

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Carthage, Miner County
MJA-Lake-598-000
2017

Lake Information

Name: Carthage
County: Miner
Surface Area: 211 Acres

Surveys and Investigations

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

Gear	Date	Effort
AFS std frame net	June 21, 2017	5 net-nights
AFS std gill net	June 21, 2017	4 net-nights

Common Fish Species Present

Black Bullhead

Channel Catfish

Black Crappie

White Sucker

Walleye

Common Carp

Gizzard Shad

Bluegill

Pumpkinseed

Northern Pike

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).

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

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)
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

Species Name	Stock		Quality		Preferred		Memorable		Trophy	
	(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).

Gear	Species	Abundance		Stock Density Indices			Condition		
		CPUE	CI-80	PSD	CI-80	PSD-P	CI-80	Wr	CI-80
AFS std frame net	Black Bullhead	18.4	5.4	1		0			
	Black Crappie	7.8	9.3	85	9	13	9	98	2
	Bluegill	1.4	1.0	14		0		122	8
	Channel Catfish	0.2	0.3	100		0		107	
	Common Carp	2.4	2.3	92		75			
	Gizzard Shad	0.6	0.4	0					
	Northern Pike	0.4	0.6	100		50		88	5
	Orangespotted Sunfish	0.0	0.0						
	Pumpkinseed	0.4	0.4	0		0		120	
	Sunfish Hybrid	0.0	0.0						
	Walleye	2.0	0.8	30		0		80	7
White Sucker	4.4	2.9	100		100				
AFS std gill net	Black Bullhead	80.8	13.7	0		0			
	Black Crappie	0.8	0.4	100		0		102	2
	Channel Catfish	12.3	3.7	31	10	2		94	2
	Common Carp	4.5	1.9	56	19	11			
	Gizzard Shad	2.3	1.7	0					
	Northern Pike	0.3	0.4	100		100		78	
	Walleye	5.5	3.0	59	17	0		85	2
	White Sucker	7.5	0.5	100		100			
Yellow Perch	0.3	0.4	100		0		84		

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
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
AFS std frame net	Black Bullhead										18.4	18.4
	Black Crappie										7.8	7.8
	Bluegill										1.4	1.4
	Channel Catfish										0.2	0.2
	Common Carp										2.4	2.4
	Gizzard Shad										0.6	0.6
	Northern Pike										0.4	0.4
	Orangespotted Sunfish										0.0	0.0
	Pumpkinseed										0.4	0.4
	Sunfish Hybrid										0.0	0.0
	Walleye										2.0	2.0
White Sucker										4.4	4.4	
AFS std gill net	Black Bullhead										80.8	80.8
	Black Crappie										0.8	0.8
	Channel Catfish										12.3	12.3
	Common Carp										4.5	4.5
	Gizzard Shad										2.3	2.3
	Northern Pike										0.3	0.3
	Walleye										5.5	5.5
	White Sucker										7.5	7.5
Yellow Perch										0.3	0.3	
boat shocker (night)	Largemouth Bass		6.0		6.0							6.0
large frame net	Black Bullhead	665.1			441.7		810.6					639.1
	Black Crappie	8.8			1.1		0.1					3.3
	Bluegill	3.6			3.8							3.7
	Channel Catfish	0.7			2.8		0.7					1.4
	Common Carp	3.9			20.0		1.5					8.5
	Northern Pike	1.5			3.0		0.4					1.6
	Sunfish Hybrid	0.0			0.0							0.0
	Walleye	0.1			0.1							0.1
	White Sucker	1.2			3.1		8.4					4.2
Yellow Perch				0.2		0.1					0.2	
std exp gill net	Black Bullhead							189.3	148.3	249.7		195.8

		CPUE										
Gear	Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg
std exp gill net	Black Crappie								3.0	1.7		2.4
	Channel Catfish							6.3	5.0	17.3		9.5
	Common Carp							5.3	9.0	1.7		5.3
	Northern Pike							1.7	2.0	1.7		1.8
	Walleye							12.0	7.3	3.3		7.5
	White Sucker							2.0	1.7	10.3		4.7
	Yellow Perch							1.0	0.7			0.9
std frame net (3/8 inch)	Black Bullhead							100.4	377.4	1,495.6		657.8
	Black Crappie							2.6	6.0	9.4		6.0
	Bluegill							1.0	0.8	1.4		1.1
	Channel Catfish							3.8	0.4	6.2		3.5
	Common Carp							1.8	0.8	3.8		2.1
	Green Sunfish								0.2			0.2
	Northern Pike							2.0	3.0	3.4		2.8
	Walleye							0.2	1.4	0.6		0.7
	White Sucker							38.0	7.8	5.4		17.1
Yellow Perch									0.2		0.2	

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											
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017		
AFS std frame net	Black Crappie	PSD											85	
		PSD-P											13	
		Wr											98	
	Northern Pike	PSD												100
		PSD-P												50
		Wr												88
	Walleye	PSD												30
		PSD-P												0
		Wr												80
AFS std gill net	Black Crappie	PSD											100	
		PSD-P											0	
		Wr											102	
	Northern Pike	PSD												100
		PSD-P												100
		Wr												78
	Walleye	PSD												59
		PSD-P												0
		Wr												85
Yellow Perch	PSD												100	
	PSD-P												0	
	Wr												84	
large frame net	Black Crappie	PSD		18		9		100						
		PSD-P		1		0		0						
		Wr		111		116		126						
	Northern Pike	PSD		60		50		100						
		PSD-P		7		10		50						
		Wr		83		81		78						
	Walleye	PSD		100		100								
		PSD-P		100		0								
		Wr		89		87								
Yellow Perch	PSD				100		100							

Gear	Species	Index	Year										
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
large frame net	Yellow Perch	PSD-P				0	0						
		Wr				87	115						
std exp gill net	Black Crappie	PSD								33	100		
		PSD-P								0	0		
		Wr								102	98		
	Northern Pike	PSD								80	83	80	
		PSD-P								20	0	40	
		Wr								93	82	81	
	Walleye	PSD								0	32	70	
		PSD-P								0	0	0	
		Wr								94	81	78	
	Yellow Perch	PSD								100	50		
		PSD-P								100	50		
		Wr								94	87		
std frame net (3/8 inch)	Black Crappie	PSD								46	73	83	
		PSD-P								31	20	15	
		Wr								122	108	96	
	Northern Pike	PSD								90	80	88	
		PSD-P								10	27	47	
		Wr								90	77	78	
	Walleye	PSD								0	57	67	
		PSD-P								0	0	0	
		Wr								83	78	67	
	Yellow Perch	PSD										100	
		PSD-P										0	
		Wr										87	

Length at Capture

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

Species: Black Crappie

Year	N	Mean Length (expanded sample number) at capture by age									
		1	2	3	4	5	6	7	8	9	10+
2013	1				241 (1)						
2011	11	154 (10)		246 (1)							
2009	92	119 (4)	168 (63)	206 (24)	233 (1)						

Fish Condition

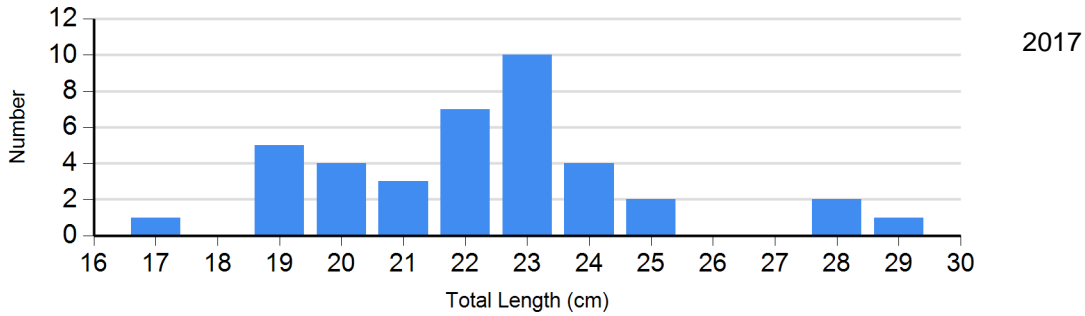
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

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	2013	0		1	126	0		0	
	2014	7	119 (2.6)	2	122 (3.0)	4	125 (1.3)	0	
	2015	8	121 (7.6)	16	106 (1.5)	6	98 (3.2)	0	
	2016	8	102 (2.9)	32	97 (1.8)	6	89 (2.1)	1	73
	2017	6	107 (1.4)	28	98 (1.5)	5	87 (7.0)	0	
Northern Pike Gill Net	2014	1	98	3	91 (3.6)	1	95	0	
	2015	1	74	5	84 (3.6)	0		0	
	2016	1	95	2	77 (0.1)	2	79 (2.6)	0	
	2017	0		0		1	78	0	
Walleye Gill Net	2014	36	94 (1.3)	0		0		0	
	2015	15	80 (1.5)	7	82 (2.1)	0		0	
	2016	3	81 (2.6)	7	76 (2.1)	0		0	
	2017	9	82 (2.0)	13	87 (1.5)	0		0	
Yellow Perch Gill Net	2014	0		0		3	94 (0.5)	0	
	2015	1	98	0		1	75	0	
	2017	0		1	84	0		0	

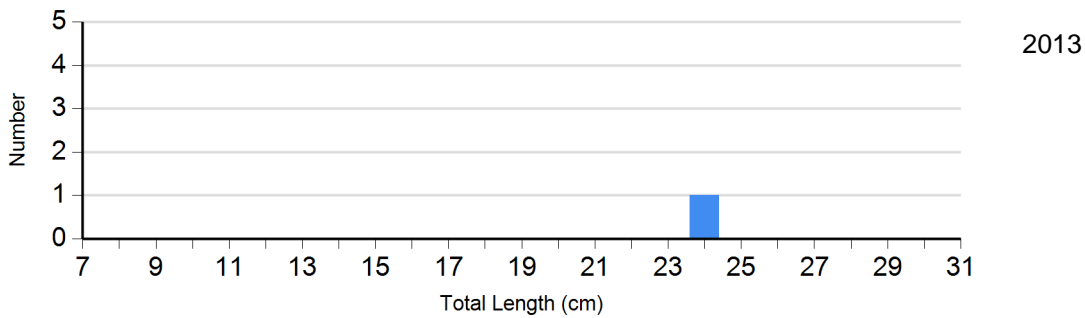
Length Frequency Distribution

Length frequency histogram of species sampled by year.

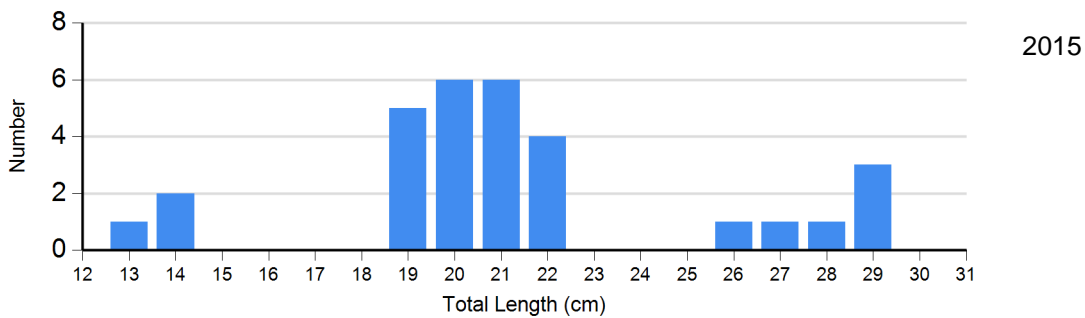
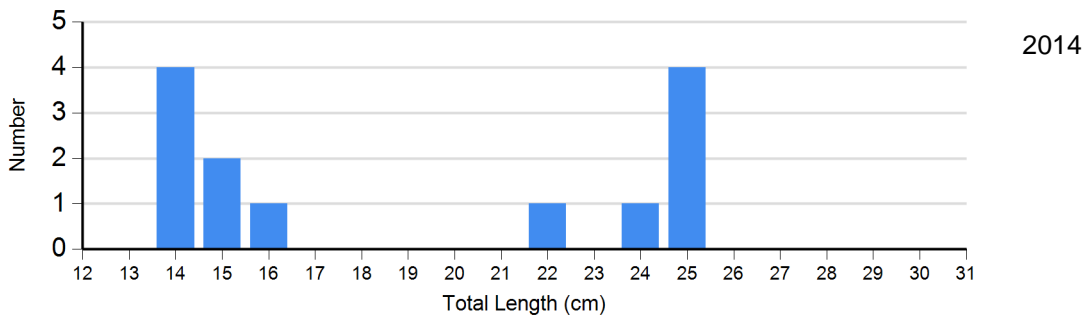
Species: Black Crappie
Gear: AFS std frame net

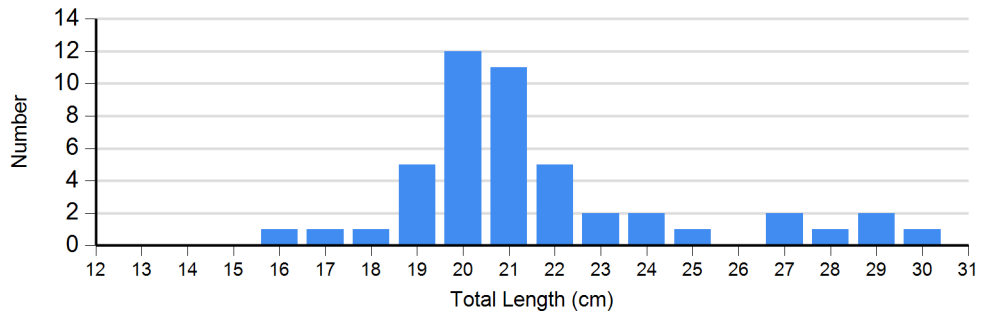


Species: Black Crappie
Gear: large frame net



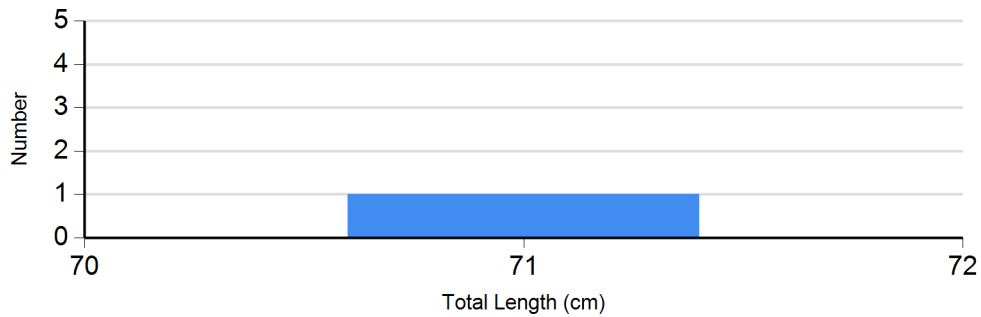
Species: Black Crappie
Gear: std frame net (3/8 inch)





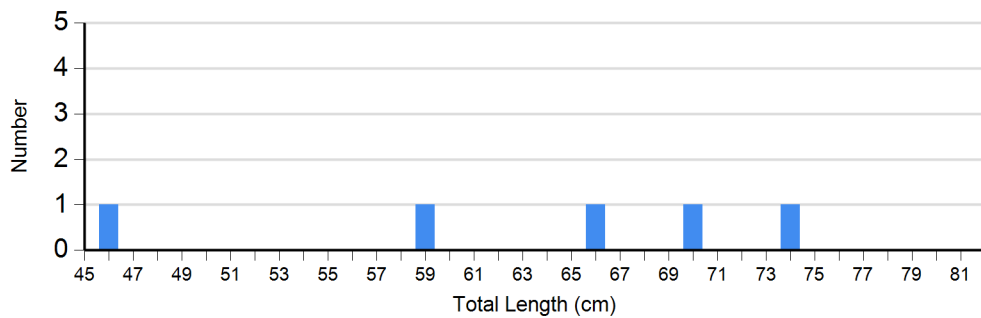
2016

Species: Northern Pike
Gear: AFS std gill net

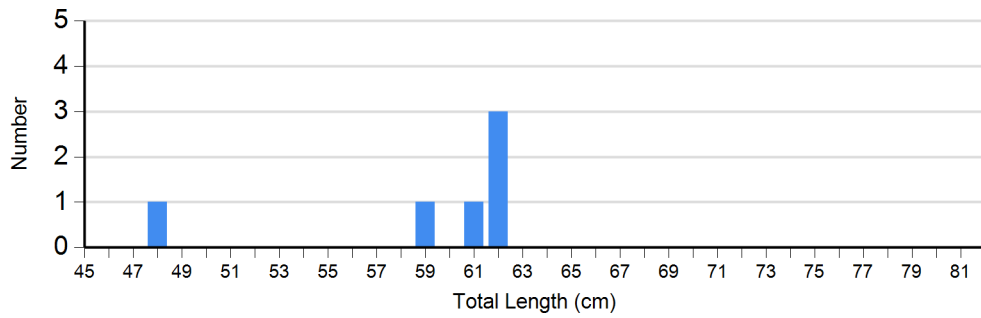


2017

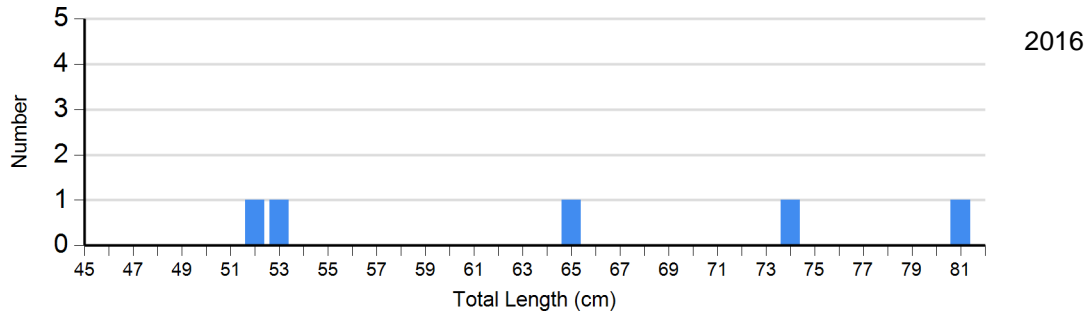
Species: Northern Pike
Gear: std exp gill net



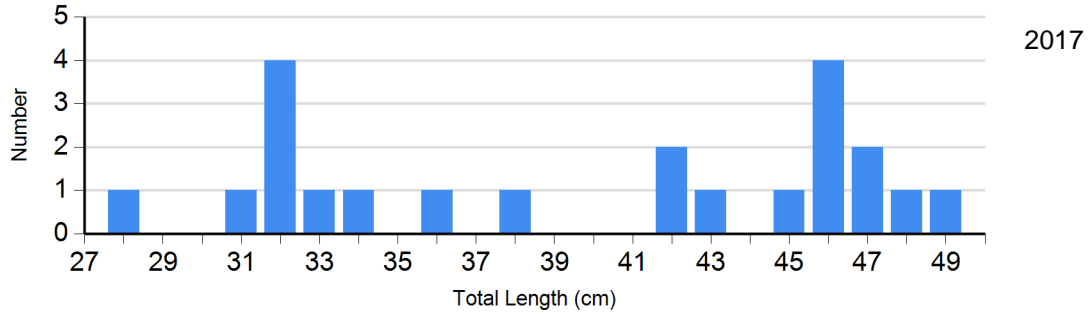
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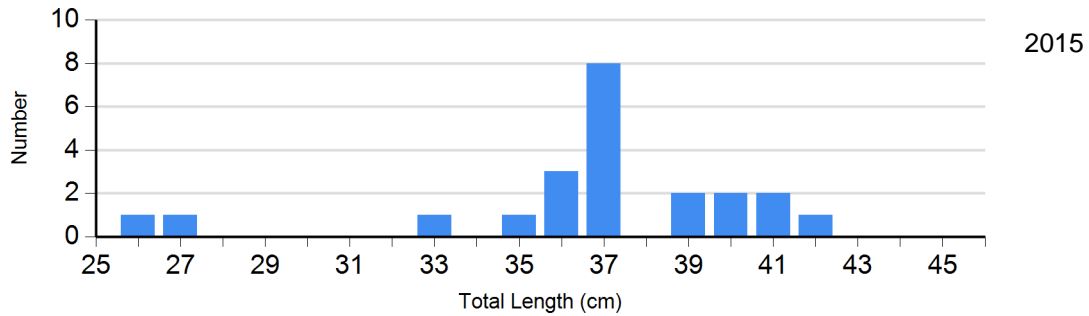
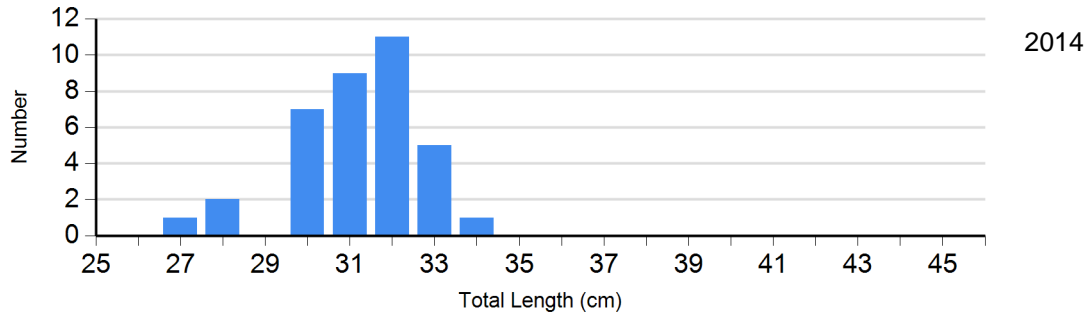
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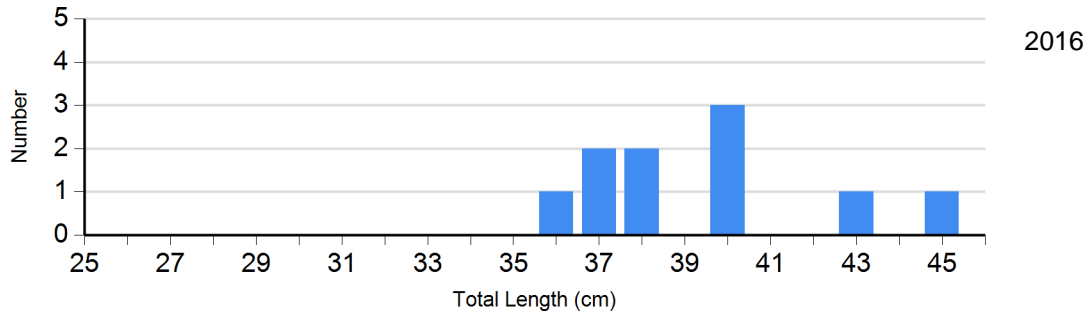


Species: Walleye
Gear: AFS std gill net

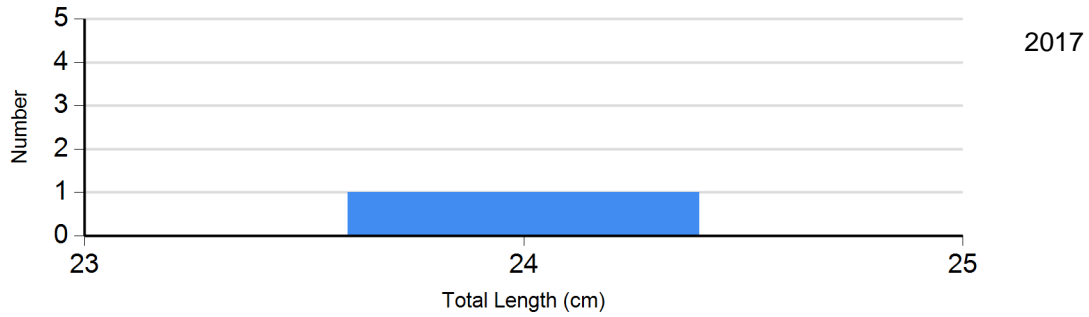


Species: Walleye
Gear: std exp gill net

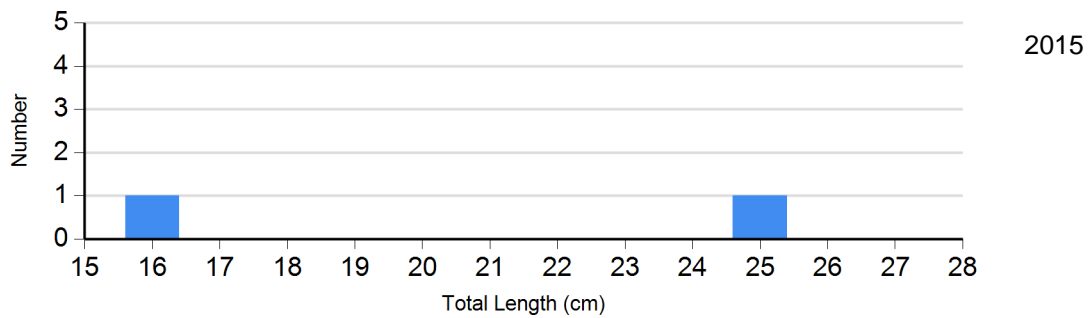
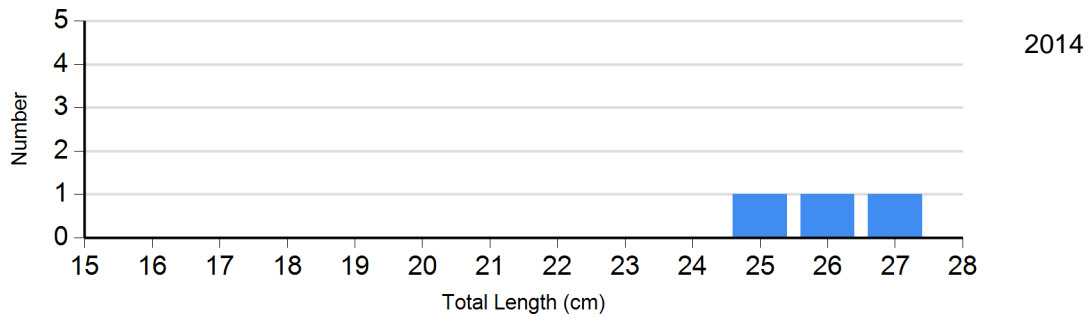




Species: Yellow Perch
Gear: AFS std gill net



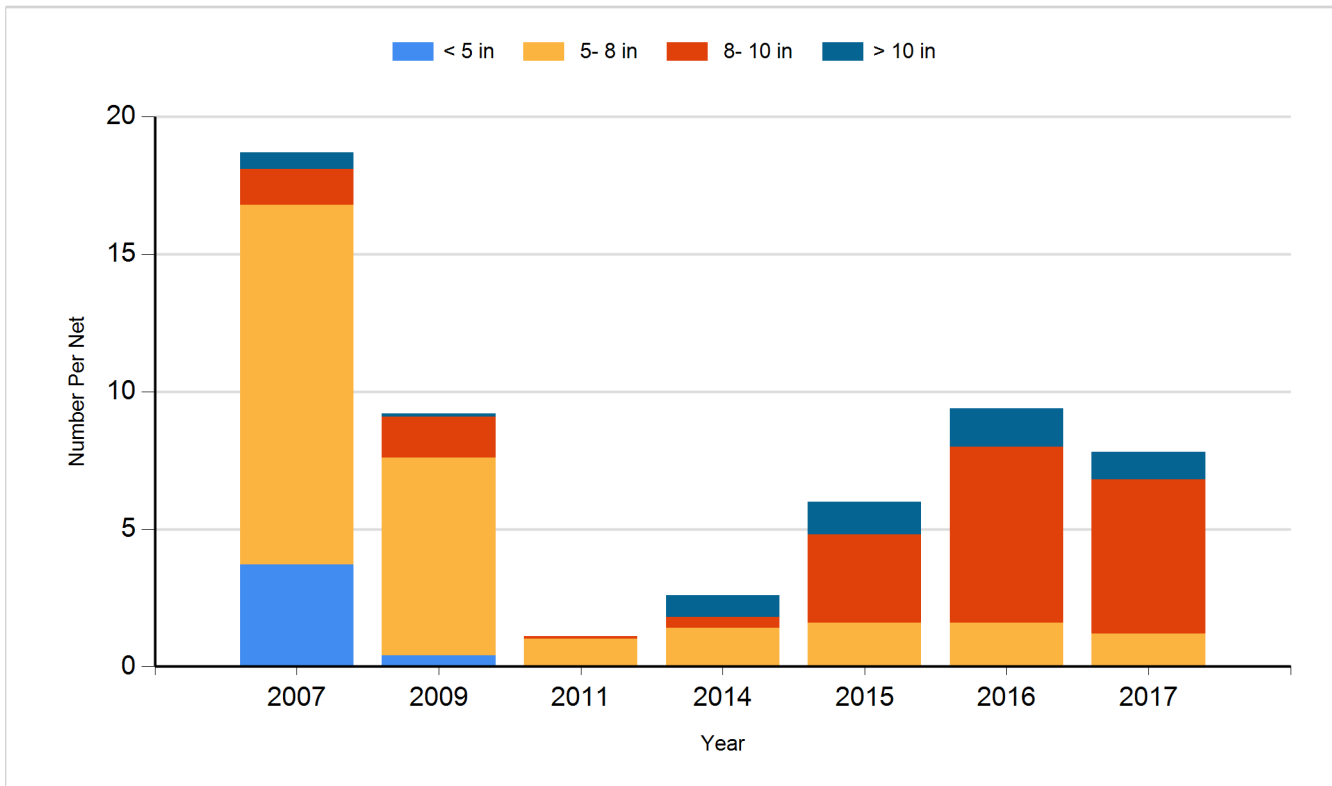
Species: Yellow Perch
Gear: std exp gill net



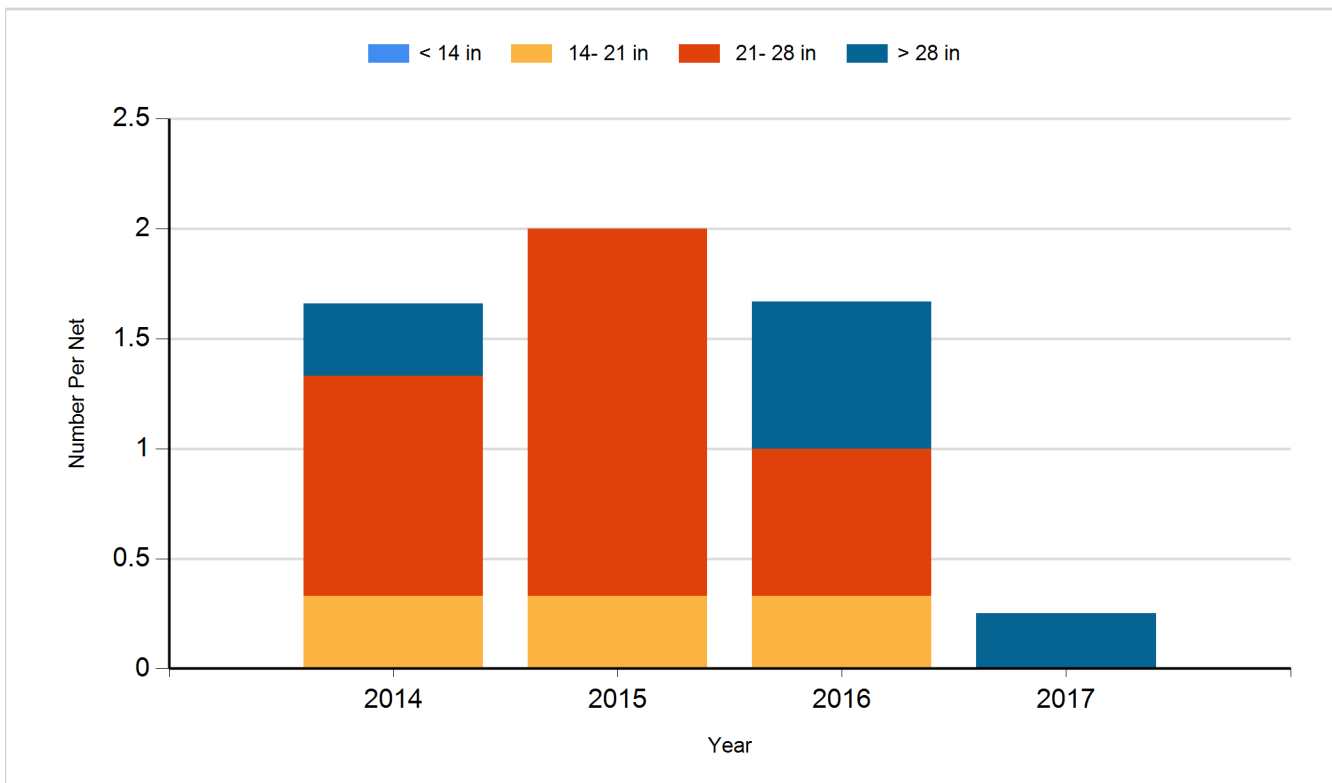
Historic Fish Sizes and Relative Abundance

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

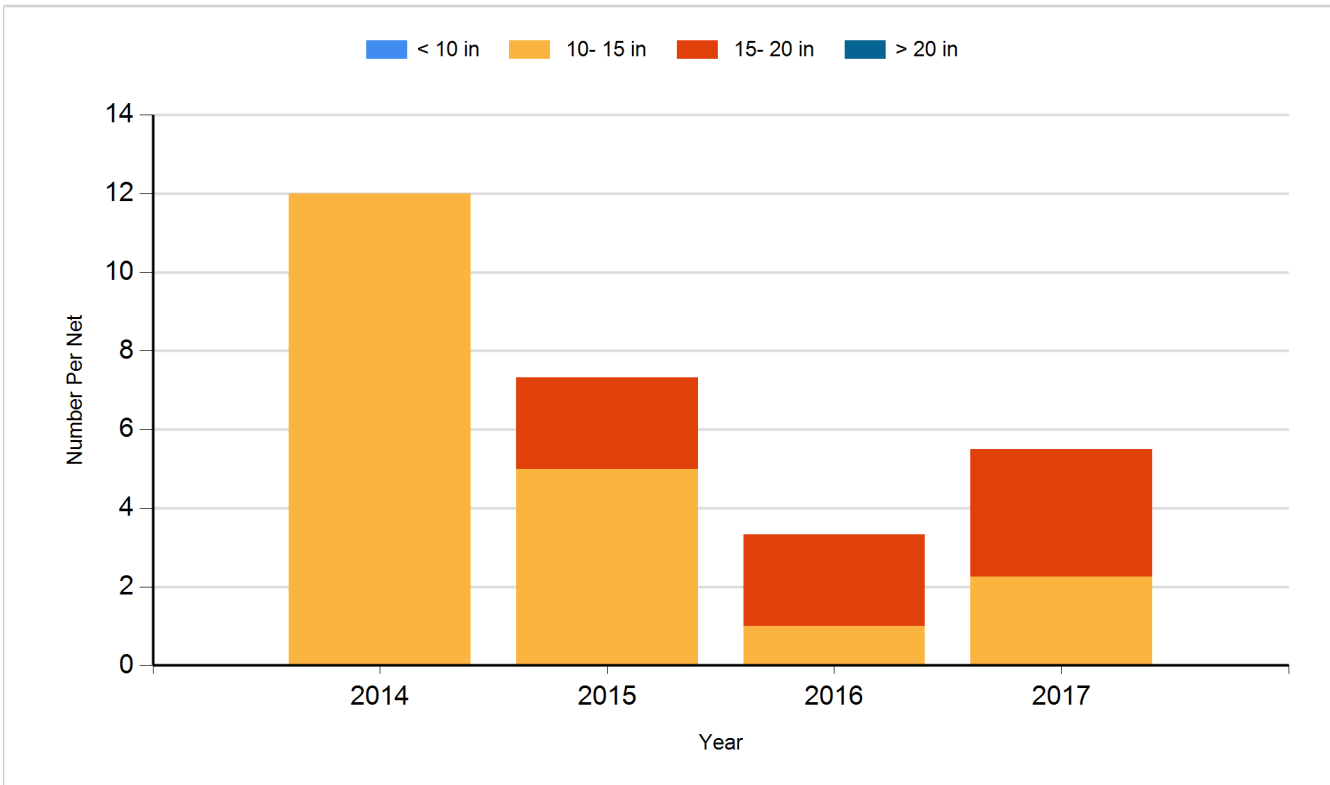
Species: Black Crappie
Gear: Frame Net



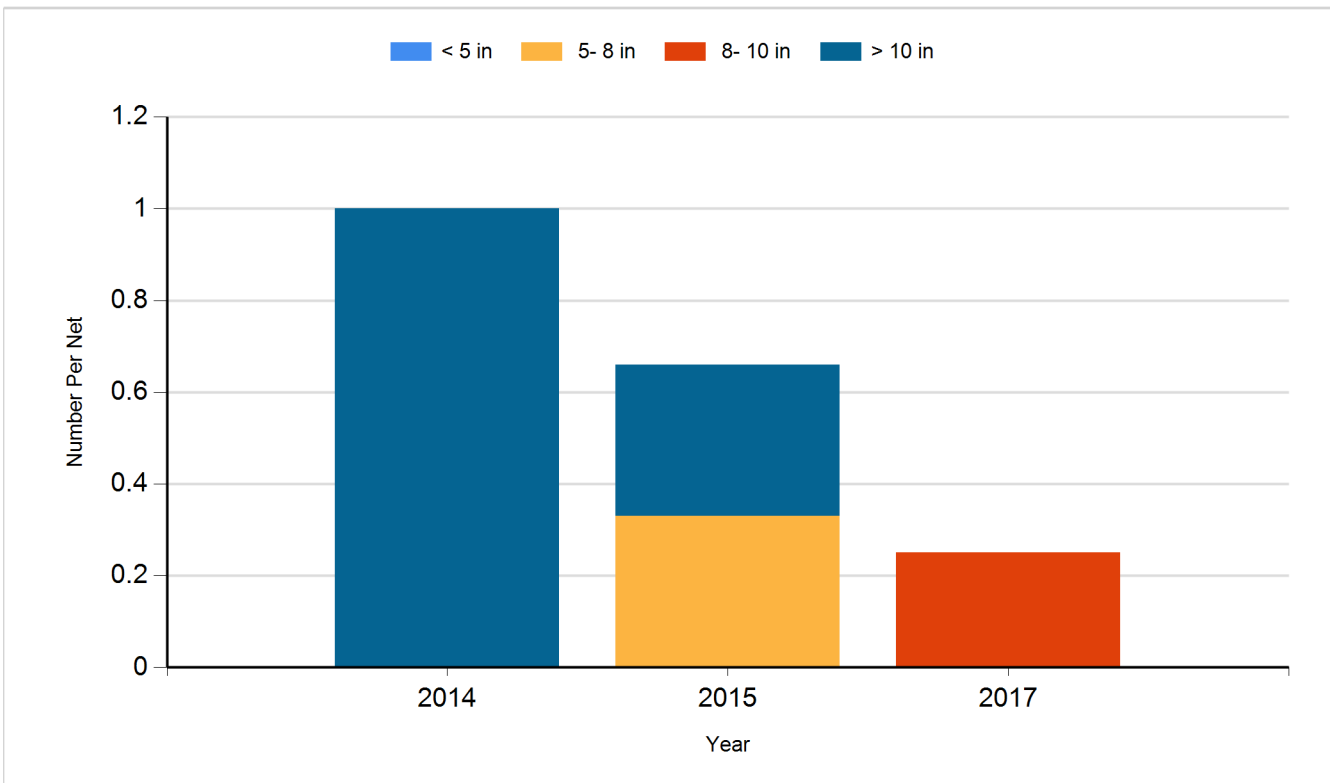
Species: Northern Pike
Gear: Gill Net



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
2006	Largemouth Bass	Adult	115
2007	Walleye	Adult	692
2011	Largemouth Bass	Fingerling	2,890
2012	Largemouth Bass	Juvenile	1,739
2015	Walleye	Small Fingerling	14,080
2016	Gizzard Shad	Adult	437
2016	Walleye	Fingerling	680
2016	Walleye	Juvenile	467
2017	Yellow Perch	Adult	6,953