SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Madison, Lake County
LBS-Lake-135-000
2017

Lake Information

Name:	Madison		
County:	Lake		
Legal Description:	T106-R51,52-Sec. 21-23, 25-27, 29, 30-32	**OHWM Elevation:**	1,604
Surface Area:	2,703 Acres	**Outlet Elevation:**	1,603

Surveys and Investigations

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

Gear	Date	Effort
AFS std frame net	July 18, 2017	10 net-nights
AFS std gill net	July 18, 2017	10 net-nights

Common Fish Species Present

Walleye

Yellow Perch

White Sucker

White Bass

Black Bullhead

Common Carp

Smallmouth Bass

Black Crappie

Bigmouth Buffalo

Bluegill

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
AFS std frame net	Bigmouth Buffalo	1.2	0.7	83		8			
	Black Bullhead	2.9	0.9	100		79	12		
	Black Crappie	1.4	0.5	43	22	36	22	111	6
	Bluegill	0.5	0.4	80		20		144	29
	Common Carp	3.1	1.3	100		32	13		
	Northern Pike	0.4	0.3	100		75		89	4
	Smallmouth Bass	1.9	0.9	53	18	16		89	2
	Sunfish Hybrid	0.0	0.0						
	Walleye	0.9	0.4	44		0		76	2
	White Bass	1.5	0.8	87		73		85	2
	White Sucker	0.7	0.4	100		100			
AFS std gill net	Bigmouth Buffalo	1.1	1.0	27		0			
	Black Bullhead	4.9	1.4	98		80	9		
	Bluegill	0.3	0.3	100		33		119	7
	Common Carp	3.6	1.1	100		22	11		
	Smallmouth Bass	0.3	0.2	0		0		94	2
	Walleye	3.3	0.8	52	13	9		80	1
	White Bass	6.6	1.9	86	6	35	9	93	1
	White Sucker	8.5	3.0	98		94	4		
	Yellow Perch	9.4	2.6	44	7	26	7	105	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	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg
AFS std frame net	Bigmouth Buffalo										1.2	1.2
	Black Bullhead										2.9	2.9
	Black Crappie										1.4	1.4
	Bluegill										0.5	0.5
	Common Carp										3.1	3.1
	Northern Pike										0.4	0.4
	Smallmouth Bass										1.9	1.9
	Sunfish Hybrid										0.0	0.0
	Walleye										0.9	0.9
	White Bass										1.5	1.5
	White Sucker										0.7	0.7
AFS std gill net	Bigmouth Buffalo										1.1	1.1
	Black Bullhead										4.9	4.9
	Bluegill										0.3	0.3
	Common Carp										3.6	3.6
	Smallmouth Bass										0.3	0.3
	Walleye										3.3	3.3
	White Bass										6.6	6.6
	White Sucker										8.5	8.5
	Yellow Perch										9.4	9.4
fall night EF-WAE	Walleye	347.0	27.0	710.0	28.0	2.5	113.5	31.0	10.0			158.6
	Yellow Perch					0.0						0.0
large frame net	Bigmouth Buffalo	6.1	11.0	4.0	4.3	5.7	3.6					5.8
	Black Bullhead	8.8	4.3	28.4	74.2	73.9	24.0					35.6
	Black Crappie	17.9	3.3	7.1	26.6	8.3	0.1					10.6
	Bluegill	0.9	0.1	7.7	3.9	1.4	0.7					2.5
	Channel Catfish	0.1			0.1							0.1
	Common Carp	4.7	3.2	2.0	2.2	8.2	6.3					4.4
	Green Sunfish	0.6		5.5	2.5		0.2					2.2
	Northern Pike	0.3	1.2		0.5	0.9	0.4					0.7
	Smallmouth Bass			0.2	0.2	0.1	0.1					0.2
	Sunfish Hybrid		0.0				0.0					0.0
	Walleye	0.3	0.9	0.5	1.9	16.8	0.2					3.4

		CPUE										
Gear	Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg
large frame net	White Bass		0.2	0.1	0.3	5.1	0.2					1.2
	White Sucker	1.2	0.7	0.2	2.3	5.6	2.2					2.0
	Yellow Perch	32.0	1.5	165.9	100.9	5.5	0.6					51.1
std exp gill net	Bigmouth Buffalo	1.8	0.2	0.0		1.0		0.8	0.8			0.8
	Black Bullhead	2.0	2.7	6.3	26.8	19.7	15.8	63.4	91.0	7.8		26.2
	Black Crappie	5.2	0.2	2.3	10.8			0.2	0.3			3.2
	Bluegill			0.3	1.0	0.3			0.5			0.5
	Channel Catfish							0.2	0.3	0.2		0.2
	Common Carp	0.7	0.3		2.5	0.3	0.0	1.4	3.5	2.2		1.4
	Green Sunfish				0.3		0.0					0.2
	Northern Pike	0.8	0.2		0.3	0.7		0.2		0.2		0.4
	Smallmouth Bass							0.6				0.6
	Spottail Shiner		0.0					0.0				0.0
	Walleye	2.5	11.0	19.0	12.8	23.7	9.6	7.0	7.3	17.8		12.3
	White Bass				1.5	0.0	1.2	0.8	0.8	0.8		0.9
	White Sucker	12.2	18.0	9.0	15.8	14.7	11.6	20.0	11.0	13.6		14.0
	Yellow Bullhead				0.3							0.3
	Yellow Perch	100.2	18.3	162.3	265.8	130.0	6.0	24.2	8.3	15.6		81.2
std frame net (3/8 inch)	Bigmouth Buffalo							8.0	9.3	9.1		8.8
	Black Bullhead							301.9	61.0	21.5		128.1
	Black Crappie							2.1	1.7	3.6		2.5
	Bluegill							8.6	1.7	3.8		4.7
	Common Carp							16.6	14.2	7.6		12.8
	Green Sunfish							0.4	0.2	0.1		0.2
	Northern Pike							0.2	0.3	0.1		0.2
	Smallmouth Bass							3.5	0.9	2.4		2.3
	Sunfish Hybrid							0.0	0.0			0.0
	Walleye							0.2	0.7	1.7		0.9
	White Bass								0.5	4.8		2.7
	White Sucker							0.8	3.4	2.5		2.2
	Yellow Perch							2.2	0.4	0.8		1.1

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.

			Year									
Gear	Species	Index	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AFS std frame net	Black Crappie	PSD										43
		PSD-P										36
		Wr										111
	Northern Pike	PSD										100
		PSD-P										75
		Wr										89
	Walleye	PSD										44
		PSD-P										0
		Wr										76
AFS std gill net	Walleye	PSD										52
		PSD-P										9
		Wr										80
	Yellow Perch	PSD										44
		PSD-P										26
		Wr										105
fall night EF-WAE	Walleye	Wr	99	107	95	100	105	83	98	92		
large frame net	Black Crappie	PSD	54	97	70	16	100	100				
		PSD-P	8	12	66	11	11	100				
		Wr	110	109	112	131	93	105				
	Northern Pike	PSD	67	75		60	67	75				
		PSD-P	33	25		20	22	0				
		Wr	86	100		92	67	85				
	Walleye	PSD	33	33	20	16	2	0				
		PSD-P	33	11	0	0	2	0				
		Wr	98	91	92	90	86	97				
	Yellow Perch	PSD	5	80	8	4	96	0				
		PSD-P	2	13	5	1	24	0				
		Wr	103	103	99	101	90	123				
std exp gill net	Black Crappie	PSD	45	0	29	2			0	100		
		PSD-P	0	0	29	2			0	0		

			Year									
Gear	Species	Index	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
std exp gill net	Black Crappie	Wr	115	112	113	120			116	117		
	Northern Pike	PSD	60	100		0	0		100		100	
		PSD-P	0	100		0	0		0		100	
		Wr	87	79		87	77		100		86	
	Walleye	PSD	93	15	39	49	6	48	89	0	1	
		PSD-P	7	2	0	10	3	0	11	0	0	
		Wr	85	88	91	87	77	100	85	86	86	
	Yellow Perch	PSD	25	89	34	18	87	17	3	82	37	
		PSD-P	3	11	25	3	12	3	2	24	36	
		Wr	109	114	106	102	91	112	106	110	108	
std frame net (3/8 inch)	Black Crappie	PSD							14	100	100	
		PSD-P							14	12	86	
		Wr							107	107	106	
	Northern Pike	PSD							100	100	100	
		PSD-P							50	67	100	
		Wr							84	91		
	Walleye	PSD							50	29	0	
		PSD-P							0	14	0	
		Wr							83	79	81	
	Yellow Perch	PSD							9	100	13	
		PSD-P							0	75	13	
		Wr							93	98	97	

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+
2012	83		222 (74)		288 (3)	320 (5)	326 (1)				
2011	268	147 (230)	221 (9)	254 (8)	295 (16)	302 (3)	315 (2)				
2010	74	145 (24)	235 (2)	265 (44)	286 (4)						
2009	33	150 (1)	215 (22)	240 (10)							
2008	156	155 (70)	212 (78)	259 (6)	257 (2)						

Species: Walleye

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2017	34	254 (4)	255 (2)	373 (10)	397 (15)				669 (1)		645 (2)
2016	90	238 (1)	284 (56)	314 (32)	425 (1)						
2015	101	196 (48)	254 (53)								
2014	68	206 (37)	415 (1)	436 (8)	462 (19)	496 (1)	558 (2)				
2013	48		334 (7)	386 (41)							
2012	74	250 (8)	303 (63)		515 (2)	536 (1)					
2011	98	245 (73)	401 (6)	448 (8)	494 (11)						
2010	57	312 (12)	370 (37)	423 (7)		470 (1)					
2009	97	240 (45)	324 (49)		506 (1)		548 (2)				
2008	35	208 (21)		436 (9)		481 (5)					

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	94	171 (53)	247 (28)	275 (1)	281 (12)						
2015	33	166 (6)	240 (27)								
2014	121	173 (119)	251 (1)		318 (1)						

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2013	30	165 (25)	233 (3)	256 (2)							
2012	390	155 (35)	231 (347)	263 (4)		325 (4)					
2011	1063	180 (938)	242 (125)								
2010	487	178 (355)	259 (16)	281 (112)	304 (6)						
2009	110	162 (8)	228 (98)	260 (4)							
2008	608	155 (450)	229 (103)	247 (50)	223 (6)						

Fish Condition

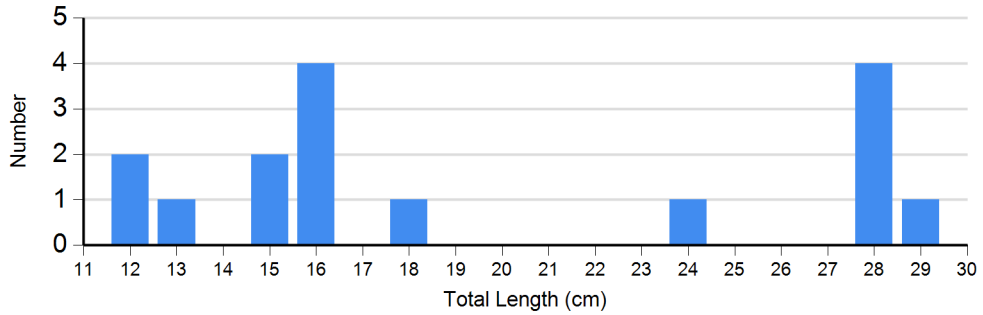
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		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		0		1	105	0	
	2014	18	110 (2.1)	0		3	90 (3.2)	0	
	2015	0		15	109 (1.7)	1	93	1	89
	2016	0		5	119 (11.2)	29	105 (1.1)	2	87 (4.3)
	2017	8	121 (4.5)	1	108	5	96 (3.5)	0	
Northern Pike Gill Net	2014	0		1	100	0		0	
	2016	0		0		1	86	0	
Walleye Gill Net	2013	25	97 (1.3)	23	102 (1.1)	0		0	
	2014	4	83 (2.1)	27	84 (1.1)	4	95 (3.2)	0	
	2015	29	86 (0.8)	0		0		0	
	2016	88	86 (0.6)	1	85	0		0	
	2017	16	80 (0.8)	14	80 (1.2)	0		3	82 (6.6)
Yellow Perch Gill Net	2013	25	111 (1.4)	4	121 (7.9)	1	113	0	
	2014	117	106 (1.0)	2	104 (3.5)	1	102	1	90
	2015	6	104 (1.1)	19	111 (2.0)	8	113 (3.0)	0	
	2016	49	111 (1.2)	1	101	28	106 (1.2)	0	
	2017	53	108 (1.0)	17	107 (2.6)	20	100 (2.7)	4	95 (2.7)

Length Frequency Distribution

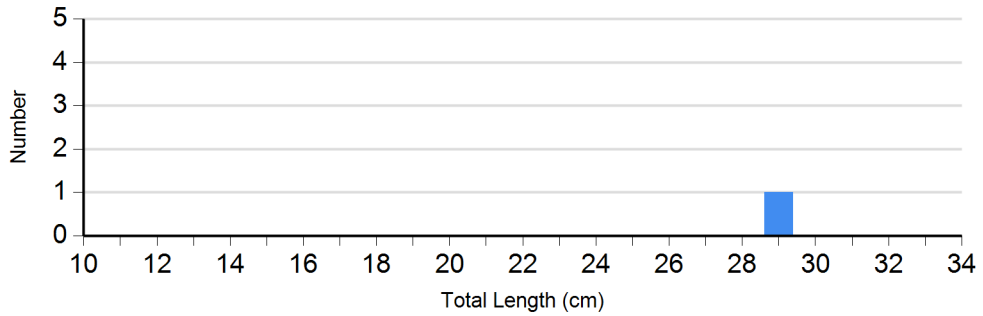
Length frequency histogram of species sampled by year.

Species: Black Crappie
Gear: AFS std frame net



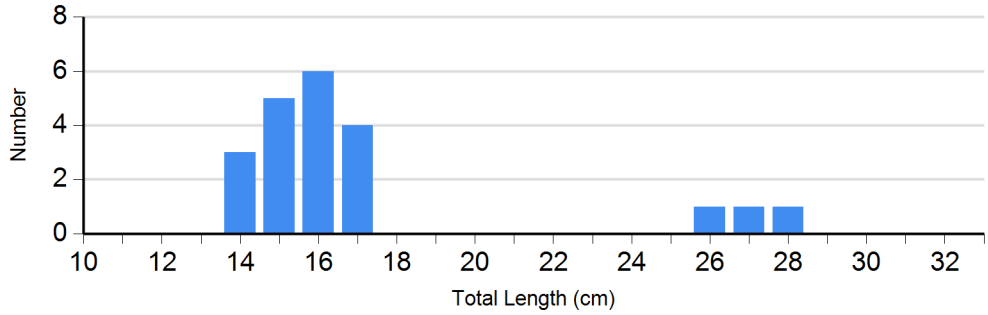
2017

Species: Black Crappie
Gear: large frame net

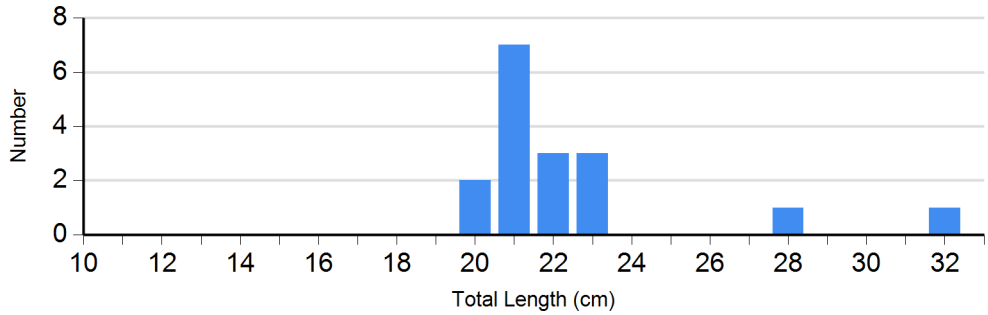


2013

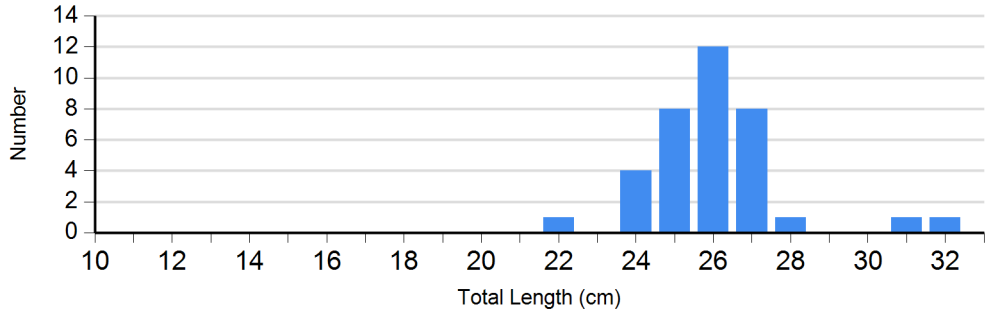
Species: Black Crappie
Gear: std frame net (3/8 inch)



2014

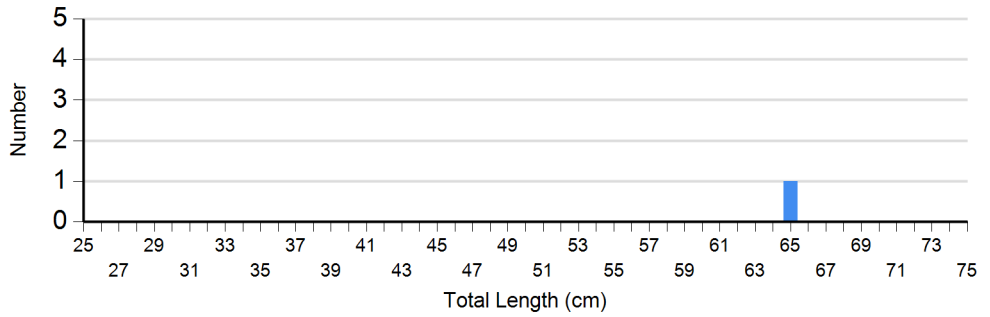


2015

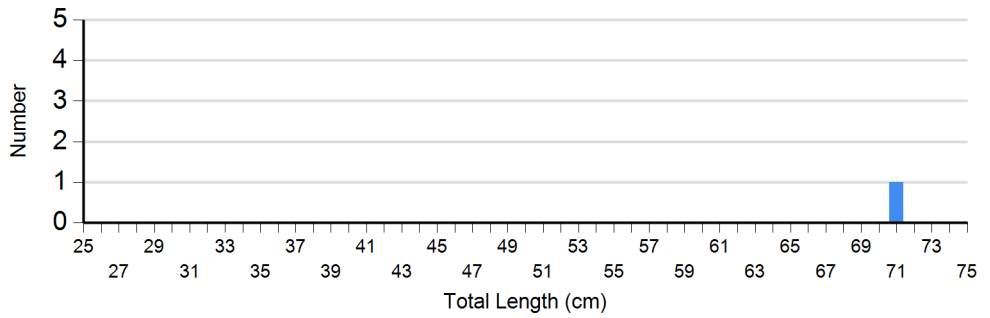


2016

Species: Northern Pike
Gear: std exp gill net

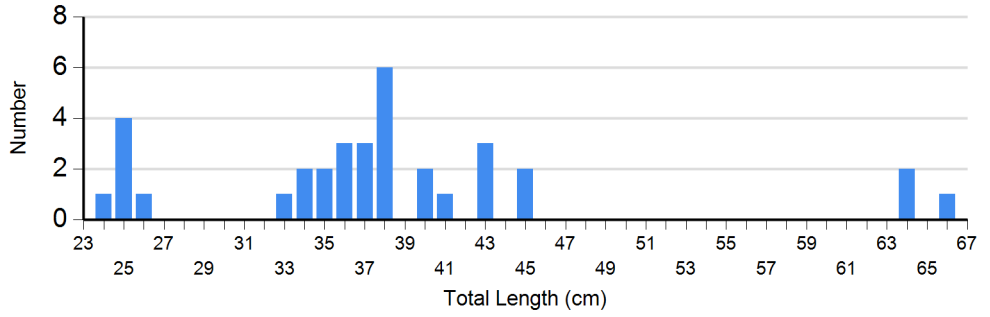


2014



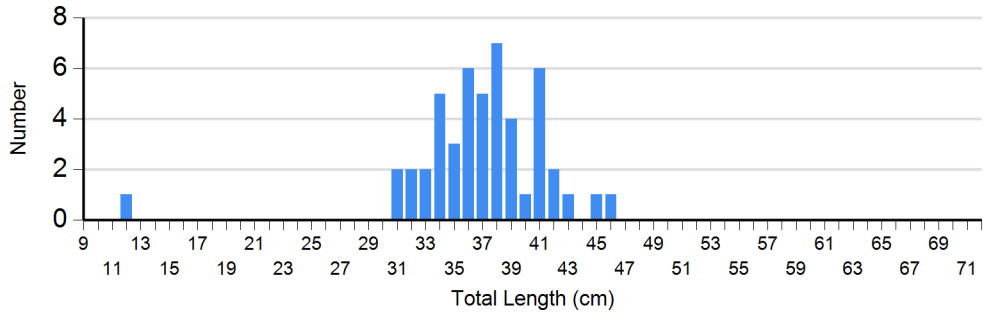
2016

Species: Walleye
Gear: AFS std gill net

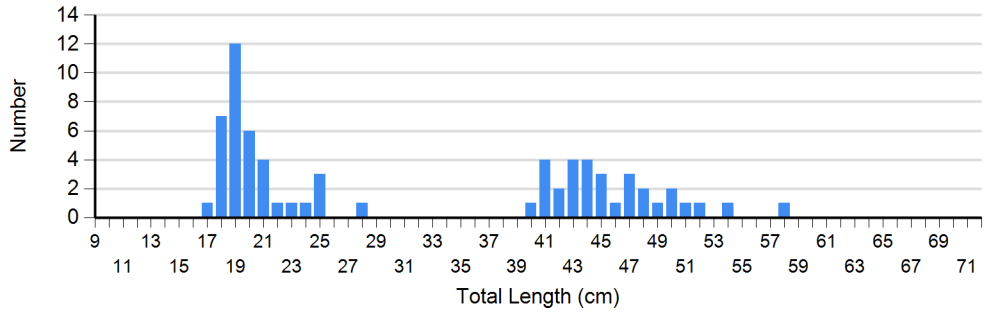


2017

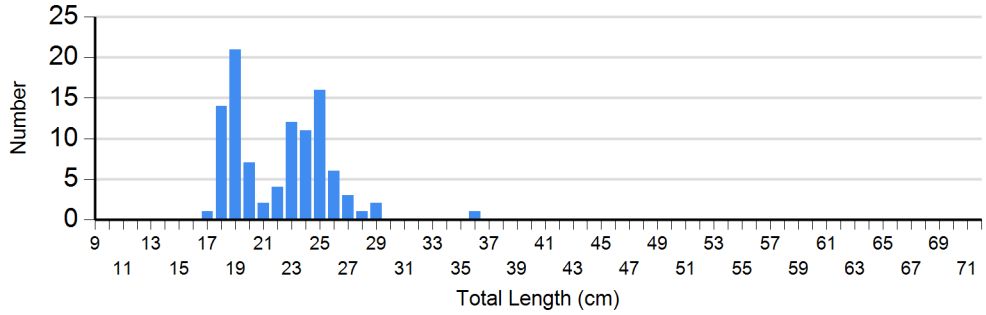
Species: Walleye
Gear: std exp gill net



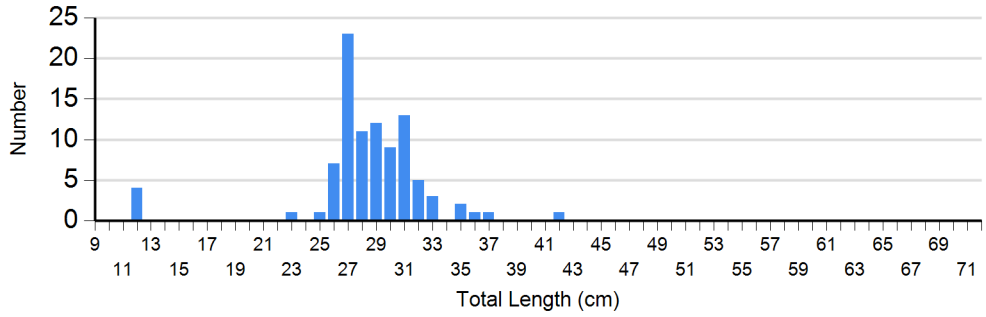
2013



2014

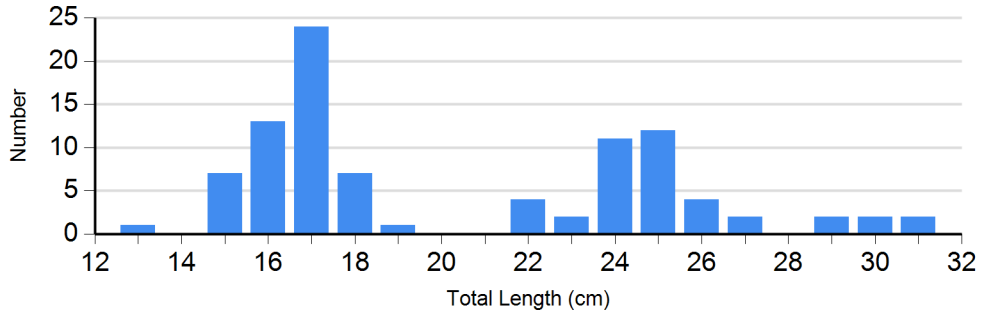


2015



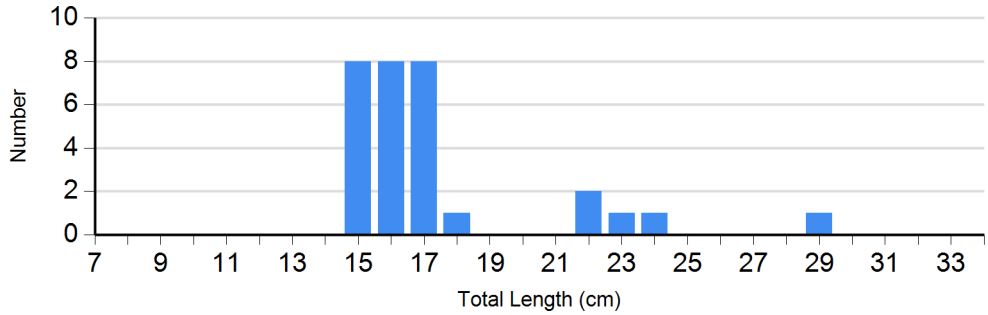
2016

Species: Yellow Perch
Gear: AFS std gill net

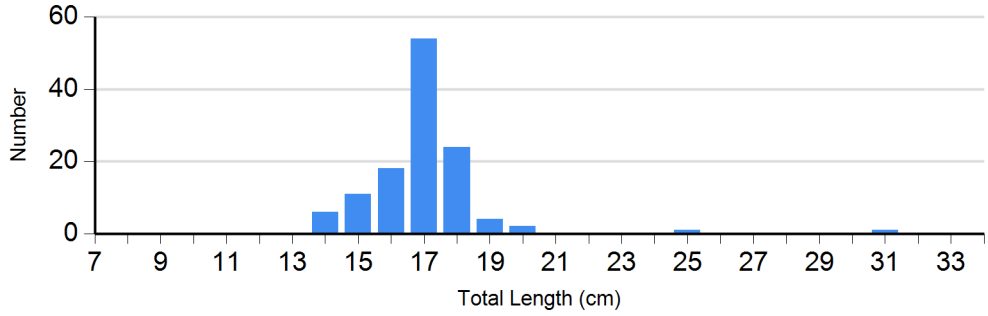


2017

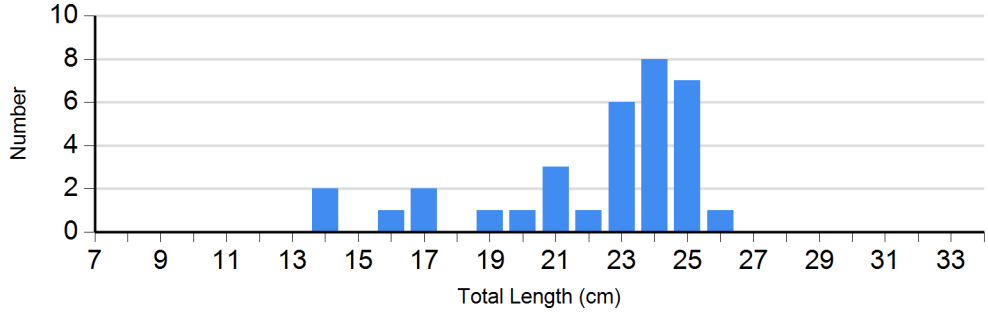
Species: Yellow Perch
Gear: std exp gill net



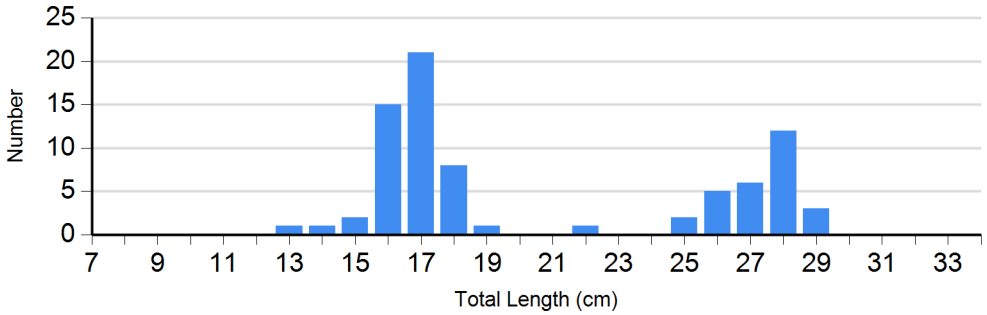
2013



2014



2015

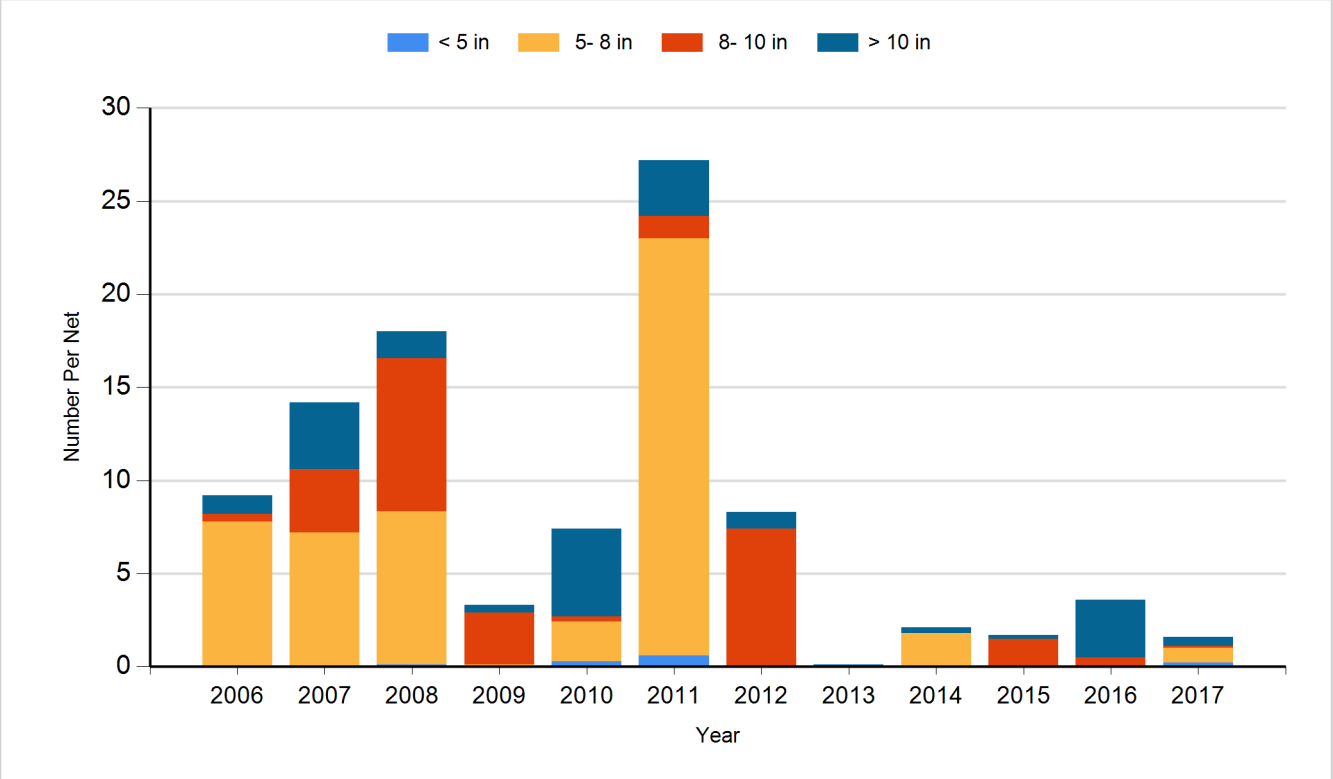

25
20
15
10
5
0
Number
7
9
11
13
15
17
19
21
23
25
27
29
31
33
Total Length (cm)

2016

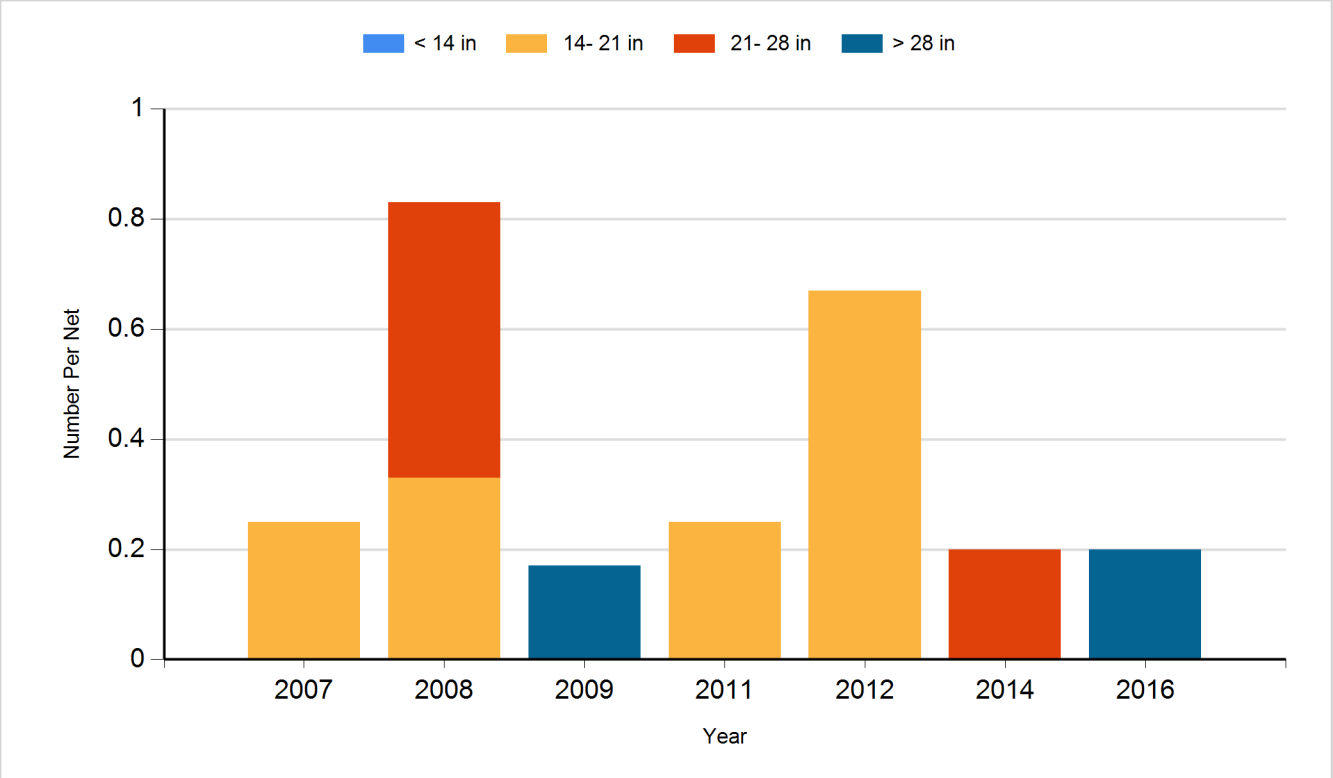
Historic Fish Sizes and Relative Abundance

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

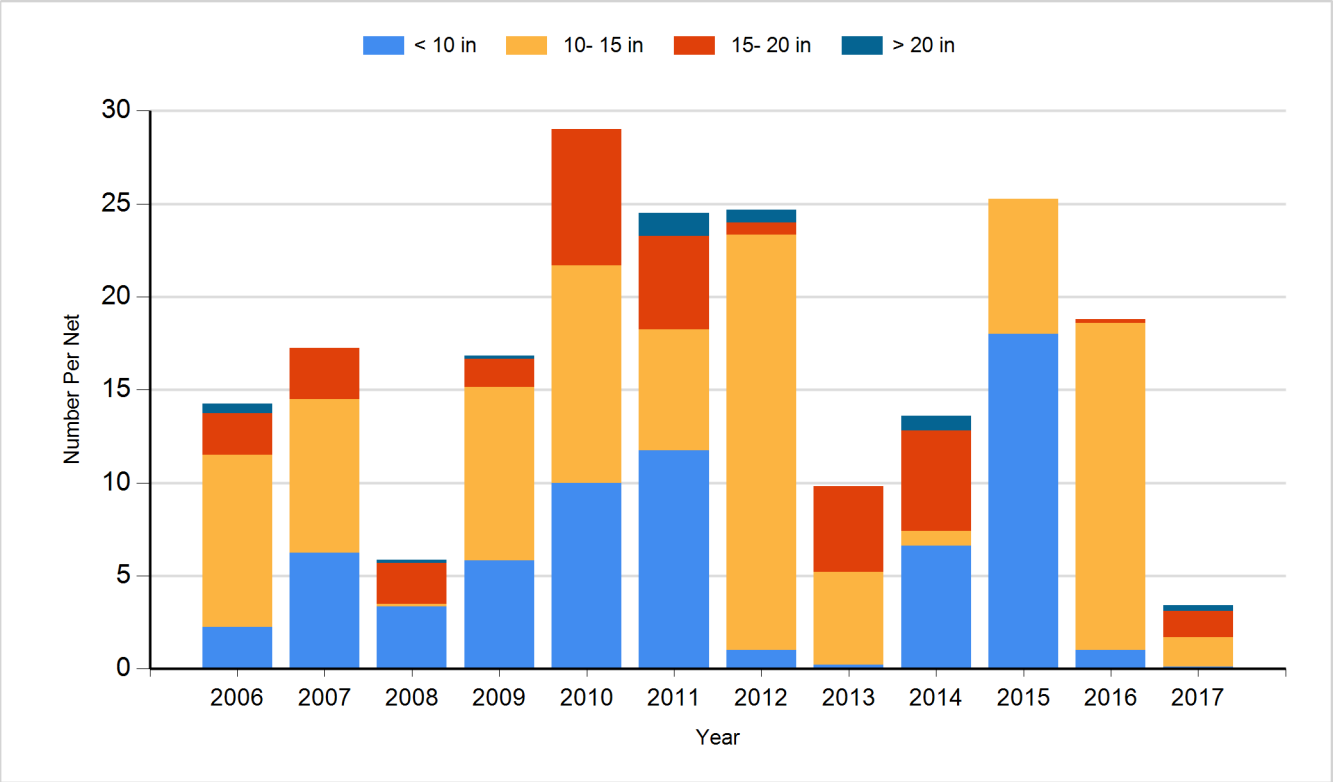
Species: Black Crappie
Gear: Frame Net



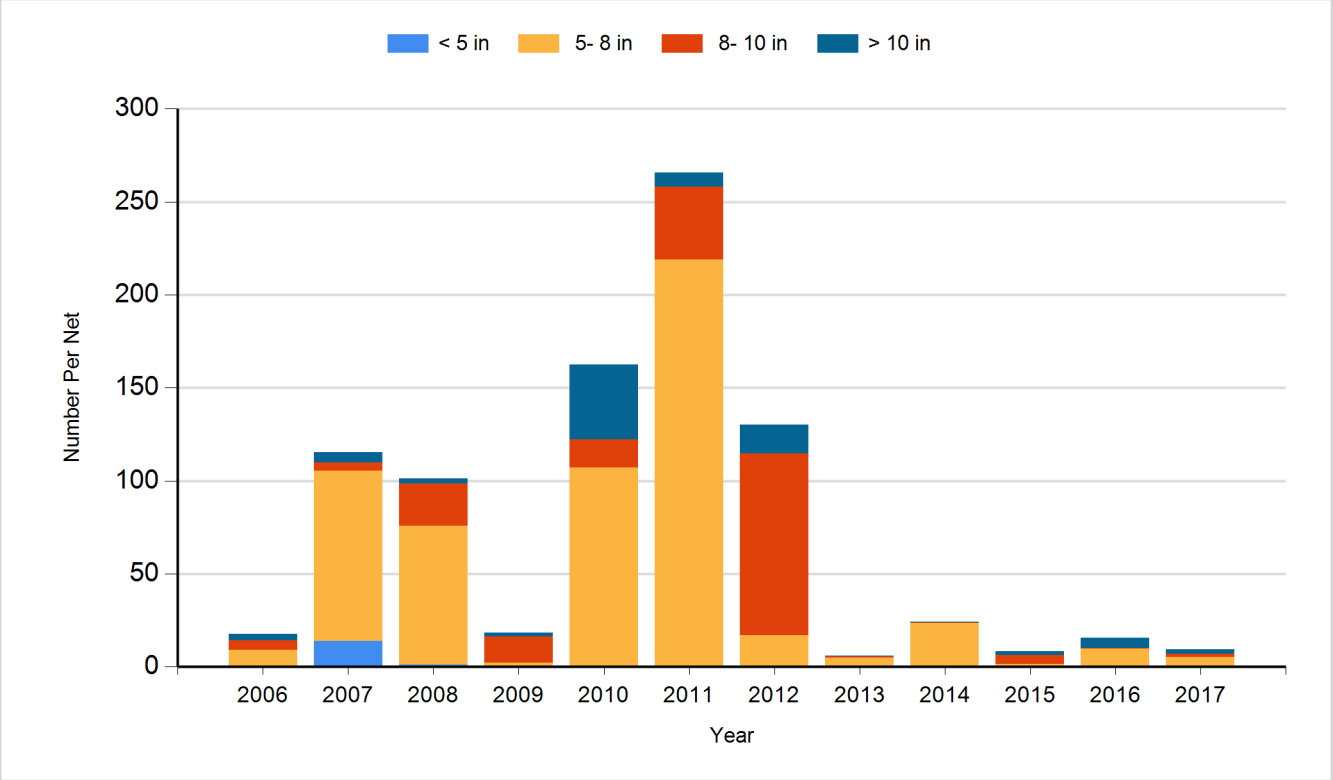
Species: Northern Pike
Gear: Gill Net



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
2007	Walleye	Small Fingerling	264,440
2007	Yellow Perch	Fingerling	187,000
2008	Walleye	Small Fingerling	218,020
2010	Walleye	Small Fingerling	280,320
2011	Northern Pike	Fry	35,200
2011	Walleye	Fry	70,000
2013	Walleye	Small Fingerling	280,150
2014	Walleye	Small Fingerling	196,200
2017	Walleye	Fingerling	195,515