Elm Lake Survey Summary

Elm Lake, located 9.0 miles west and 1 mile north of Frederick, is managed as a black crappie and walleye fishery; however, other fish species (e.g., channel catfish, northern pike) are present and contribute to the fishery.

- **Black crappie.** Black crappie populations are assessed using frame nets in northeast South Dakota; no frame nets were used during the 2018 Elm Lake survey.

- **Channel catfish.** Channel catfish numbers were higher in 2018 (3.3/gill net) than 2016 (1.6/gill net). Sampled catfish ranged in length from 15.7 to 28.3 inches; most (>70%) were 16.0 to 19.0 inches. Opportunity exists for anglers to catch the channel catfish from Elm Lake.

- **Walleye.** Walleye (includes saugeye) numbers were higher in 2018 than 2016. However at 3.3/gill net, relative abundance was still considered low. Those sampled ranged in length from 8.3 to 23.2 inches; six year classes (2009, 2010, and 2014 – 2017) were present. The majority (57%) of fish sampled were from the 2014 year class, which coincided with a walleye stocking. Recent saugeye stockings in 2016 and 2017 were represented in the gill net catch. Growth of the 2014 (age-4) year class has been slow (mean length = 12.7 inches).

- **Yellow Perch**. Similar to 2016, yellow perch numbers were low (0.6/gill net) in 2018; seven yellow perch ranging in length from 7.9 to 9.4 inches were sampled.

For more detailed results see the computer generated South Dakota Statewide Fisheries Survey for Elm Lake (below).

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Elm, Brown County
ELM-Lake-5-800
2018

Lake Information

Name:	Elm	**Maximum Depth:**	34 Feet
County:	Brown	**Mean Depth:**	18 Feet
Surface Area:	1,221 Acres		

Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	Aug 01, 2018	4 net-nights
AFS std gill net	Aug 02, 2018	4 net-nights
AFS std gill net	Aug 03, 2018	4 net-nights
fall night EF-WAE	Oct 16, 2018	3600 seconds

Common Fish Species Present

Walleye

Black Crappie

Black Bullhead

Common Carp

Channel Catfish

White Sucker

Yellow Perch

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).

A statewide effort to help make netting efforts comparable to all waters sampled across the state, occurred in 2017, with a switch to American Fisheries Society gill nets. Past gill netting efforts were completed with different style/types of nets and are not comparable side by side.

- **AFS std gill net** – 80 ft experimental gill net containing eight panels (10 ft each) of varying monofilament meshes of 0.75, 1.00, 1.25, 1.50, 1.75, 2.00, 2.25 and 2.50 inches.
- **std experimental gill net for non-Missouri River waters** - 150 ft experimental gill net containing six panels (25 ft each) of varying monofilament meshes of 0.5, 0.75, 1.00, 1.25, 1.50 and 2.00 inches.
- s**td experimental gill net for Missouri River reservoirs** – 300 ft experimental gill net containing six panels (50 ft each) of varying multifilament meshes of 0.5, 0.75, 1.00, 1.25, 1.50 and 2.00 inches.

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

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
Bluegill	3	8	6	15	8	20	10	25	12	30
Channel Catfish	11	28	16	41	24	61	28	71	36	91
Common Carp	11	28	16	41	21	53	26	66	33	84
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
Muskellunge	20	51	30	76	38	97	42	107	50	127
Northern Pike	14	35	21	53	28	71	34	86	44	112
Pumpkinseed	3	8	6	15	8	20	10	25	12	30
Rock Bass	4	10	7	18	9	23	11	28	13	33
Rudd	6	15	10	25	12	30	15	38	19	48
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
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 Sucker	6	15	10	25	13	33	16	41	20	51
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).

*** CPUE represents age-0 individuals**

		Abundance		Stock Density Indices				Condition	
Gear	Species	CPUE	CI-80	PSD	CI-80	PSD-P	CI-80	Wr	CI-80
AFS std gill net	Black Bullhead	10.8	2.3	100		0		85	1
	Black Crappie	0.8	0.3	89		67		100	2
	Channel Catfish	3.3	0.8	92		18	10	96	2
	Common Carp	3.5	0.9	98		0		91	1
	Northern Pike	0.1	0.1	100		100		83	
	Walleye (saugeye)	3.3	1.0	10		10		82	1
	White Sucker	3.1	1.0	100		95		97	1
	Yellow Perch	0.6	0.5	100		0		103	4
fall night EF-WAE*	Walleye (saugeye)	112.0	26.7					83	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	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Avg
AFS std frame net	Black Bullhead								181.2			181.2
	Black Crappie								10.0			10.0
	Channel Catfish								1.6			1.6
	Common Carp								9.3			9.3
	Northern Pike								0.8			0.8
	Walleye (saugeye)								0.3			0.3
	White Sucker								0.2			0.2
AFS std gill net	Black Bullhead								32.1		10.8	21.5
	Black Crappie								0.8		0.8	0.8
	Channel Catfish								1.6		3.3	2.5
	Common Carp								3.5		3.5	3.5
	Northern Pike								0.7		0.1	0.4
	Walleye (saugeye)								1.0		3.3	2.2
	White Sucker								2.9		3.1	3.0
	Yellow Perch								0.4		0.6	0.5
fall night EF-WAE	Walleye (saugeye)								117.5	109.5	112.0	113.0
frame net (std 3/4 in)	Black Bullhead	148.3	113.1		1,255.8		333.4					462.7
	Black Crappie	12.6	7.3		11.4		3.2					8.6
	Bluegill	2.0	4.2		0.0		0.0					1.6
	Channel Catfish	0.2	0.0		4.4		5.6					2.6
	Common Carp	0.2	1.7		0.1		0.1					0.5
	Northern Pike	0.9	1.8		2.6		0.2					1.4
	Orangespotted Sunfish	0.7	0.2		0.0		0.0					0.2
	Walleye (saugeye)	0.4	0.4		4.1		0.2					1.3
	White Sucker	0.9	0.8		0.9		0.3					0.7
	Yellow Perch	1.2	3.8		0.6		0.3					1.5
std exp gill net	Black Bullhead	22.8	35.3		281.8		166.8					126.7
	Black Crappie	4.2	2.3		0.2		3.5					2.6
	Channel Catfish	0.2	0.0		0.3		1.0					0.4
	Common Carp	0.2	0.3		0.0		0.3					0.2
	Northern Pike	2.5	3.8		0.8		1.3					2.1
	Orangespotted Sunfish	0.0	0.2		0.0		0.0					0.1
	Walleye (saugeye)	5.0	3.0		4.2		1.7					3.5
	White Sucker	12.8	10.0		6.3		2.2					7.8
	Yellow Perch	2.7	3.0		7.8		1.2					3.7

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	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AFS std gill net	Channel Catfish	PSD								79		92
		PSD-P								26		18
		Wr								107		96
	Walleye	PSD								100		10
		PSD-P								75		10
		Wr								88		82
	Yellow Perch	PSD								80		100
		PSD-P								0		0
		Wr								101		103
std exp gill net	Channel Catfish	PSD	100	0		0		100				
		PSD-P	0	0		0		0				
		Wr	99			105		94				
	Walleye	PSD	83	89		44		90				
		PSD-P	7	28		4		0				
		Wr	100	94		84		98				
	Yellow Perch	PSD	94	11		72		71				
		PSD-P	13	0		4		14				
		Wr	101	101		99		93				

Length at Capture

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

Species: Walleye

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2018	46	230 (6)	280 (6)	277 (4)	322 (26)				531 (1)	539 (3)	
2016	29	196 (1)	214 (16)	392 (1)			591 (1)	547 (10)			
2014	13	243 (3)		405 (5)	507 (1)	460 (4)					
2012	28	211 (2)	222 (1)	350 (23)	537 (1)		492 (1)				
2010	38	191 (20)	378 (4)	418 (3)	489 (4)	521 (2)	545 (3)				604 (2)
2009	30	277 (1)	380 (10)	431 (8)	473 (6)	499 (4)					589 (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+
2018	7		222 (5)	247 (1)		247 (1)					
2016	5	154 (1)	202 (1)	225 (3)							
2014	7	153 (2)		235 (4)		234 (1)					
2012	47	149 (5)	199 (11)	230 (31)							
2010	18	150 (16)	213 (2)								
2009	15		230 (14)	280 (1)							

Fish Condition

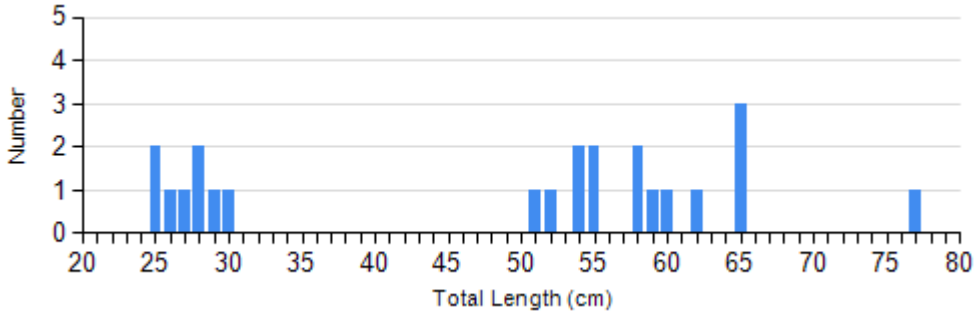
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Channel Catfish Gill Net	2014	0		6	94 (3.4)	0		0	
	2016	4	92 (2.0)	10	111 (3.7)	4	111 (3.7)	1	
	2018	3	89 (1.5)	29	94 (1.7)	6	105 (2.0)	1	108
Walleye Gill Net	2014	1	88	9	99 (2.2)	0		0	
	2016	0		3	82 (4.1)	9	90 (1.7)	0	
	2018	36	82 (0.8)	0		4	87 (1.8)	0	
Yellow Perch Gill Net	2014	2	89 (4.0)	4	94 (4.8)	1	94	0	
	2016	1	109	4	99 (1.0)	0		0	
	2018	0		7	103 (3.0)	0		0	

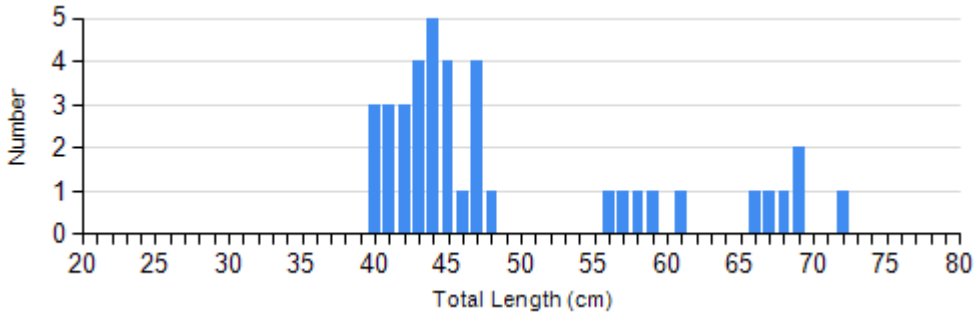
Length Frequency Distribution

Length frequency histogram of species sampled by year.

Species: Channel Catfish
Gear: AFS std gill net

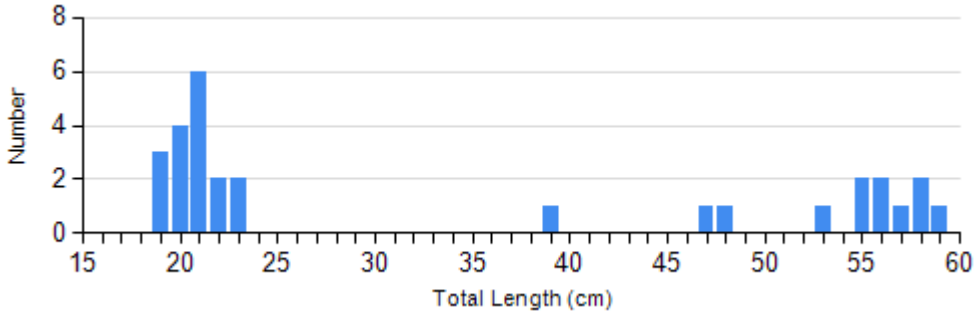


2016

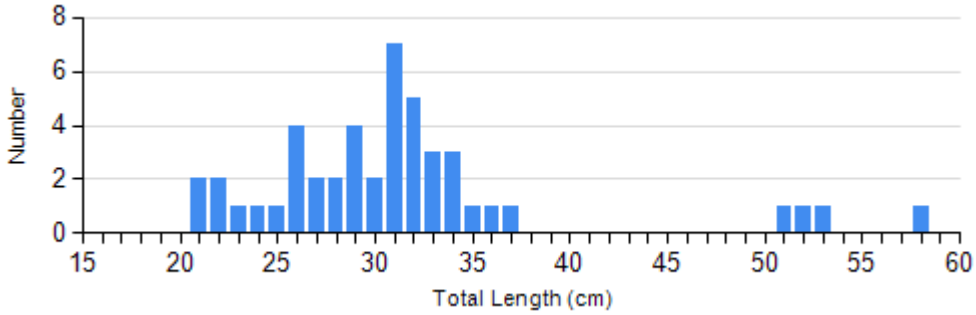


2018

Species: Walleye
Gear: AFS std gill net



2016

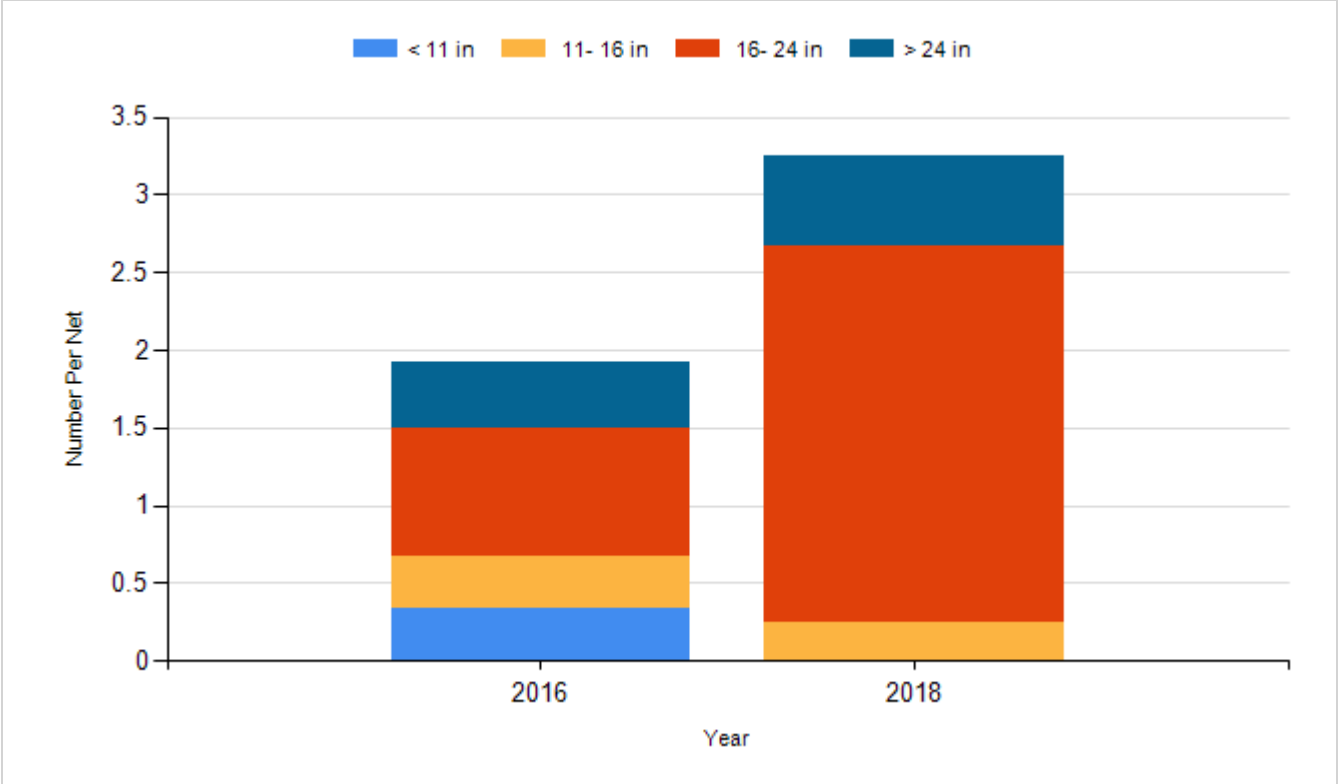


2018

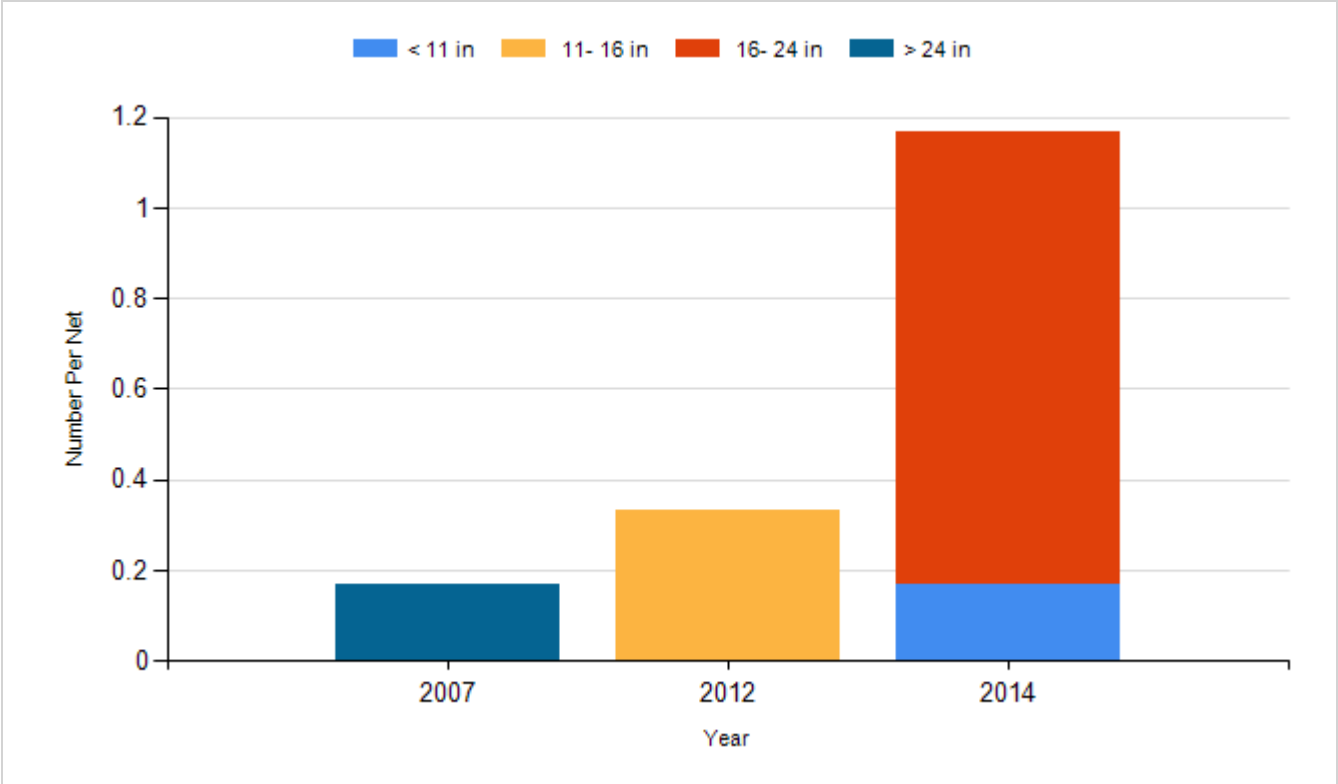
Historic Fish Sizes and Relative Abundance

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

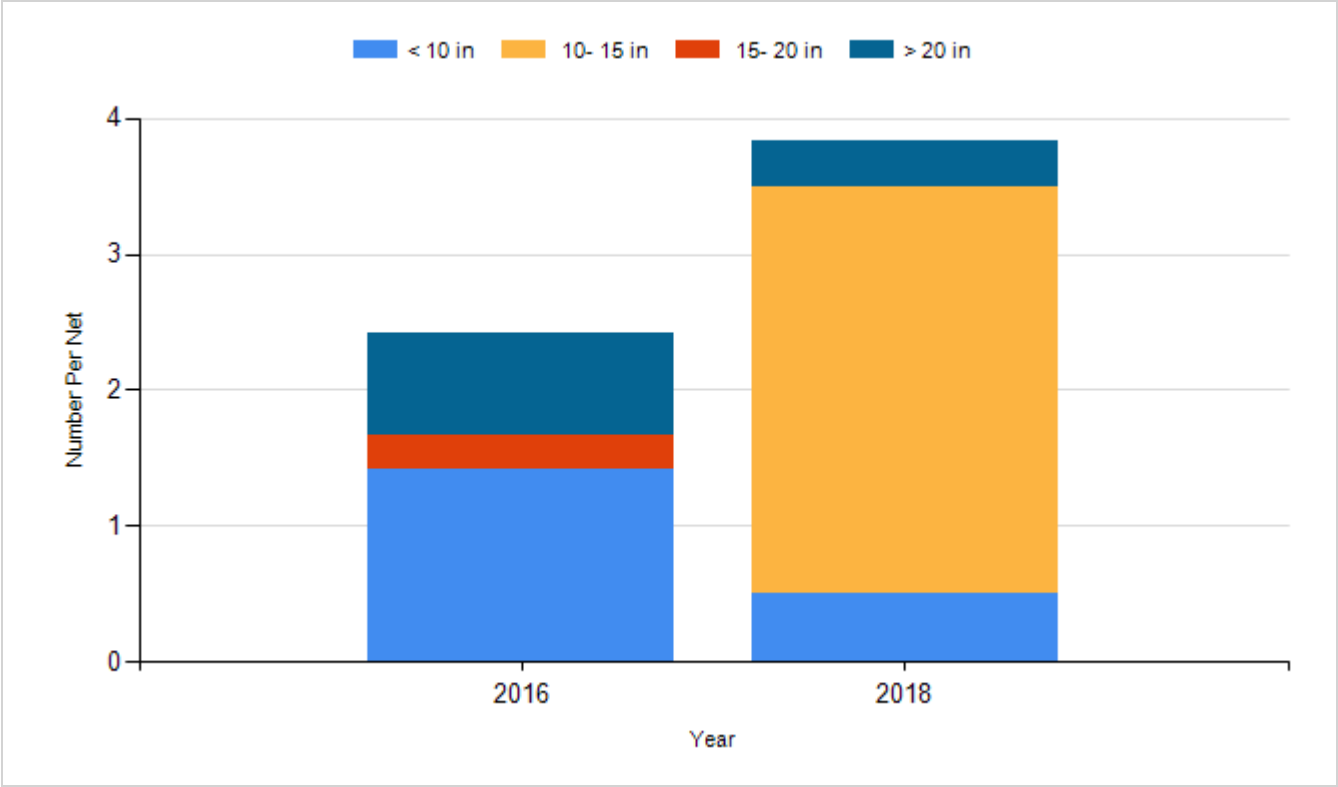
Species: Channel Catfish
Gear: AFS std gill net



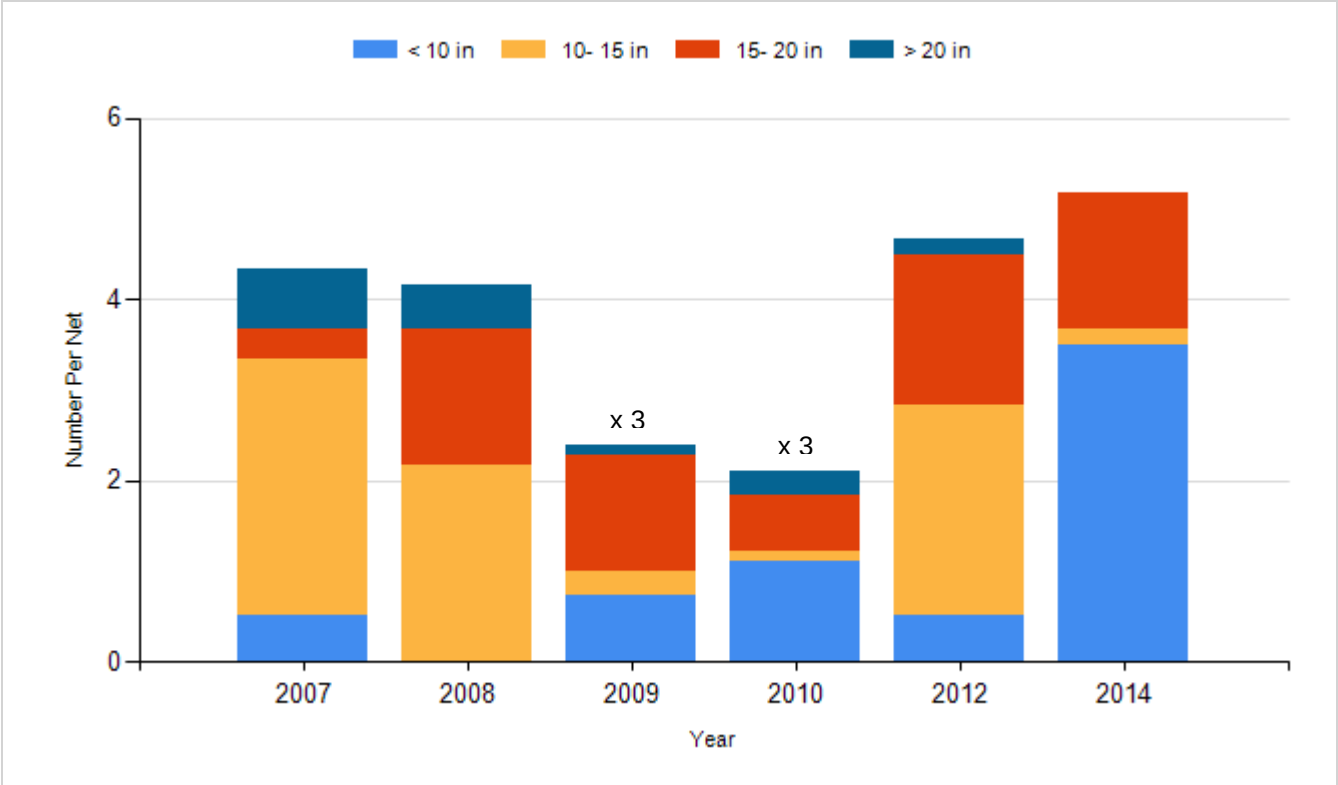
Species: Channel Catfish
Gear: std exp gill net



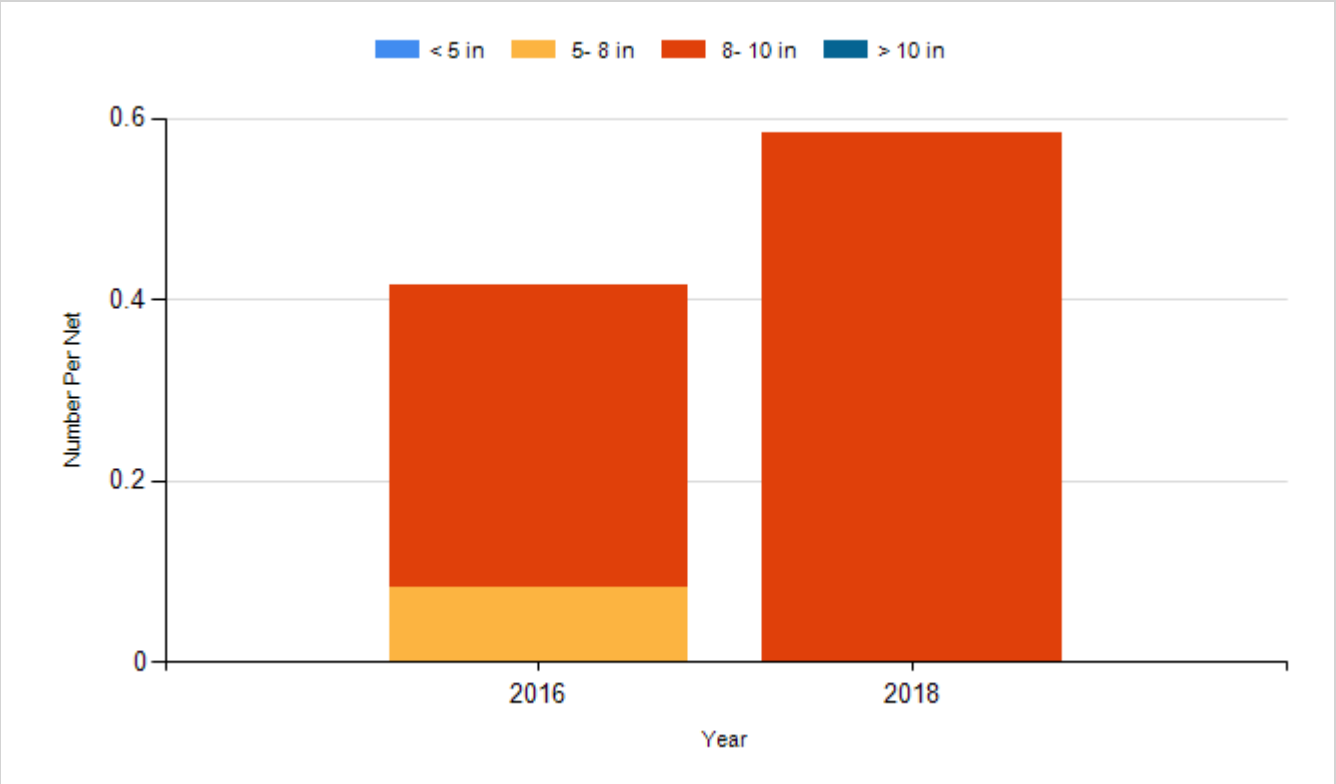
Species: Walleye
Gear: AFS std gill net



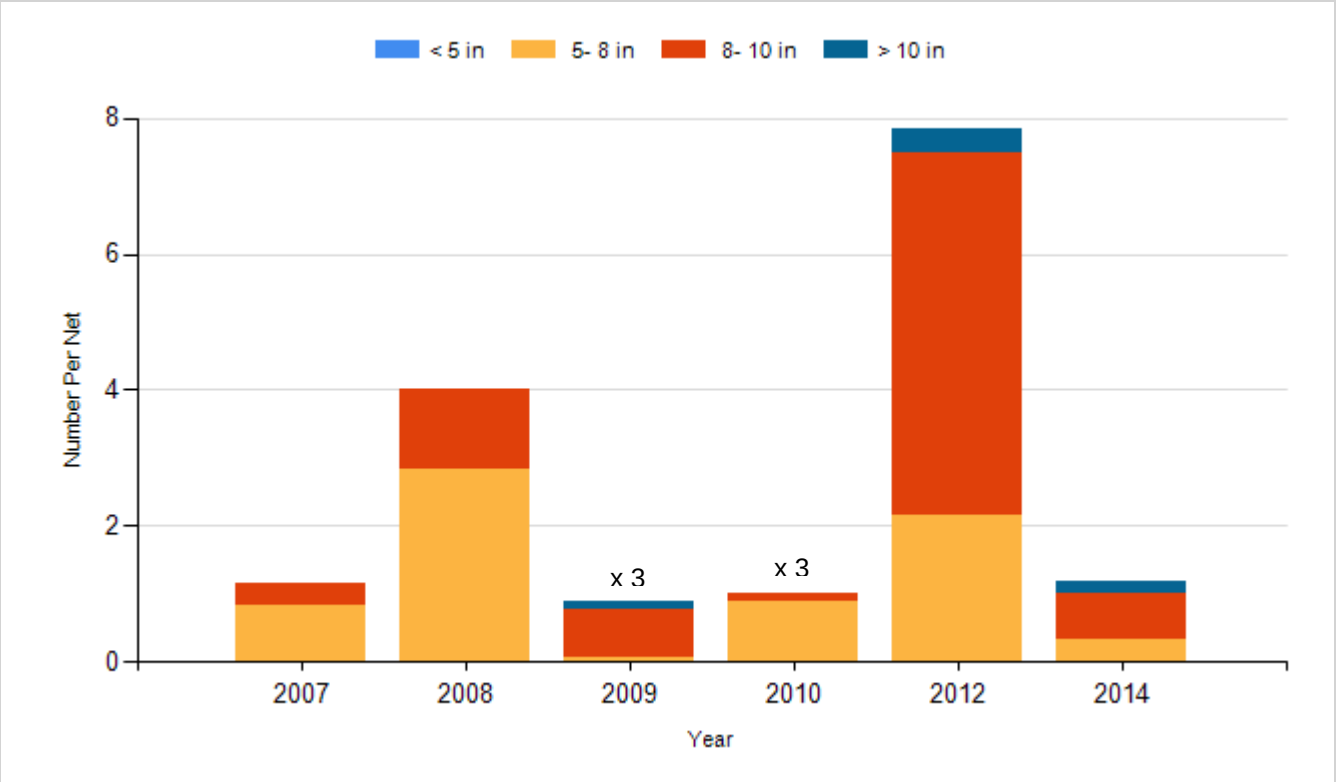
Species: Walleye
Gear: std exp gill net



Species: Yellow Perch
Gear: AFS std gill net



Species: Yellow Perch
Gear: std exp gill net



Fish Stocking

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

Year	Species	Size	Number
2009	Walleye	Small Fingerling	121,260
2010	Walleye	Small Fingerling	122,820
2011	Walleye	Small Fingerling	121,860
2012	Walleye	Small Fingerling	119,050
2013	Walleye	Large Fingerling	28,595
2014	Walleye	Small Fingerling	121,350
2015	Walleye	Small Fingerling	122,290
2016	Saugeye	Small Fingerling	121,080
2017	Saugeye	Small Fingerling	91,520
2018	Saugeye	Small Fingerling	91,120