North Buffalo Survey Summary

North Buffalo Lake, located 6.0 miles east of Eden, is managed as a multiple species fishery including panfish (i.e., bluegill and yellow perch), northern pike, and walleye; other fish species are present and contribute to the fishery.

- **Bluegill.** At 50.0/frame net, bluegills were the most abundant fish species in the frame net catch and relative abundance was considered high. Sampled bluegill ranged in length from 3.1 to 8.7 inches; most (86%) were less than 6.0 inches. Eight year classes (2009, 2010, 2011, and 2013 – 2017) were present with cohorts produced in 2015 and 2016 accounting for nearly 95% of the total catch. Growth of these strong classes has been slow with mean length at capture values of 4.7 inches at age 3 (2016 cohort) and 5.3 inches at age 4 (2015 cohort).

- **Northern pike.** More northern pike were sampled in 2019 than 2016. In 2019, the mean gill net CPUE of 5.0 suggested high relative abundance. Sampled northern pike ranged in length from 16.9 to 33.9 inches; 60% were $\geq$21.0 inches and 3% were 28 inches or longer. Northern pike respond to rising water levels and population increases are expected following high-water conditions experienced across northeast South Dakota in 2019.

- **Walleye.** Walleye numbers were similar to those observed in 2016. At 3.7/gill net, relative abundance was considered low. Sampled walleyes ranged in length from 15.4 to 26.0, more than half (55%) were $\geq$20.0 inches. Seven year classes produced between 2000 and 2018 were represented, each by eight or fewer individuals. No fish younger than age 4 were sampled.

- **Yellow perch**. Yellow perch were the most abundant species in the 2019 gill net catch. At 15.2/gill net, relative abundance was considered moderate. Of the 91 individuals sampled, most (98%) were from year classes produced in 2015 and 2016 and none exceeded 8.0 inches. Growth is slow with mean length at capture values at age 3 from 5.6 to 6.0 inches since 2011. In 2019, the mean length at capture of age-3 fish was 5.7 inches.

For more detailed results see the computer generated South Dakota Statewide Fisheries Survey for Buffalo North (Marshall; below).

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Buffalo North, Marshall County
UJA-Lake-917-700
2019

Lake Information

Name: Buffalo North

County: Marshall

Surface Area: 414 Acres

OHWM Elevation: 1,835

Outlet Elevation: 1,835

Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	Jun 11, 2019	6 net-nights
frame net (std 3/4 in)	Jun 10, 2019	6 net-nights
frame net (std 3/4 in)	Jun 11, 2019	5 net-nights

Common Fish Species Present

Bluegill

Yellow Perch

Black Bullhead

Northern Pike

Walleye

Black Crappie

Common Carp

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)
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
Brown Trout	8	20	12	30	16	40	20	50	18	46
Channel Catfish	11	28	16	41	24	61	28	71	36	91
Freshwater Drum	8	20	12	30	15	38	20	51	25	63
Lake Trout	12	30	20	50	26	65	31	80	39	100
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
Rainbow Trout	10	25	16	40	20	50	26	65	31	80
Rudd	6	15	10	25	12	30	15	38	19	48
Sauger	8	20	12	30	15	38	20	51	25	63
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
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).

*** Methods/Species that ignore stock length**

			Abundance		Stock Density Indices				Condition	
Gear	Species	Sample Size (n)*	CPUE	CI-80	PSD	CI-80	PSD-P	CI-80	Wr	CI-80
AFS std gill net	Black Bullhead	6	1.0	0.9	83		0		95	5
	Black Crappie	6	0.3	0.5	0		0		104	6
	Bluegill	10	1.7	1.2	10		0		104	4
	Common Carp	1	0.2	0.2	0		0		105	
	Northern Pike	30	5.0	1.3	60	14	3		90	2
	Walleye	22	3.7	2.2	100		55	17	92	2
	Yellow Perch	91	15.2	8.2	0		0		103	1
frame net (std 3/4 in)	Black Bullhead	128	11.6	5.7	95	3	14	4	88	1
	Black Crappie	62	2.7	1.3	37	14	20	12	96	2
	Bluegill	550	50.0	22.1	14	2	1	1	102	1
	Northern Pike	5	0.5	0.3	100		0		83	4
	Yellow Perch	8	0.5	0.4	0		0		94	7

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.

*** Methods/Species that ignore stock length; **AFS standard frame nets used in 2016**

		CPUE										
Gear	Species	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Avg
AFS std gill net	Black Bullhead							22.2			1.0	11.6
	Black Crappie							0.8			0.3	0.6
	Bluegill							1.0			1.7	1.4
	Common Carp							0.2			0.2	0.2
	Golden Shiner*							0.3			0.0	0.2
	Largemouth Bass							0.3			0.0	0.2
	Northern Pike							3.2			5.0	4.1
	Walleye							3.0			3.7	3.4
	White Sucker							3.0			0.0	1.5
	Yellow Perch							14.7			15.2	15.0
frame net (std 3/4 in)**	Black Bullhead	14.4			128.4			31.8			11.6	46.6
	Black Crappie	5.4			4.8			0.3			2.7	3.3
	Bluegill	65.5			47.1			33.8			50.0	49.1
	Golden Shiner	0.1			0.0			0.2			0.0	0.1
	Green Sunfish	2.6			0.0			0.0			0.0	0.7
	Northern Pike	0.5			0.3			0.2			0.5	0.4
	Orangespotted Sunfish*	0.3			0.0			0.0			0.0	0.1
	Walleye	0.3			0.2			0.4			0.0	0.2
	White Sucker	0.3			0.0			0.2			0.0	0.1
	Yellow Perch	32.7			25.4			1.1			0.5	14.9
std exp gill net	Black Bullhead	0.1			62.3							31.2
	Black Crappie	0.1			1.3							0.7
	Bluegill	0.1			0.3							0.2
	Common Carp	0.2			0.3							0.3
	Northern Pike	3.9			11.7							7.8
	Walleye	1.2			4.0							2.6
	White Sucker	0.8			0.7							0.8
	Yellow Perch	4.7			68.0							36.4

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.

****AFS standard frame nets used in 2016**

			Year									
Gear	Species	Index	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AFS std gill net	Northern Pike	PSD							84			60
		PSD-P							21			3
		Wr							86			90
	Walleye	PSD							89			100
		PSD-P							33			55
		Wr							90			92
	Yellow Perch	PSD							3			0
		PSD-P							0			0
		Wr							90			103
frame net (std 3/4 in)**	Bluegill	PSD	3			56			88			14
		PSD-P	1			2			32			1
		Wr	110			102			113			102
std exp gill net	Northern Pike	PSD	57			60						
		PSD-P	0			6						
		Wr	96			91						
	Walleye	PSD	55			67						
		PSD-P	45			8						
		Wr	101			90						
	Yellow Perch	PSD	0			1						
		PSD-P	0			0						
		Wr	105			91						

Length at Capture

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

Species: Bluegill

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2019	550		83 (5)	116 (326)	134 (195)	180 (3)	190 (12)		206 (8)	221 (2)	214 (2)
2016	434	78 (50)	95 (5)	144 (34)		192 (167)	192 (90)	245 (1)	212 (52)	198 (34)	256 (1)

Species: Walleye

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2019	22				432 (8)		514 (2)		553 (6)	618 (2)	581 (4)
2016	18					393 (10)	478 (2)	517 (2)	656 (1)		595 (3)
2013	16		212 (4)	358 (7)	471 (4)						585 (1)
2010	19	178 (8)	348 (5)			515 (1)	596 (1)				545 (4)

Species: Yellow Perch

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2019	91			144 (30)	149 (59)		176 (1)			176 (1)	
2016	88			149 (16)		176 (13)	183 (53)	184 (5)			
2013	211		106 (1)	141 (64)	157 (109)	171 (36)					
2010	816	89 (2)	109 (809)	153 (4)	164 (2)						

Fish Condition

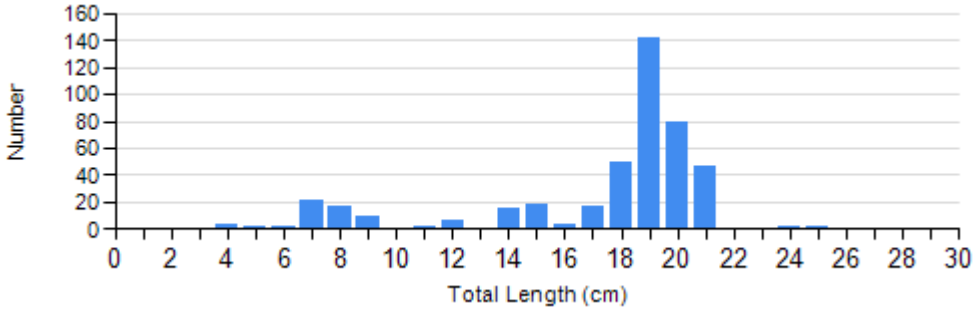
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Bluegill Frame Net	2016	48	114 (1.3)	230	116 (0.7)	127	107 (0.9)	1	108
	2019	475	101 (0.4)	68	106 (1.1)	7	104 (5.3)	0	
Northern Pike Gill Net	2016	3	89 (3.7)	12	85 (1.4)	3	85 (3.6)	1	89
	2019	12	93 (1.5)	17	88 (1.3)	0		1	75
Walleye Gill Net	2016	2	95 (7.3)	10	88 (2.1)	5	93 (3.2)	1	83
	2019	0		10	94 (1.1)	11	90 (2.4)	1	82
Yellow Perch Gill Net	2016	85	90 (0.9)	3	88 (4.1)	0		0	
	2019	91	103 (0.8)	0		0		0	

Length Frequency Distribution

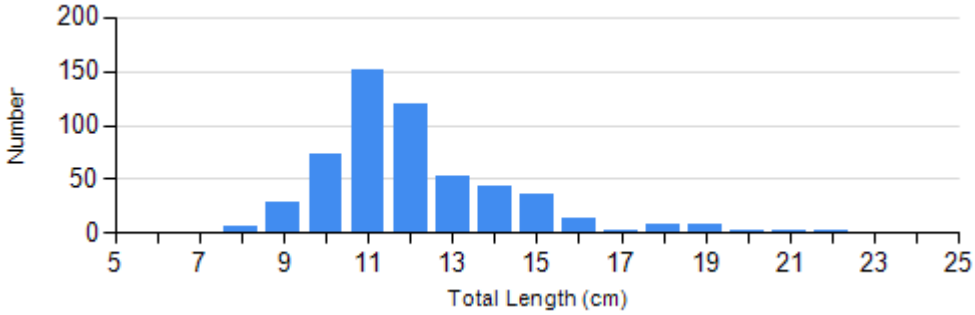
Length frequency histogram of species sampled by year.

Species: Bluegill
Gear: AFS std frame net



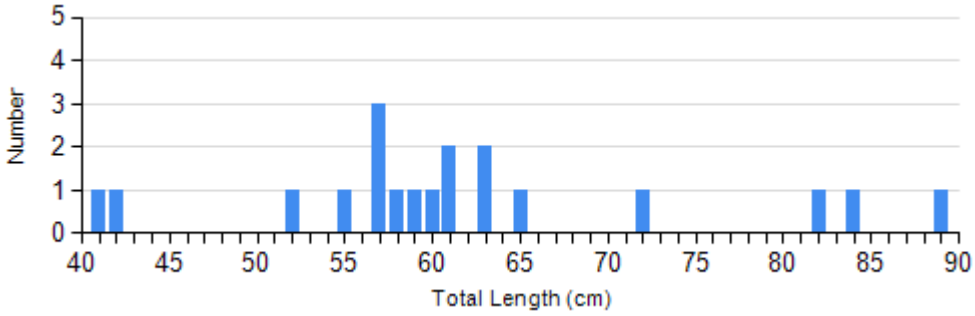
2016

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

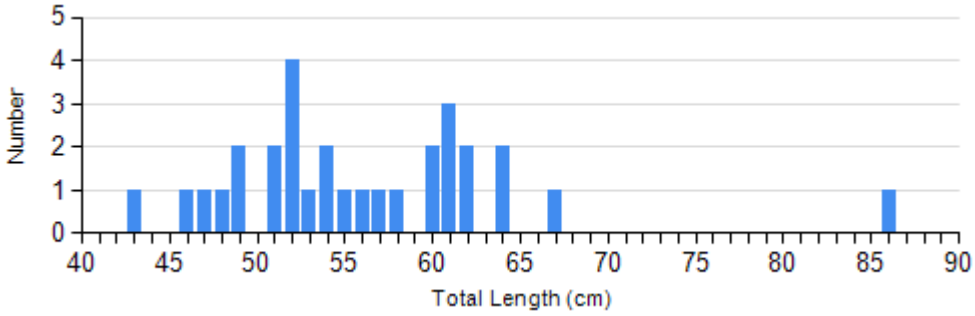


2019

Species: Northern Pike
Gear: AFS std gill net

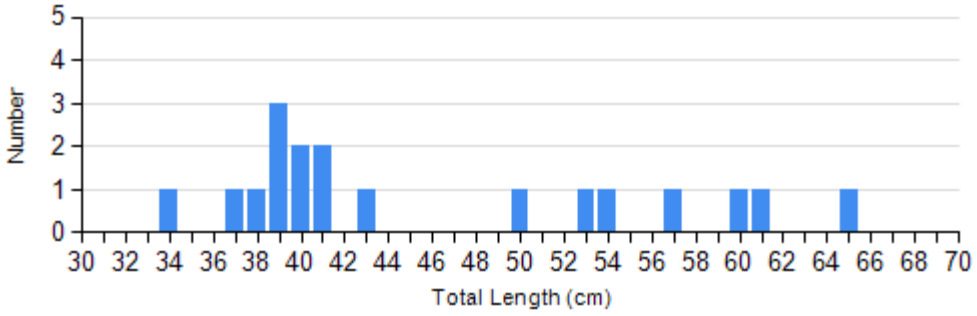


2016

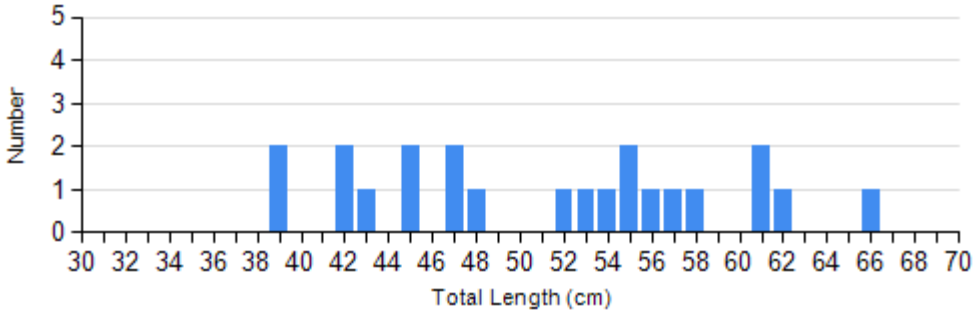


2019

Species: Walleye
Gear: AFS std gill net

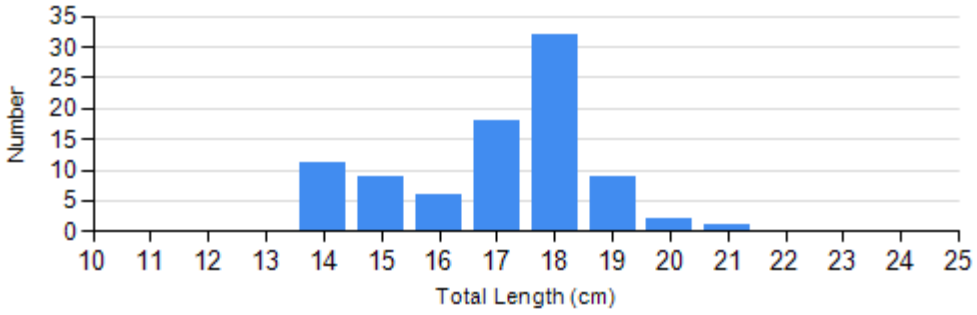


2016

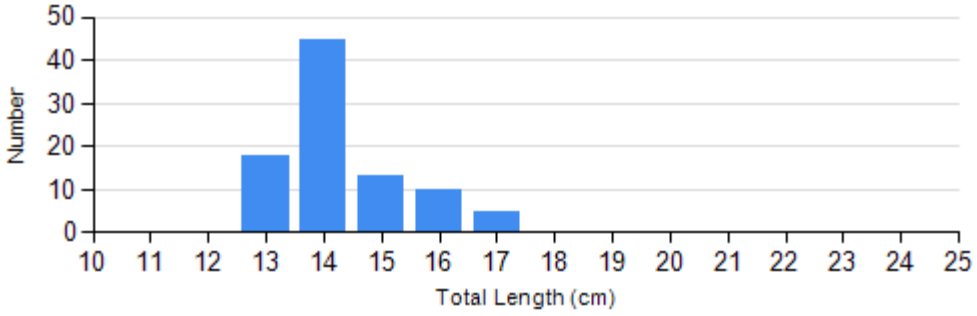


2019

Species: Yellow Perch
Gear: AFS std gill net



2016

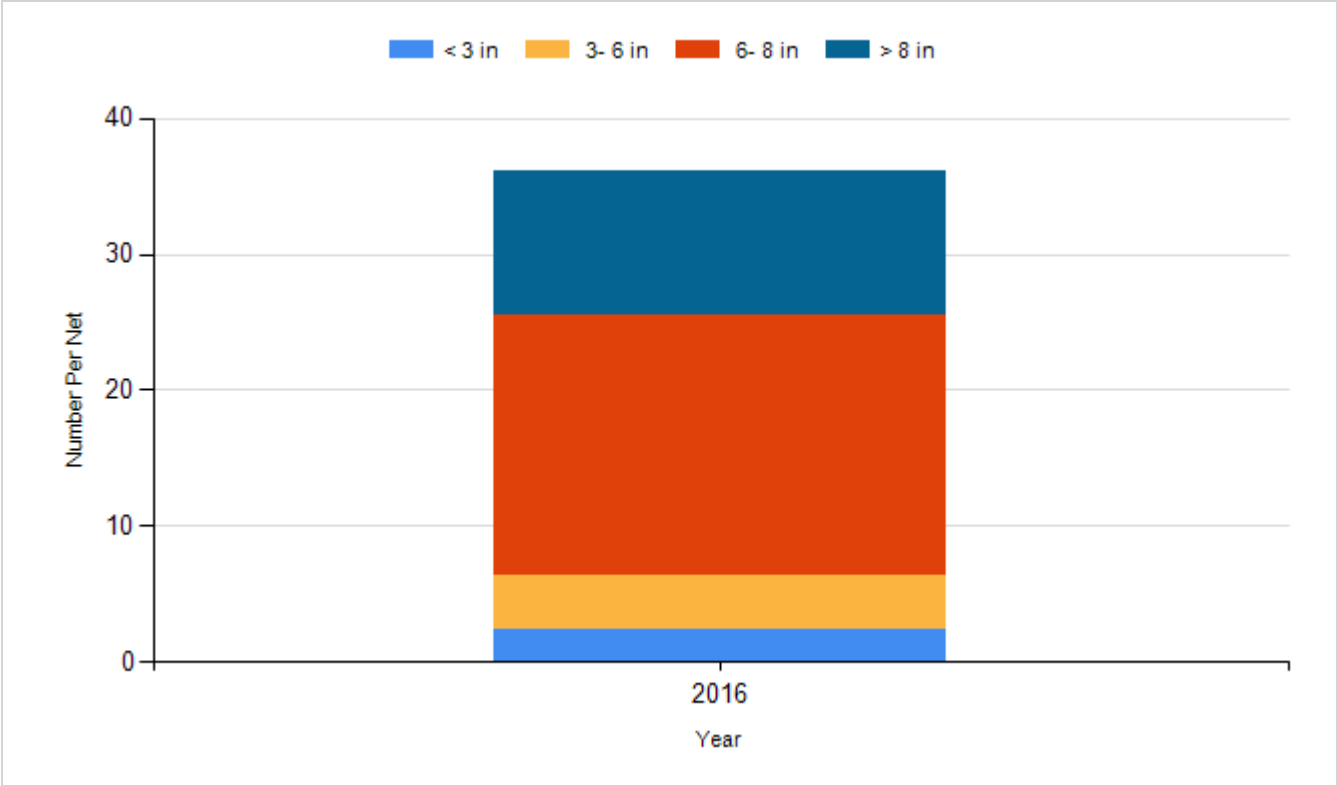


2019

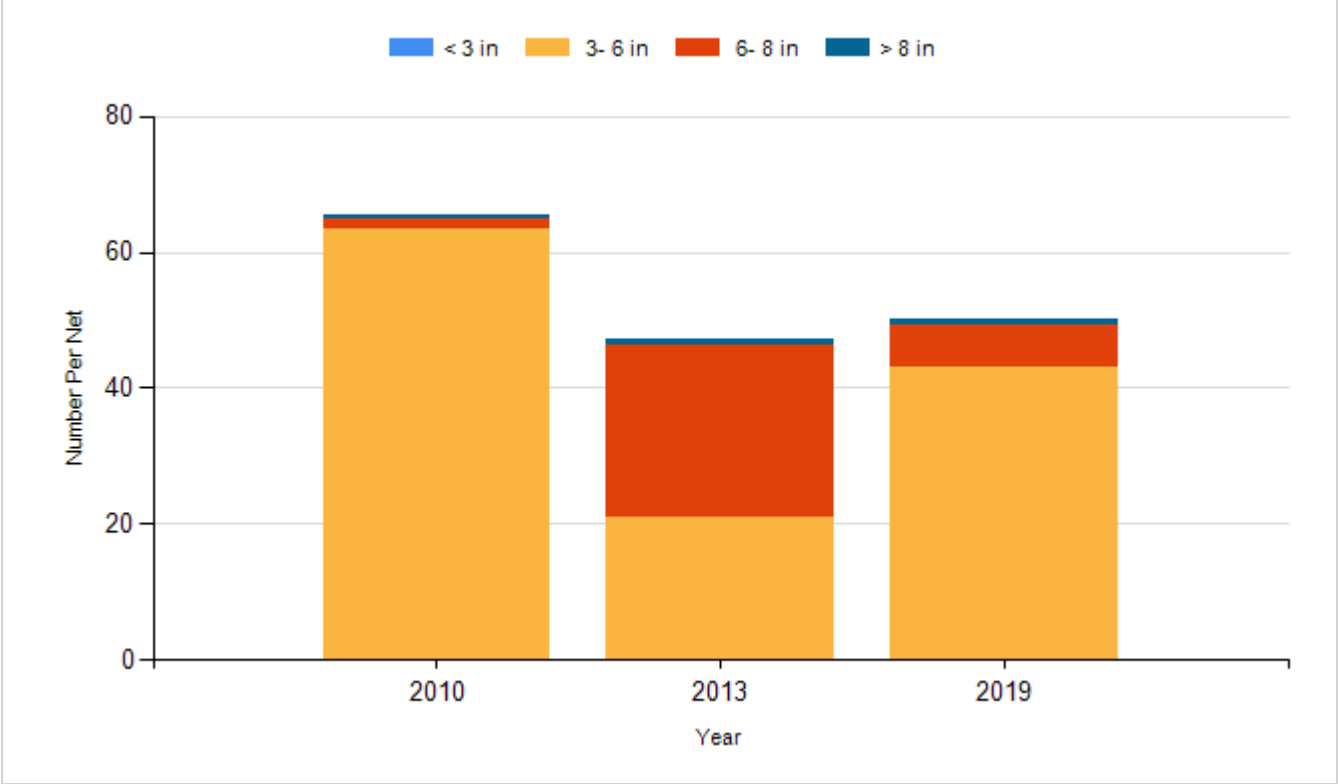
Historic Fish Sizes and Relative Abundance

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

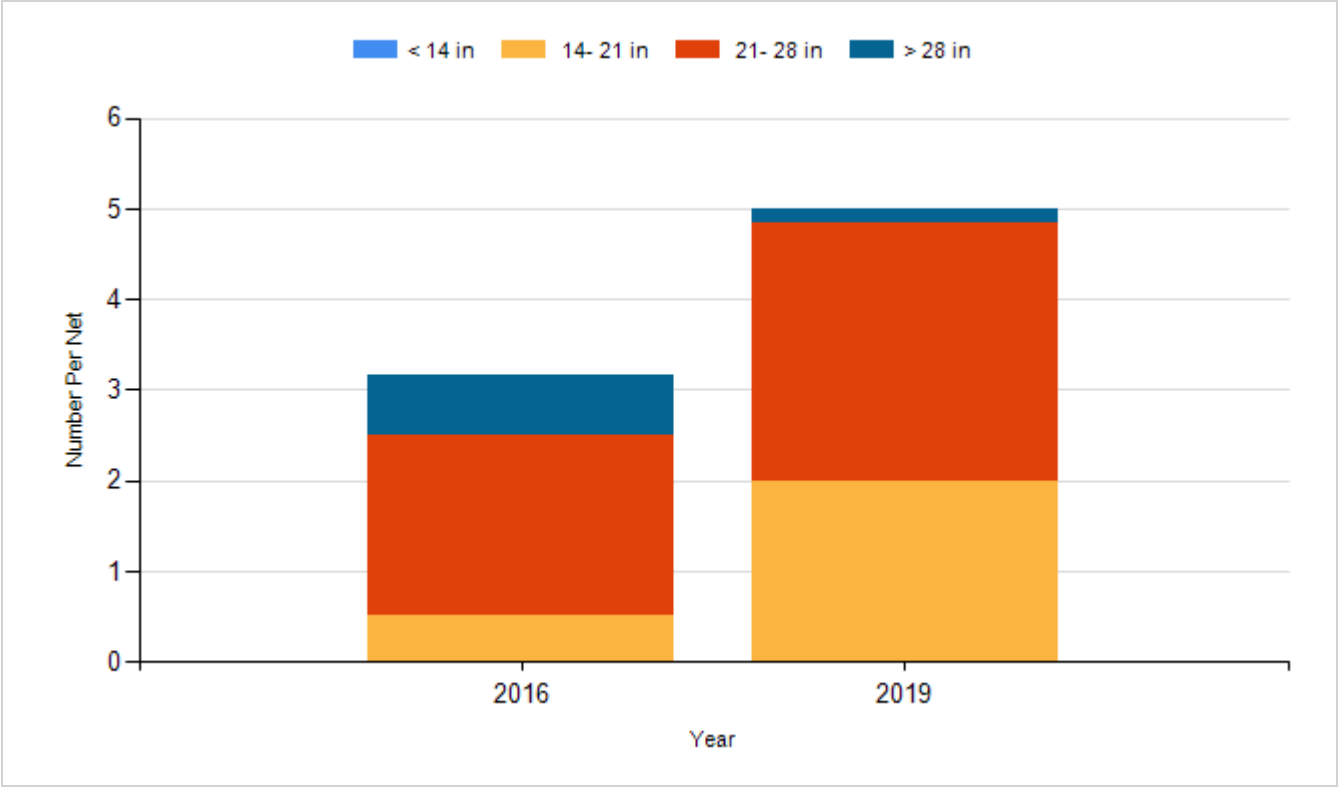
Species: Bluegill
Gear: AFS std frame net



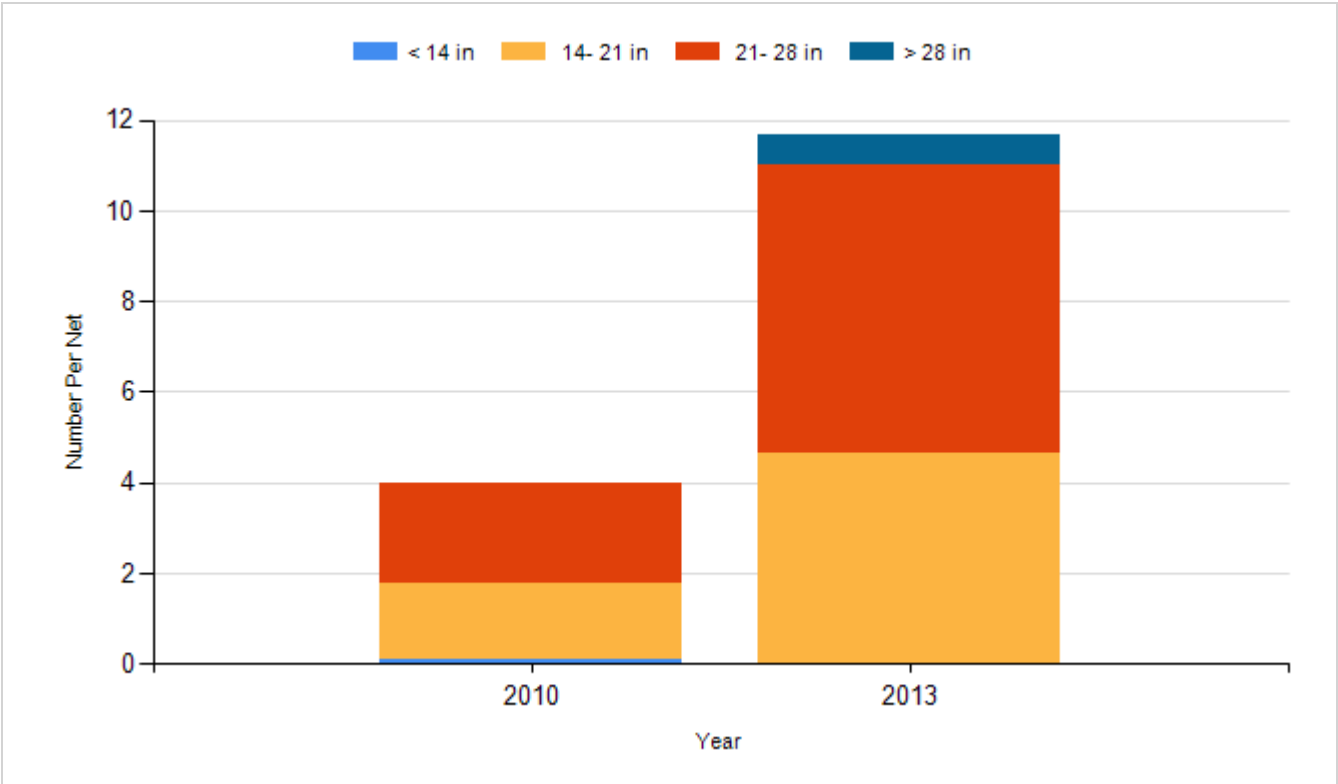
Species: Bluegill
Gear: frame net (std 3/4 in)



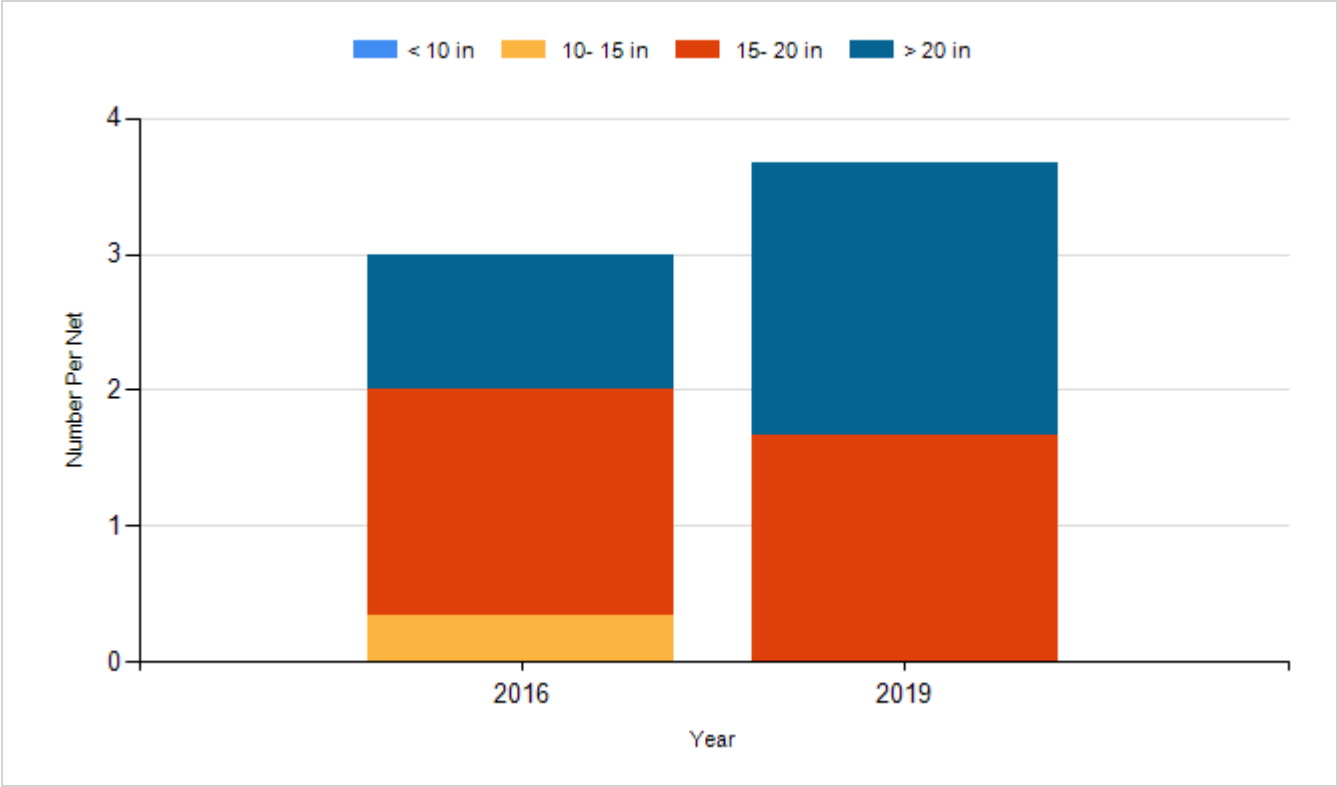
Species: Northern Pike
Gear: AFS std gill net



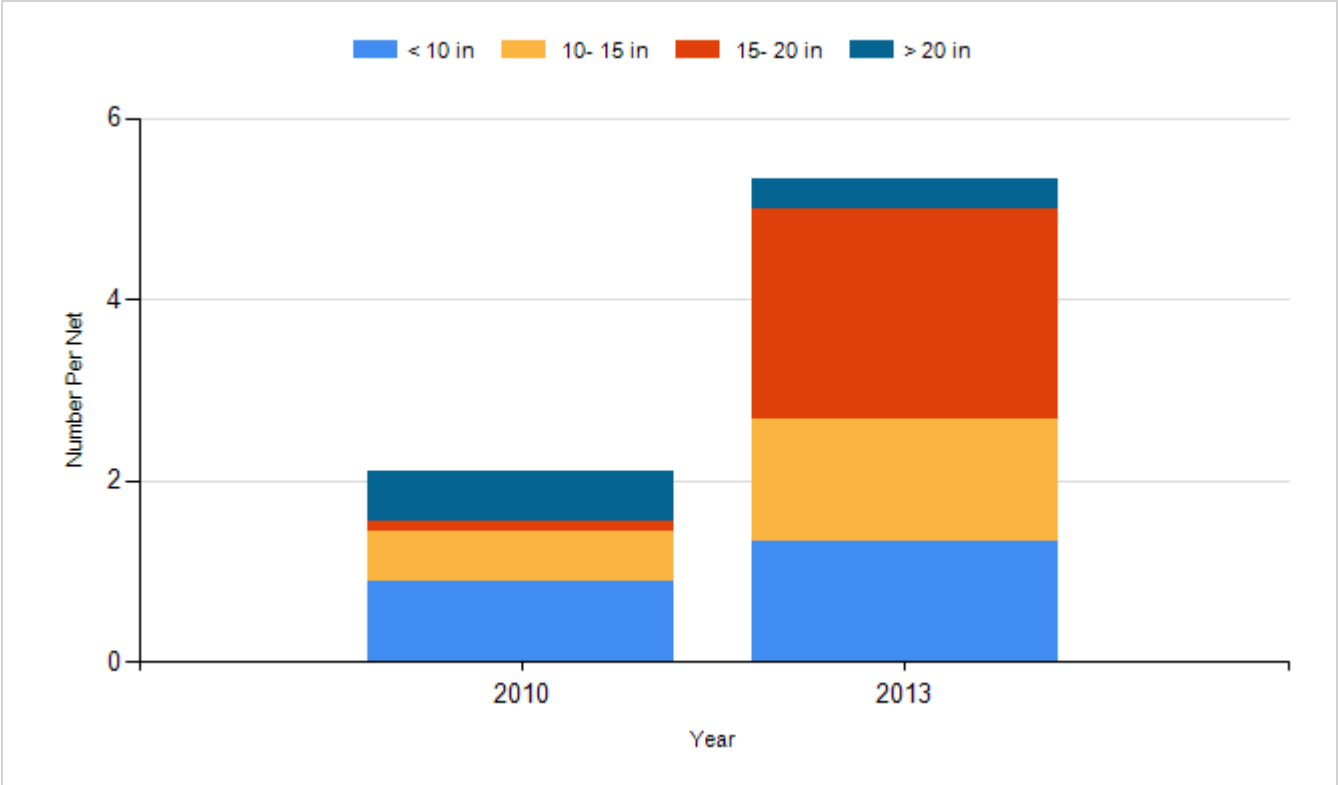
Species: Northern Pike
Gear: std exp gill net



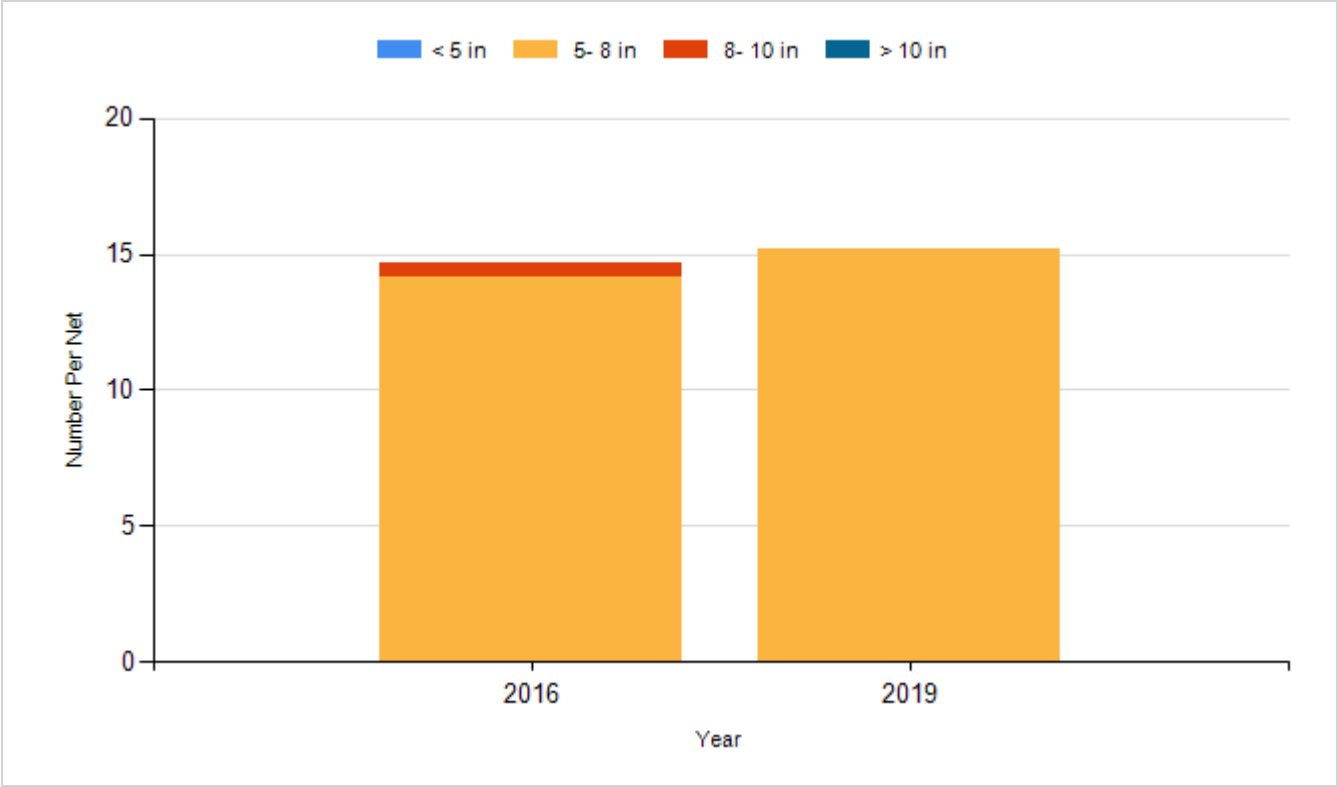
Species: Walleye
Gear: AFS std gill net



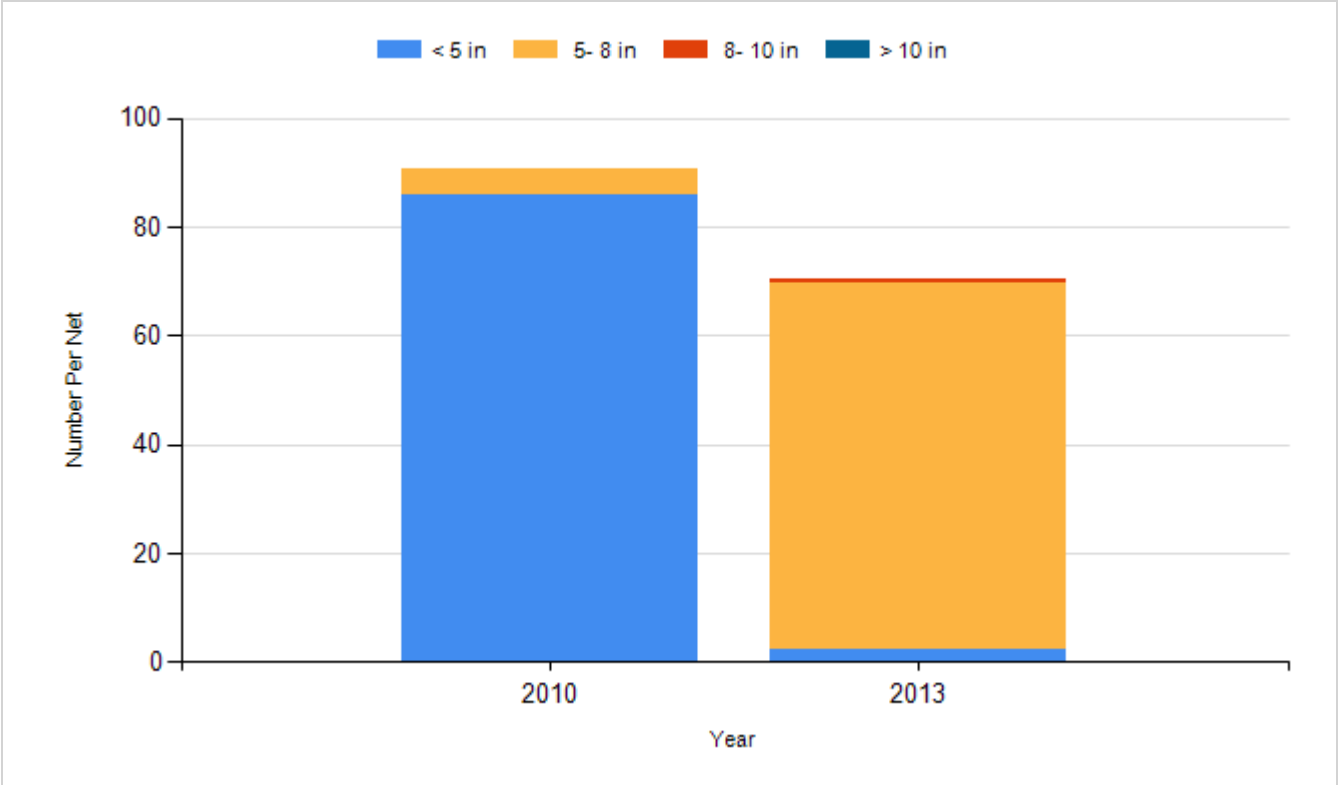
Species: Walleye
Gear: std exp gill net



Species: Yellow Perch
Gear: AFS std gill net



Species: Yellow Perch
Gear: std exp gill net



Fish Stocking

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

Year	Species	Size	Number
2009	Walleye	Small Fingerling	33,720
2011	Walleye	Fry	175,000
2013	Walleye	Fry	175,000
2015	Walleye	Fry	170,000
2017	Walleye	Fry	170,000
2019	Walleye	Fry	170,000