

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

Hayes, Stanley County

BAD-Lake-3119-000

2021

Lake Information

Name: Hayes **Maximum Depth:** 17 Feet
County: Stanley **Mean Depth:** 6 Feet
Legal Description: T5-R26-S29
Surface Area: 61 Acres

Surveys and Investigations

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

Gear	Date	Effort
frame net (std 3/4 in)	Jun 15, 2021	5 net-nights
frame net (std 3/4 in)	Jun 16, 2021	5 net-nights

Common Fish Species Present

Largemouth Bass

Bluegill

Black Bullhead

Northern Pike

Yellow Perch

Yellow Bullhead

White Crappie

Sunfish Hybrid

Golden Shiner

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.
- **std 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.

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

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.

$$PSD = \left(\frac{\text{number of fish} \geq \text{quality length}}{\text{number of fish} \geq \text{stock length}} \right) \times 100$$

$$PSD - P = \left(\frac{\text{number of fish} \geq \text{preferred length}}{\text{number of fish} \geq \text{stock length}} \right) \times 100$$

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.

$$Wr = \left(\frac{W}{W_s} \right) \times 100$$

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).

Species Name	Stock		Quality		Preferred		Memorable		Trophy	
	(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**

Gear	Species	Sample Size (n)	Abundance		Stock Density Indices			Condition		
			CPUE	CI-80	PSD	CI-80	PSD-P	CI-80	Wr	CI-80
frame net (std 3/4 in)	Black Bullhead	1152	115.2	42.8	100		0			
	Bluegill	677	67.7	29.4	73	2	8	1	106	1
	Golden Shiner	1	0.0	0.0						
	Largemouth Bass	4	0.4	0.4	75		50		103	5
	Northern Pike	23	2.3	1.2	61	16	4		90	2
	Sunfish Hybrid	11	0.0	0.0						
	White Crappie	1	0.1	0.1	100		100		116	
	Yellow Bullhead	1	0.1	0.1	100		100			
	Yellow Perch	3	0.3	0.2	100		33		102	9

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**

Gear	Species	CPUE										Avg
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
boat shocker (night)	Largemouth Bass			3.0				69.0	49.0	66.0		46.75
frame net (std 3/4 in)	Black Bullhead			10.0				139.8			115.2	88.33
	Black Crappie			0.0				0.1			0.0	0.03
	Bluegill			10.0				34.3			67.7	37.33
	Golden Shiner			0.0				0.0			0.0	0.00
	Green Sunfish			2.2				0.0			0.0	0.73
	Largemouth Bass			0.0				0.2			0.4	0.20
	Northern Pike			0.8				1.4			2.3	1.50
	Sunfish Hybrid			0.0				0.0			0.0	0.00
	White Crappie			0.0				0.0			0.1	0.03
	Yellow Bullhead			0.0				0.0			0.1	0.03
	Yellow Perch			0.0				0.0			0.3	0.10

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.

Gear	Species	Index	Year										
			2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
boat shocker (night)	Largemouth Bass	PSD			100					42	44	88	
		PSD-P			33					25	11	34	
		Wr			108					112	112	113	
frame net (std 3/4 in)	Black Bullhead	PSD			44					35			100
		PSD-P			1					24			0
		Wr			93					90			
	Bluegill	PSD			65					46			73
		PSD-P			13					13			8
		Wr			113					104			106
	Largemouth Bass	PSD								0			75
		PSD-P								0			50
		Wr											103
	Northern Pike	PSD			63					21			61
		PSD-P			0					0			4
		Wr			82					94			90
	White Crappie	PSD											100
		PSD-P											100
		Wr											116
	Yellow Bullhead	PSD											100
		PSD-P											100
	Yellow Perch	PSD											100
PSD-P												33	
Wr												102	

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+
2018	325		117 (168)	165 (31)	190 (77)	205 (49)					
2014	100		108 (26)	145 (12)	177 (12)	188 (16)	197 (18)	200 (13)	203 (2)		

Species: Largemouth Bass

Mean Length (expanded sample number) at capture by age											
Year	N	1	2	3	4	5	6	7	8	9	10+
2020	132	229 (5)	244 (7)	303 (11)	343 (24)	370 (43)	388 (12)	400 (13)	450 (13)	474 (4)	512 (2)
2018	159	156 (8)	216 (85)	280 (34)	395 (6)	428 (9)	413 (5)	414 (2)	459 (8)	466 (5)	435 (3)
2014	11	128 (8)	366 (1)		376 (1)	412 (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).

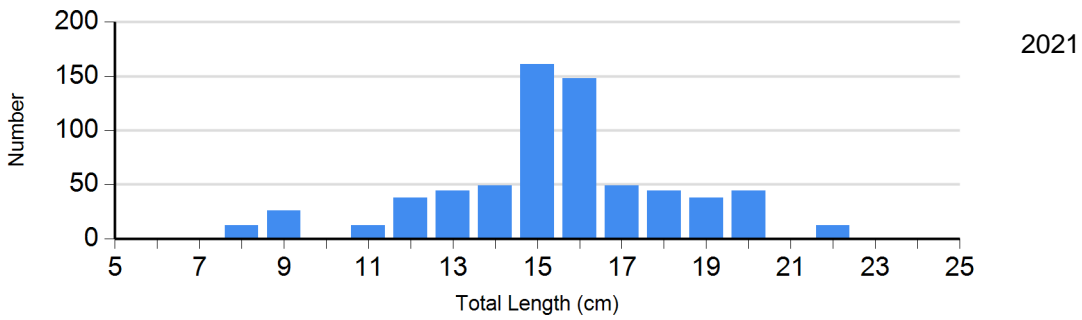
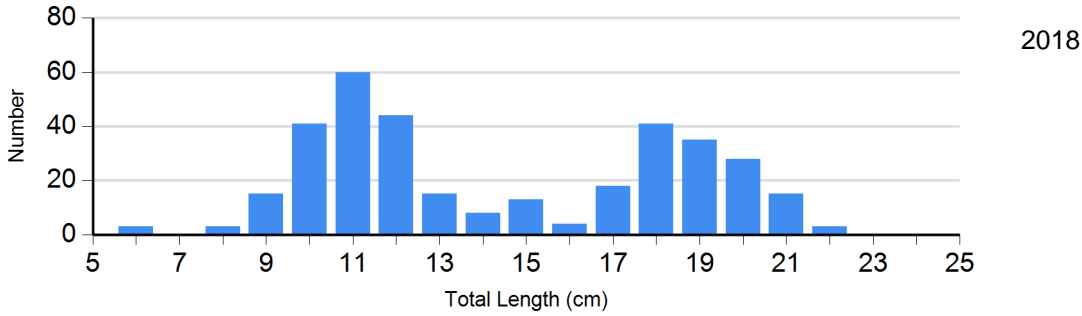
Species	Year	Length Groups							
		S-Q		Q-P		P-M		M	
		N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Bluegill Frame Net	2018	186	108 (1.5)	111	99 (1.2)	46	99 (1.9)	0	
	2021	181	109 (1.8)	440	105 (1.6)	56	101 (1.5)	0	
Largemouth Bass Electro Fishing	2018	80	107 (0.8)	24	115 (3.9)	33	119 (1.5)	1	132
	2019	82	110 (0.9)	49	113 (1.8)	16	119 (2.8)	0	
	2020	16	111 (2.8)	71	112 (1.0)	44	115 (1.5)	1	130
White Crappie Frame Net	2021	0		0		0		1	116

Length Frequency Distribution

Length frequency histogram of species sampled by year.

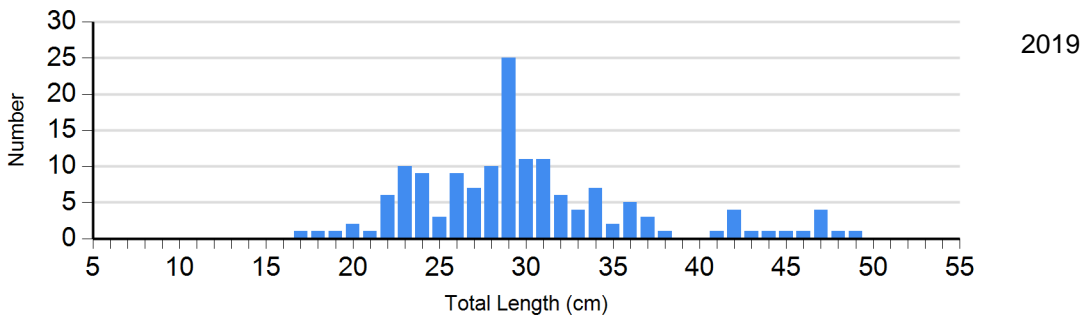
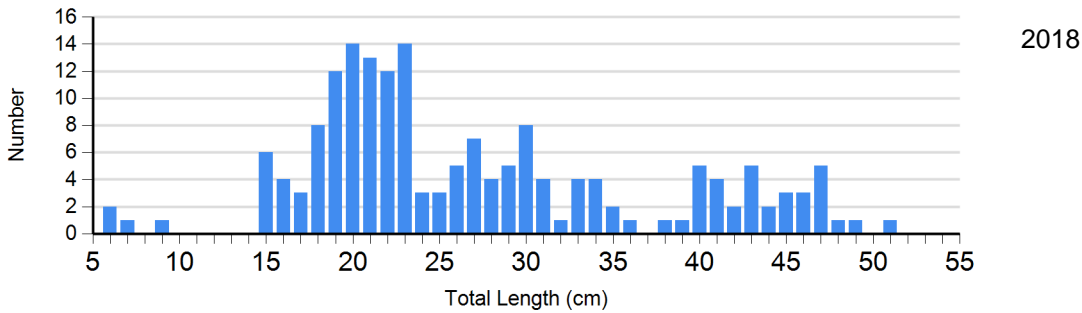
Species: Bluegill

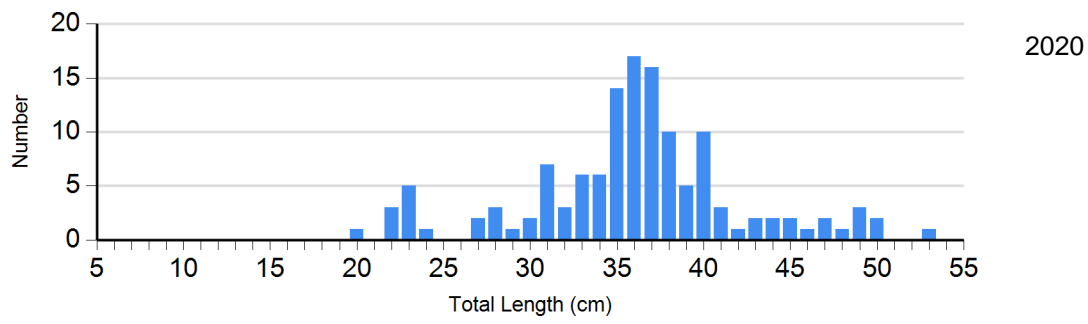
Gear: frame net (std 3/4 in)



Species: Largemouth Bass

Gear: boat shocker (night)



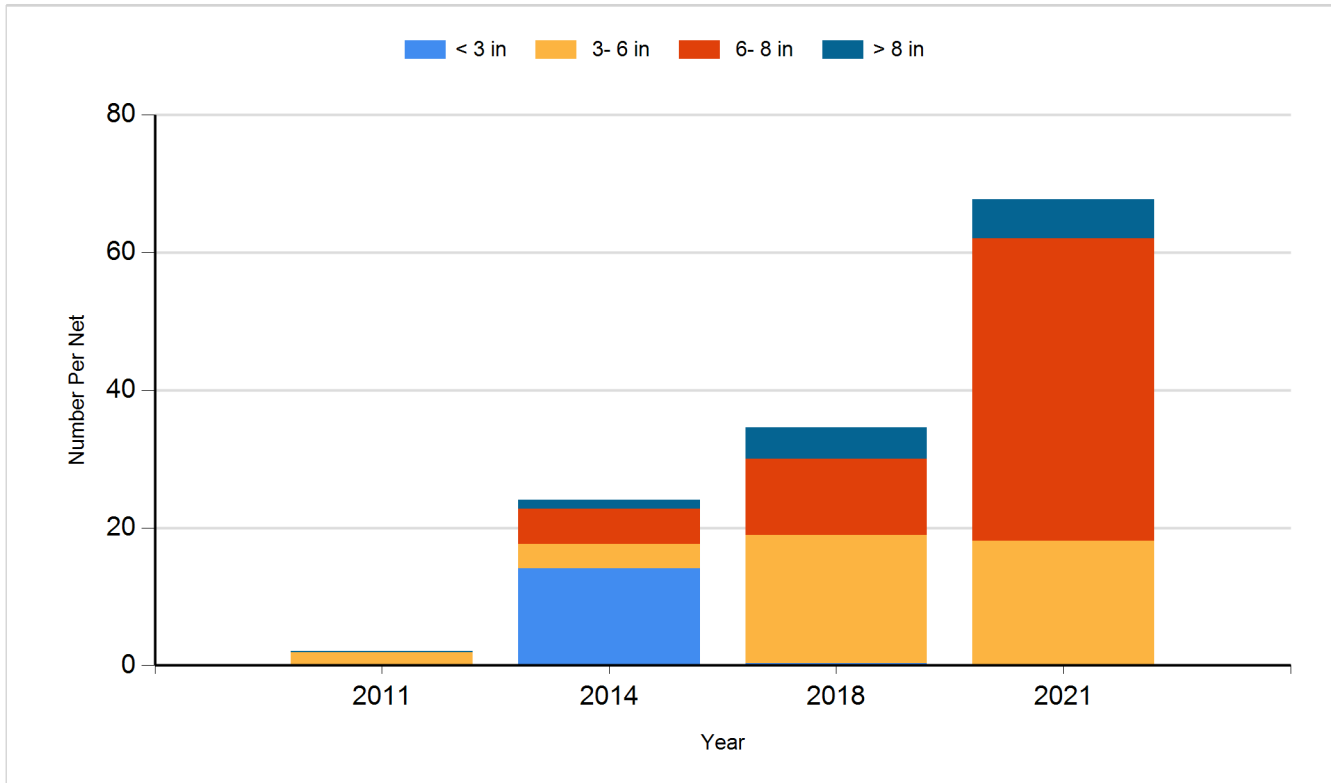


Historic Fish Sizes and Relative Abundance

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

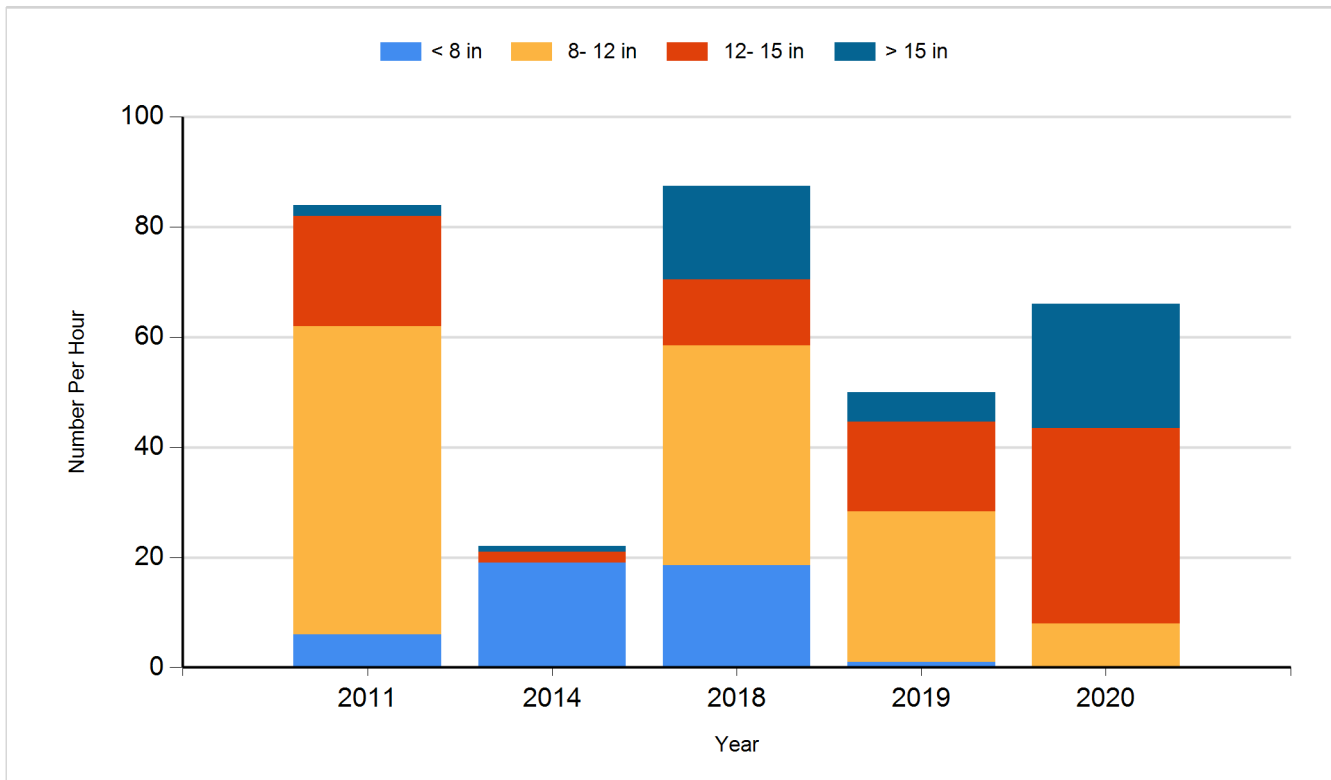
Species: Bluegill

Gear: frame net (std 3/4 in)



Species: Largemouth Bass

Gear: boat shocker (night)



Fish Stocking

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

Year	Species	Size	Number
2010	Largemouth Bass	Juvenile	561
2015	Largemouth Bass	Juvenile	500
2018	Black Crappie	Adult	50
2018	White Crappie	Adult	25