Four-Mile Lake Survey Summary

Four Mile Lake, located 3.0 miles northwest and 1.5 miles south of Lake City, is managed as a northern pike and yellow perch fishery, but other fish species (e.g., bluegill, walleye) are present and contribute to the fishery.

- **Northern pike.** Northern pike numbers were considerably lower in 2019 than 2014, but relative abundance was still considered high (4.7/gill net). Those sampled ranged in length from 19.7 to 26.8 inches. Northern pike respond to rising water levels and population increases are expected following high-water conditions experienced across northeast South Dakota in 2019.

- **Walleye.** Although the lake is managed as a northern pike and yellow perch fishery, walleyes are commonly stocked. In 2019, relative abundance was low (1.5/gill net) as only nine individuals that ranged in length from 20.0 to 26.4 inches were caught.

- **Yellow perch**. Yellow perch were the most abundant species in the 2019 gill net catch. At 14.0/gill net, relative abundance was considered moderate. Individuals from three consecutive year classes (2015 – 2017) were sampled. Those from the 2016 (age-3) cohort, which had a mean length at capture of 6.0 inches, were the most abundant accounting for 86% of sampled yellow perch.

For more detailed results see the computer generated South Dakota Statewide Fisheries Survey for Four Mile (Marshall; below)

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Four Mile, Marshall County
UJA-Lake-866-007
2019

Lake Information

Name: Four Mile

County: Marshall

Surface Area: 415 Acres

Maximum Depth: 11 Feet

Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	Jun 27, 2019	6 net-nights

Common Fish Species Present

Yellow Perch

Walleye

Northern Pike

Black Bullhead

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	1	0.2	0.2	100		100		90	
	Northern Pike	28	4.7	1.4	89		0		92	1
	Walleye	9	1.5	0.6	100		89		98	2
	Yellow Perch	85	14.0	4.6	1		0		96	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	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Avg
AFS std gill net	Black Bullhead										0.2	0.2
	Northern Pike										4.7	4.7
	Walleye										1.5	1.5
	Yellow Perch										14.0	14.0
frame net (std 3/4 in)	Black Bullhead					56.2						56.2
	Black Crappie					0.3						0.3
	Bluegill					4.9						4.9
	Green Sunfish					0.4						0.4
	Northern Pike					0.7						0.7
	White Sucker					0.6						0.6
	Yellow Perch					28.8						28.8
std exp gill net	Black Bullhead					15.7						15.7
	Northern Pike					15.3						15.3
	White Sucker					0.7						0.7
	Yellow Perch					38.7						38.7

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	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AFS std gill net	Northern Pike	PSD										89
		PSD-P										0
		Wr										92
	Walleye	PSD										100
		PSD-P										89
		Wr										98
	Yellow Perch	PSD										1
		PSD-P										0
		Wr										96
std exp gill net	Northern Pike	PSD					46					
		PSD-P					2					
		Wr					89					
	Yellow Perch	PSD					14					
		PSD-P					5					
		Wr					98					

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+
2019	9			509 (1)		556 (3)	515 (1)	515 (1)	535 (1)		650 (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+
2019	85		140 (11)	153 (73)	183 (1)						
2014	162	92 (21)	136 (114)	152 (11)	235 (10)	251 (5)		265 (1)			

Fish Condition

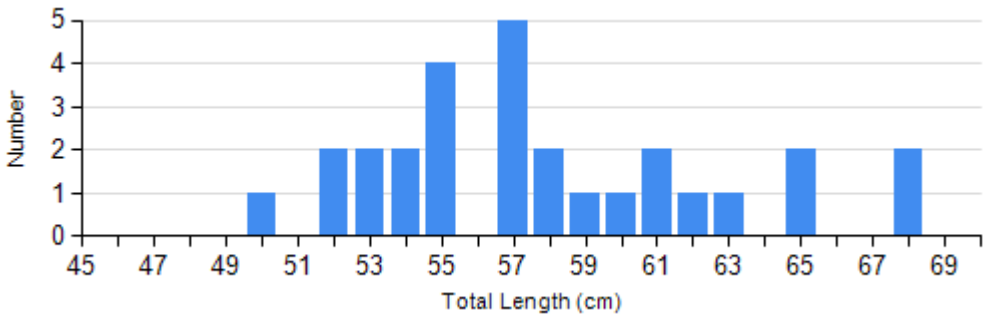
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Northern Pike Gill Net	2019	3	96 (4.2)	25	91 (1.1)	0		0	
Walleye Gill Net	2019	0		1	102	6	100 (1.9)	2	90 (0.2)
Yellow Perch Gill Net	2019	83	96 (0.9)	1	88	0		0	

Length Frequency Distribution

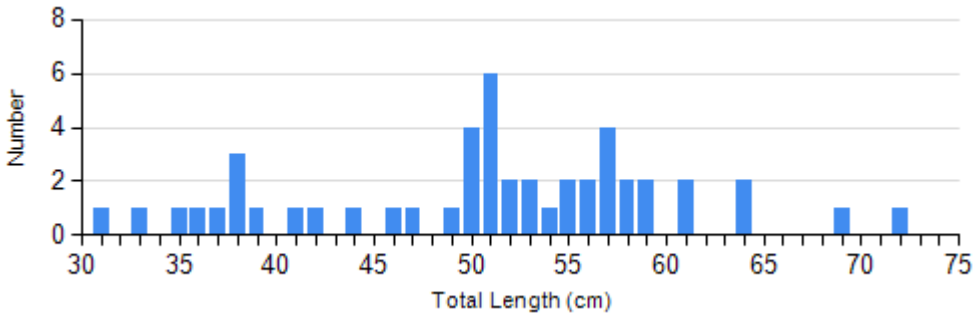
Length frequency histogram of species sampled by year.

Species: Northern Pike
Gear: AFS std gill net



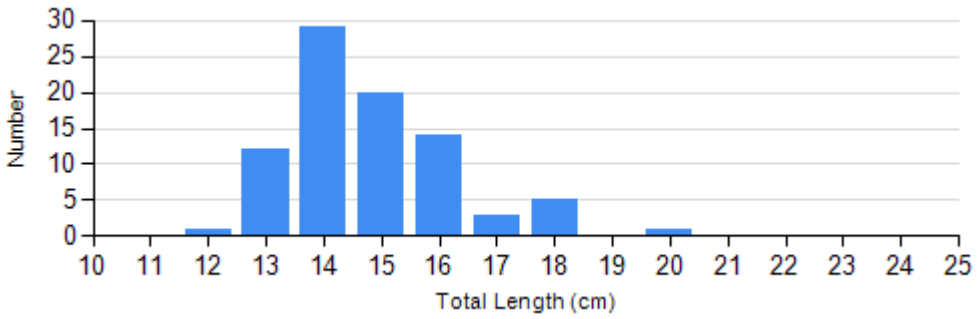
2019

Species: Northern Pike
Gear: std exp gill net



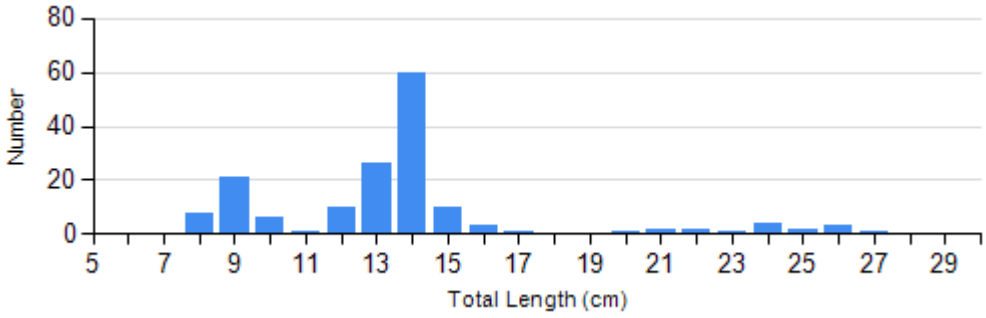
2014

Species: Yellow Perch
Gear: AFS std gill net



2019

Species: Yellow Perch
Gear: std exp gill net

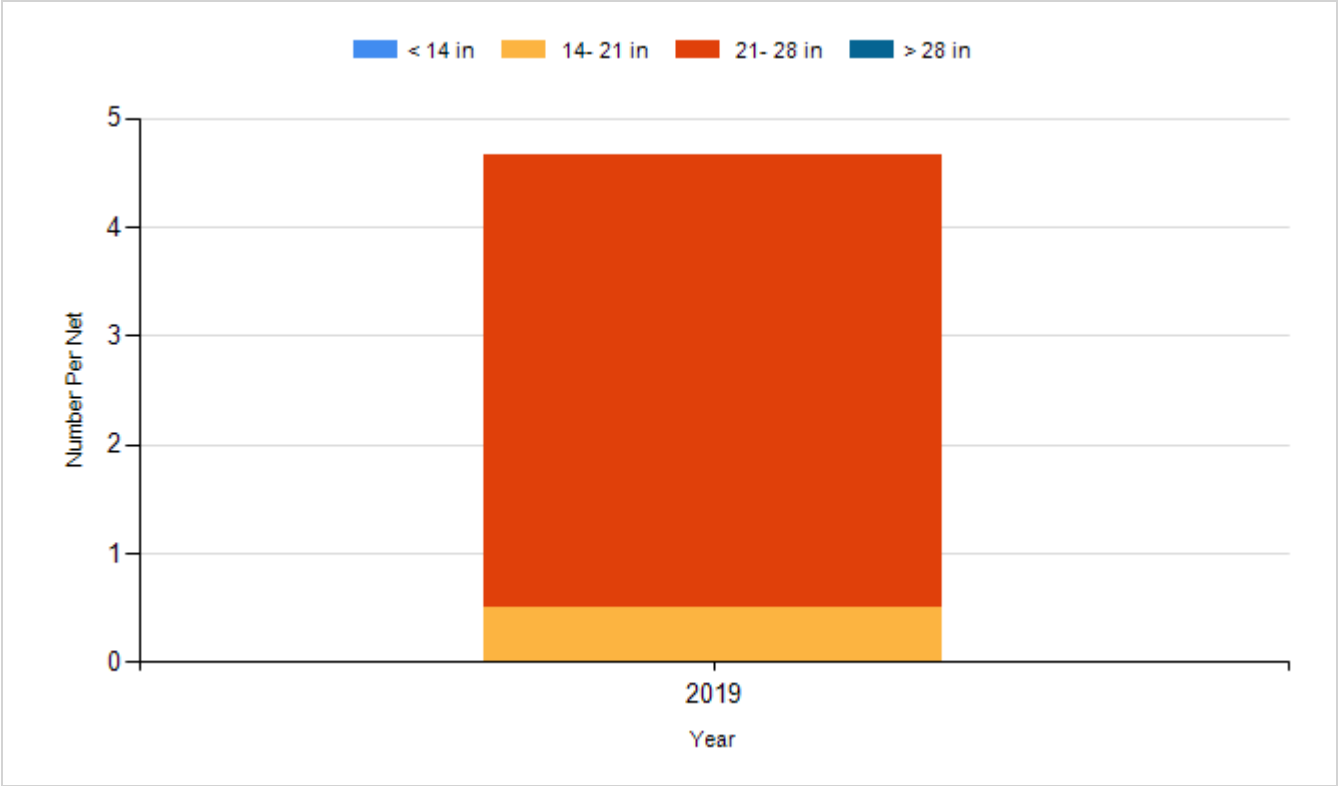


2014

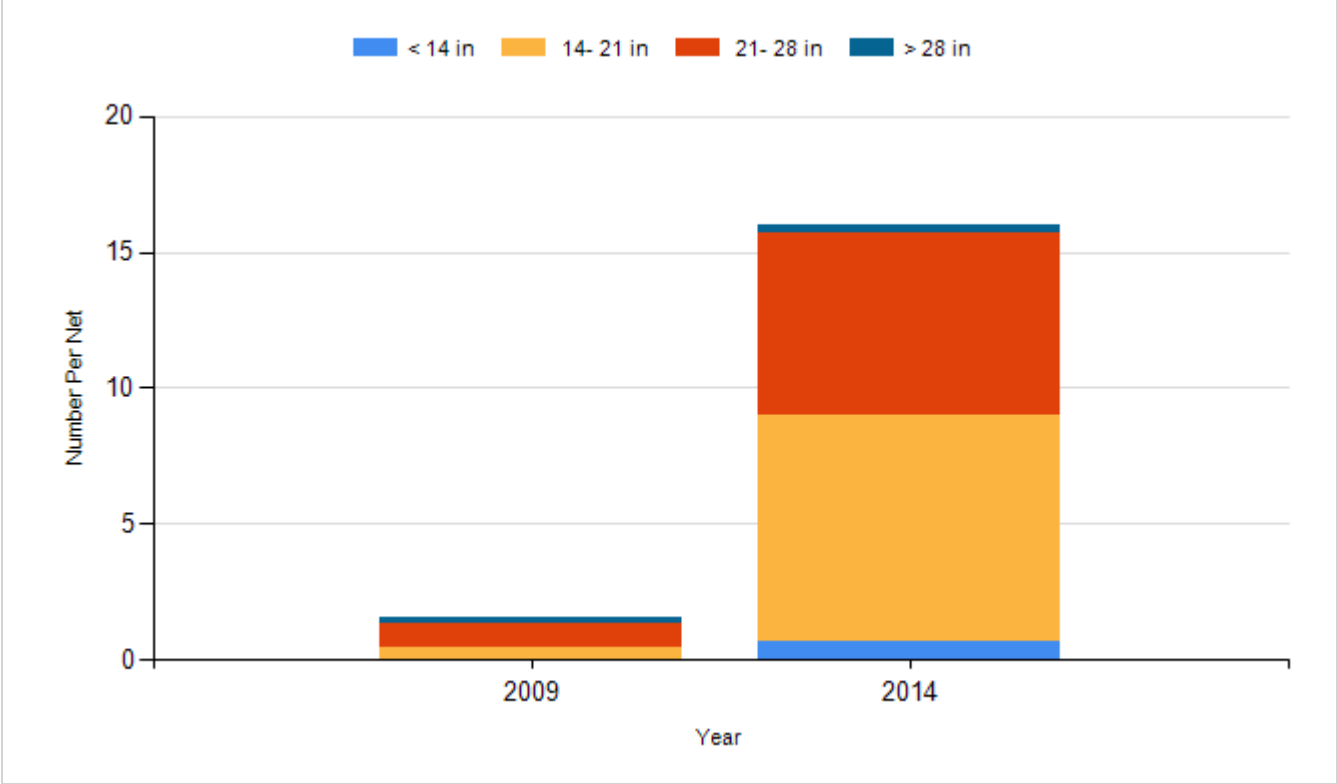
Historic Fish Sizes and Relative Abundance

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

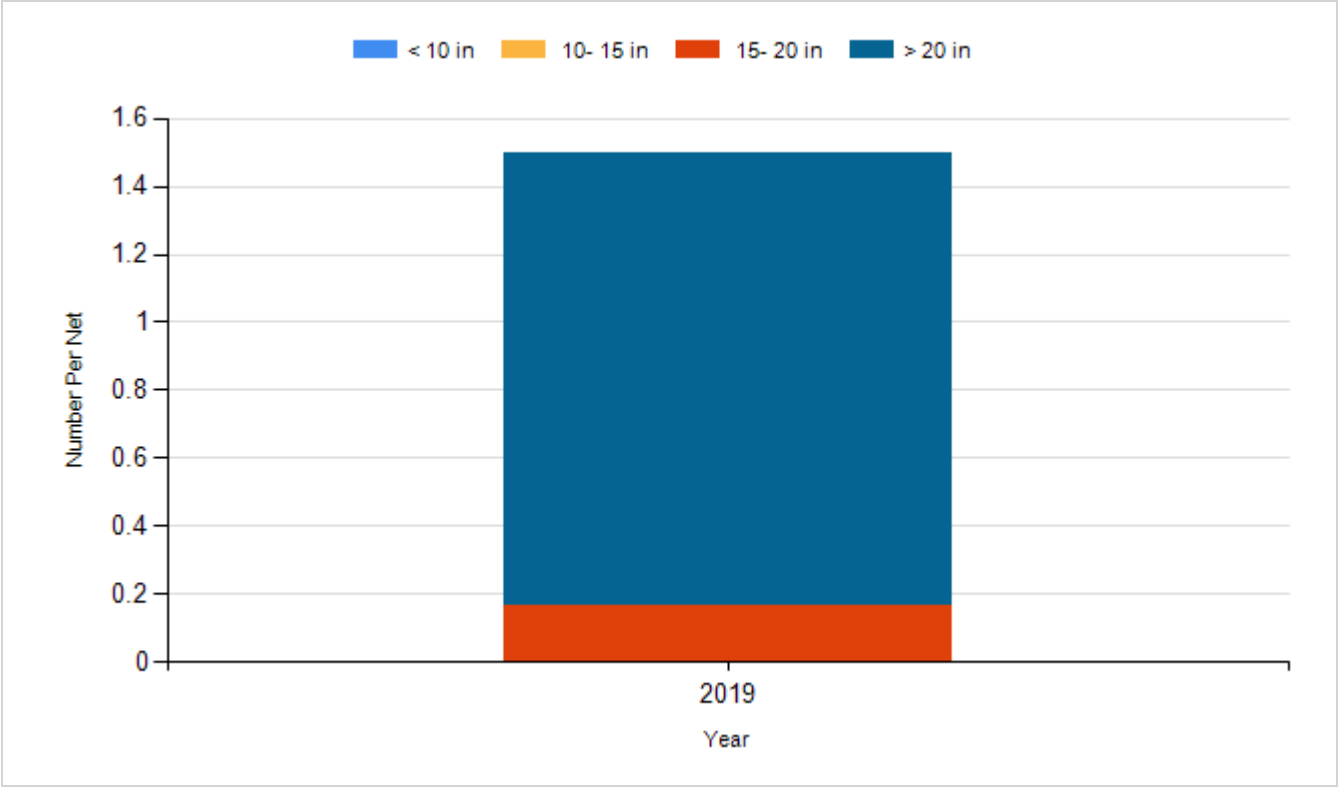
Species: Northern Pike
Gear: AFS std gill net



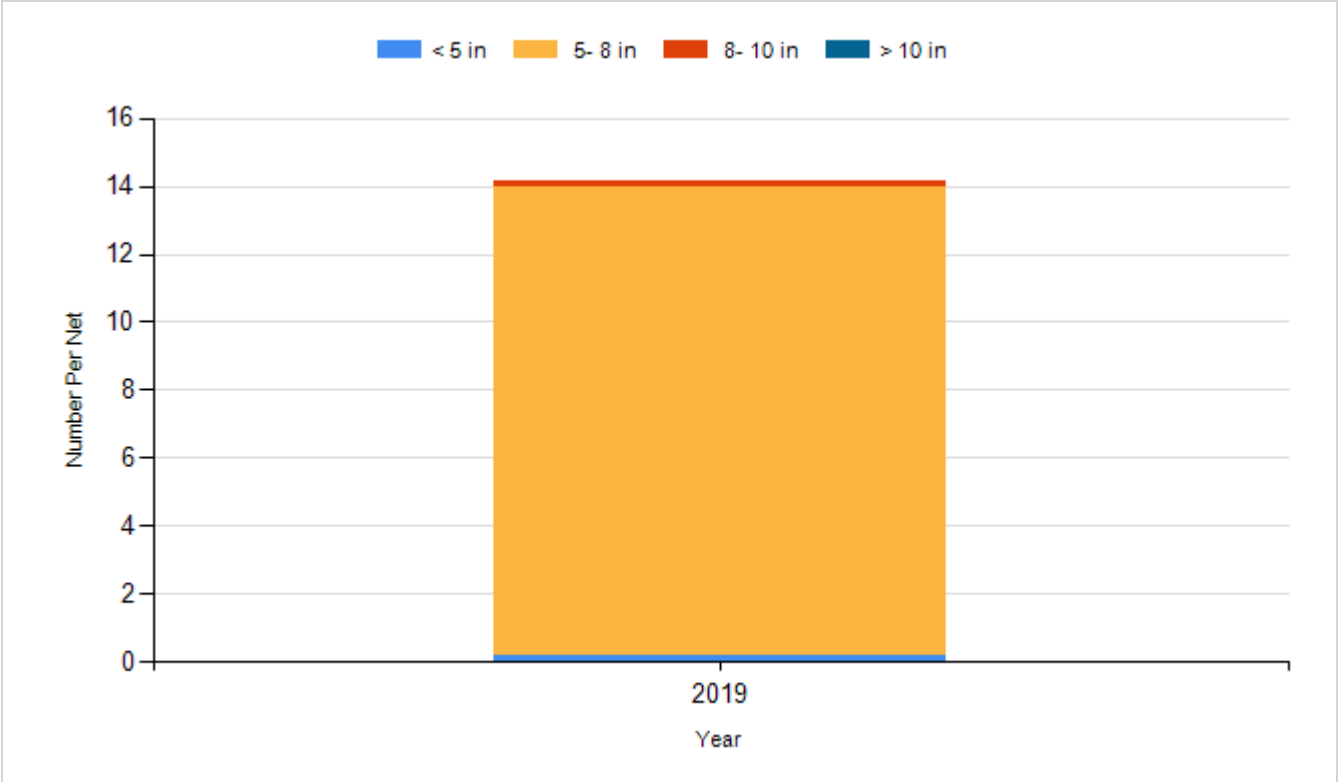
Species: Northern Pike
Gear: std exp gill net



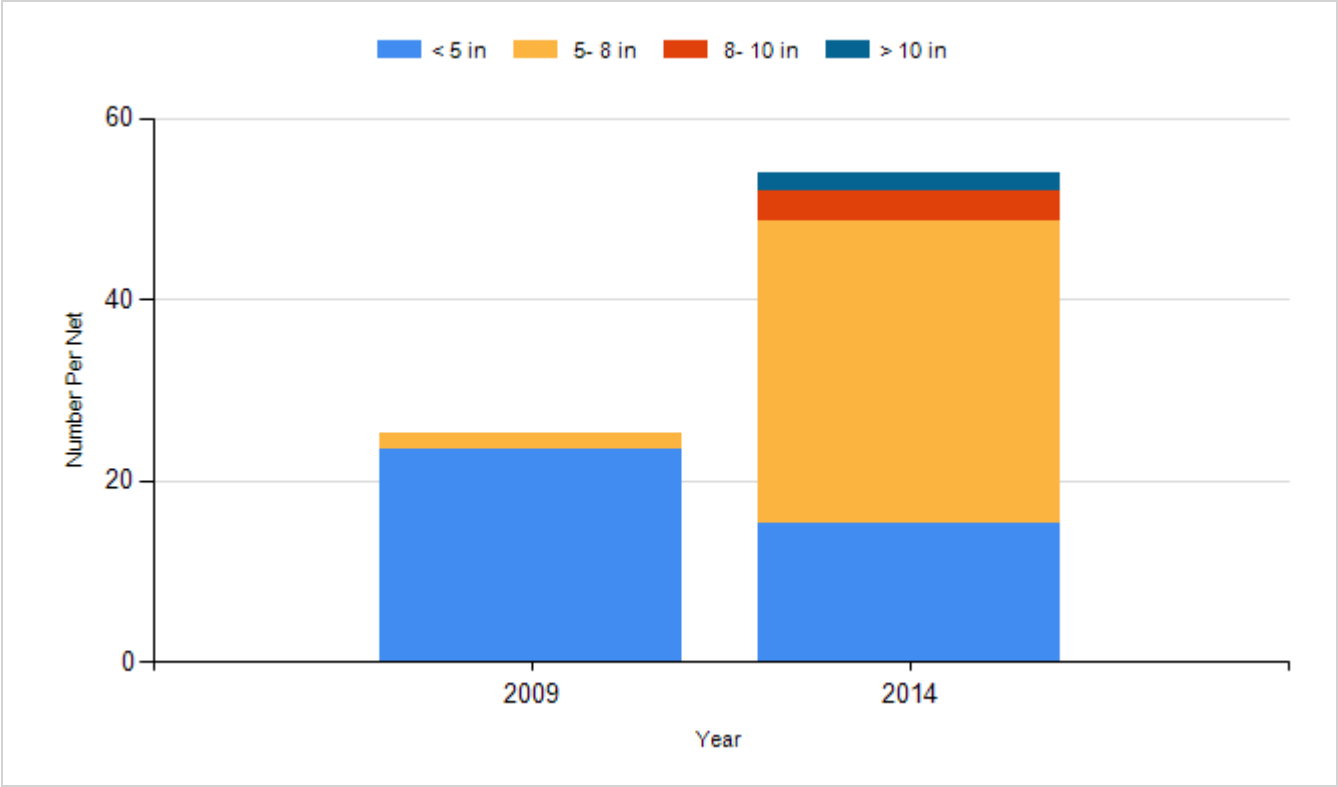
Species: Walleye
Gear: AFS std gill net



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
2008	Walleye	Fry	200,000
2010	Walleye	Fry	350,000
2012	Walleye	Fry	175,000
2014	Walleye	Fry	200,000
2017	Walleye	Fry	180,000
2019	Walleye	Fry	200,000