Roy Lake Survey Summary

Roy Lake, located 2.0 miles south and 1.0 miles west of Lake City, is managed as a multiple species fishery including panfish (i.e., bluegill and yellow perch), black bass (largemouth and smallmouth), northern pike, and walleye; other fish species are present and contribute to the fishery.

In 2018, experimental gill nets and fall night electrofishing (used to monitor age-0 walleye relative abundance) were the only gears deployed at Roy Lake. Frame nets are included in fish sampling efforts on a three-year rotation (next survey scheduled for 2020). Thus, the following summary will focus on those fish species assessed using gill nets (i.e., northern pike, walleye, and yellow perch).

- **Northern pike.** Northern pike numbers have declined since 2016. In 2018, relative abundance was considered moderate at 1.7/gill net; sampled northern pike ranged in length from 14.6 to 28.0 inches.

- **Walleye.** Walleyes were not abundant (2.2/gill net). Gill net captured walleyes ranged in length from 7.9 to 26.0 inches; 10 year classes (2005, 2006, 2009 – 2012, and 2014 – 2017), each represented by 8 or fewer individuals were present. Walleyes appear to grow well with mean length at capture values for age-4 fish from 16.1 to 20.9 inches in surveys conducted since 2009. In 2018, the mean length of age-4 walleyes was 18.3 inches.

- **Yellow perch**. Similar to walleyes, yellow perch were not abundant (4.2/gill net) in 2018. Of the 50 individuals sampled, few (≈4%) exceeded 8.0 inches; four cohorts (2013 – 2016) were represented. Those from the 2015 (age 3) cohort, which had a mean length at capture of 6.3 inches, were the most abundant accounting for 64% sampled yellow perch.

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

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Roy, Marshall County
UJA-Lake-866-001
2018

Lake Information

Name:	Roy	**Maximum Depth:**	21 Feet
County:	Marshall	**Mean Depth:**	10 Feet
		OHWM Elevation:	1,796
Surface Area:	2,113 Acres	**Outlet Elevation:**	1,795

Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	Jul 10, 2018	4 net-nights
AFS std gill net	Jul 11, 2018	4 net-nights
AFS std gill net	Jul 12, 2018	4 net-nights
fall night EF-WAE	Sep 24, 2018	3600 seconds

Common Fish Species Present

Walleye

Smallmouth Bass

Northern Pike

Largemouth Bass

Yellow Perch

Bluegill

Black Crappie

Black Bullhead

White Sucker

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)
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).

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

		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	2.1	1.2	100		92		90	4
	Black Crappie	0.8	0.4	30		20		115	5
	Bluegill	1.1	0.5	15		8		110	3
	Common Carp	0.1	0.1	100		100		81	
	Largemouth Bass	0.1	0.1	100		0		111	
	Northern Pike	1.7	0.6	65	17	5		92	3
	Smallmouth Bass	1.1	0.6	100		100		99	2
	Walleye	2.2	0.6	69	14	38	15	94	2
	White Sucker	1.9	0.7	100		100		98	2
	Yellow Perch	4.2	1.5	4		0		95	1
fall night EF-WAE*	Walleye	38.0	25.1					96	2

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 std frame nets used in 2017**

		CPUE										
Gear	Species	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Avg
AFS std gill net	Black Bullhead								1.3	0.9	2.1	1.4
	Black Crappie								0.3	0.2	0.8	0.4
	Bluegill								0.3	0.3	1.1	0.6
	Common Carp								0.0	0.0	0.1	0.0
	Largemouth Bass								0.1	0.0	0.1	0.1
	Northern Pike								3.2	2.3	1.7	2.4
	Smallmouth Bass								2.6	4.2	1.1	2.6
	Walleye								2.4	3.4	2.2	2.7
	White Sucker								2.8	2.8	1.9	2.5
	Yellow Perch								7.4	2.8	4.2	4.8
fall night EF-WAE*	Walleye	285.7	154.0	466.5	4.0	286.0	90.0	27.0	87.0	24.5	38.0	146.3
boat shocker (night, AC)	Largemouth Bass	18.7	26.3		36.7		58.8		44.0			36.9
boat shocker (night, DC)	Smallmouth Bass	17.3	42.4		110.8		19.7		3.0			38.6
frame net (std 3/4 in)**	Black Bullhead	0.5	0.5	0.6	8.2	6.5	3.3	3.0		1.4		3.0
	Black Crappie	0.0	0.2	0.5	0.6	0.6	0.2	0.3		0.2		0.3
	Bluegill	16.8	8.2	7.2	12.9	8.0	8.0	56.6		22.5		17.5
	Common Carp	0.0	0.1	0.0	0.1	0.1	0.0	0.0		0.2		0.1
	Green Sunfish	0.7	0.1	0.0	0.7	0.2	0.0	0.2		2.0		0.5
	Largemouth Bass	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.1		0.0
	Northern Pike	0.8	0.5	0.5	1.5	1.2	1.0	0.5		0.7		0.8
	Smallmouth Bass	0.3	0.5	0.8	0.3	0.2	0.9	0.3		0.0		0.4
	Walleye	0.5	0.3	0.1	0.5	0.2	0.2	0.0		0.1		0.2
	White Sucker	0.3	0.0	0.0	0.0	0.1	0.0	0.2		0.0		0.1
	Yellow Perch	6.8	20.9	19.6	21.3	9.8	4.1	2.0		7.8		11.5
std exp gill net	Black Bullhead	0.0	0.0	0.0	4.3	1.2	1.5	0.3				1.0
	Black Crappie	0.2	0.2	0.0	0.2	0.0	0.3	0.2				0.2
	Bluegill	0.0	0.0	0.0	0.0	0.3	0.0	0.7				0.1
	Common Carp	0.3	0.7	0.3	0.0	0.0	0.0	0.2				0.2
	Northern Pike	1.5	2.7	7.8	10.3	7.5	6.3	6.0				6.0
	Smallmouth Bass	0.3	0.8	0.2	0.5	2.3	4.0	2.3				1.5
	Walleye	3.0	3.3	1.8	2.8	8.3	6.3	6.5				4.6
	White Sucker	6.2	4.7	7.2	6.7	4.7	8.5	5.0				6.1
	Yellow Perch	14.7	51.0	80.3	99.3	82.2	10.0	23.3				51.5

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	Northern Pike	PSD								89	82	65
		PSD-P								5	4	5
		Wr								89	89	92
	Walleye	PSD								76	90	69
		PSD-P								34	34	38
		Wr								91	87	94
	Yellow Perch	PSD								2	0	4
		PSD-P								1	0	0
		Wr								97	102	95
std exp gill net	Northern Pike	PSD	100	81	66	65	51	61	81			
		PSD-P	11	19	15	5	0	5	6			
		Wr	87	93	90	90	88	85	88			
	Walleye	PSD	83	45	64	41	36	68	77			
		PSD-P	39	10	27	41	14	18	8			
		Wr	87	87	94	86	91	88	90			
	Yellow Perch	PSD	1	0	0	7	13	7	3			
		PSD-P	0	0	0	0	0	0	0			
		Wr	102	100	103	101	91	99	92			

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	28	213 (2)	326 (8)	397 (3)	466 (3)		521 (2)	524 (4)	557 (3)	526 (1)	612 (2)
2017	42	215 (1)		395 (13)	450 (1)		511 (16)	510 (4)	547 (4)		661 (3)
2016	30		285 (6)	371 (2)	455 (1)	476 (9)	486 (4)	597 (2)	626 (1)		637 (5)
2015	42	194 (3)	282 (2)	356 (7)	427 (23)	443 (4)	575 (1)				678 (2)
2014	40		232 (2)	377 (19)	408 (10)	482 (2)	592 (2)	476 (1)			652 (4)
2013	50		300 (21)	367 (15)	424 (6)	535 (3)					631 (5)
2012	23	197 (6)	294 (2)	351 (8)	530 (1)						622 (6)
2011	16	183 (4)	276 (5)	398 (1)	485 (2)	464 (1)		513 (1)			661 (2)
2010	24	177 (3)	294 (12)	384 (1)	464 (2)	523 (3)	473 (2)			483 (1)	
2009	22	194 (4)	301 (2)	398 (5)	465 (2)	502 (2)	506 (1)	562 (1)	570 (3)		592 (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+
2018	50		141 (9)	160 (32)	175 (8)	205 (1)					
2017	34		138 (10)	157 (23)	186 (1)						
2016	89		140 (27)	153 (37)	165 (22)	195 (1)	249 (2)				
2015	728	99 (187)	112 (423)	153 (113)	194 (2)	219 (3)					
2014	275	97 (55)	116 (172)	129 (23)	182 (22)	214 (4)					
2013	1069	99 (563)	138 (44)	167 (258)	187 (165)	202 (33)	205 (9)				
2012	644	102 (45)	149 (412)	184 (106)	195 (80)						
2011	1506	99 (764)	128 (548)	156 (194)							
2010	1178	97 (208)	121 (926)	158 (44)							
2009	506	94 (138)	116 (361)	176 (5)	194 (2)						

Fish Condition

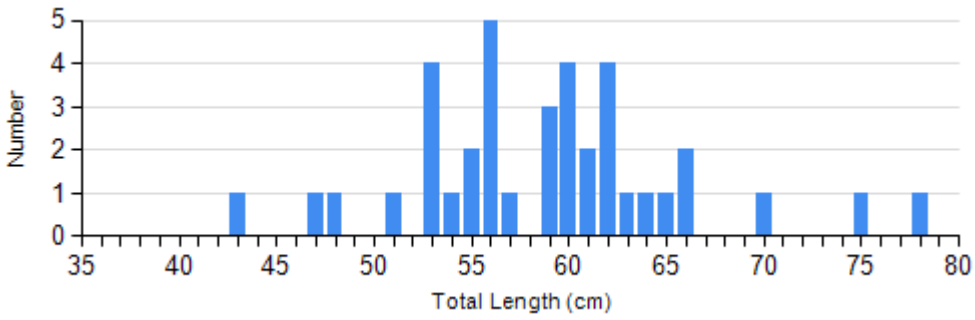
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Northern Pike Gill Net	2014	15	87 (1.6)	21	85 (1.2)	2	65 (19.2)	0	
	2015	7	93 (2.8)	27	87 (2.3)	2	82 (1.7)	0	
	2016	4	90 (2.4)	32	88 (1.2)	2	95 (4.1)	0	
	2017	5	98 (3.4)	22	87 (1.4)	1	83	0	
	2018	7	99 (4.6)	12	89 (0.9)	1	70	0	
Walleye Gill Net	2014	12	88 (1.3)	19	89 (1.2)	5	82 (2.9)	2	92 (6.1)
	2015	9	90 (0.8)	27	90 (1.0)	1	89	2	79 (2.6)
	2016	7	92 (1.3)	12	94 (2.0)	7	90 (1.2)	3	81 (3.8)
	2017	4	84 (2.6)	23	89 (1.0)	12	86 (1.7)	2	77 (3.4)
	2018	8	93 (1.6)	8	99 (1.5)	9	92 (2.5)	1	77
Yellow Perch Gill Net	2014	56	99 (0.9)	4	97 (4.5)	0		0	
	2015	136	93 (0.9)	4	87 (1.5)	0		0	
	2016	87	97 (0.8)	1	93	1	81	0	
	2017	33	102 (1.2)	0		0		0	
	2018	48	95 (1.1)	2	96 (1.2)	0		0	

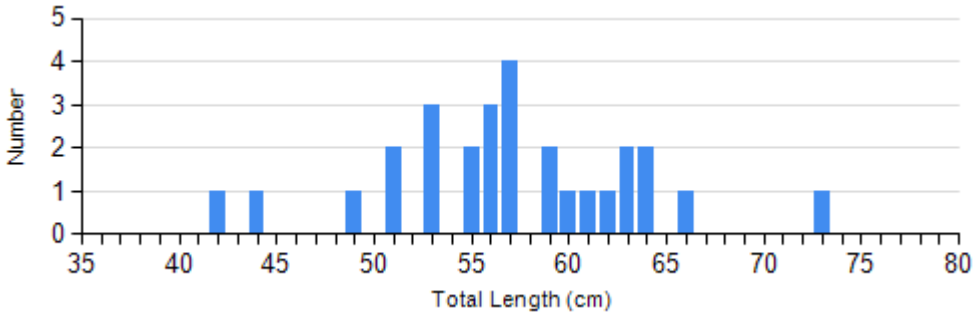
Length Frequency Distribution

Length frequency histogram of species sampled by year.

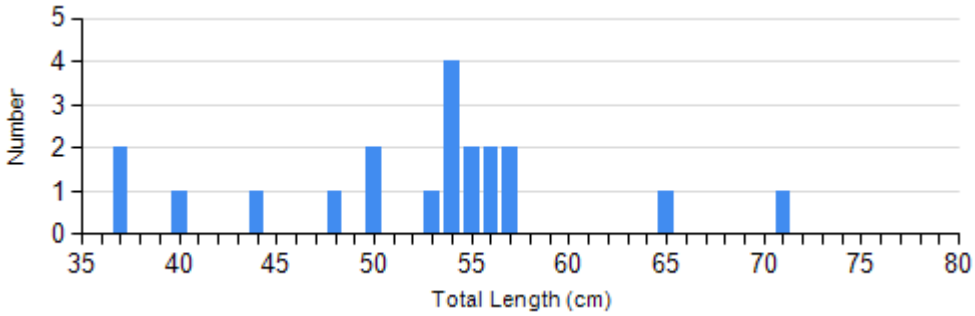
Species: Northern Pike
Gear: AFS std gill net



2016



2017



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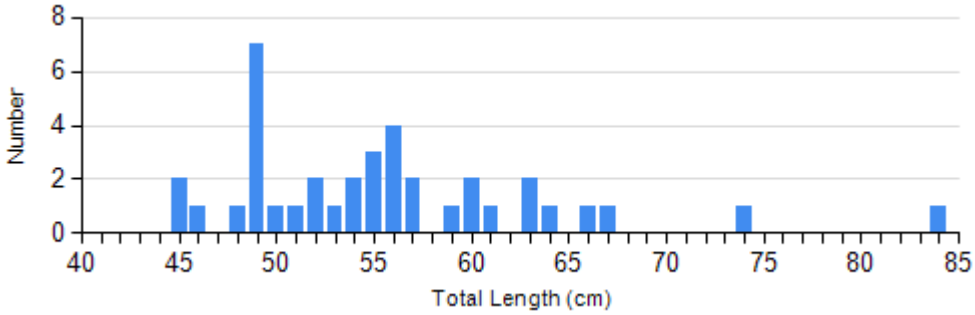
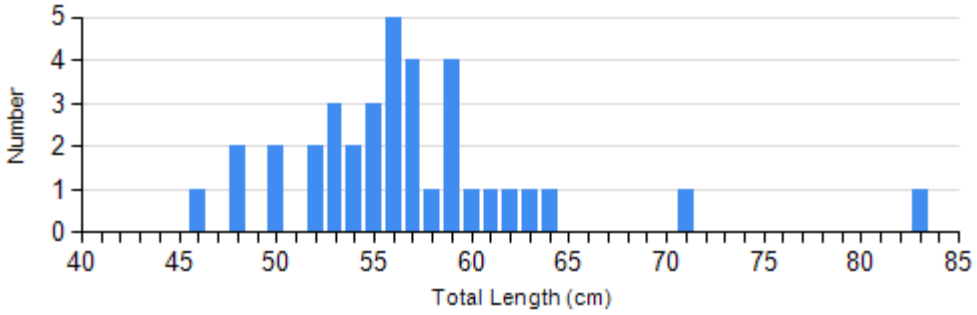
Species: Northern Pike
Gear: std exp gill net

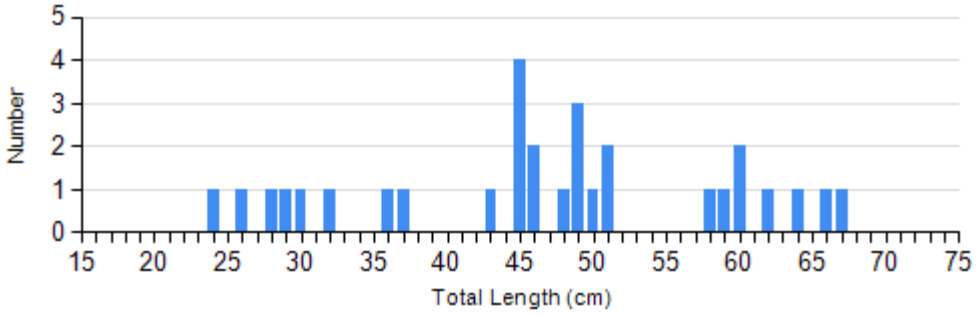


2014

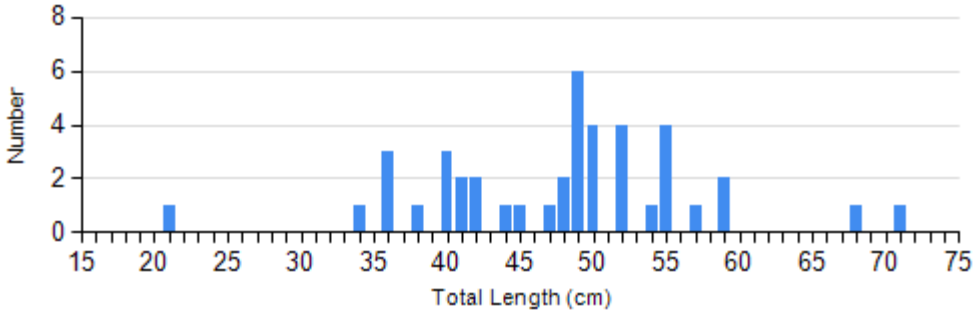


2015

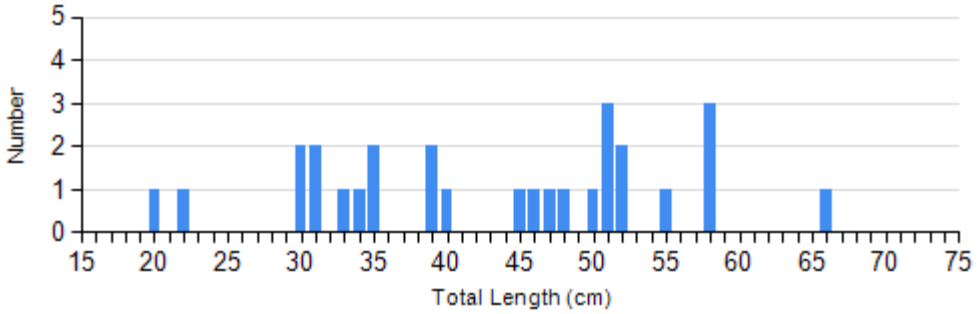
Species: Walleye
Gear: AFS std gill net



2016

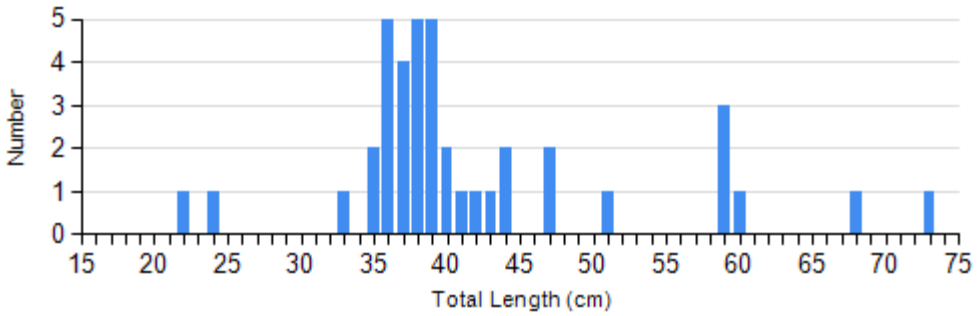


2017

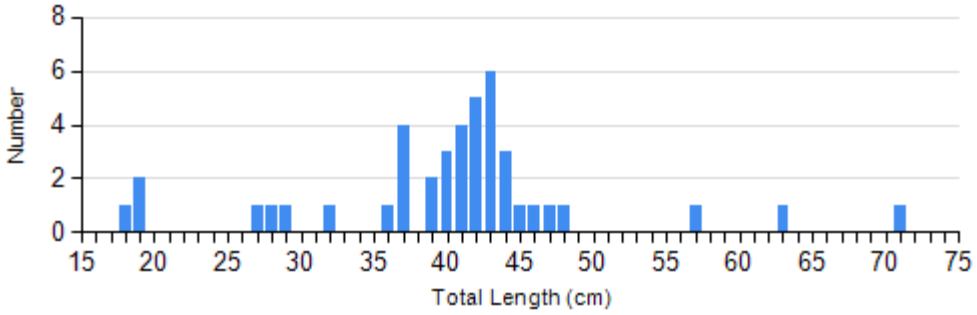


2018

Species: Walleye
Gear: std exp gill net

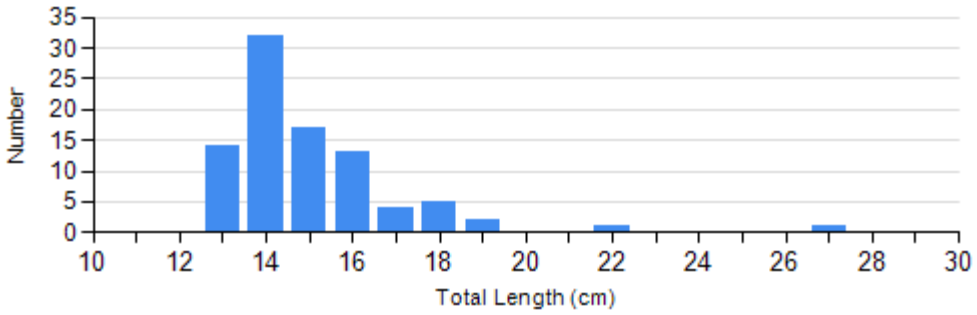


2014

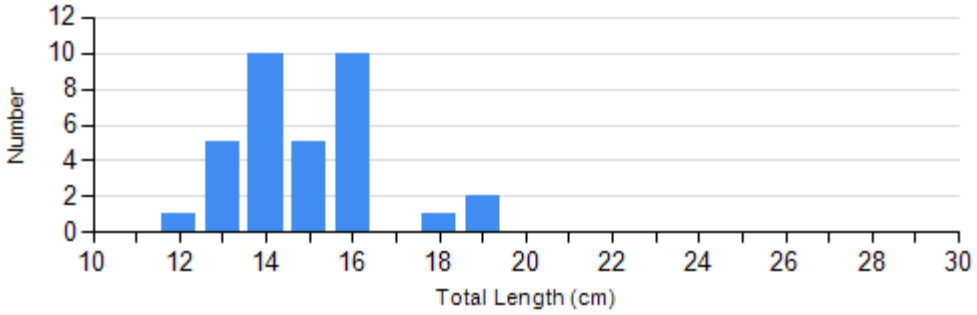


2015

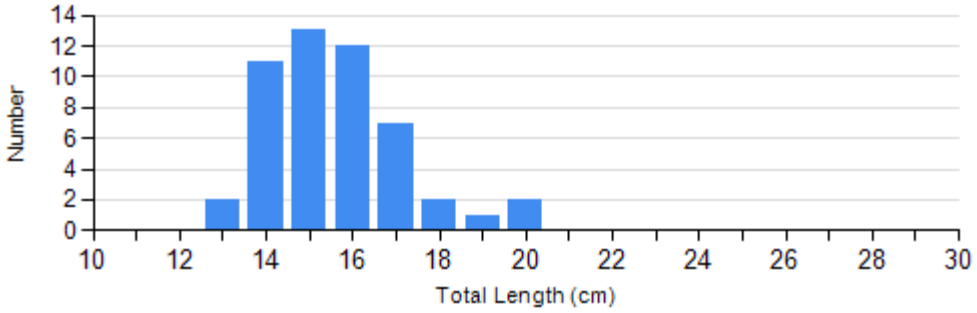
Species: Yellow Perch
Gear: AFS std gill net



2016

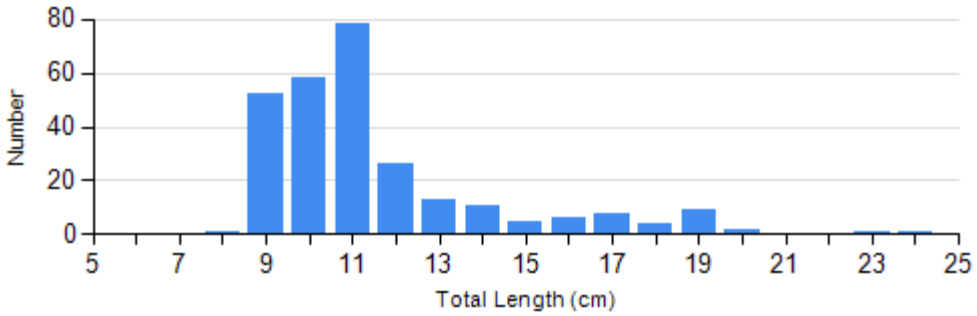


2017

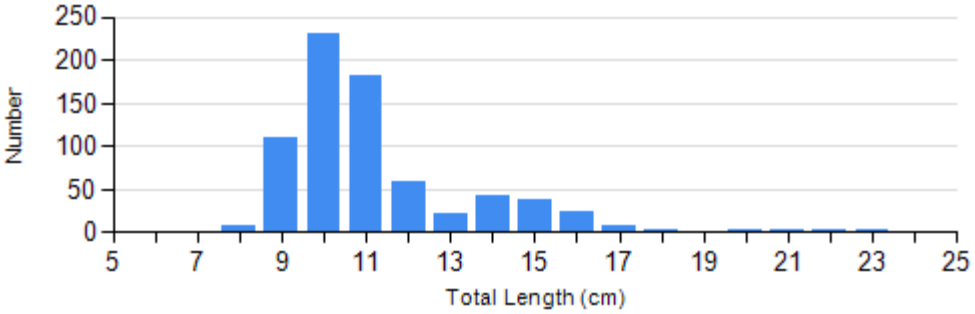


2018

Species: Yellow Perch
Gear: std exp gill net



2014

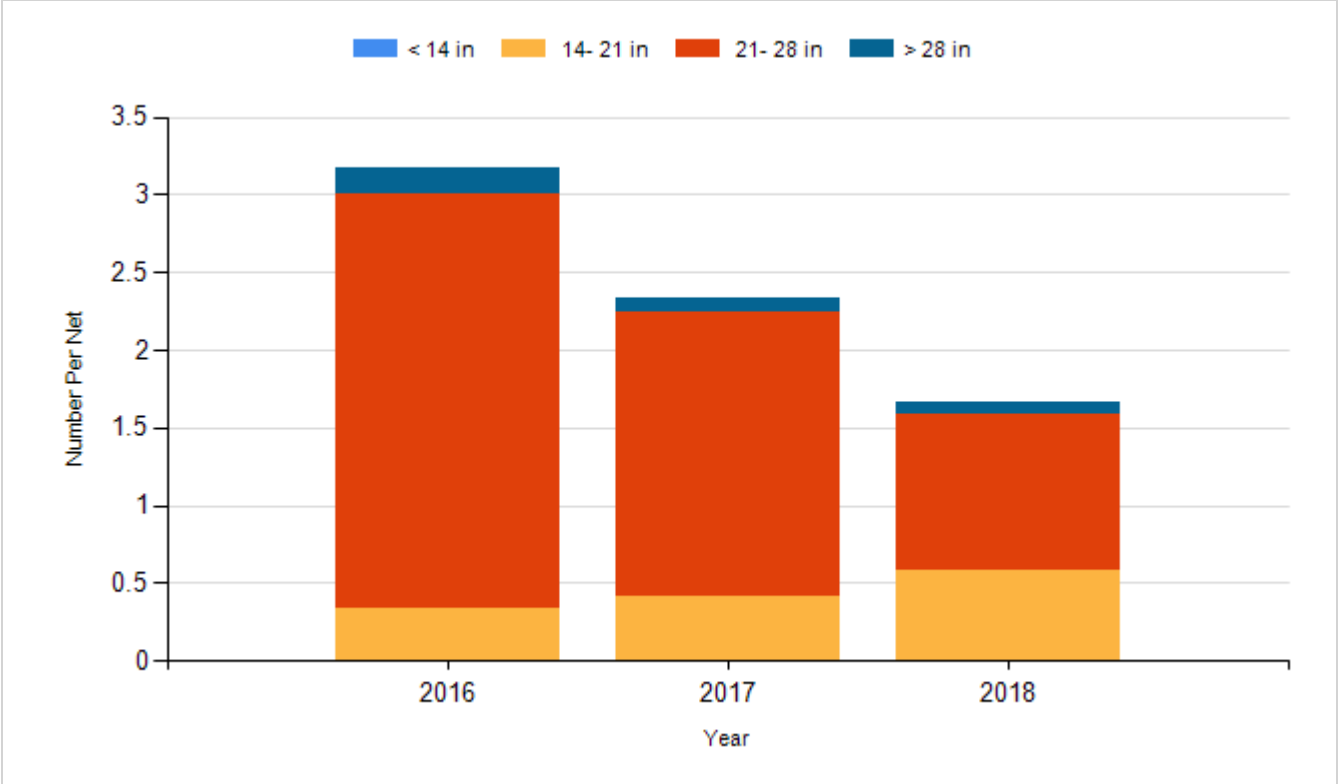

250
200
150
100
50
0
Number
5
7
9
11
13
15
17
19
21
23
25
Total Length (cm)

2015

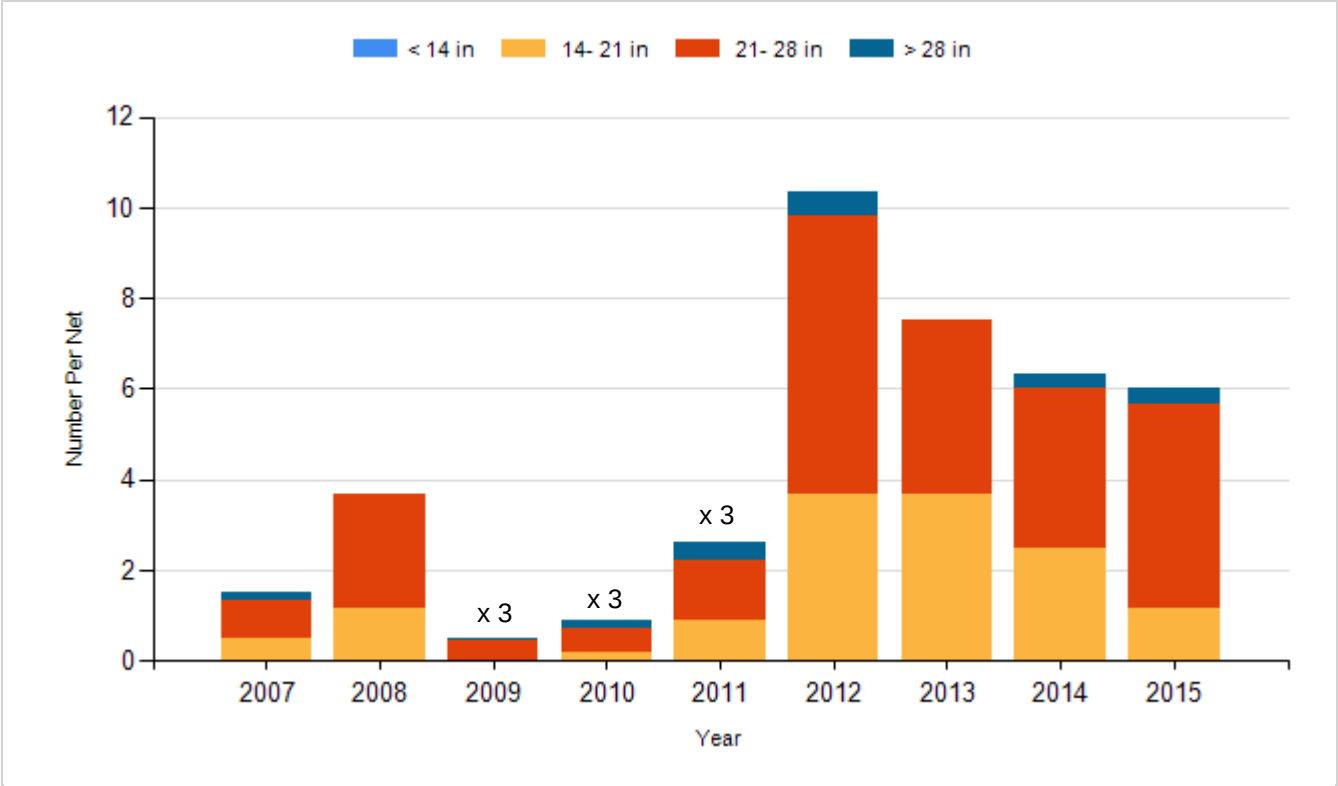
Historic Fish Sizes and Relative Abundance

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

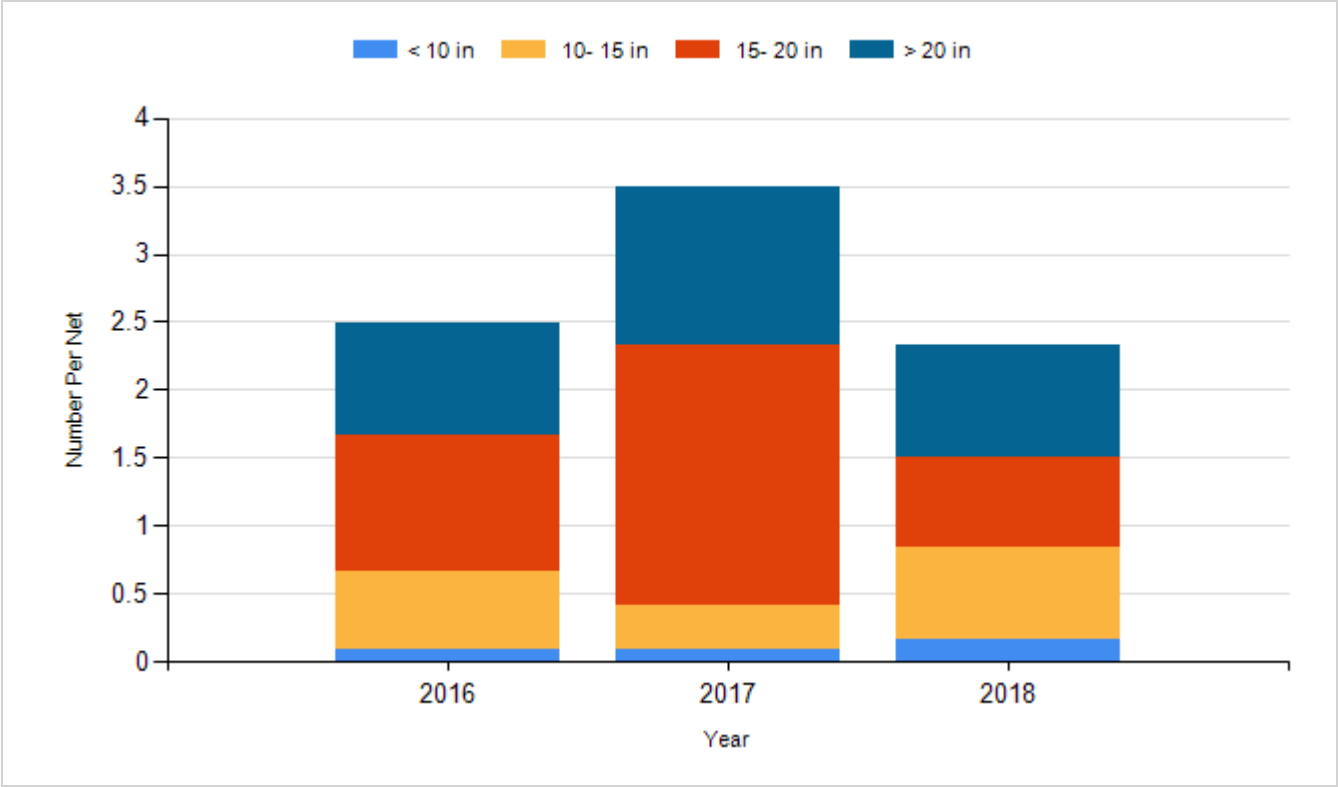
Species: Northern Pike
Gear: AFS std gill net



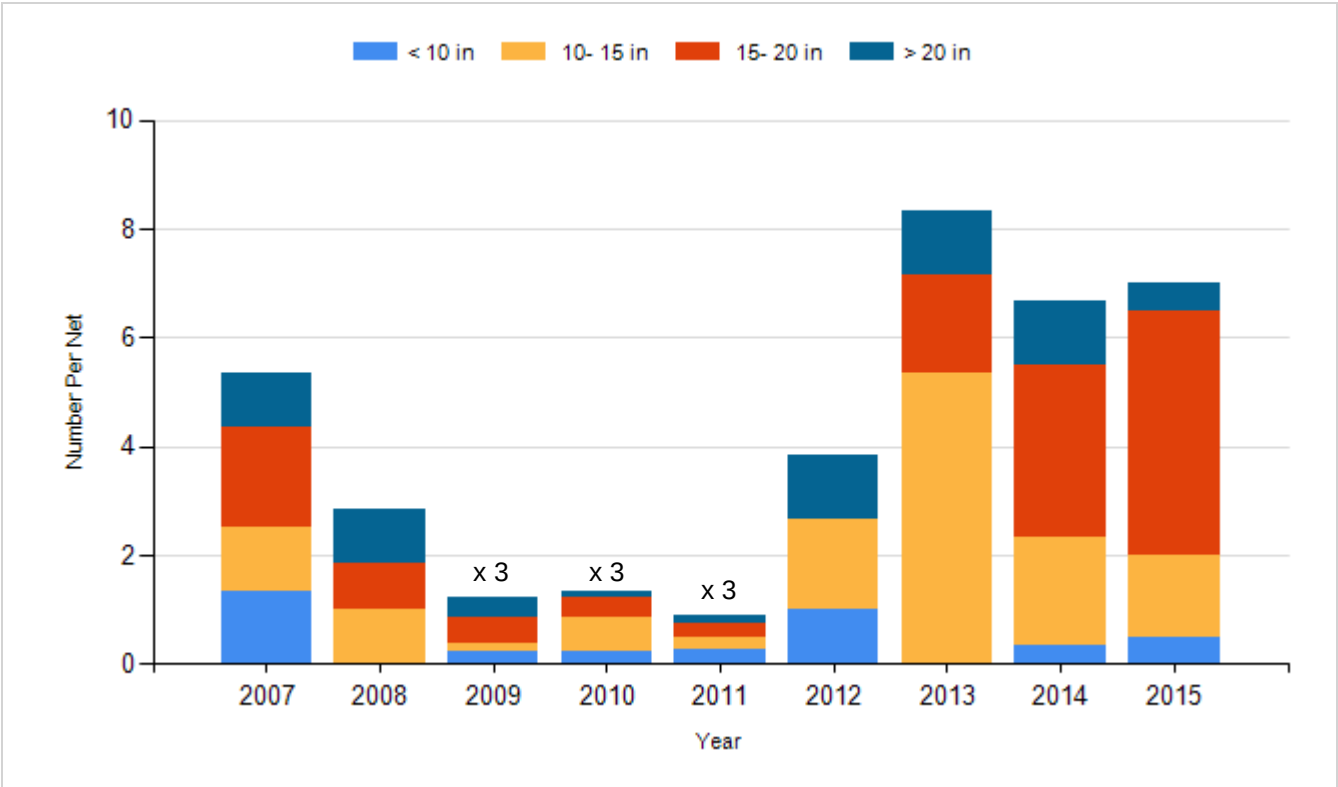
Species: Northern Pike
Gear: std exp gill net



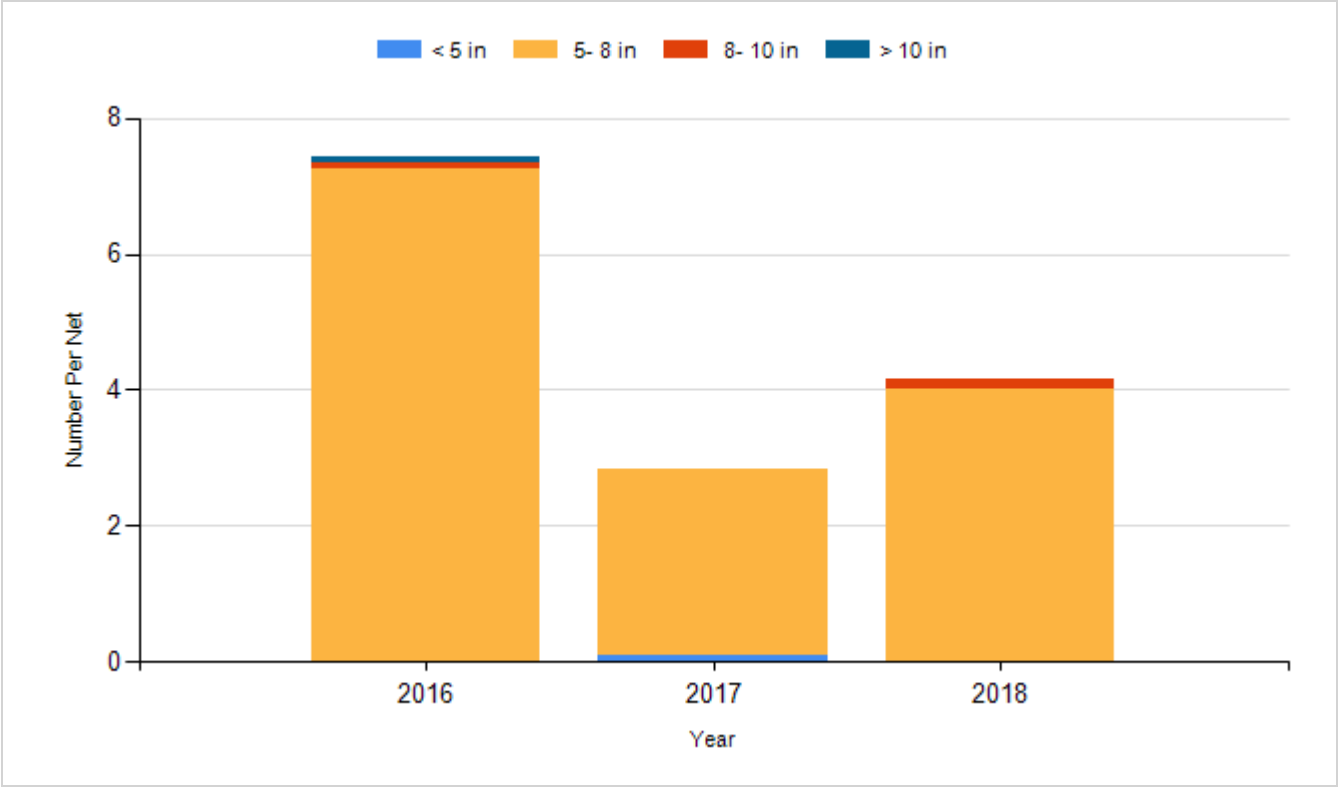
Species: Walleye
Gear: AFS std gill net



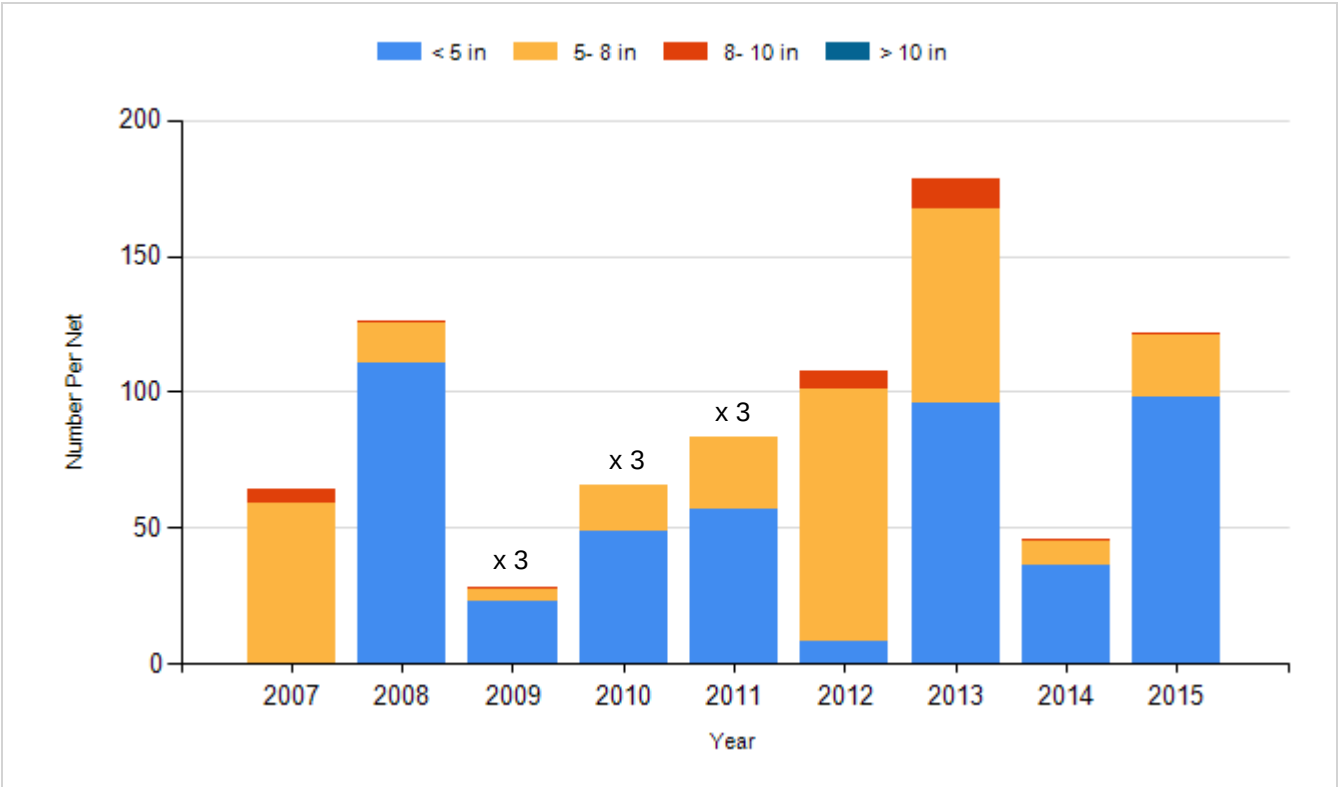
Species: Walleye
Gear: std exp gill net



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
2013	Walleye	Fry	850,000
2016	Walleye	Fry	1,000,000
2018	Walleye	Fry	1,030,000