

**SOUTH DAKOTA STATEWIDE FISHERIES SURVEY**  
**Kettle, Marshall County**  
**UJA-Lake-866-000**  
**2017**

**Lake Information**

<b>Name:</b>	Kettle	<b>Maximum Depth:</b>	18 Feet
<b>County:</b>	Marshall	<b>Mean Depth:</b>	10 Feet
<b>Surface Area:</b>	3,229 Acres		

**Surveys and Investigations**

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

Gear	Date	Effort
AFS std gill net	August 15, 2017	4 net-nights
AFS std gill net	August 16, 2017	4 net-nights
AFS std gill net	August 17, 2017	4 net-nights

## **Common Fish Species Present**

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Walleye

Yellow Perch

Northern Pike

Black Crappie

White Sucker

Black Bullhead

Common Carp

Bluegill

Smallmouth Bass

White Bass

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## 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 gill net	Black Bullhead	0.6	0.3	86		86		104	6
	Black Crappie	0.7	0.3	0		0		129	4
	Bluegill	0.2	0.2	0		0		124	3
	Common Carp	0.3	0.3	100		50		104	3
	Northern Pike	1.3	0.5	100		31		77	3
	Smallmouth Bass	0.1	0.1	100		100		117	
	Walleye	5.1	1.8	90	6	75	8	88	1
	White Bass	0.0	0.0	0		0			
	White Sucker	0.6	0.4	100		100		107	3
	Yellow Perch	12.2	3.5	8	3	0		102	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
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
AFS std gill net	Black Bullhead									8.8	0.6	4.7
	Black Crappie									1.3	0.7	1.0
	Bluegill									0.5	0.2	0.4
	Common Carp									0.8	0.3	0.6
	Largemouth Bass									0.0		0.0
	Northern Pike									2.4	1.3	1.9
	Smallmouth Bass									0.2	0.1	0.2
	Walleye									2.6	5.1	3.9
	White Bass									0.1	0.0	0.1
	White Sucker									0.8	0.6	0.7
	Yellow Perch									19.2	12.2	15.7
boat shocker (night)	Largemouth Bass	4.0										4.0
	Smallmouth Bass	8.9										8.9
	Walleye	295.1			87.0			2.0	75.0	38.0		99.4
frame net (std 3/4 in)	Black Bullhead	0.1			0.1	4.4	20.2	23.7				9.7
	Black Crappie	2.5	0.4	1.9	5.5	11.9	3.2	1.9				3.9
	Bluegill	1.8	0.1	0.7	1.8	2.4	13.3	23.6				6.2
	Bluegill X Gr. Sunfish Hybrid						0.1					0.1
	Common Carp	0.9	0.4	0.5	0.1	0.2	0.0	0.1				0.3
	Green Sunfish							0.1				0.1
	Largemouth Bass	0.1	0.1	0.0	0.0	0.2	0.0	0.0				0.1
	Northern Pike	1.3	0.6	0.3	0.2	0.5	0.7	0.7				0.6
	Smallmouth Bass	0.8	0.2	0.7	1.3	0.6	0.7	0.5				0.7
	Walleye	2.0	1.2	0.3	0.1	0.5	0.3	0.1				0.6
	Western Painted Turtle	0.0										0.0
	White Bass								0.0			0.0
	White Sucker	0.2	0.1	0.1	0.1	0.3						0.2
	Yellow Perch	3.2	5.6	18.7	19.0	21.2	26.1	36.7				18.6
std exp gill net	Black Bullhead					2.3	4.2	2.8	45.2			13.6
	Black Crappie	0.3	0.2	10.2	2.8	12.3	2.5	0.3	26.0			6.8
	Bluegill							0.5	0.2			0.4
	Common Carp	2.0	0.5	0.1	0.1	0.0		0.2	0.0			0.4
	Largemouth Bass			0.0	0.0	0.0	0.0	0.0				0.0

		CPUE										
Gear	Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg
std exp gill net	Northern Pike	1.3	0.3	0.1	0.2	4.0	5.0	4.0	1.8			2.1
	Smallmouth Bass		0.1	1.2	0.1		0.2	0.2				0.4
	Walleye	5.3	2.2	2.8	2.5	2.8	3.7	2.0	6.3			3.5
	White Bass							0.0				0.0
	White Sucker	0.2	0.1	0.2	0.2	1.3	2.5	0.7	0.2			0.7
	Yellow Perch	58.7	27.7	46.8	30.7	152.0	156.8	67.2	28.8			71.1

## 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 gill net	Black Crappie	PSD										7	0	
		PSD-P											7	0
		Wr											118	129
	Northern Pike	PSD											97	100
		PSD-P											21	31
		Wr											86	77
	Walleye	PSD											74	90
		PSD-P											61	75
		Wr											93	88
Yellow Perch	PSD											1	8	
	PSD-P											0	0	
	Wr											99	102	
boat shocker (night)	Walleye	PSD	0			0				0	0	0		
		PSD-P	0			0				0	0	0		
		Wr	88			93						97	100	
frame net (std 3/4 in)	Black Crappie	PSD	78	57	31	4	4	9	3					
		PSD-P	64	57	31	2	0	2	0					
		Wr	111	113	115	114	118	121	117					
	Northern Pike	PSD	96	100	100	100	89	92	92					
		PSD-P	9	20	0	0	22	25	8					
		Wr	76	86	94	109	87	89	84					
	Walleye	PSD	36	90	100	100	44	100	100					
		PSD-P	28	19	60	0	44	33	100					
		Wr	84	89	88		91	92						
Yellow Perch	PSD	12	0	0	2	1	0	1						
	PSD-P	0	0	0	0	0	0	0						
	Wr	100	98	95	88	91	87	86						
std exp gill net	Black Crappie	PSD	50	25	0	0	0	0	0	0				
		PSD-P	50	25	0	0	0	0	0	0				
		Wr	112	126	126	119	121	118	123	119				
	Northern Pike	PSD	100	100	50	100	75	90	100	100				



Gear	Species	Index	Year									
			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
std exp gill net	Northern Pike	PSD-P	0	20	50	0	4	3	13	9		
		Wr	85	83	91	88	93	88	89	91		
	Walleye	PSD	16	90	67	80	65	73	83	26		
		PSD-P	9	3	12	20	18	36	50	24		
	Yellow Perch	Wr	87	89	96	96	94	89	93	98		
		PSD	26	3	10	16	10	3	5	5		
		PSD-P	2	0	0	1	2	0	0	0		
		Wr	108	106	103	96	96	98	97	98		

## 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	63	143 (54)	179 (9)								
2012	262	139 (252)	224 (9)					359 (1)			
2009	8	138 (4)			299 (4)						
2008	46	135 (11)	211 (4)	276 (27)	305 (3)		325 (1)				

Species: Walleye

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2017	61	302 (6)	398 (2)	492 (6)	521 (2)		535 (4)	599 (4)	625 (2)	592 (7)	620 (28)
2016	31	292 (8)	436 (3)	520 (1)		526 (3)	545 (1)	568 (2)	573 (1)		598 (12)
2015	40	311 (30)			518 (4)	514 (1)		632 (1)		557 (4)	
2014	12	307 (1)	331 (1)	467 (4)		526 (1)			565 (5)		
2013	22	309 (1)	377 (9)	492 (4)	567 (2)	554 (1)		559 (3)			618 (2)
2012	17	301 (6)	440 (4)		494 (6)		546 (1)				
2011	45	322 (8)	408 (4)	452 (21)		517 (9)	544 (1)				605 (2)
2010	51	299 (6)	373 (20)		482 (22)			608 (1)			564 (2)
2009	48	242 (11)		412 (35)	435 (1)						586 (1)
2008	32	257 (2)	323 (26)			473 (1)				635 (1)	566 (2)

Species: Yellow Perch

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2017	146	158 (129)	209 (17)								
2016	231	150 (170)	171 (43)	154 (18)							
2015	258	134 (227)	192 (31)								
2014	495	144 (462)	196 (23)	212 (10)							

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2013	1412	129 (788)	169 (624)								
2012	2774	121 (2573)	195 (187)	254 (14)							
2011	565	163 (453)	212 (109)	271 (4)							
2010	842	160 (711)	210 (132)								
2009	506	156 (488)	227 (17)	285 (1)							

## Fish Condition

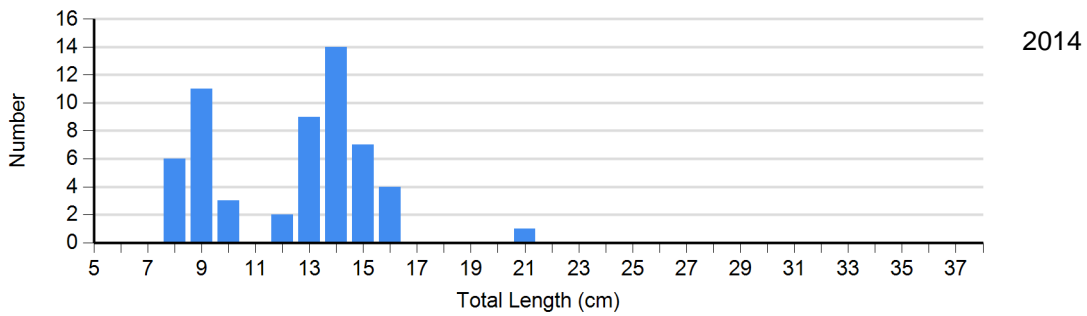
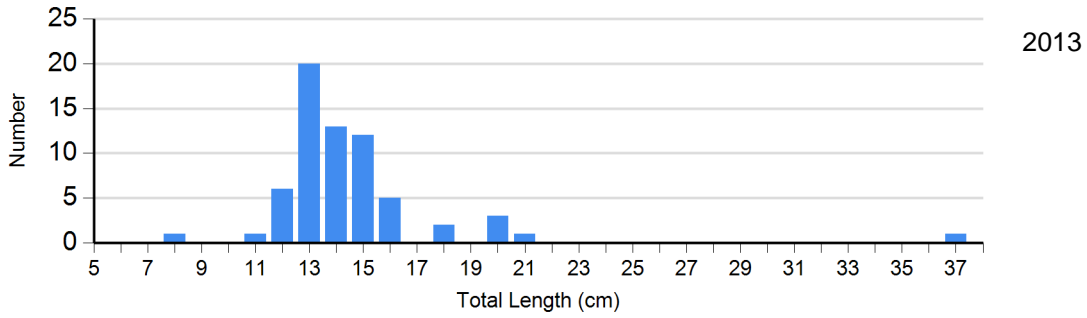
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

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	52	121 (1.3)	4	123 (4.5)	0		1	94
	2014	34	117 (1.2)	1	112	0		0	
Northern Pike Gill Net	2013	3	93 (2.2)	26	87 (1.0)	1	79	0	
	2014	0		21	89 (0.8)	2	88 (1.2)	1	83
	2015	0		10	92 (1.8)	1	77	0	
	2016	1	101	22	87 (1.2)	6	82 (1.7)	0	
	2017	0		11	79 (3.2)	5	71 (1.6)	0	
Walleye Gill Net	2013	6	88 (2.0)	8	92 (2.1)	7	86 (2.1)	1	81
	2014	2	92 (1.6)	4	97 (3.9)	5	92 (3.2)	1	89
	2015	28	98 (1.5)	1	104	8	100 (2.3)	1	86
	2016	8	92 (2.0)	4	99 (1.1)	16	94 (1.6)	3	88 (1.5)
	2017	6	92 (2.7)	9	94 (2.1)	31	89 (1.1)	15	81 (2.1)
Yellow Perch Gill Net	2013	916	98 (0.4)	25	92 (1.6)	0		0	
	2014	384	97 (0.4)	18	96 (1.4)	1	91	0	
	2015	165	99 (0.5)	8	93 (1.7)	0		0	
	2016	228	99 (0.5)	2	94 (1.8)	0		0	
	2017	134	102 (0.6)	12	96 (2.2)	0		0	

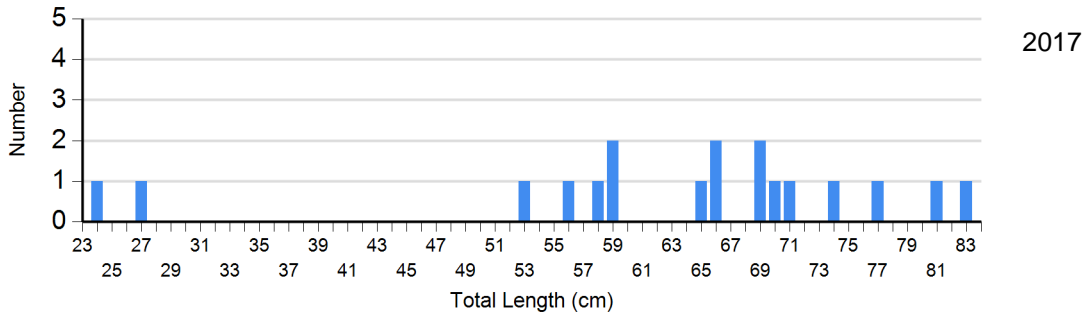
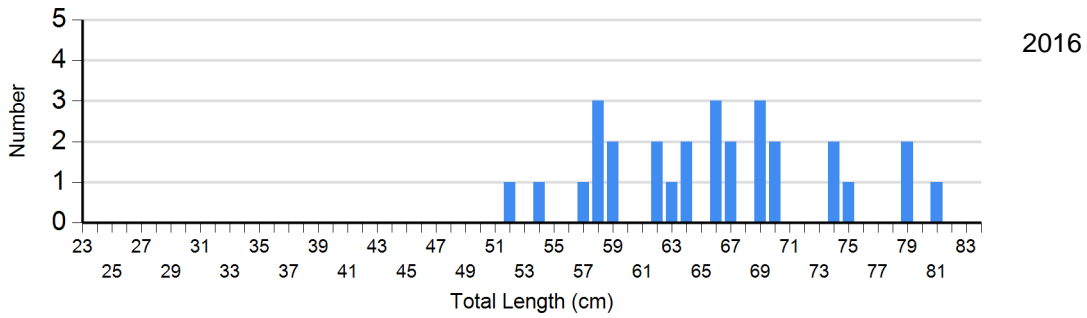
# Length Frequency Distribution

Length frequency histogram of species sampled by year.

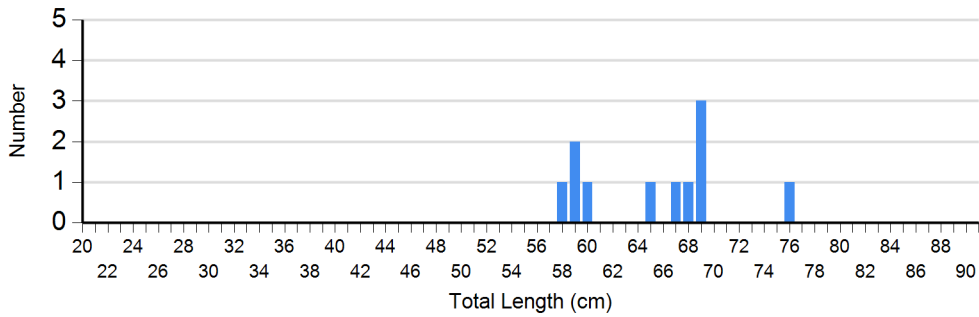
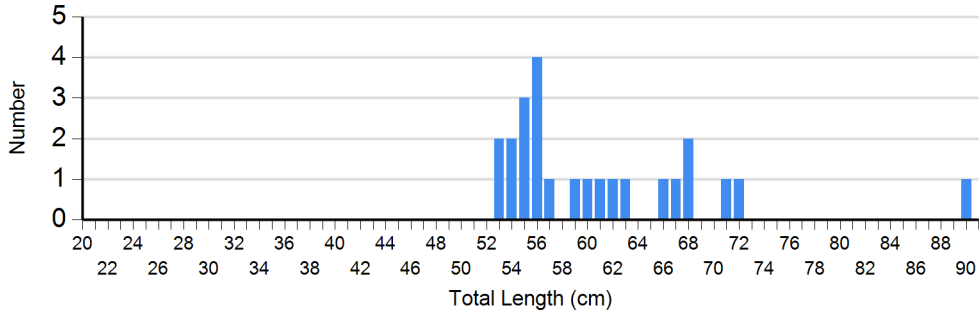
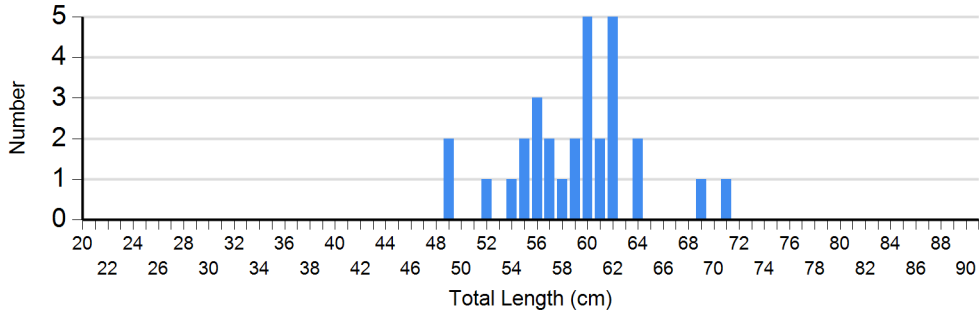
Species: Black Crappie  
 Gear: frame net (std 3/4 in)



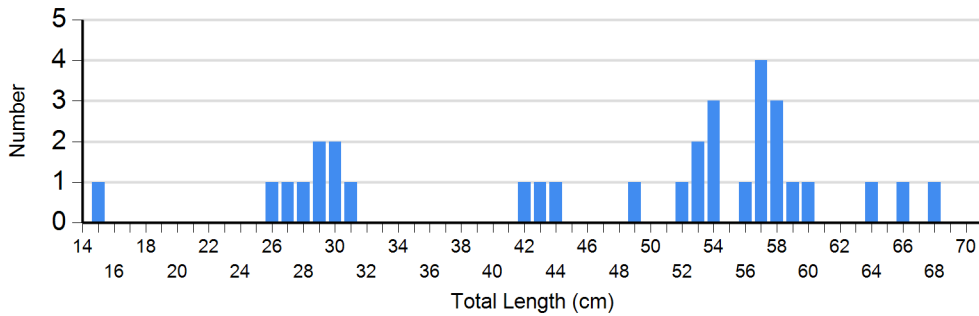
Species: Northern Pike  
 Gear: AFS std gill net

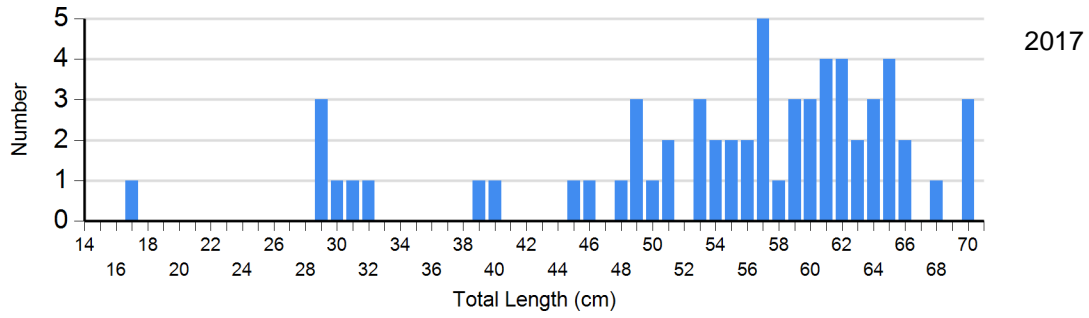


Species: Northern Pike  
 Gear: std exp gill net

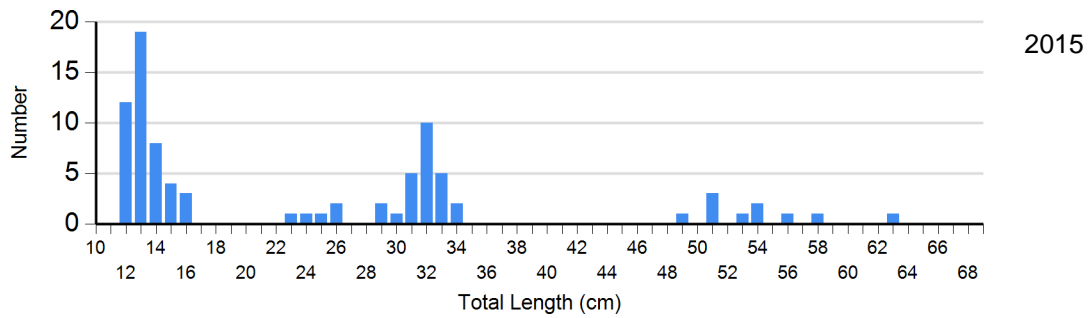
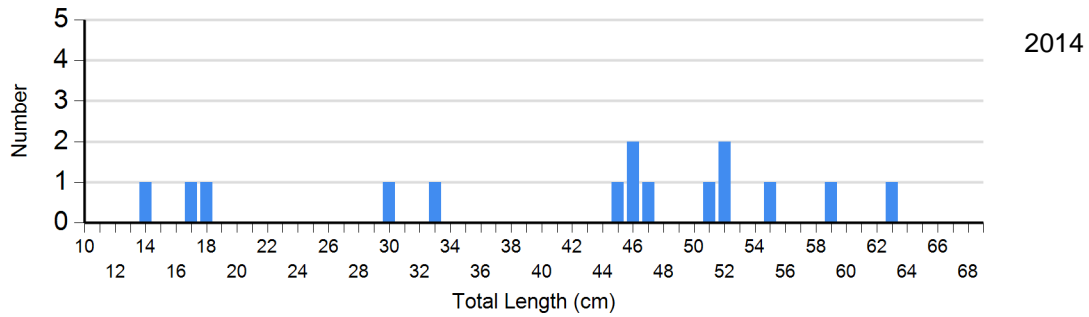
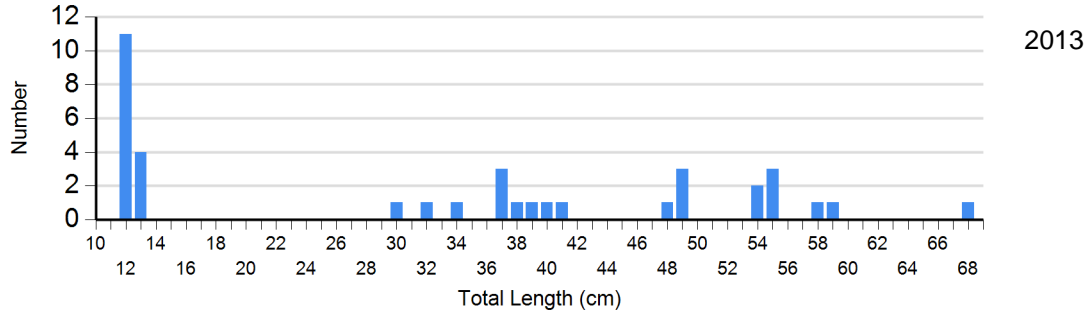


Species: Walleye  
 Gear: AFS std gill net

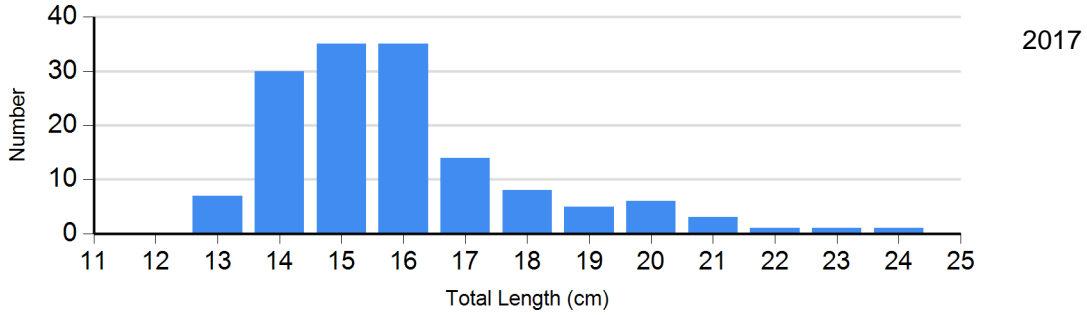
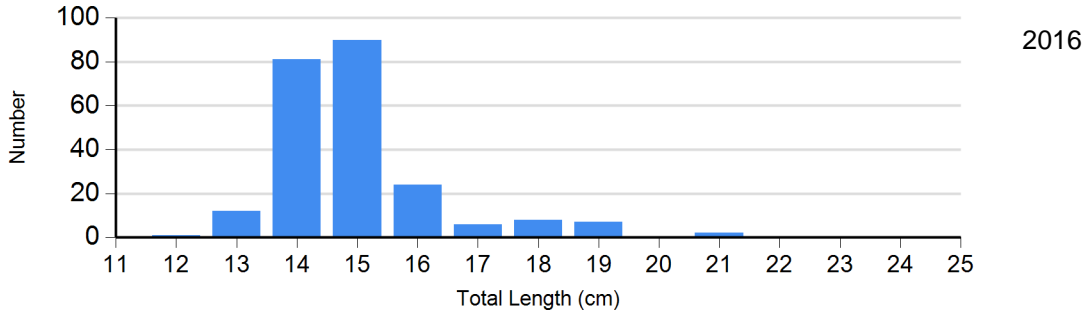




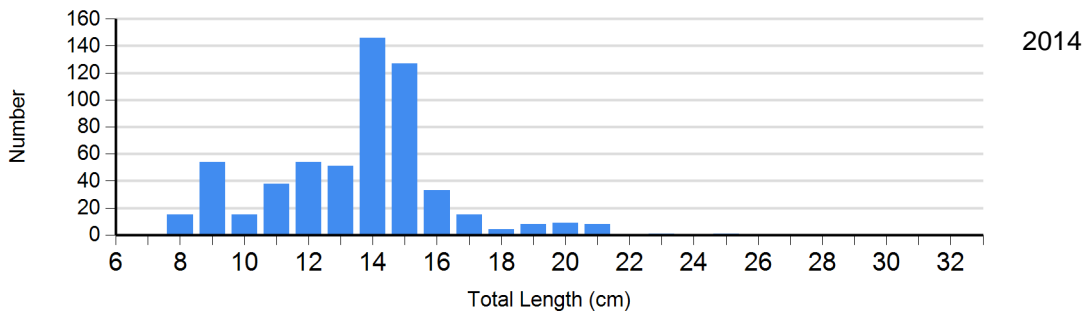
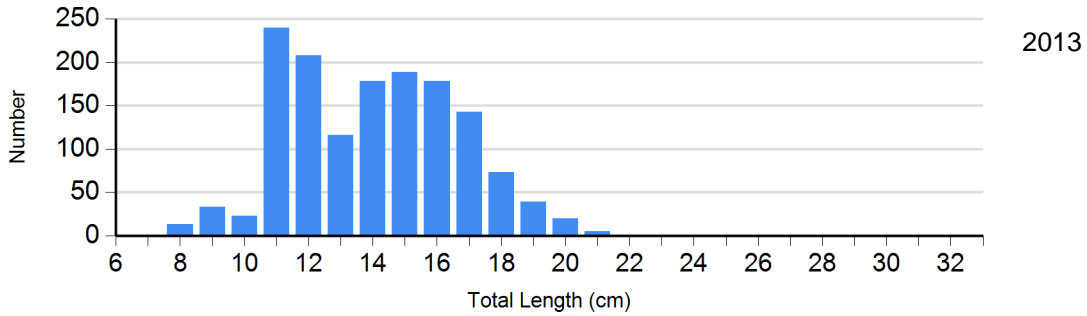
Species: Walleye  
 Gear: std exp gill net



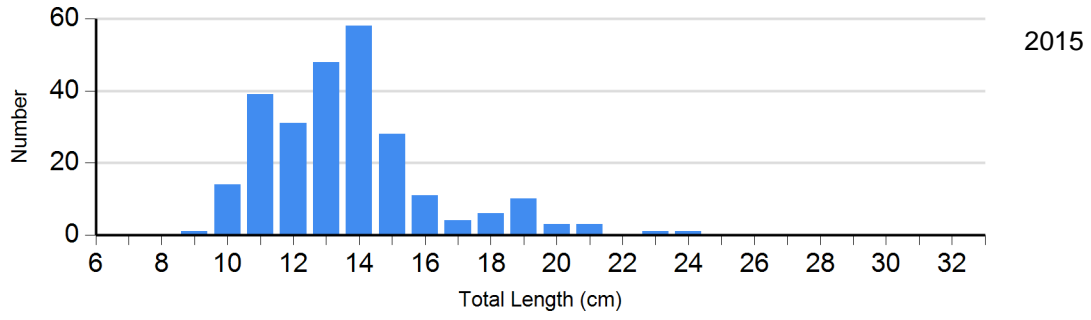
Species: Yellow Perch  
Gear: AFS std gill net



Species: Yellow Perch  
Gear: std exp gill net



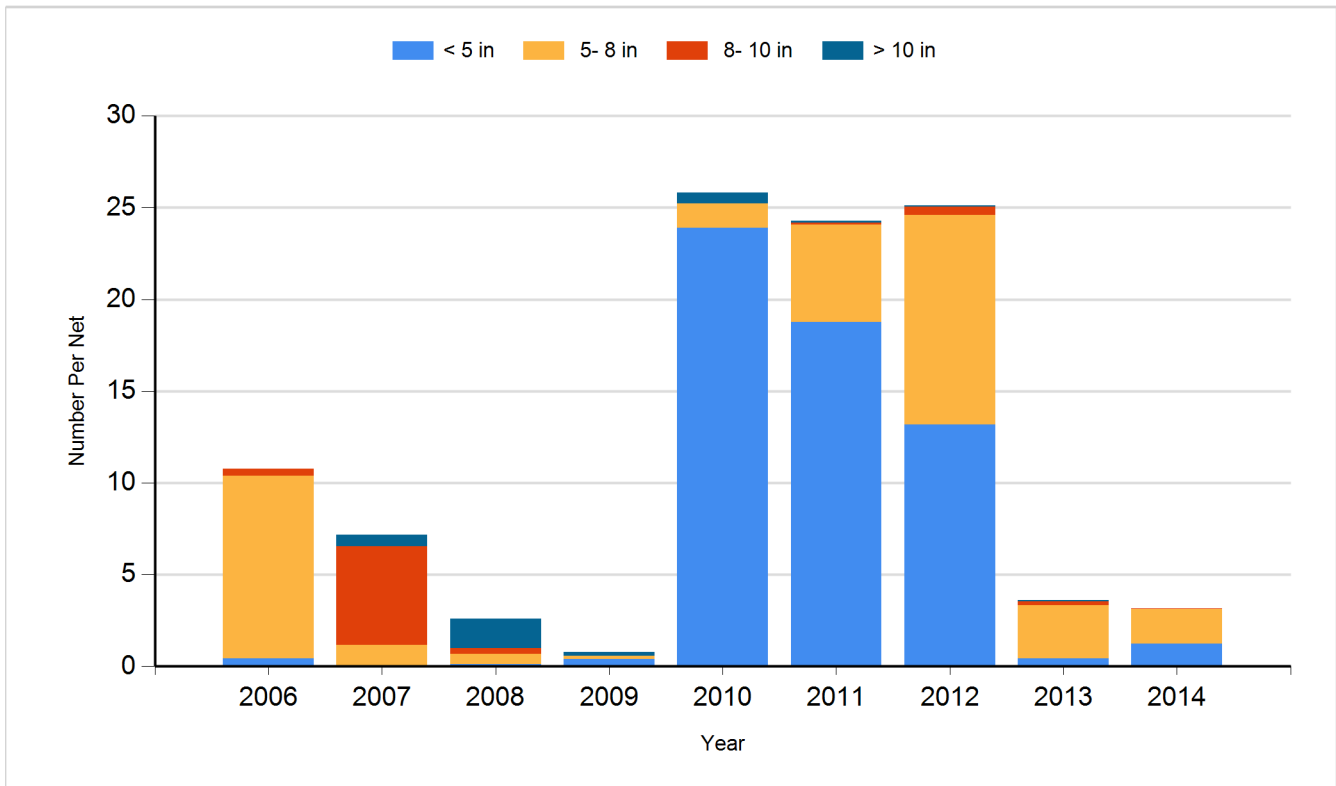




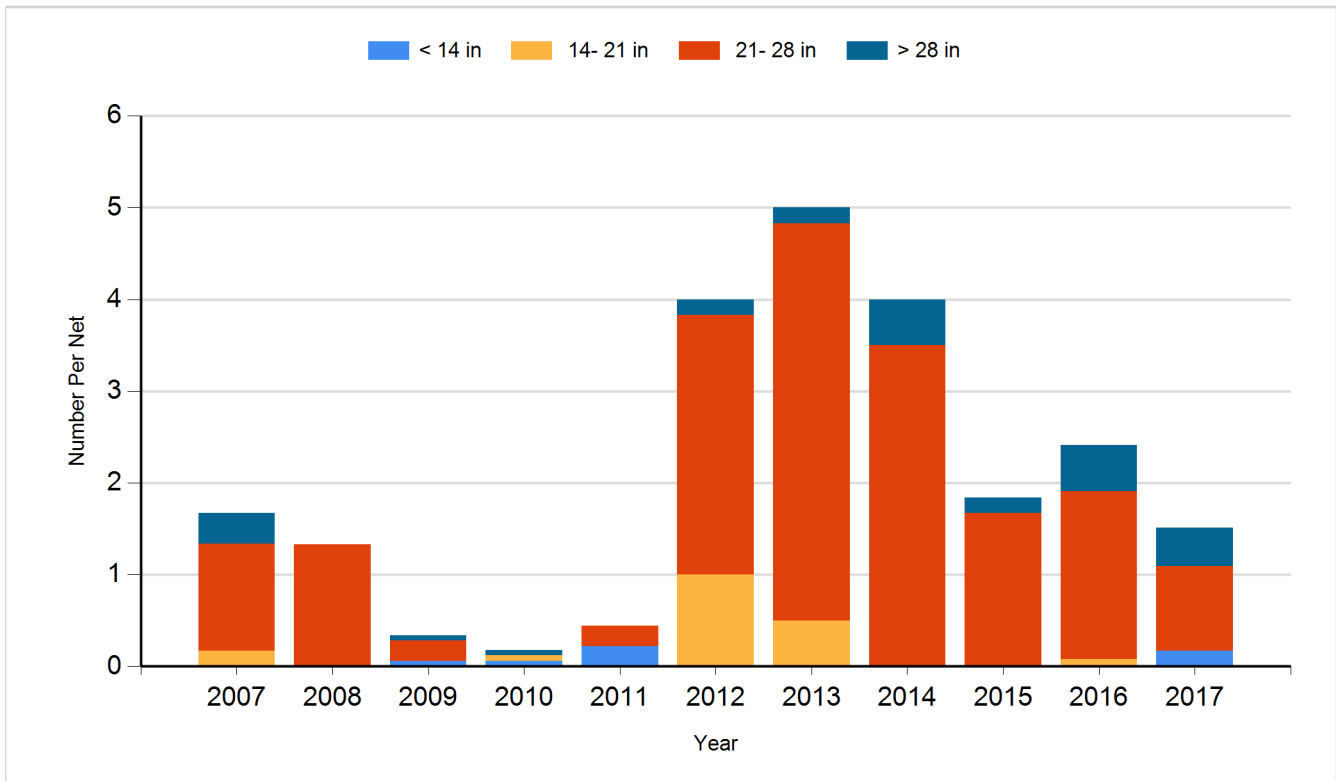
## Historic Fish Sizes and Relative Abundance

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

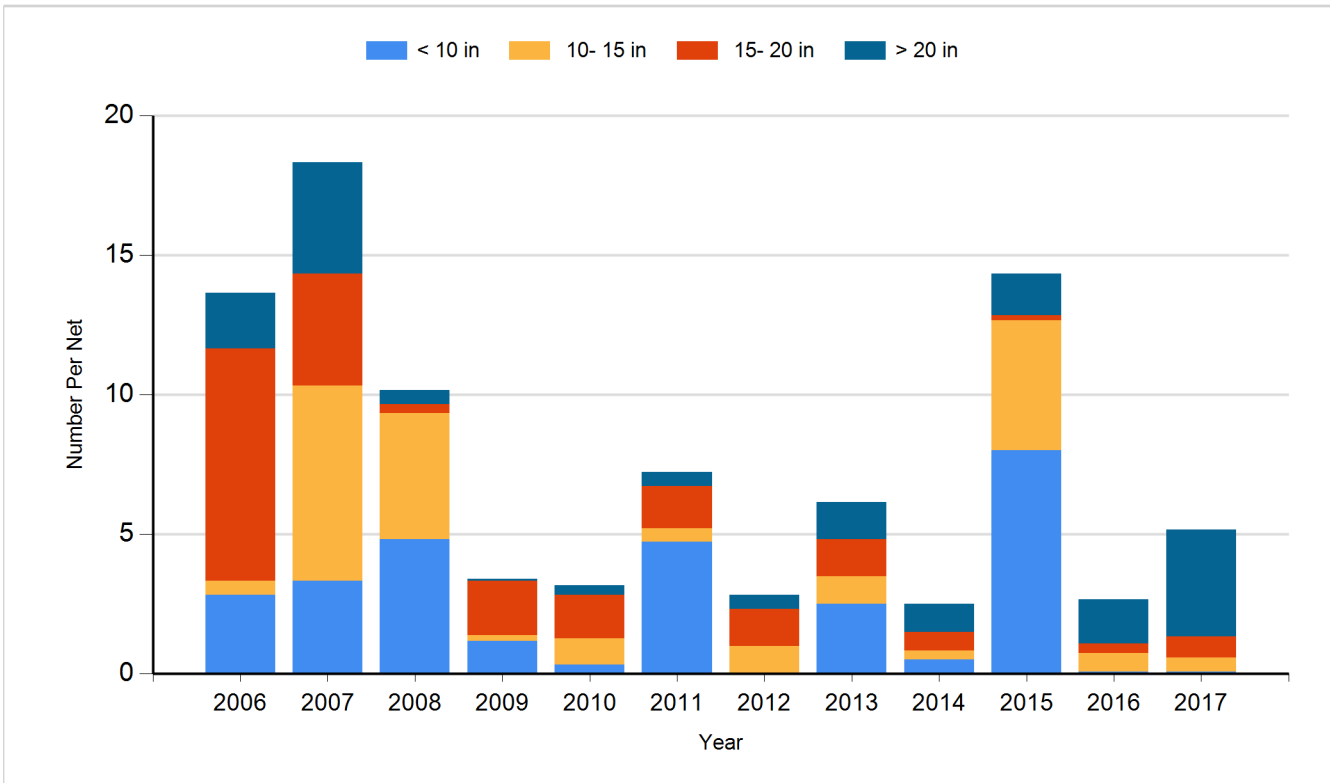
Species: Black Crappie  
Gear: Frame Net



Species: Northern Pike  
Gear: Gill Net



Species: Walleye  
Gear: Gill Net



Species: Yellow Perch  
Gear: Gill Net

