SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Carthage, Miner County
MJA-Lake-598-000
2016

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
std exp gill net	June 21, 2016	3 net-nights
std frame net (3/8 inch)	June 21, 2016	5 net-nights

Common Fish Species Present

Black Bullhead

Channel Catfish

White Sucker

Black Crappie

Common Carp

Northern Pike

Walleye

Bluegill

Yellow Perch

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
std exp gill net	Black Bullhead	249.7	113.9	0		0			
	Black Crappie	1.7	1.3	100		0		98	3
	Channel Catfish	17.3	5.5	17	8	0		92	4
	Common Carp	1.7	3.1	100		20			
	Northern Pike	1.7	1.3	80		40		81	5
	Walleye	3.3	3.5	70		0		78	2
	White Sucker	10.3	1.7	100		61	13		
std frame net (3/8 inch)	Black Bullhead	1,495.6	631.4	0		0			
	Black Crappie	9.4	8.4	83	8	15	8	96	2
	Bluegill	1.4	2.1	100		29		103	5
	Channel Catfish	6.2	4.7	0		0		83	2
	Common Carp	3.8	2.5	95		42	18		
	Northern Pike	3.4	3.5	88		47	20	78	5
	Walleye	0.6	0.9	67		0		67	9
	White Sucker	5.4	3.5	100		100			
	Yellow Perch	0.2	0.3	100		0		87	

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	8.5		6.0		6.0						6.8
large frame net	Black Bullhead	227.2		665.1		441.7		810.6				536.2
	Black Crappie	15.0		8.8		1.1		0.1				6.3
	Bluegill	9.0		3.6		3.8						5.5
	Channel Catfish	2.0		0.7		2.8		0.7				1.6
	Common Carp	20.0		3.9		20.0		1.5				11.4
	Northern Pike	0.2		1.5		3.0		0.4				1.3
	Sunfish Hybrid	0.0		0.0		0.0						0.0
	Walleye	0.1		0.1		0.1						0.1
	White Sucker	14.6		1.2		3.1		8.4				6.8
	Yellow Perch	0.7				0.2		0.1				0.3
std exp gill net	Black Bullhead								189.3	148.3	249.7	195.8
	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.

			Year									
Gear	Species	Index	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
large frame net	Black Crappie	PSD	13		18		9		100			
		PSD-P	4		1		0		0			
		Wr	126		111		116		126			
	Northern Pike	PSD	100		60		50		100			
		PSD-P	100		7		10		50			
		Wr	86		83		81		78			
	Walleye	PSD	100		100		100					
		PSD-P	100		100		0					
		Wr	67		89		87					
	Yellow Perch	PSD	14				100		100			
		PSD-P	0				0		0			
		Wr	88				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

			Year									
Gear	Species	Index	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
std frame net (3/8 inch)	Walleye	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

		Mean Length (expanded sample number) at capture by age									
Year	N	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)						
2007	187	132 (87)	176 (84)	216 (12)		298 (4)					

Fish Condition

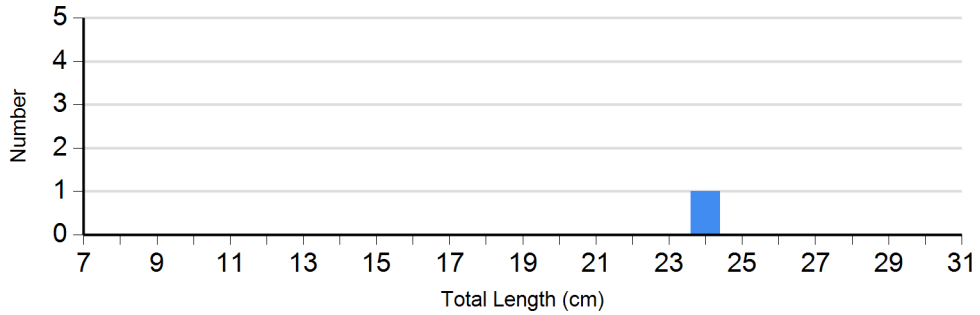
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		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	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
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	
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	
Yellow Perch Gill Net	2014	0		0		3	94 (0.5)	0	
	2015	1	98	0		1	75	0	

Length Frequency Distribution

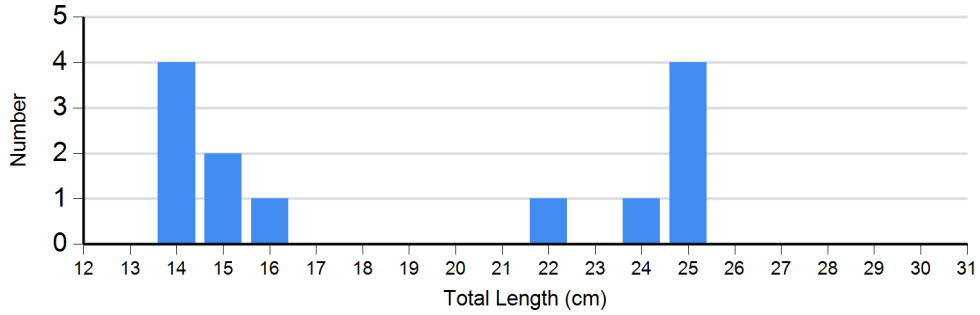
Length frequency histogram of species sampled by year.

Species: Black Crappie
Gear: large frame net

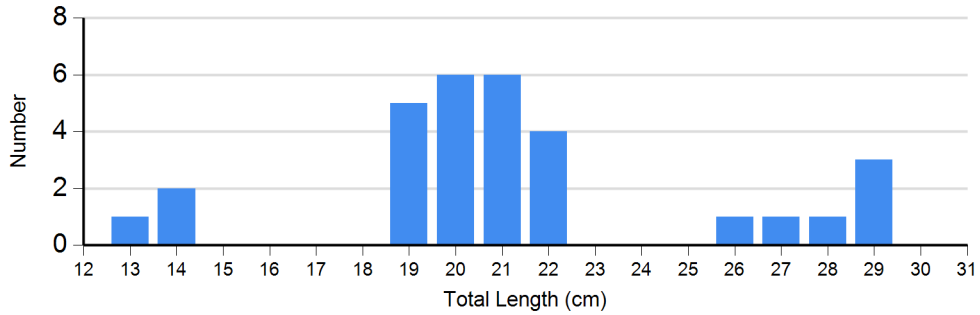


2013

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



2014



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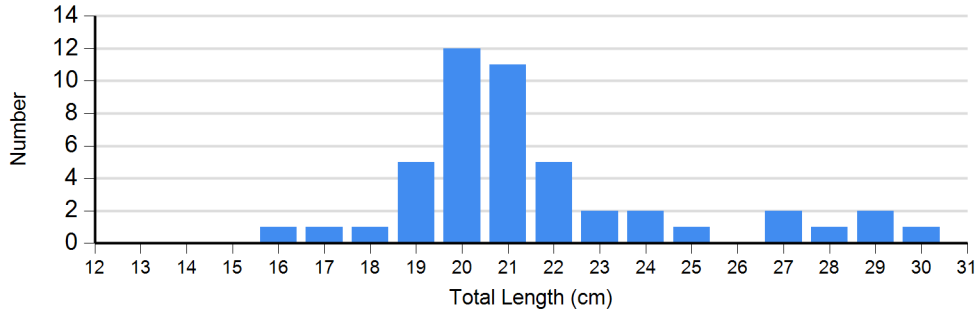
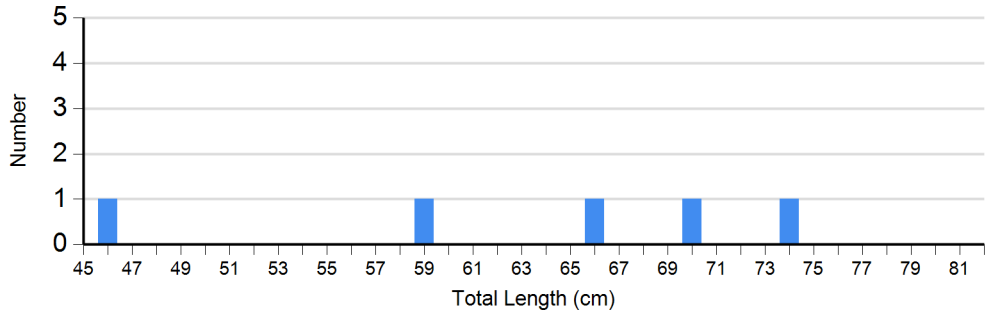
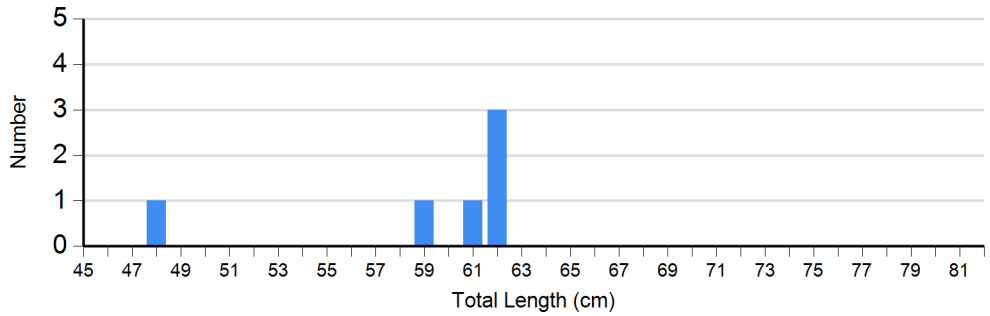


2016

Species: Northern Pike
Gear: std exp gill net



2014



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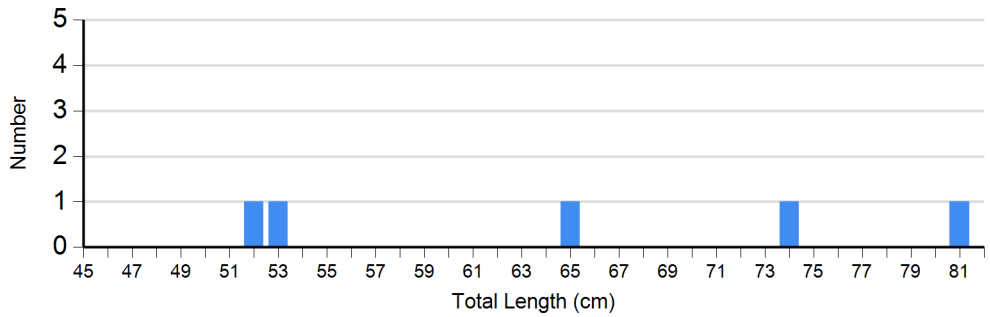
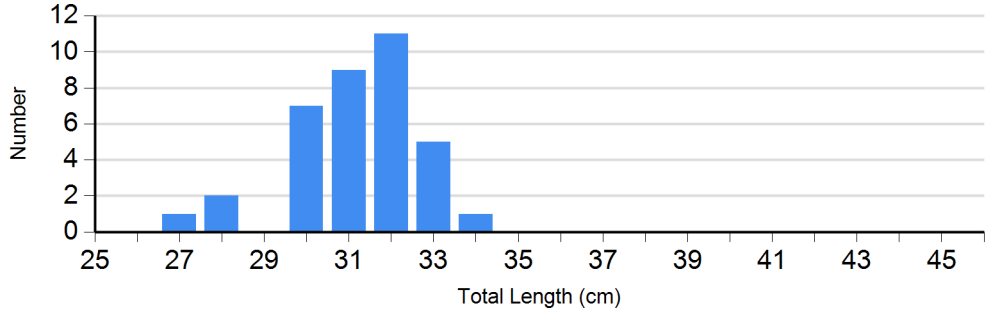
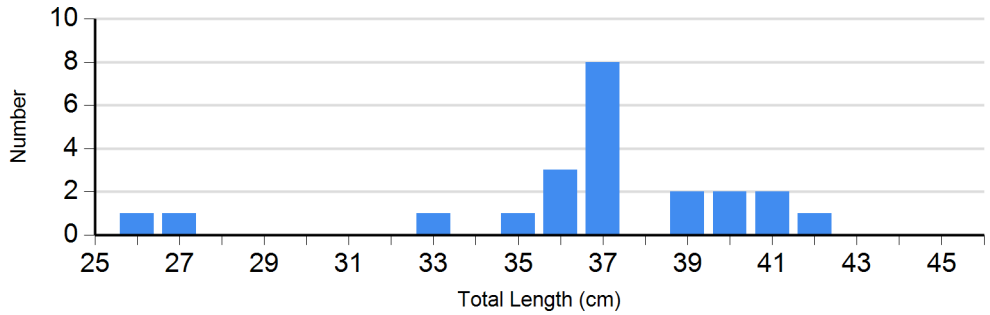


2016

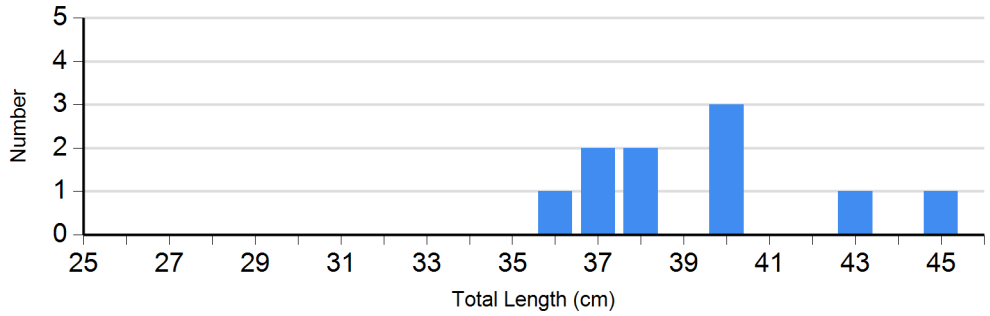
Species: Walleye
Gear: std exp gill net



2014

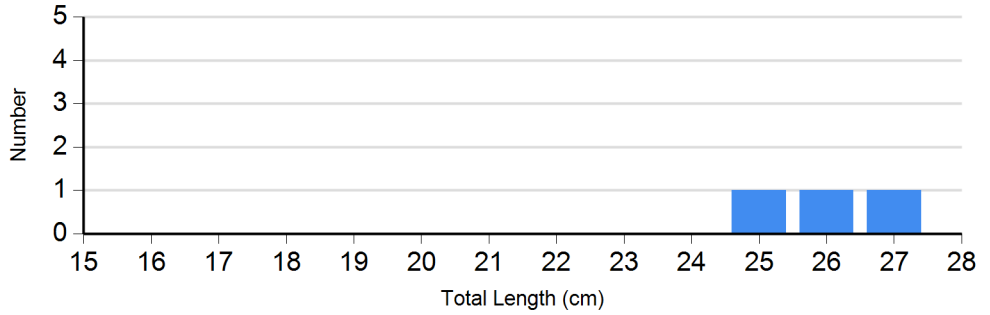


2015

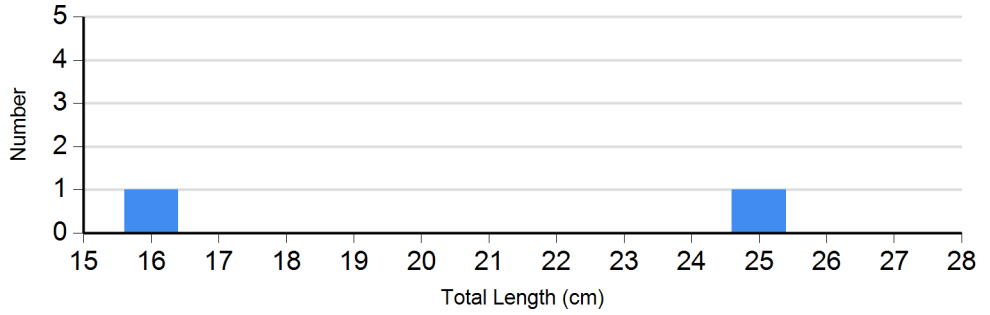


2016

Species: Yellow Perch
Gear: std exp gill net



2014

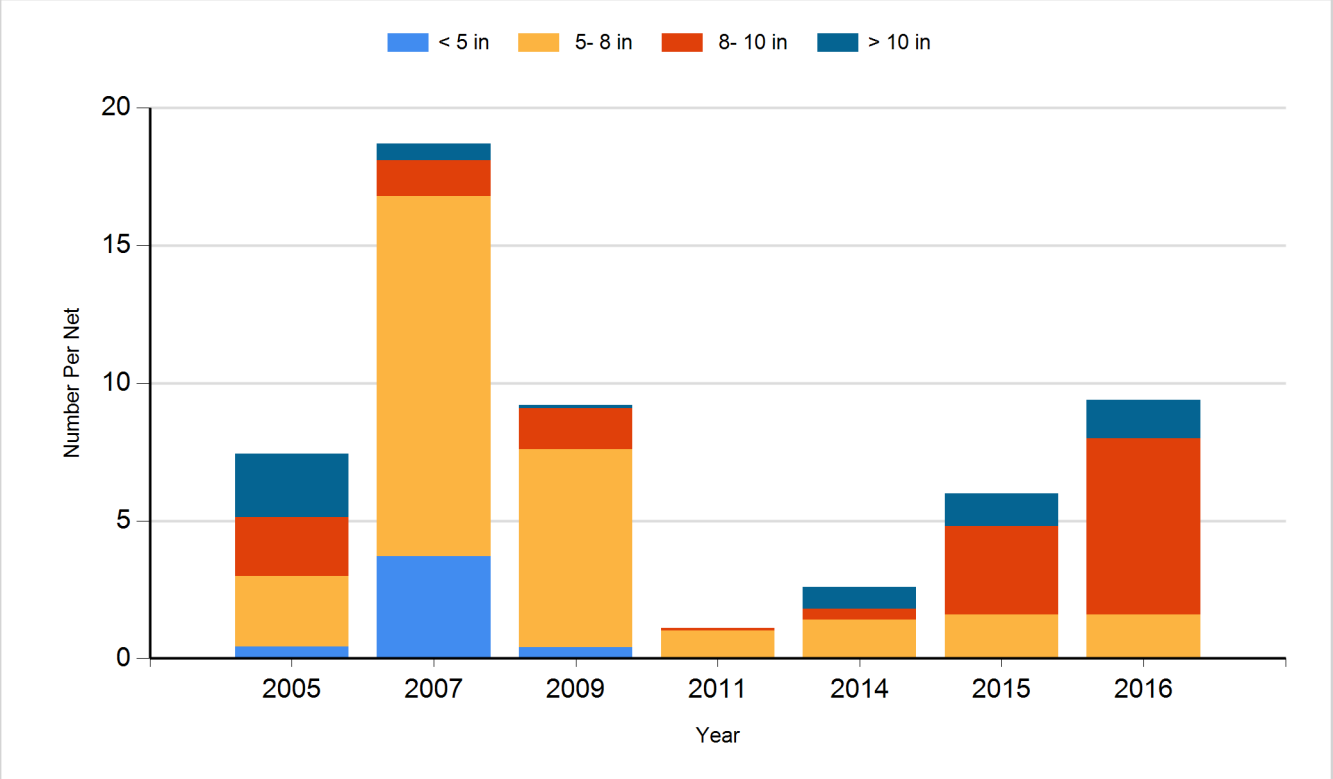


2015

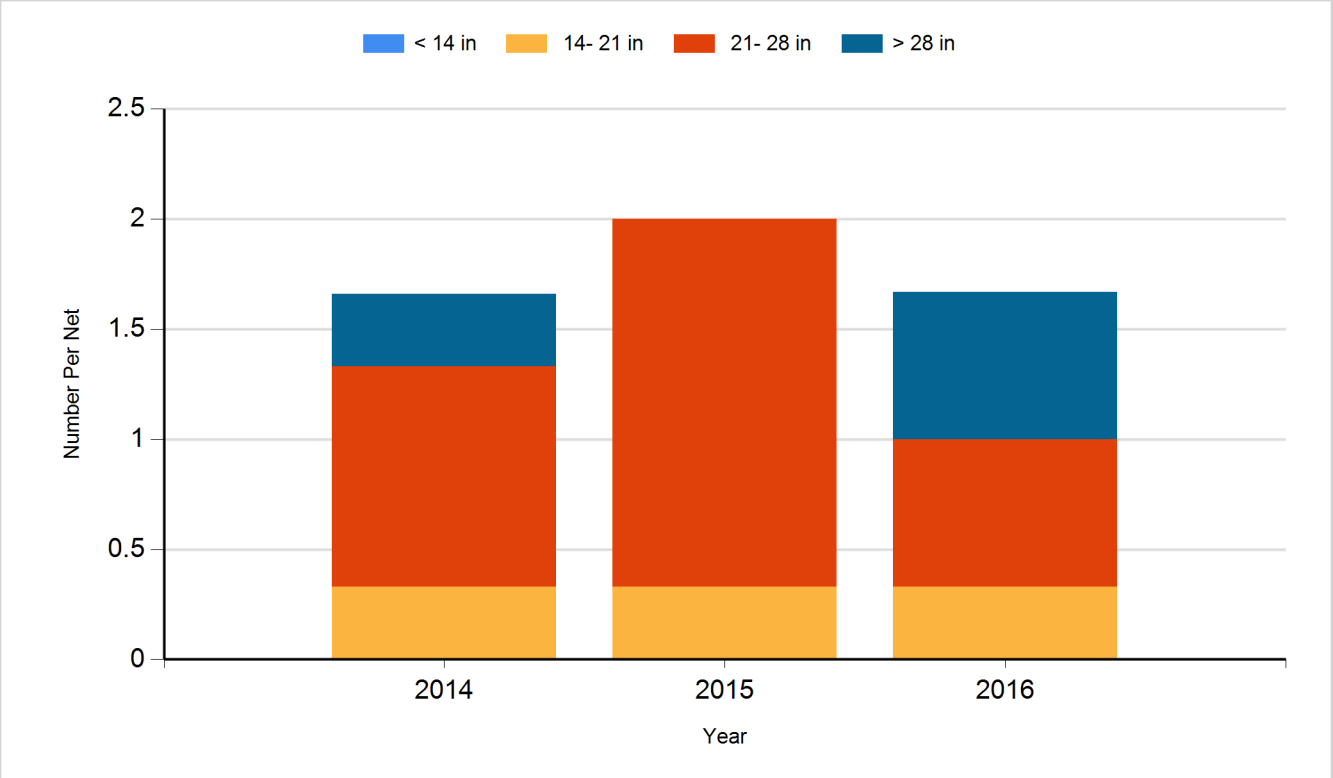
Historic Fish Sizes and Relative Abundance

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

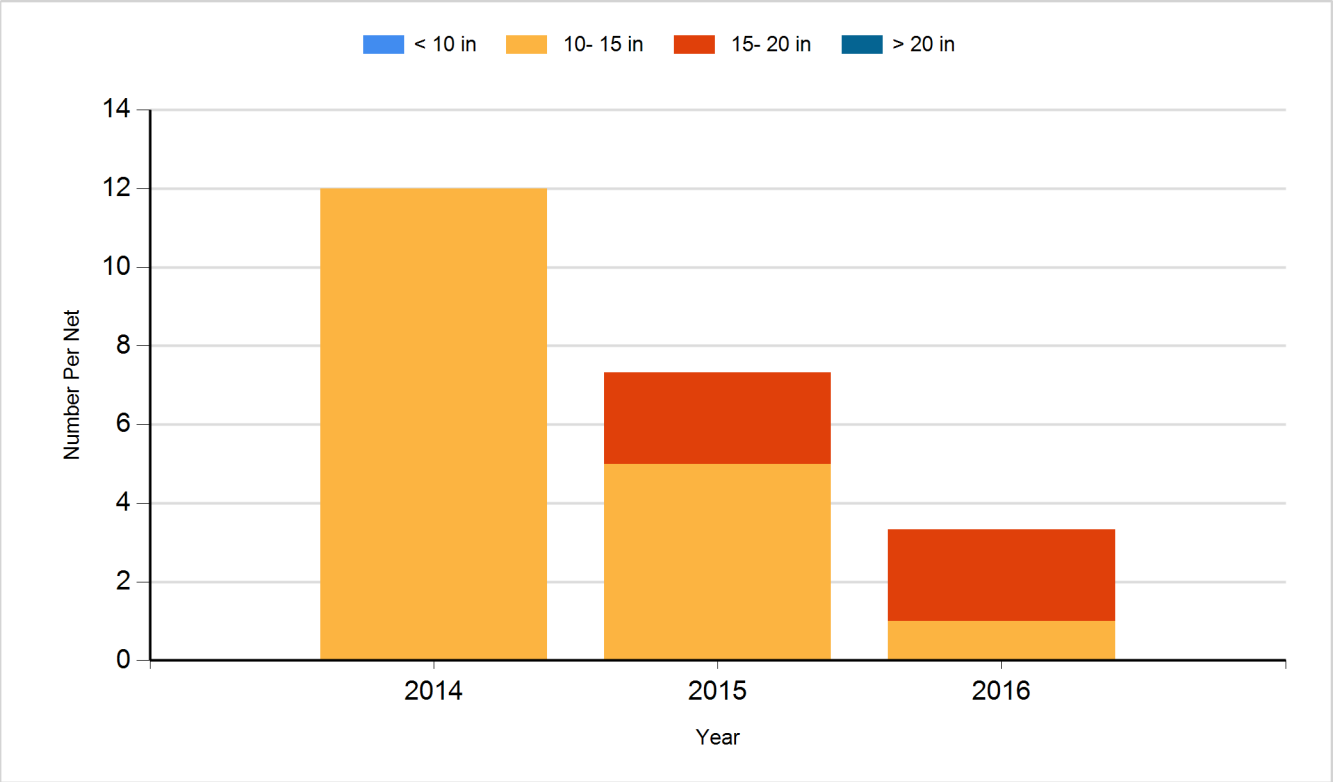
Species: Black Crappie
Gear: Frame Net



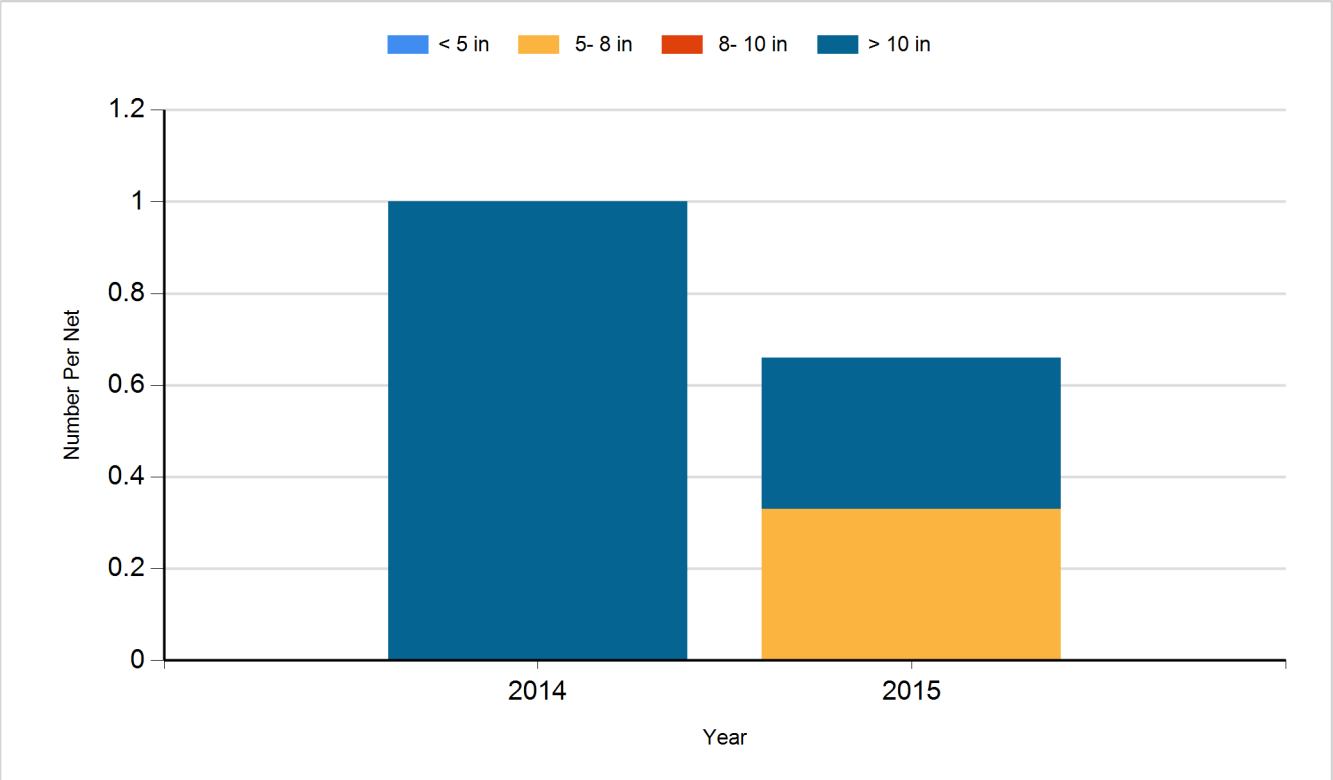
Species: Northern Pike
Gear: Gill Net



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	Channel Catfish	Adult	230
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