Willow Dam Survey Summary

Willow Dam, located 4.0 miles north and 4.5 miles west of Westport, serves as a municipal water source for the city of Aberdeen. Water levels in Willow Dam are dependent on water usage by the city of Aberdeen. Because of this uncertainty, fisheries management objectives have not been established for the Willow Dam fishery.

In 2012-13, Willow Dam was drained to facilitate the repair of ruptured lines on the lakes bottom. The dam refilled quickly and fish stockings were resumed in 2014 (see Fish Stocking). Unfortunately, the fishery has been slow to recover. Black bullheads and white suckers were the most abundant fish species sampled in each of the last two surveys (2018 and 2023).

- **Northern pike.** Northern pike were the third most abundant fish species in the 2023 gill net catch (2.2 per gill net), behind black bullhead and white sucker. Gill nets sampled 13 northern pike from 22.8 to 31.1 inches.

- **Walleye.** Walleye (includes saugeye) have been stocked six times since the 2012-13 draw down. Despite these stocking efforts, relative abundance has remained low (e.g., <2.0 per gill net) in each of the last two surveys (2018 and 2023). In 2023, the gill net catch included seven individuals that ranged in length from 9.8 to 20.9 inches and represented three cohorts (2019, 2021, and 2022), all of which coincided with stocking events.

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

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Willow Creek, Brown County
ELM-Lake-11-000
2023

Lake Information

Name: Willow Creek

County: Brown

Surface Area: 288 Acres

Maximum Depth: 18 Feet

Surveys and Investigations

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

Gear	Date	Effort
AFS std gill net	Jul 25, 2023	3 net-nights
AFS std gill net	Jul 26, 2023	3 net-nights

Common Fish Species Present

Walleye

Northern Pike

Yellow Perch

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)
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	131	18.2	13.2	6	4	1		110	1
	Common Carp	3	0.5	0.5	33		33		101	10
	Northern Pike	13	2.2	1.3	100		8		99	4
	Walleye	7	1.2	1.0	43		14		91	3
	White Sucker	46	7.7	3.6	100		100		108	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**

		CPUE										
Gear	Species	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Avg
AFS std gill net	Black Bullhead					44.7					18.2	31.45
	Common Carp					2.2					0.5	1.35
	Northern Pike					0.5					2.2	1.35
	Walleye					0.0					1.2	0.60
	White Sucker					8.8					7.7	16.50
frame net (std 3/4 in)	Black Bullhead					184.2						184.20
	Common Carp					1.1						1.10
	Northern Pike					0.6						0.60
	Orangespotted Sunfish*					7.2						7.20
	Walleye					0.1						0.10
	White Sucker					4.4						4.40

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	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
AFS std gill net	Northern Pike	PSD					100					100
		PSD-P					33					8
		Wr					99					99
	Walleye	PSD										43
		PSD-P										14
		Wr										91

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+
2023	6	269 (3)	384 (1)		515 (2)						

Fish Condition

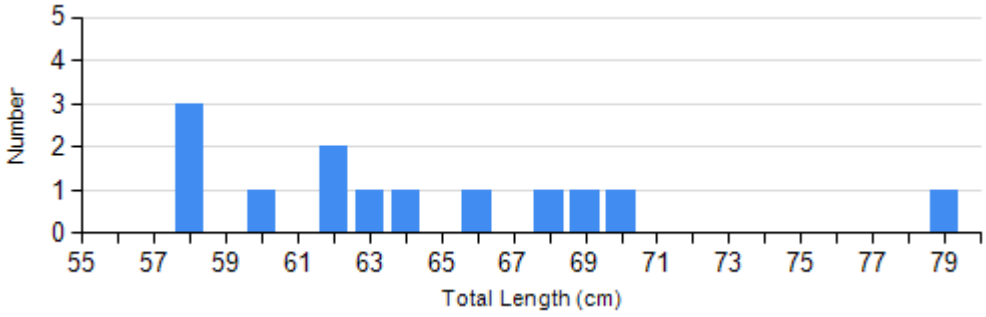
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		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	2023	0		12	100 (3.0)	1	97	0	
Walleye Gill Net	2023	4	92 (4.8)	2	92 (1.1)	1	88	0	

Length Frequency Distribution

Length frequency histogram of species sampled by year.

Species: Northern Pike
Gear: AFS std gill net

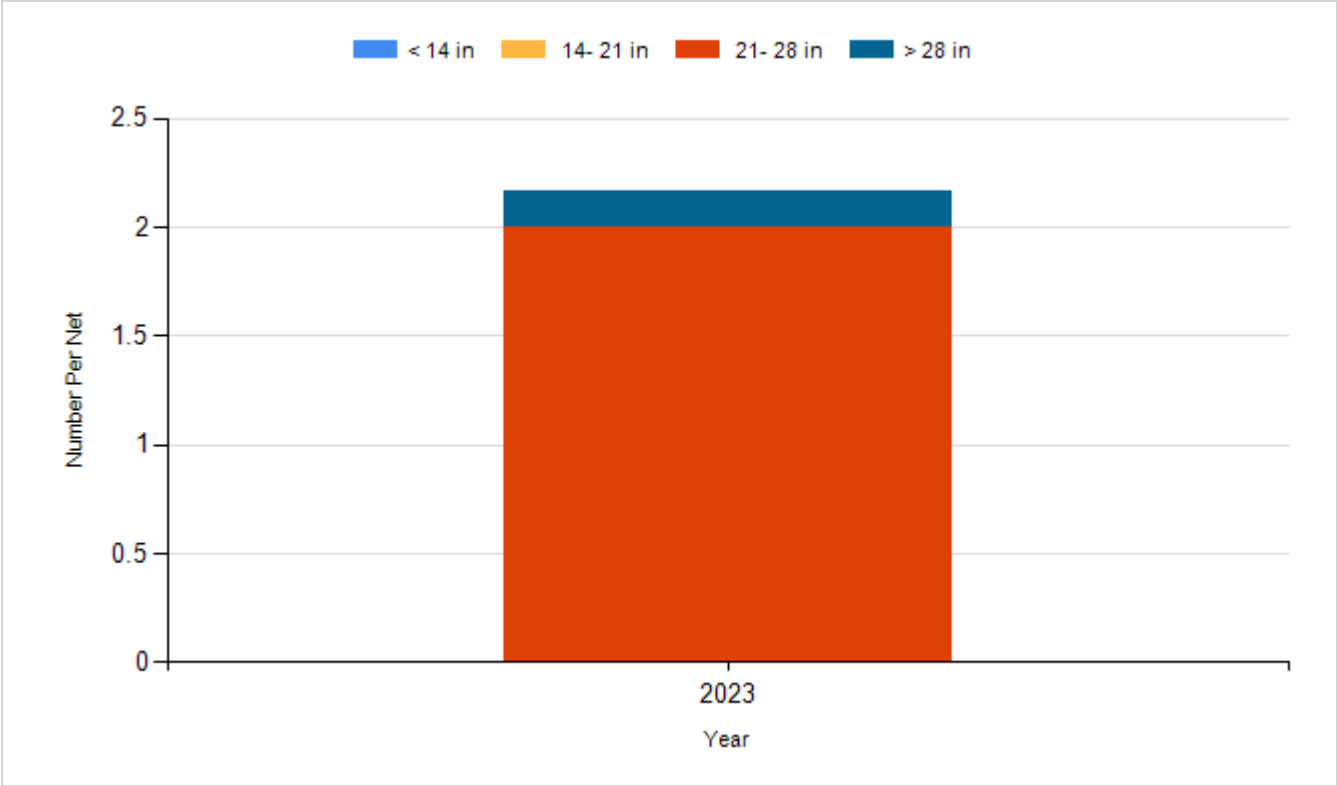


2023

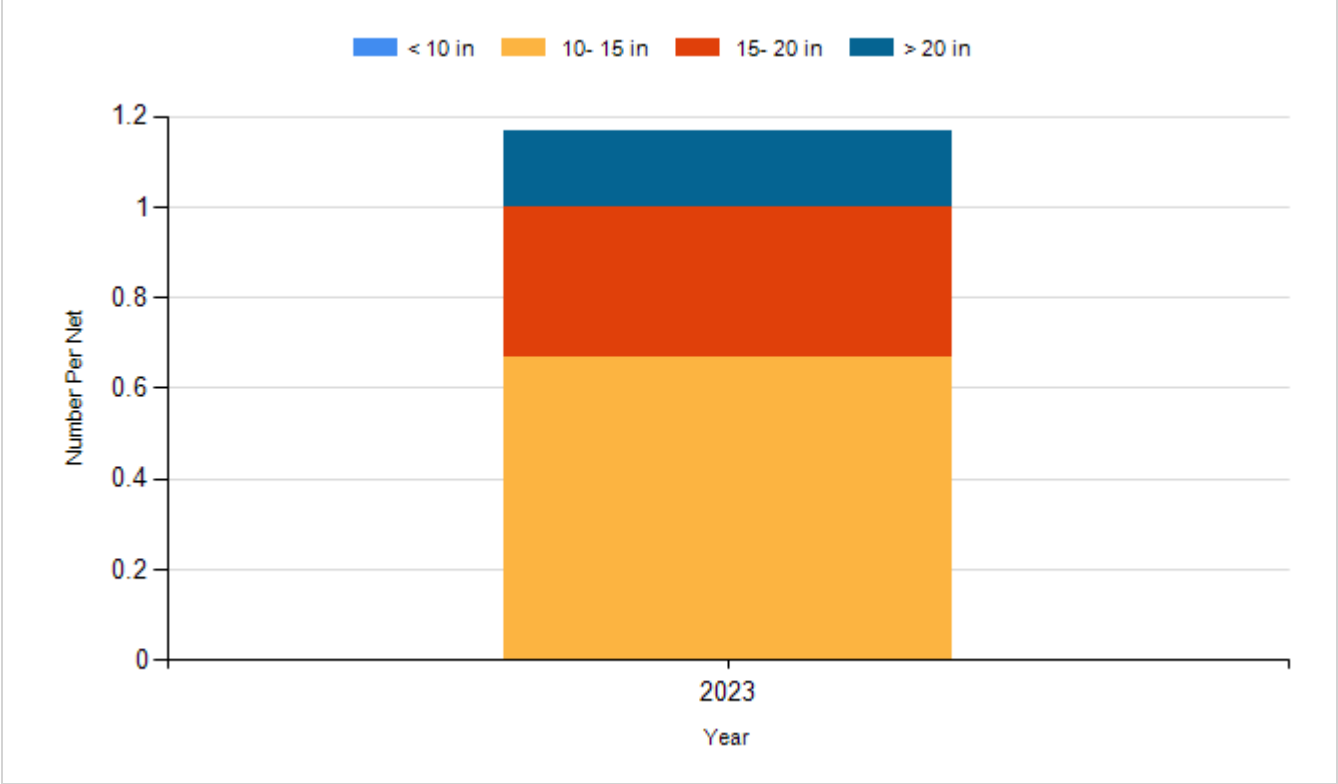
Historic Fish Sizes and Relative Abundance

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

Species: Northern Pike
Gear: AFS std gill net



Species: Walleye
Gear: AFS std gill net



Fish Stocking

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

Year	Species	Size	Number
2014	Walleye	Small Fingerling	35,970
2015	Yellow Perch	Adult	2,225
2017	Walleye	Fry	175,000
2019	Saugeye	Juvenile	26,650
2021	Saugeye	Juvenile	27,060
2022	Saugeye	Juvenile	26,800
2023	Saugeye	Fry	150,000

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

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Common Fish Species Present

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Northern Pike

Yellow Perch

Black Bullhead

White Sucker

Common Carp

Terminology

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

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.

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$$Wr = \left(\frac{W}{Ws}\right) \text{x } 100$$

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	131	18.2	13.2	6	4	1		110	1
	Common Carp	3	0.5	0.5	33		33		101	10
	Northern Pike	13	2.2	1.3	100		8		99	4
	Walleye	7	1.2	1.0	43		14		91	3
	White Sucker	46	7.7	3.6	100		100		108	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**

		CPUE										
Gear	Species	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Avg
AFS std gill net	Black Bullhead										18.2	18.20
	Common Carp										0.5	0.50
	Northern Pike										2.2	2.20
	Walleye										1.2	1.20
	White Sucker										7.7	7.70

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	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
AFS std gill net	Black Bullhead	PSD										6
		PSD-P										1
		Wr										110
	Common Carp	PSD										33
		PSD-P										33
		Wr										101
	Northern Pike	PSD										100
		PSD-P										8
		Wr										99
	Walleye	PSD										43
		PSD-P										14
		Wr										91
	White Sucker	PSD										100
		PSD-P										100
		Wr										108

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+
2023	6	269 (3)	384 (1)		515 (2)						

Fish Condition

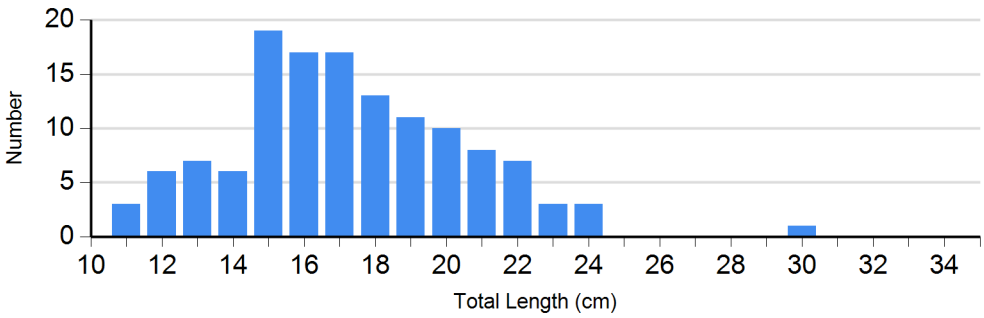
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Black Bullhead Gill Net	2023	102	110 (1.0)	6	109 (2.4)	1	96	0	
Common Carp Gill Net	2023	2	109 (4.0)	0		1	86	0	
Northern Pike Gill Net	2023	0		12	100 (3.0)	1	97	0	
Walleye Gill Net	2023	4	92 (4.8)	2	92 (1.1)	1	88	0	
White Sucker Gill Net	2023	0		0		9	110 (3.2)	37	107 (1.4)

Length Frequency Distribution

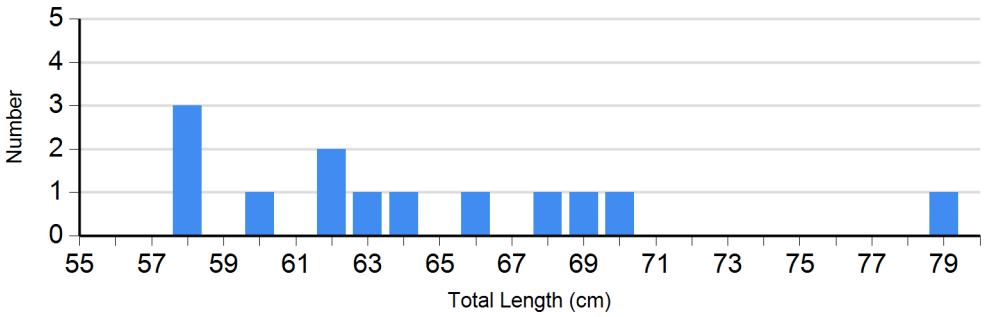
Length frequency histogram of species sampled by year.

Species: Black Bullhead
Gear: AFS std gill net



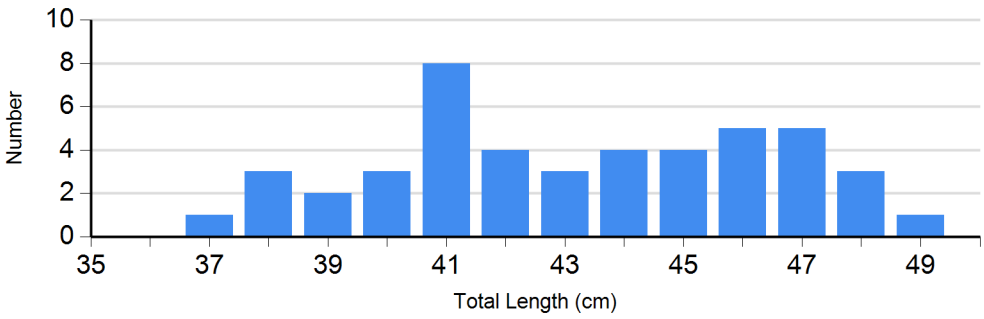
2023

Species: Northern Pike
Gear: AFS std gill net



2023

Species: White Sucker
Gear: AFS std gill net

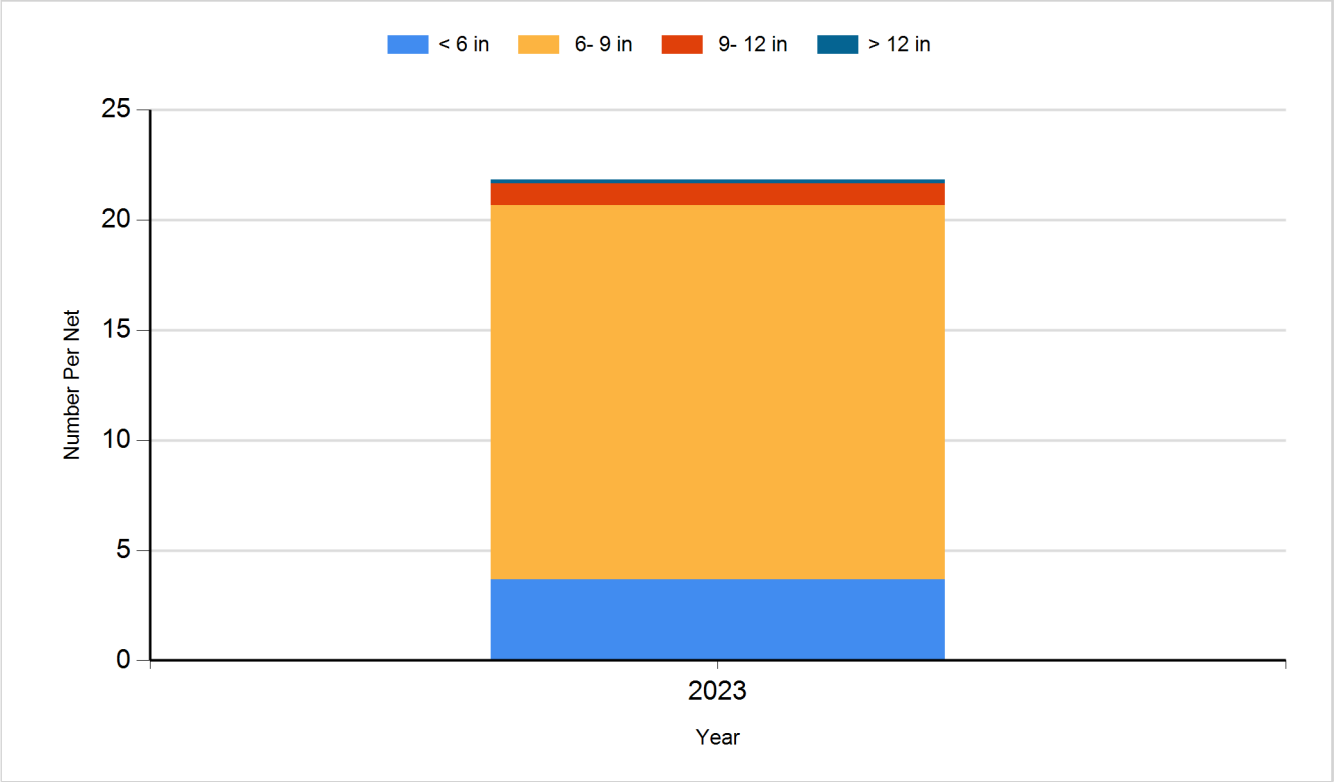


2023

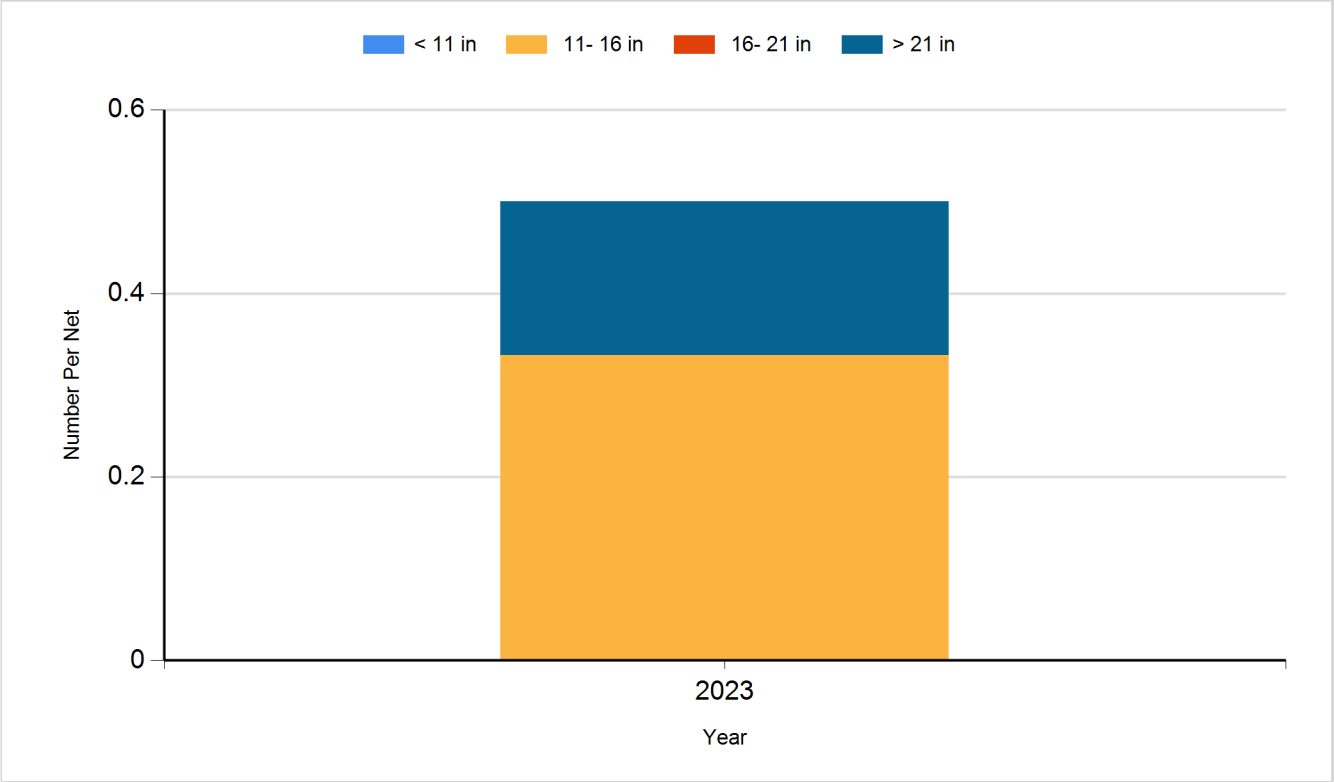
Historic Fish Sizes and Relative Abundance

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

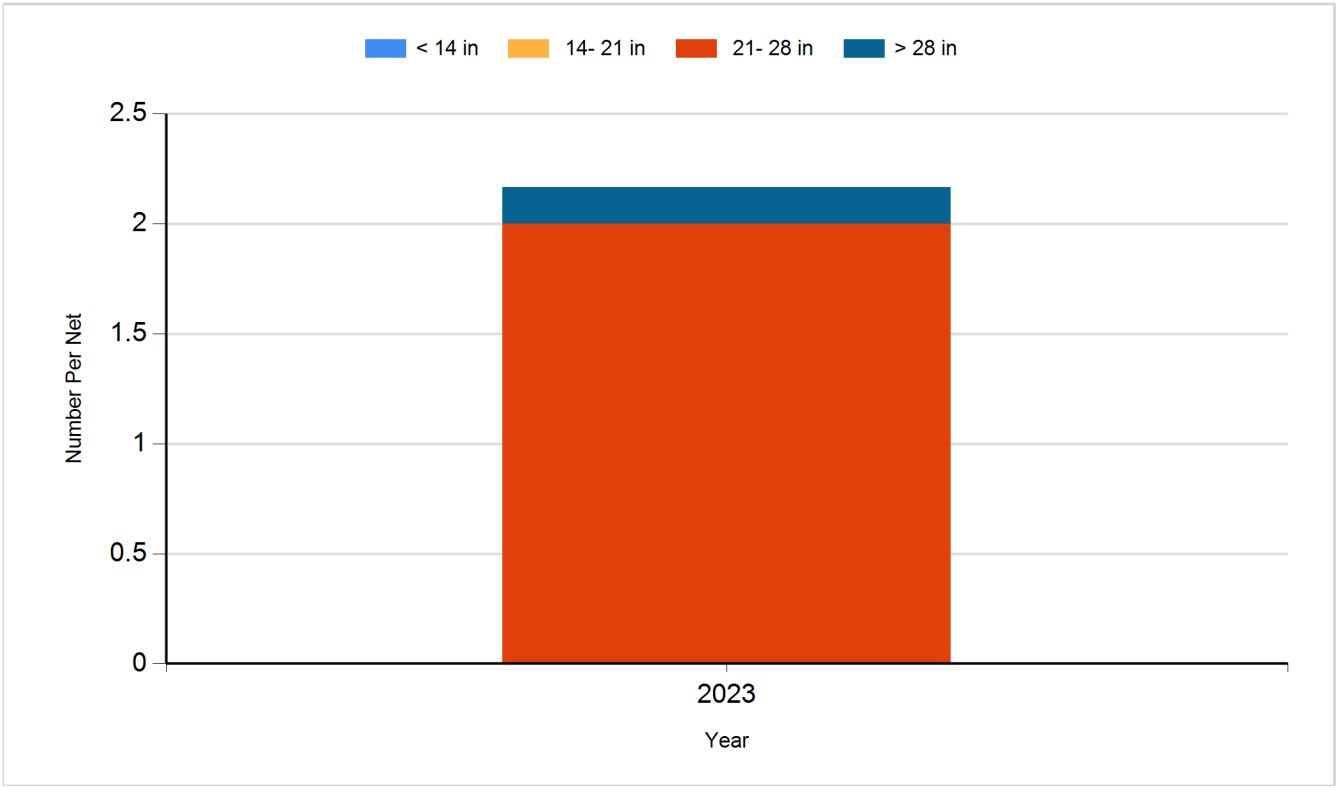
Species: Black Bullhead
Gear: AFS std gill net



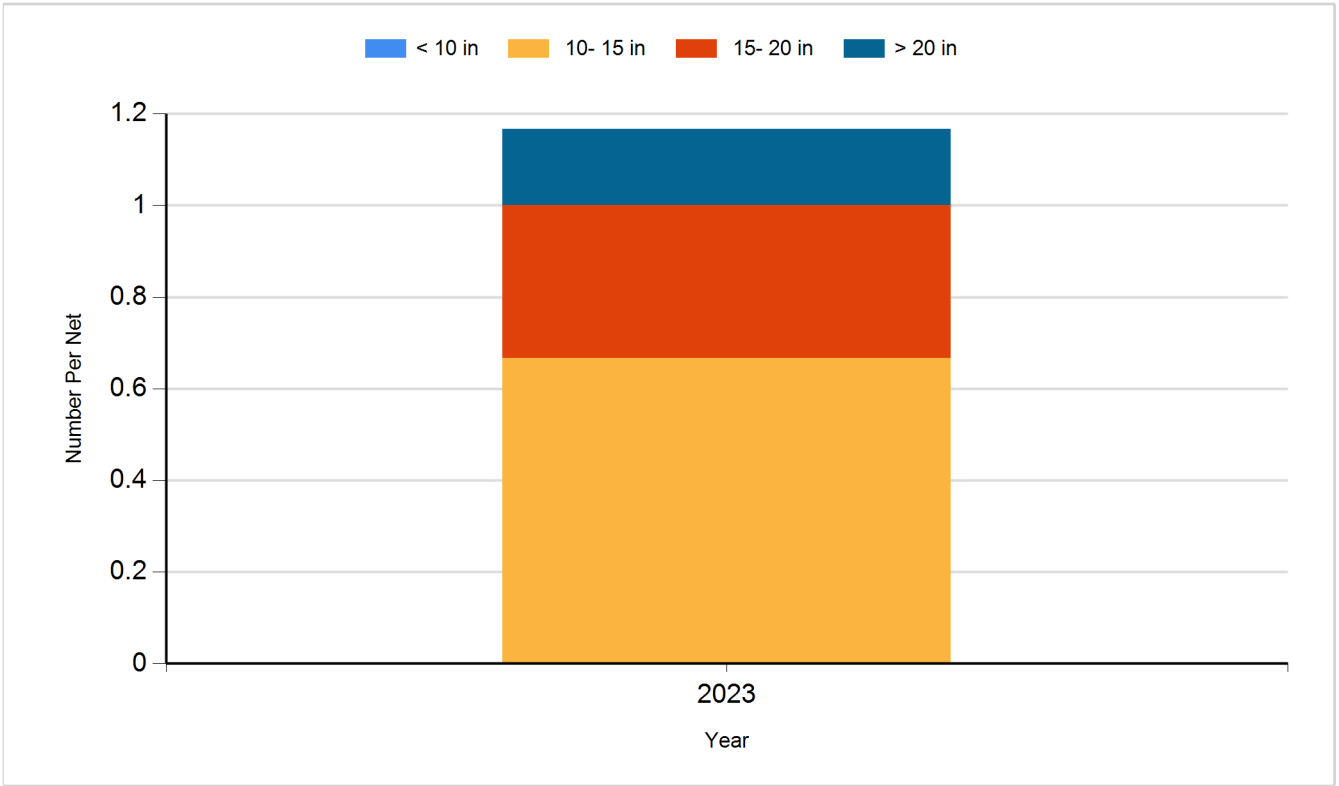
Species: Common Carp
Gear: AFS std gill net



Species: Northern Pike
Gear: AFS std gill net



Species: Walleye
Gear: AFS std gill net



Species: White Sucker
Gear: AFS std gill net