

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

Hayes, Stanley County

BAD-Lake-3119-000

2020

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
boat shocker (night)	Oct 12, 2020	3600 seconds
boat shocker (night)	Oct 15, 2020	3600 seconds

Common Fish Species Present

Largemouth Bass

Bluegill

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
boat shocker (night)	Largemouth Bass	132	66.0	8.9	88	4	34	6	113	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.

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

Gear	Species	CPUE										Avg
		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
boat shocker (night)	Largemouth Bass	78.0			3.0				69.0	49.0	66.0	53.00
frame net (std 3/4 in)	Black Bullhead	9.7			10.0				139.8			53.17
	Black Crappie	0.0			0.0				0.1			0.03
	Bluegill	2.1			10.0				34.3			15.47
	Green Sunfish	0.4			2.2				0.0			0.87
	Largemouth Bass	0.0			0.0				0.2			0.07
	Northern Pike	1.1			0.8				1.4			1.10
	Sunfish Hybrid	0.0			0.0				0.0			0.00

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										
			2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
boat shocker (night)	Largemouth Bass	PSD	28			100					42	44	88
		PSD-P	3			33					25	11	34
		Wr	114			108					112	112	113
frame net (std 3/4 in)	Bluegill	PSD	10			65					46		
		PSD-P	10			13					13		
		Wr	131			113					104		
	Largemouth Bass	PSD									0		
		PSD-P									0		

Back-Calculated Lengths

Mean species back-calculated total length (mm) at age, standard error (SE), and sample size (N).

Species: Largemouth Bass

Year Class	Age	N	Mean back-calculated length (SE) at age																	
			1	2	3	4	5	6	7	8	9	10								
2019	1	4	100 (9.3)																	
2018	2	6	97 (7.6)	192 (7.6)																
2017	3	9	80 (5.4)	188 (10.2)	273 (5.2)															
2016	4	15	81 (2.8)	153 (4.1)	251 (3.7)	312 (4.4)														
2015	5	16	80 (3.5)	168 (7.8)	225 (7.5)	298 (5.8)	345 (3.7)													
2014	6	6	76 (4.5)	157 (9.8)	211 (7.3)	267 (8)	329 (4.2)	368 (4.8)												
2013	7	8	80 (4.1)	148 (7.8)	205 (10.9)	242 (10.4)	285 (9.8)	335 (10)	376 (8.8)											
2012	8	10	85 (5.8)	153 (8.6)	228 (13.9)	286 (20.1)	346 (16.5)	384 (15.6)	411 (15)	437 (12.1)										
2011	9	4	94 (20)	172 (23.5)	256 (24.2)	322 (19.9)	360 (17.9)	395 (15.8)	424 (16.7)	440 (16.9)	462 (15.4)									
2010	10	1	159	248	306	348	376	430	449	466	490	518								
2009	11	1	75	131	220	284	353	400	424	440	452	467								
Weighted Mean		80	84	165	237	291	335	371	404	440	465	493								
Year Class	Age	N	11	12	13	14	15	16	17	18	19	20								
2019	1	4																		
2018	2	6																		
2017	3	9																		
2016	4	15																		
2015	5	16																		
2014	6	6																		
2013	7	8																		
2012	8	10																		

2011	9	4	
2010	10	1	
2009	11	1	480
Weighted Mean		80	480

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)					
2011	82	163 (4)	286 (76)					424 (1)	424 (1)		

Fish Condition

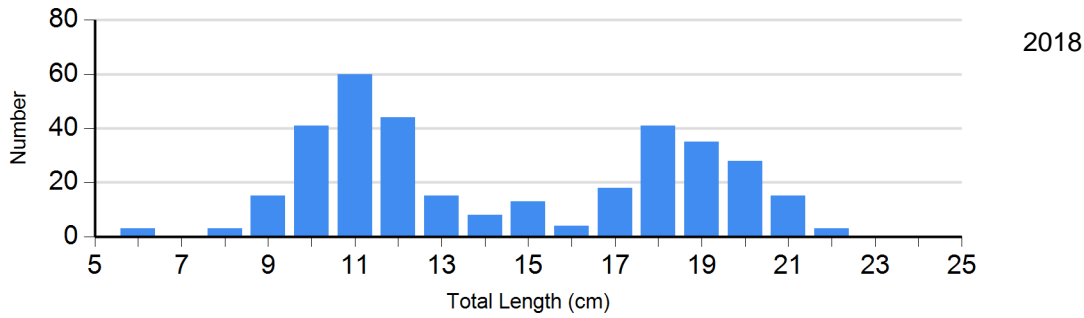
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

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	
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

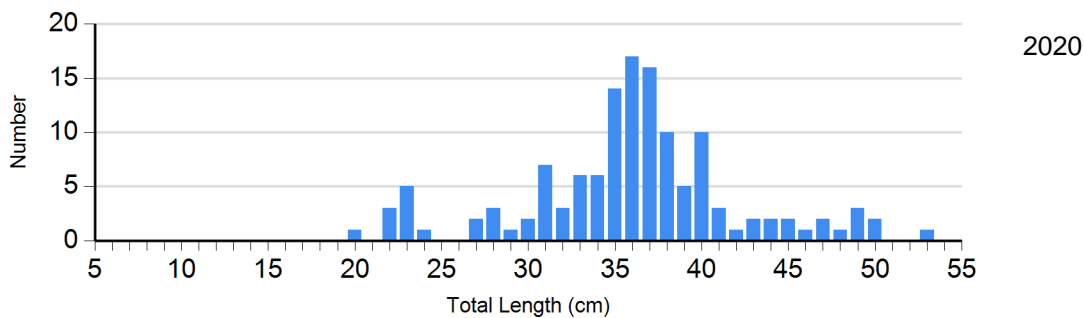
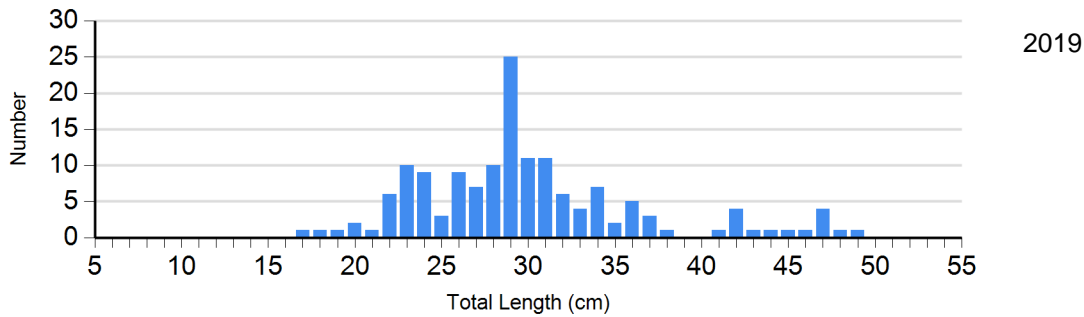
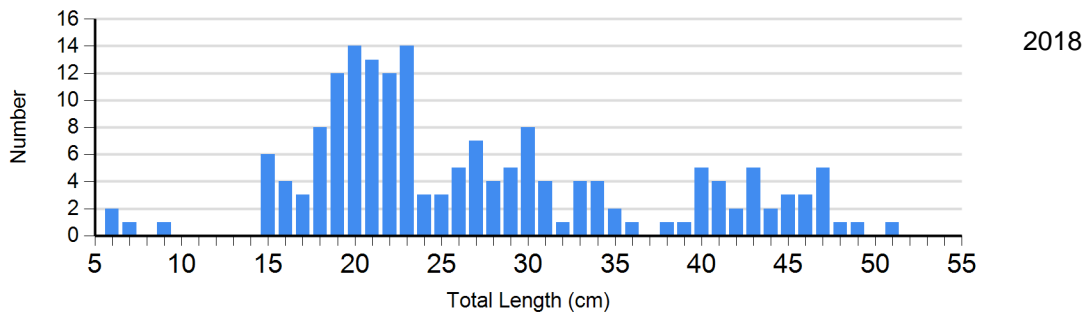
Length Frequency Distribution

Length frequency histogram of species sampled by year.

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



Species: Largemouth Bass
Gear: boat shocker (night)

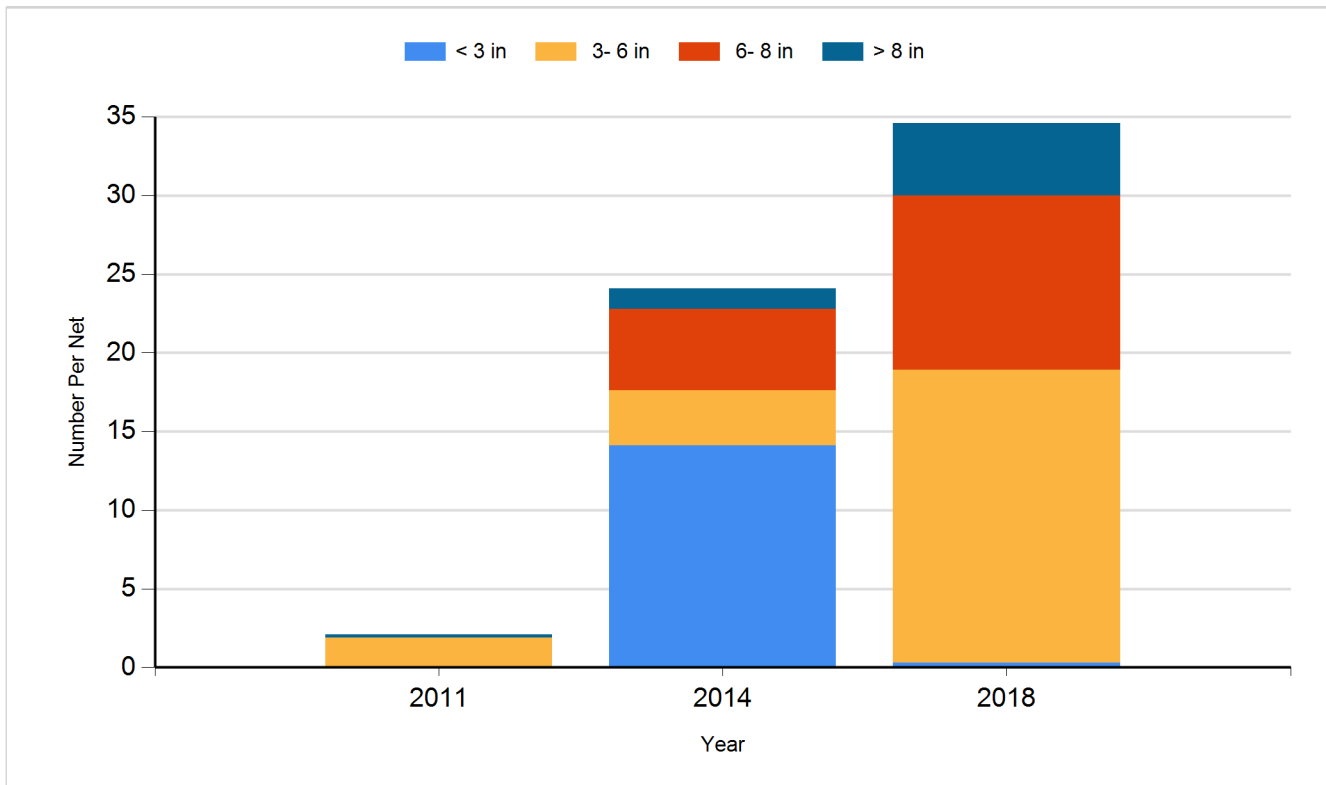


Historic Fish Sizes and Relative Abundance

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

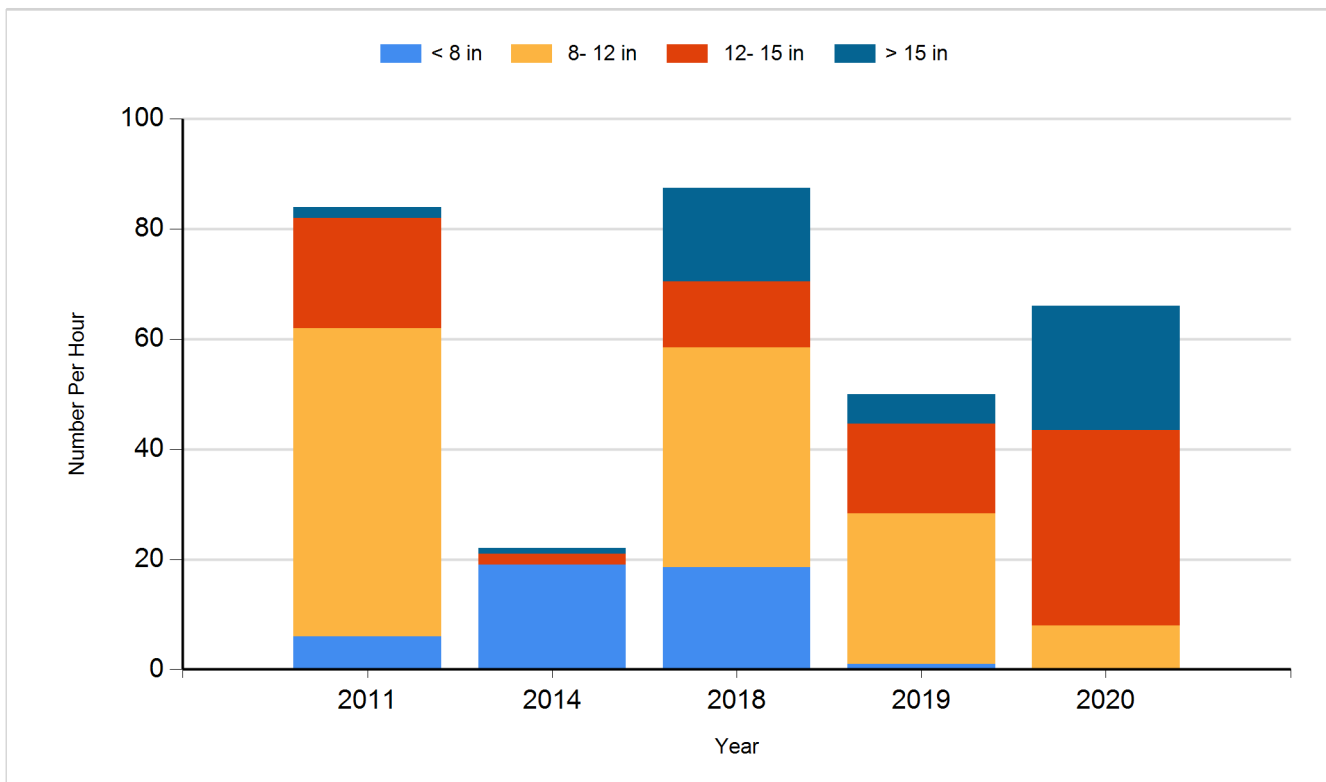
Species: Bluegill

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
2009	Bluegill	Adult	450
2009	Largemouth Bass	Fingerling	6,510
2009	Largemouth Bass	Juvenile	54
2010	Largemouth Bass	Juvenile	561
2015	Largemouth Bass	Juvenile	500
2018	Black Crappie	Adult	50
2018	White Crappie	Adult	25