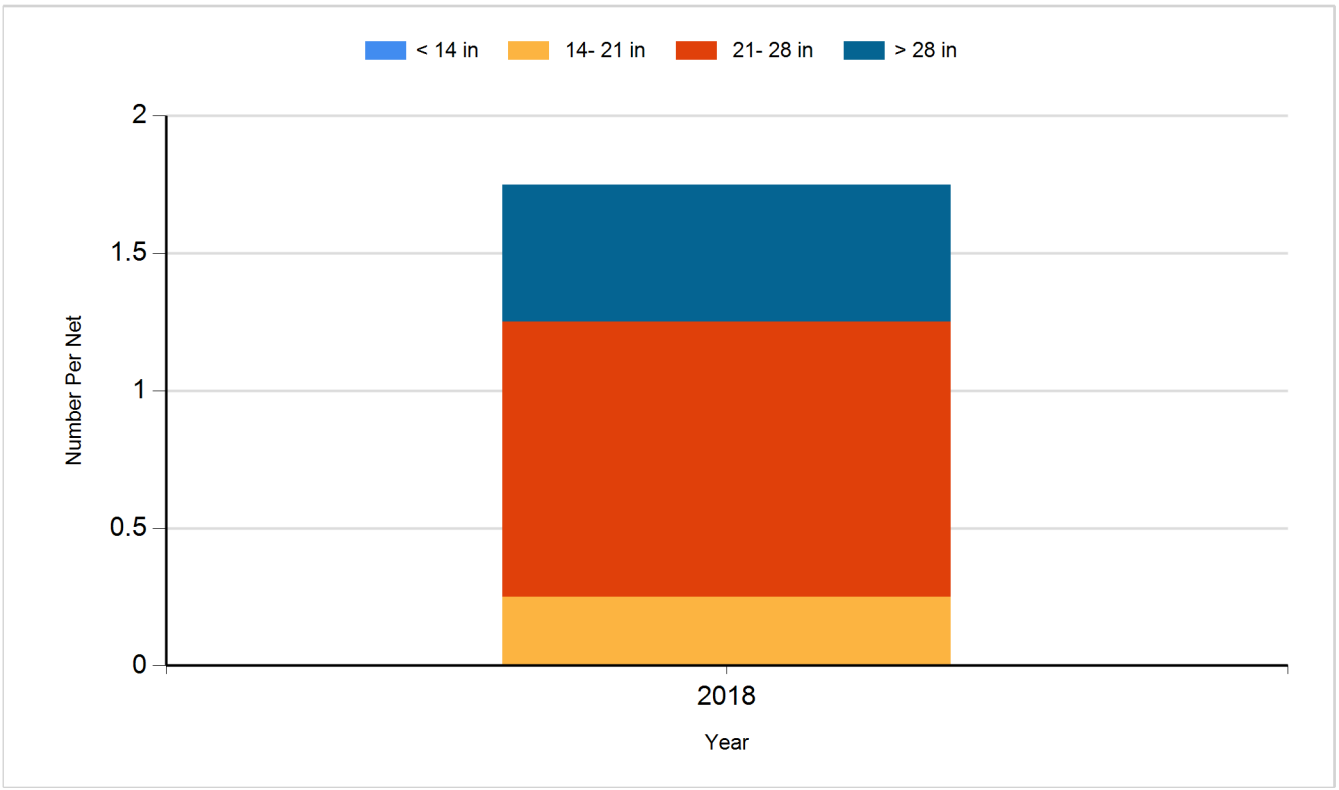
Species: Bluegill
Gear: frame net (std 3/4 in)



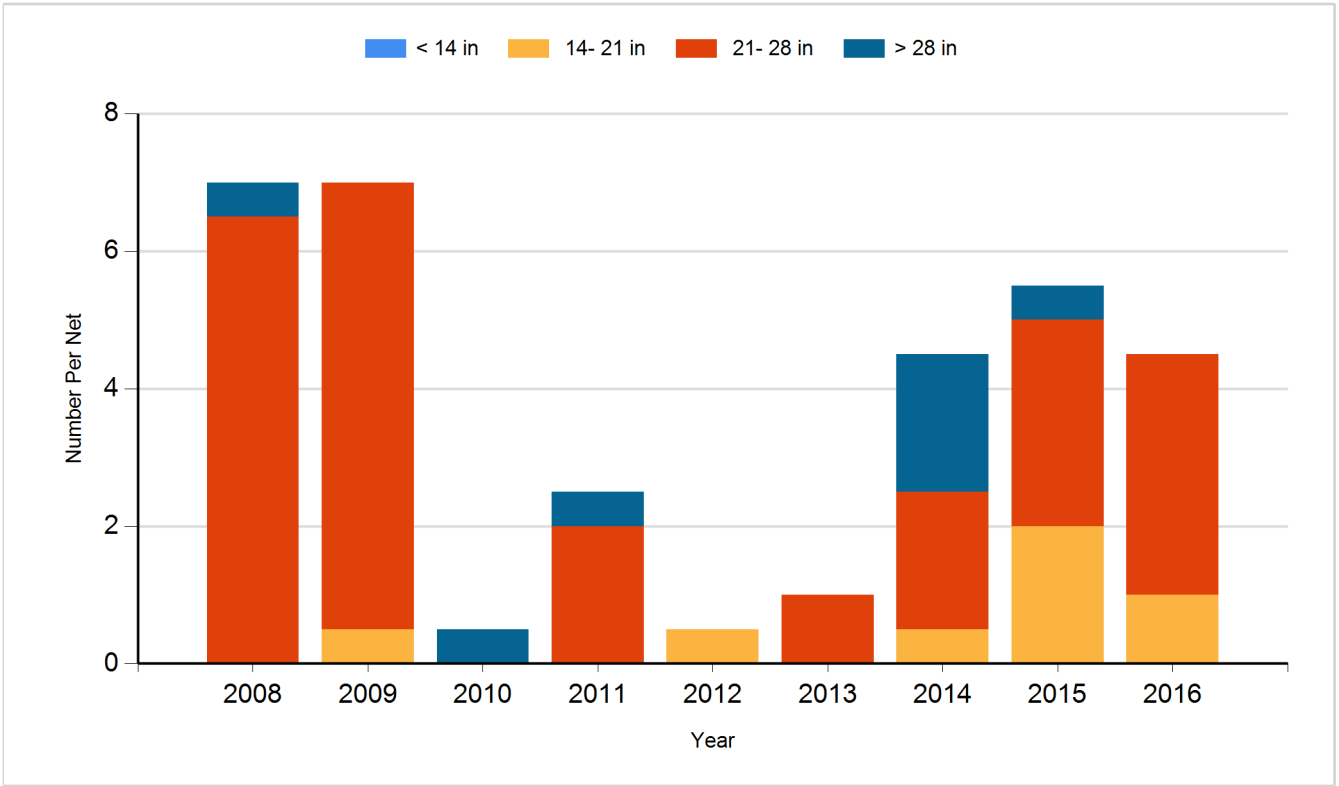
Species: Largemouth Bass
Gear: boat shocker (night)



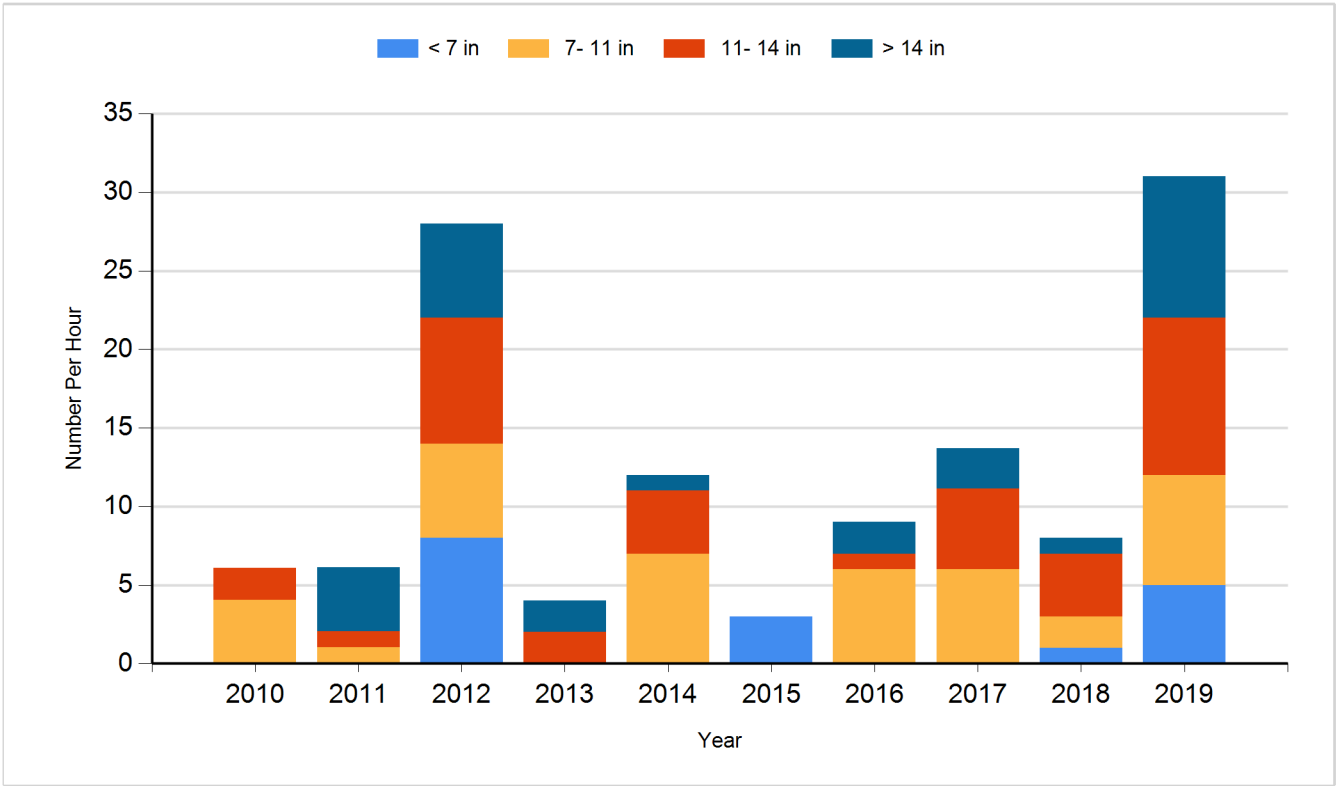
Species: Northern Pike
Gear: AFS std gill net



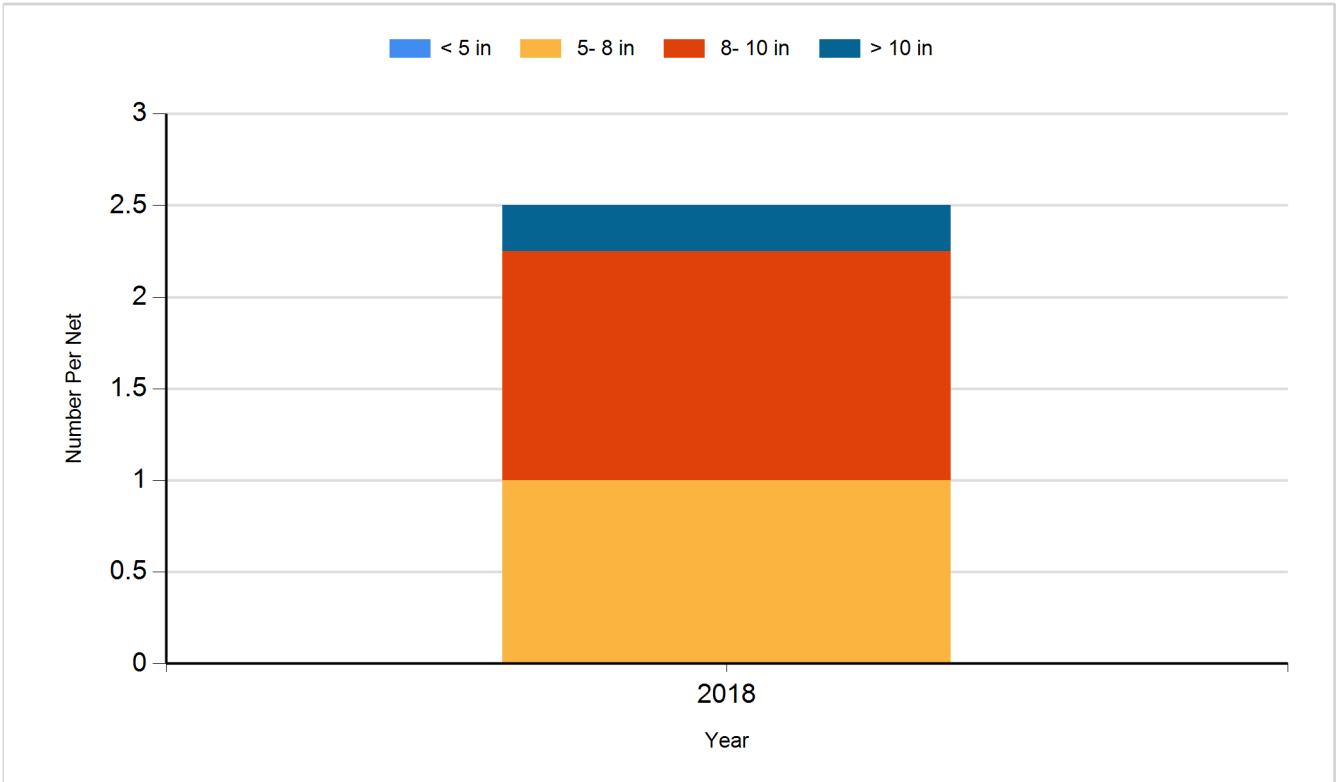
Species: Northern Pike
Gear: std exp gill net



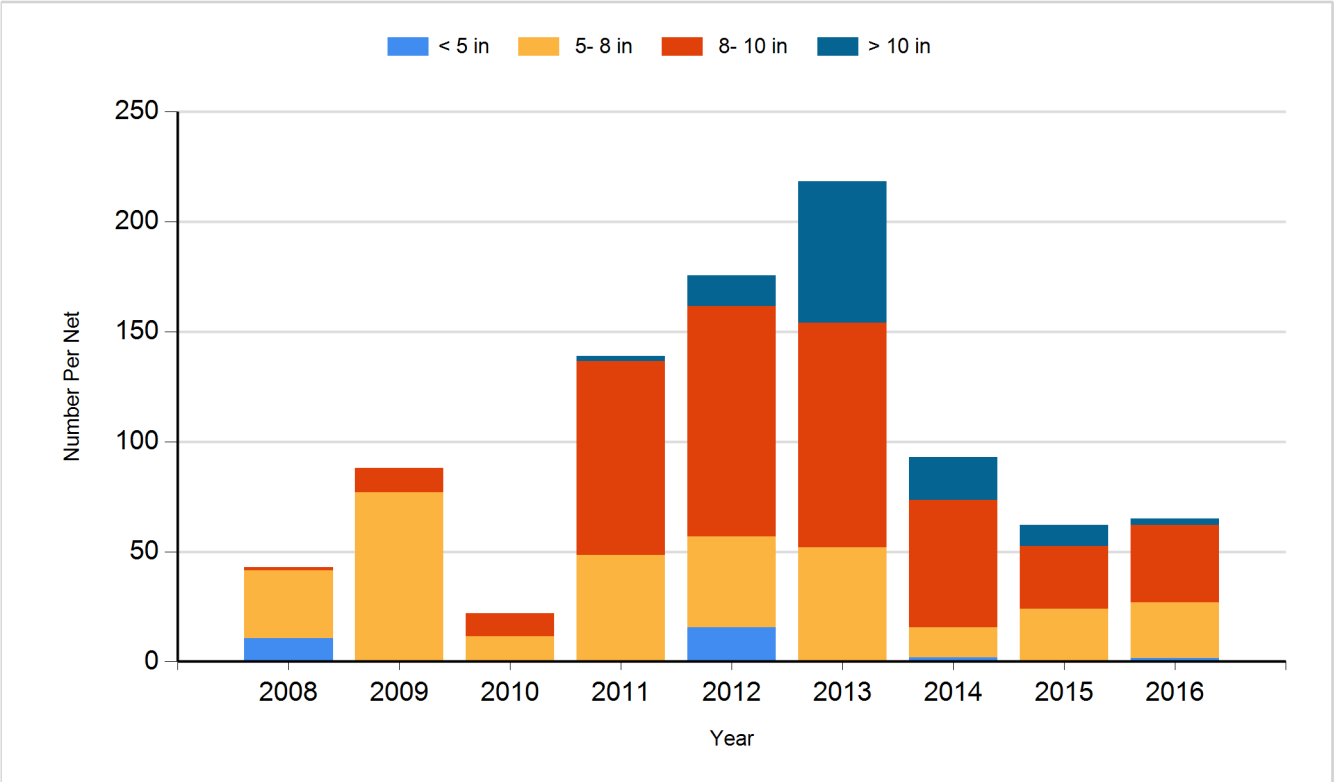
Species: Smallmouth Bass
Gear: boat shocker (night)



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	Rainbow Trout (McConaugRainbow Trout	Fingerling	1,500
2013	Smallmouth Bass	Fingerling	4,770
2016	Smallmouth Bass	Juvenile	300
2017	Walleye	Large Fingerling	9,500
2019	Walleye	Small Fingerling	12,240