SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

Fate, Lyman County

MED-Lake-638-000

2016

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
boat shocker (night)	September 21, 2016	3600 seconds
frame net (std 3/4 in)	June 28, 2016	5 net-nights
frame net (std 3/4 in)	June 29, 2016	5 net-nights
std exp gill net	June 28, 2016	1 net-nights
std exp gill net	June 29, 2016	1 net-nights

Common Fish Species Present

Walleye

Largemouth Bass

Black Crappie

Black Bullhead

Yellow Perch

Bluegill

Northern Pike

Green Sunfish

Golden Shiner

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).

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

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)
Bigmouth Buffalo	11	28	18	46	24	61	30	76	37	94
Black Bullhead	6	15	9	23	12	30	15	38	18	46
Black Crappie	5	13	8	20	10	25	12	30	15	38

	Stock		Quality		Preferred		Memorable		Trophy	
Species Name	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)
Blue Catfish	12	30	20	51	30	76	35	89	45	114
Bluegill	3	8	6	15	8	20	10	25	12	30
Bluegill X Gr. Sunfish Hybrid	3	8	6	15	8	20	10	25	12	30
Brown Bullhead	5	13	8	20	11	28	14	36	17	43
Burbot	8	20	15	38	21	53	26	67	32	82
Channel Catfish	11	28	16	41	24	61	28	71	36	91
Common Carp	11	28	16	41	21	53	26	66	33	84
Flathead Catfish	14	35	20	51	28	71	34	86	40	102
Freshwater Drum	8	20	12	30	15	38	20	51	25	63
Gizzard Shad	7	18	11	28						
Green Sunfish	3	8	6	15	8	20	10	25	12	30
Lake Herring	5	13	8	20	11	28	14	35	17	43
Largemouth Bass	8	20	12	30	15	38	20	51	25	63
Longnose Gar	16	41	27	69	36	91	45	114	55	140
Muskellunge	20	51	30	76	38	97	42	107	50	127
Northern Pike	14	35	21	53	28	71	34	86	44	112
Paddlefish	16	41	26	66	33	84	41	104	51	130
Pumpkinseed	3	8	6	15	8	20	10	25	12	30
Redear Sunfish	4	10	7	18	9	23	11	28	13	33
River Carpsucker	7	18	11	28	14	36	18	46	22	56
Rock Bass	4	10	7	18	9	23	11	28	13	33
Rudd	6	15	10	25	12	30	15	38	19	48
Sauger	8	20	12	30	15	38	20	51	25	63
Saugeye	9	23	14	35	18	46	22	56	27	69
Shorthead Redhorse	6	15	10	25	13	33	16	41	20	51
Smallmouth Bass	7	18	11	28	14	35	17	43	20	51
Smallmouth Buffalo	11	28	18	46	24	61	30	76	37	94
Spotted Bass	7	18	11	28	14	35	17	43	20	51
Striped Bass	12	30	20	51	30	76	35	89	45	114
Striped Bass Hybrid (wiper)	8	20	12	30	15	38	20	51	25	63
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
White Perch	5	13	8	20	10	25	12	30	15	38
White Sucker	6	15	10	25	13	33	16	41	20	51
Yellow Bass	4	10	7	18	9	23	11	28	13	33
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).

		Abundance		Stock Density Indices				Condition	
Gear	Species	CPUE	CI-80	PSD	CI-80	PSD-P	CI-80	Wr	CI-80
boat shocker (night)	Largemouth Bass	68.0	28.7	69	8	6		121	1
	Walleye	6.0	5.6	25		0		88	3
frame net (std 3/4 in)	Black Bullhead	13.4	10.8	40	6	13	4	91	2
	Black Crappie	0.7	0.7	57		0		106	8
	Bluegill	9.5	5.2	61	7	13	5	118	4
	Golden Shiner	0.0	0.0						
	Green Sunfish	0.1	0.1	0		0		121	
	Largemouth Bass	0.1	0.1	100		0		104	
	Northern Pike	0.2	0.3	100		100		90	11
	Yellow Perch	4.5	2.8	56	11	0		100	3
std exp gill net	Black Bullhead	195.5	23.1	40	3	0		94	1
	Black Crappie	0.0	0.0	0		0			
	Bluegill	0.5	1.5	0		0		120	
	Northern Pike	0.5	1.5	100		100		80	
	Walleye	6.0	3.1	58	24	8		85	1
	Yellow Perch	46.0	58.5	23	6	0		97	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.

		CPUE										
Gear	Species	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Avg
boat shocker (night)	Largemouth Bass			3.0			43.0		22.0		68.0	34.0
	Walleye								7.0		6.0	6.5
frame net (std 3/4 in)	Black Bullhead		1.5	3.3		10.0			7.5	10.0	13.4	7.6
	Black Crappie		4.6	1.9		3.0			7.9	10.2	0.7	4.7
	Bluegill		0.1	0.2		1.8			0.7	8.2	9.5	3.4
	Golden Shiner									0.0	0.0	0.0
	Green Sunfish										0.1	0.1
	Largemouth Bass		0.1	0.2					0.5	0.3	0.1	0.2
	Northern Pike		0.5	1.2		2.6			0.9	0.5	0.2	1.0
	Walleye		0.1						0.4	0.5		0.3
	Yellow Perch			0.5		1.4			10.0	7.2	4.5	4.7
std exp gill net	Black Bullhead					35.0			28.5	49.5	195.5	77.1
	Black Crappie			0.0					9.5	6.5	0.0	4.0
	Bluegill										0.5	0.5
	Golden Shiner					0.0				0.0		0.0
	Largemouth Bass									0.5		0.5
	Northern Pike		9.0	1.0		17.5				0.5	0.5	5.7
	Walleye		7.0	0.5					3.5	5.5	6.0	4.5
	Yellow Perch		1.5	8.0		5.0			20.5	5.0	46.0	14.3

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	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
boat shocker (night)	Walleye	PSD								100		25
		PSD-P								0		0
		Wr								91		88
frame net (std 3/4 in)	Black Crappie	PSD		100	100		73			48	32	57
		PSD-P		97	84		17			38	31	0
		Wr		90	94		101			116	97	106
	Northern Pike	PSD		75	17		77			100	100	100
		PSD-P		0	0		31			44	60	100
		Wr		71	77		81			82	85	90
	Walleye	PSD		100						25	60	
		PSD-P		0						0	0	
		Wr		85						90	73	
	Yellow Perch	PSD			80		29			59	29	56
		PSD-P			60		0			7	0	0
		Wr			99		103			97	96	100
std exp gill net	Black Crappie	PSD			0					74	54	0
		PSD-P			0					68	15	0
		Wr								104	101	
	Northern Pike	PSD		78	100		60				100	100
		PSD-P		6	0		3				0	100
		Wr		84	86		84				89	80
	Walleye	PSD		93	100					14	73	58
		PSD-P		0	0					0	0	8
		Wr		98	85					94	79	85
	Yellow Perch	PSD		67	56		0			27	0	23
		PSD-P		33	13		0			0	0	0
		Wr		98	92		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
2015	1	5	86 (3)									
2014	2	2	81 (4.1)	149 (9.2)								
2013	3	5	88 (5.5)	162 (3.9)	198 (6.5)							
Weighted Mean		12	86	158	198							
Year Class	Age	N	11	12	13	14	15	16	17	18	19	20
2015	1	5										
2014	2	2										
2013	3	5										
Weighted Mean		12										

Species: Walleye

Year Class	Age	N	Mean back-calculated length (SE) at age									
			1	2	3	4	5	6	7	8	9	10
2016	0	2										
2015	1	3	237 (11.1)									
2014	2	1	225	309								
Weighted Mean		6	234	309								

Year Class	Age	N	11	12	13	14	15	16	17	18	19	20
2016	0	2										
2015	1	3										
2014	2	1										
Weighted Mean		6										

Species: Yellow Perch

Year Class	Age	N	Mean back-calculated length (SE) at age									
			1	2	3	4	5	6	7	8	9	10
2015	1	3	87 (8.9)									
2015	1	152	88 (.6)									
2014	2	6	89 (3.5)	146 (5.3)								
2014	2	88	88 (.6)	143 (1.1)								
2013	3	18	95 (2)	160 (3)	196 (3)							
2013	3	24	98 (.7)	158 (2)	190 (2.7)							
Weighted Mean		291	89	148	193							

Year Class	Age	N	11	12	13	14	15	16	17	18	19	20
2015	1	3										
2015	1	152										
2014	2	6										
2014	2	88										
2013	3	18										
2013	3	24										
Weighted Mean		291										

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+
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)			
2009	19				279 (9)		302 (2)	325 (3)	326 (4)	334 (1)	
2008	36				251 (2)	285 (2)		270 (1)	312 (9)	328 (4)	327 (19)

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)							
2008	14		368 (2)	432 (4)	445 (5)	462 (2)	500 (1)				

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)							
2009	59	110 (43)	205 (15)	257 (1)							

Fish Condition

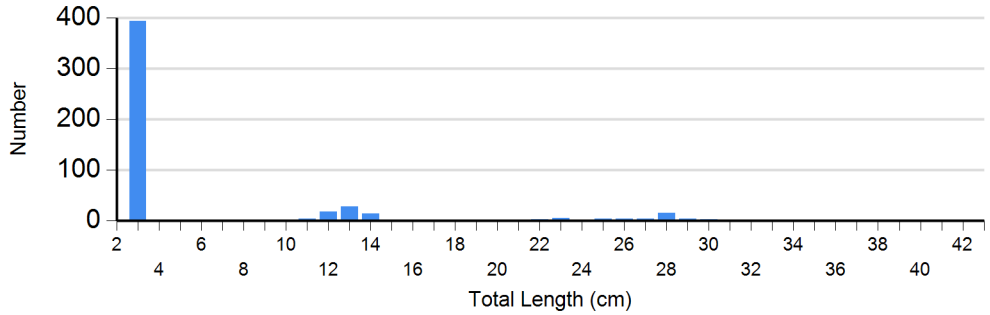
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Black Crappie Frame Net	2014	41	129 (1.7)	8	121 (13.0)	28	99 (1.2)	2	92 (0.5)
	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	
Northern Pike Gill Net	2015	0		1	89	0		0	
	2016	0		0		1	80	0	
Walleye Gill Net	2014	6	94 (0.8)	1	95	0		0	
	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	2014	30	102 (1.2)	11	101 (1.1)	0		0	
	2015	10	111 (20.2)	0		0		0	
	2016	71	98 (1.0)	21	92 (1.6)	0		0	

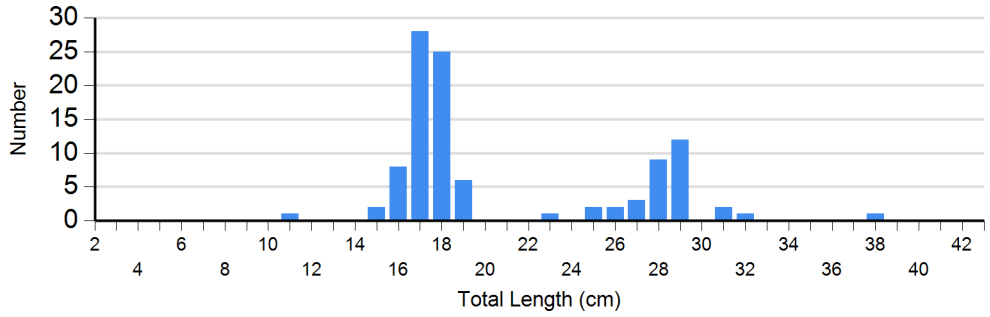
Length Frequency Distribution

Length frequency histogram of species sampled by year.

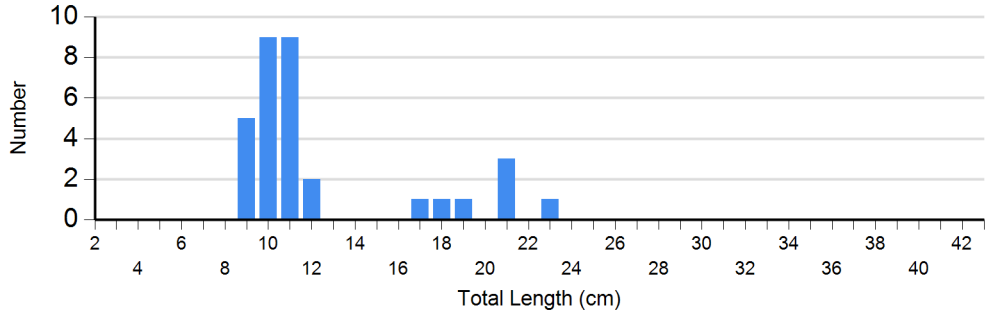
Species: Black Crappie
Gear: frame net (std 3/4 in)



2014

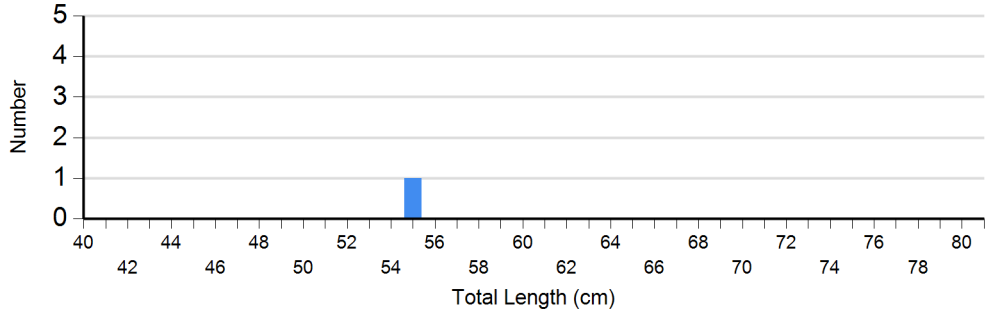


2015

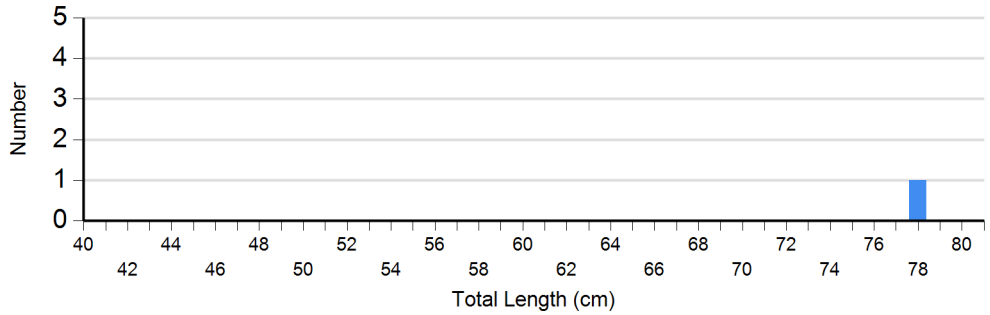


2016

Species: Northern Pike
Gear: std exp gill net

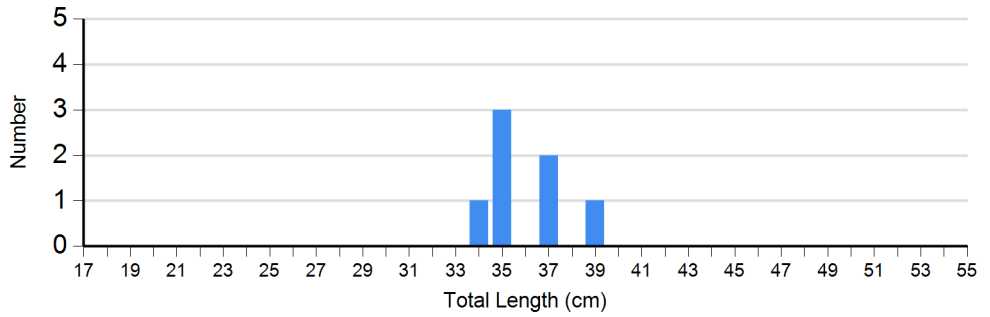


2015

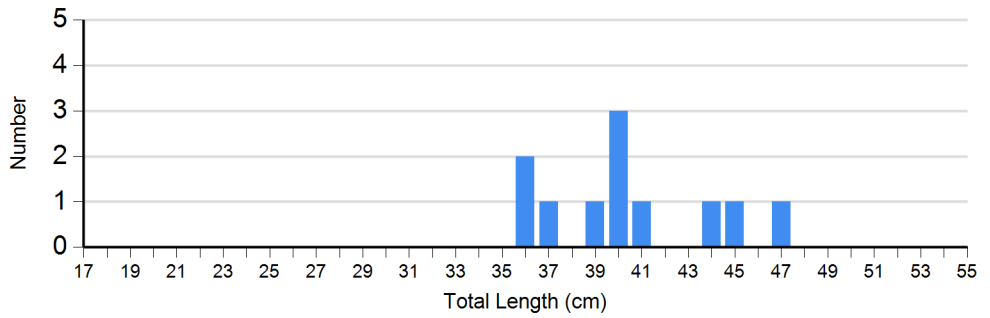


2016

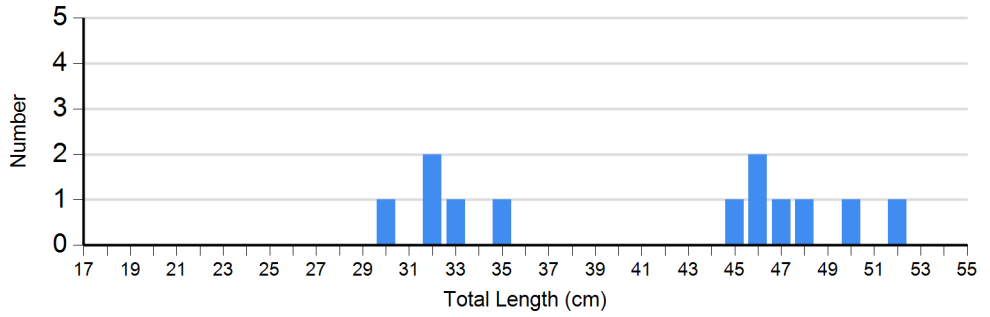
Species: Walleye
Gear: std exp gill net



2014

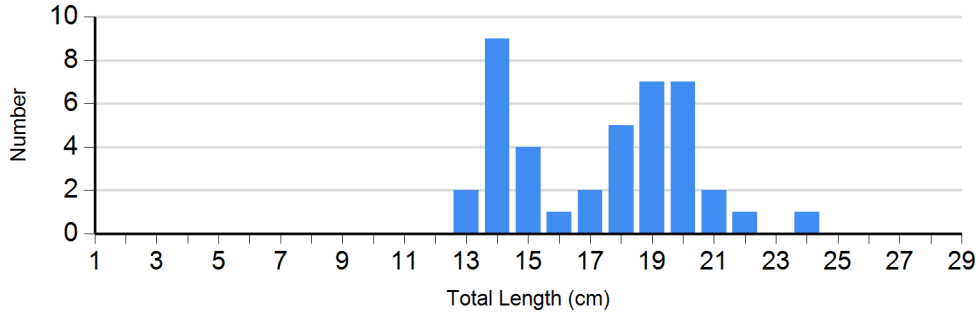


2015

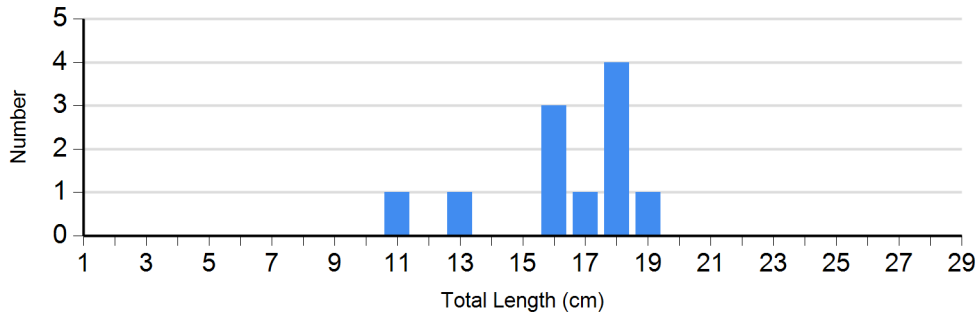


2016

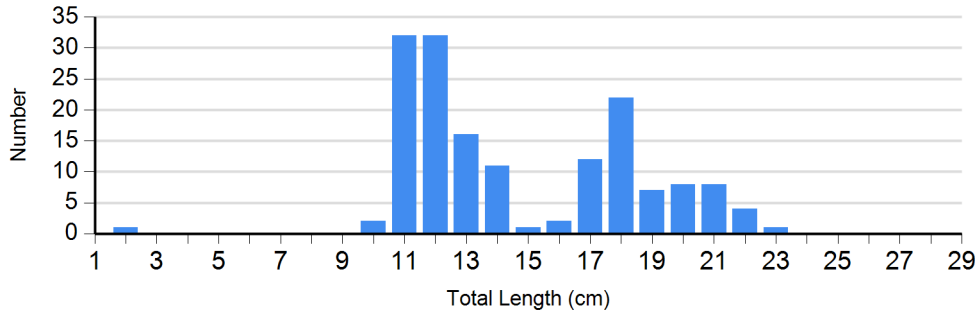
Species: Yellow Perch
Gear: std exp gill net



2014



2015

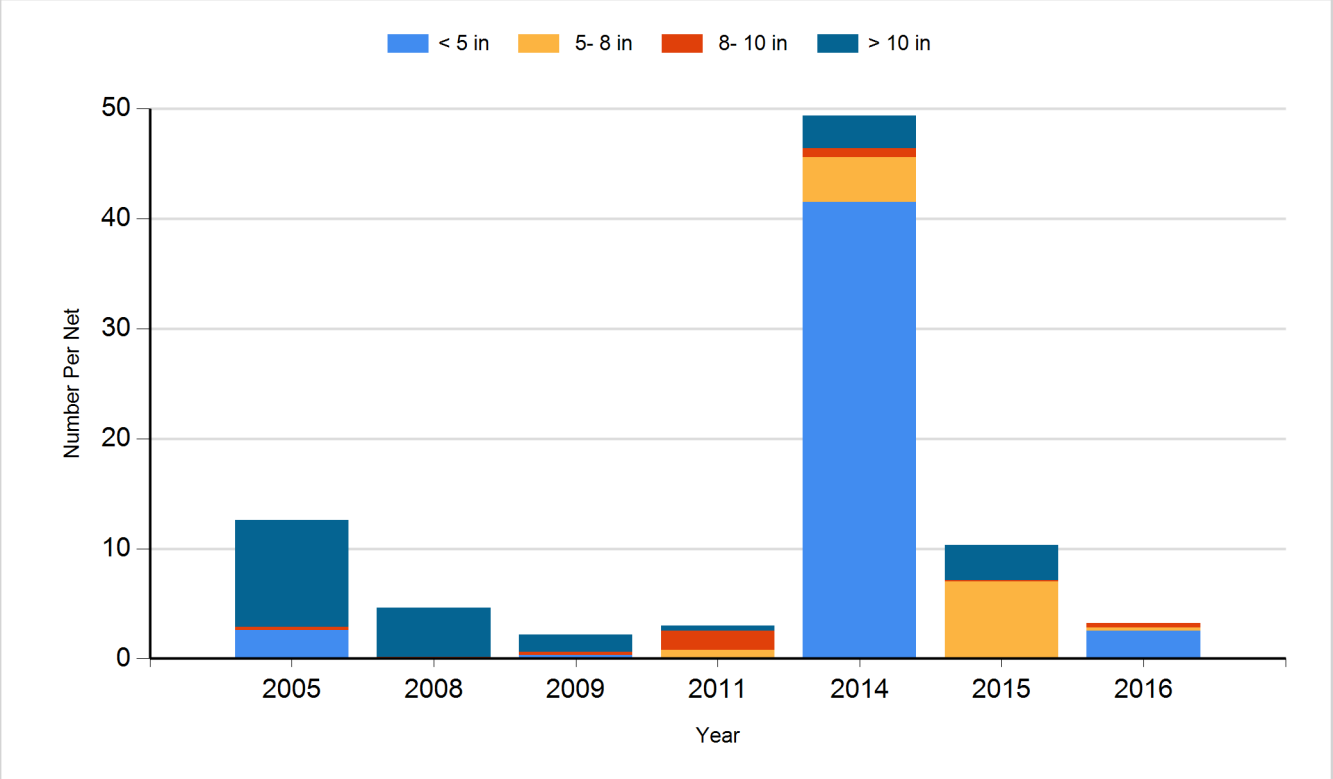


2016

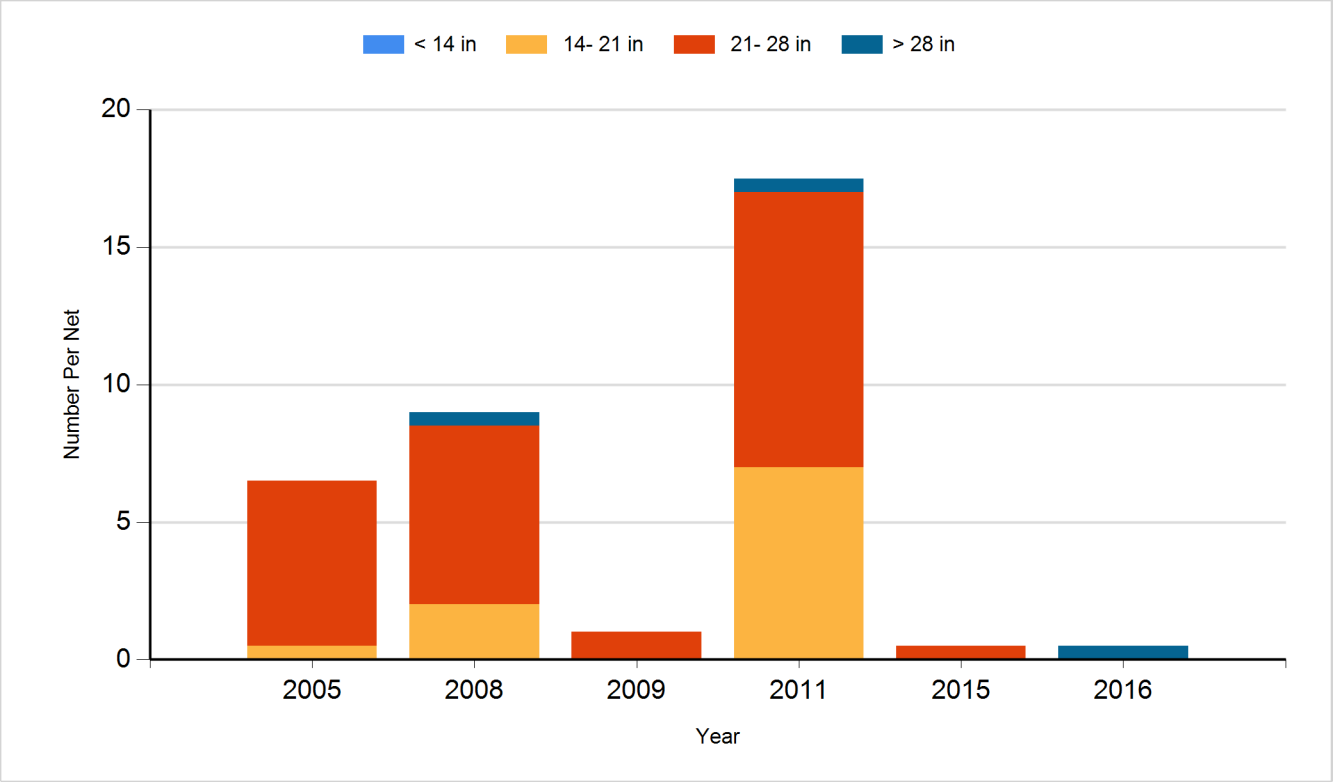
Historic Fish Sizes and Relative Abundance

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

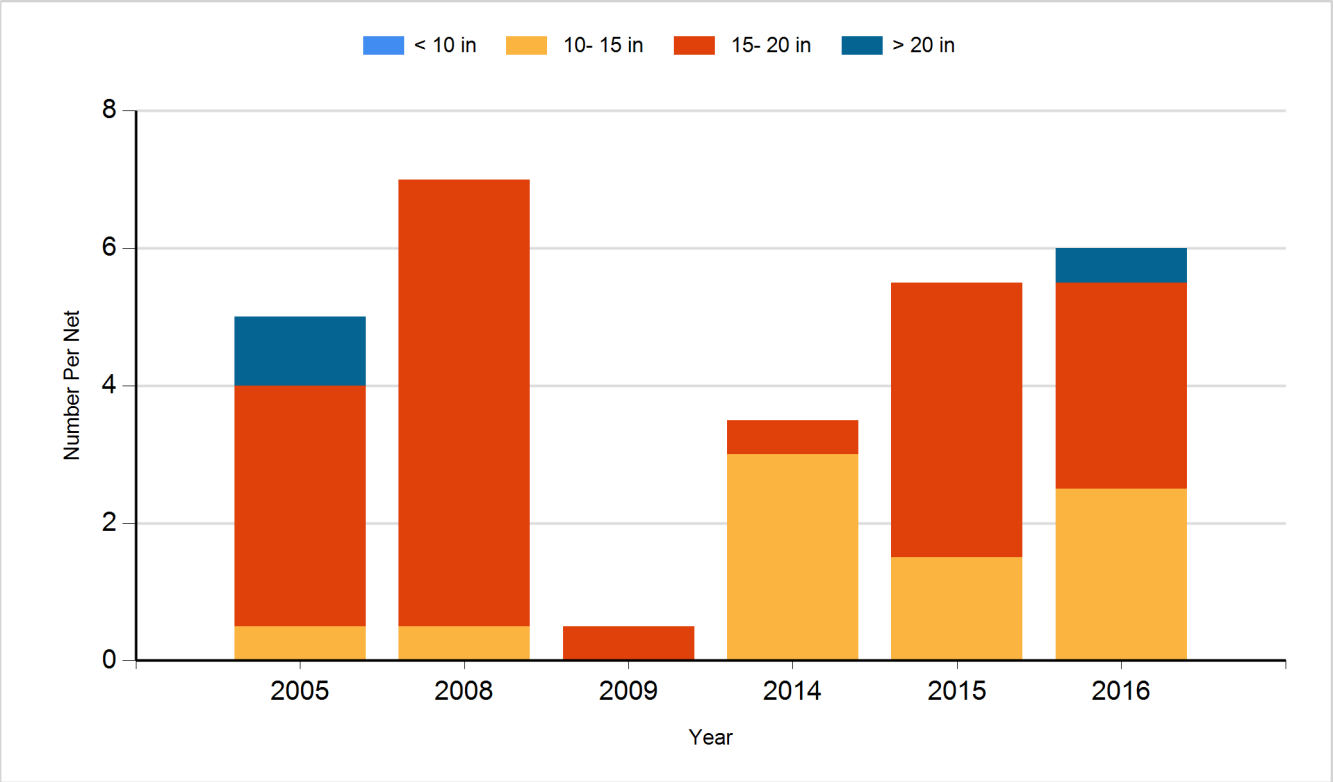
Species: Black Crappie
Gear: Frame Net



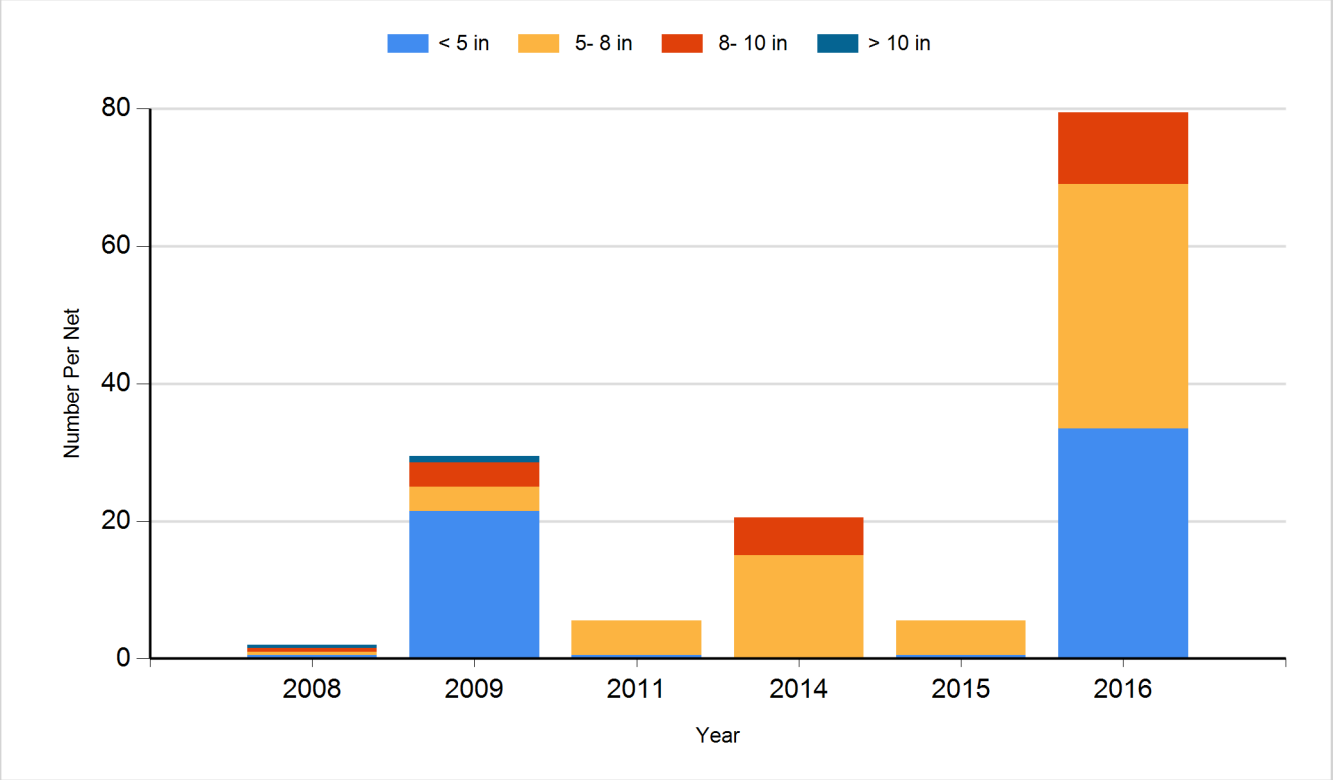
Species: Northern Pike
Gear: Gill Net



Species: Walleye
Gear: Gill Net



Species: Yellow Perch
Gear: Gill Net



Fish Stocking

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

Year	Species	Size	Number
2005	Walleye	Fingerling	2,675
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