SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
Belle Fourche Reservoir, Butte County
LBF-Lake-768-000
2017

Lake Information

Name: Belle Fourche Reservoir

County: Butte

Surface Area: 6,570 Acres

Surveys and Investigations

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

Gear	Date	Effort
std exp gill net	August 15, 2017	9 net-nights

Common Fish Species Present

Walleye

Channel Catfish

Black Crappie

Gizzard Shad

White Crappie

White Bass

Yellow Perch

Freshwater Drum

Shorthead Redhorse

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).

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

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

	Stock		Quality		Preferred		Memorable		Trophy	
Species Name	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)	(in)	(cm)
Blue Catfish	12	30	20	51	30	76	35	89	45	114
Bluegill	3	8	6	15	8	20	10	25	12	30
Bluegill X Gr. Sunfish Hybrid	3	8	6	15	8	20	10	25	12	30
Brown Bullhead	5	13	8	20	11	28	14	36	17	43
Burbot	8	20	15	38	21	53	26	67	32	82
Channel Catfish	11	28	16	41	24	61	28	71	36	91
Common Carp	11	28	16	41	21	53	26	66	33	84
Flathead Catfish	14	35	20	51	28	71	34	86	40	102
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
Longnose Gar	16	41	27	69	36	91	45	114	55	140
Muskellunge	20	51	30	76	38	97	42	107	50	127
Northern Pike	14	35	21	53	28	71	34	86	44	112
Paddlefish	16	41	26	66	33	84	41	104	51	130
Pumpkinseed	3	8	6	15	8	20	10	25	12	30
Redear Sunfish	4	10	7	18	9	23	11	28	13	33
River Carpsucker	7	18	11	28	14	36	18	46	22	56
Rock Bass	4	10	7	18	9	23	11	28	13	33
Rudd	6	15	10	25	12	30	15	38	19	48
Sauger	8	20	12	30	15	38	20	51	25	63
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
Smallmouth Buffalo	11	28	18	46	24	61	30	76	37	94
Spotted Bass	7	18	11	28	14	35	17	43	20	51
Striped Bass	12	30	20	51	30	76	35	89	45	114
Striped Bass Hybrid (wiper)	8	20	12	30	15	38	20	51	25	63
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 Perch	5	13	8	20	10	25	12	30	15	38
White Sucker	6	15	10	25	13	33	16	41	20	51
Yellow Bass	4	10	7	18	9	23	11	28	13	33
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).

		Abundance		Stock Density Indices				Condition	
Gear	Species	CPUE	CI-80	PSD	CI-80	PSD-P	CI-80	Wr	CI-80
std exp gill net	Black Crappie	0.1	0.2	100		0		123	
	Channel Catfish	4.1	0.9	97		30	12	86	2
	Common Carp	0.6	0.2	100		0		93	2
	Freshwater Drum	1.0	0.4	100		44		101	3
	Gizzard Shad	0.2	0.2	100				106	4
	River Carpsucker	0.6	0.3	100		100		108	5
	Shorthead Redhorse	0.8	0.6	100		86		99	3
	Smallmouth Bass	0.2	0.3	50		0		96	12
	Walleye	12.7	1.6	56	7	0		83	1
	White Bass	1.3	0.5	100		100		94	2
	White Crappie	0.2	0.2	100		100		104	1
	Yellow Perch	1.3	0.7	67		17		91	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.

		CPUE										
Gear	Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg
frame net (1/2 inch)	Black Crappie	0.1		1.0								0.6
	Channel Catfish	2.6		0.1								1.4
	Common Carp	0.7		0.3								0.5
	Freshwater Drum	0.1		0.1								0.1
	Northern Pike			0.1								0.1
	River Carpsucker	3.4		0.4								1.9
	Shorthead Redhorse	0.3		0.6								0.5
	Walleye	4.0		2.6								3.3
	White Bass	2.4		2.0								2.2
	White Crappie			0.3								0.3
	Yellow Perch	0.1		1.0								0.6
frame net (std 3/4 in)	Black Bullhead					0.1						0.1
	Black Crappie				0.7	1.5	1.0	0.8				1.0
	Channel Catfish				15.1	0.1	0.1	0.1	0.1			3.1
	Common Carp				9.9		1.4	6.1	1.3			4.7
	Freshwater Drum				0.1							0.1
	Gizzard Shad						0.2	0.3				0.3
	Green Sunfish							0.3				0.3
	Rainbow Trout							0.0				0.0
	River Carpsucker				1.2	0.4	0.6	0.4				0.7
	Rudd						0.1	0.1				0.1
	Shorthead Redhorse				0.6		0.2	0.1				0.3
	Smallmouth Bass							0.1				0.1
	Walleye				1.4	1.3	1.3	2.0	1.5			1.5
	White Bass				2.0	0.3	1.7	11.0	1.8			3.4
	White Crappie				2.1	3.8	19.8	16.9	15.0			11.5
	Yellow Perch					0.5		0.4	0.1			0.3
std exp gill net	Black Crappie	0.2	0.0							0.5	0.1	0.2
	Channel Catfish	4.2	1.6				3.8			4.0	4.1	3.5
	Common Carp	1.7	1.0				1.4			1.0	0.6	1.1
	Freshwater Drum	0.2	0.1				1.4			0.3	1.0	0.6
	Gizzard Shad	0.7	0.0				0.4			0.3	0.2	0.3
	River Carpsucker	0.7	0.1				0.6			0.8	0.6	0.6

		CPUE										
Gear	Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Avg
std exp gill net	Shorthead Redhorse	0.3	0.5				3.0			0.5	0.8	1.0
	Smallmouth Bass						1.2				0.2	0.7
	Spottail Shiner	0.0	0.0				0.0			0.0		0.0
	Walleye	16.2	6.1				24.6			23.0	12.7	16.5
	White Bass	0.2	1.1				3.4			5.8	1.3	2.4
	White Crappie		0.0							0.2	0.2	0.1
	Yellow Perch	1.7	10.9				3.4			14.8	1.3	6.4
std exp gill net (150 ft)	Black Crappie			0.0								0.0
	Channel Catfish			3.9	2.9	4.0		1.8	3.3			3.2
	Common Carp			1.5	0.9	1.1		0.3	0.7			0.9
	Freshwater Drum			0.6	0.5	0.9		2.0	0.2			0.8
	Gizzard Shad			0.0		2.4		0.7				1.0
	Northern Pike					0.4						0.4
	River Carpsucker			0.3		0.4		0.7				0.5
	Shorthead Redhorse			0.8	1.1	0.7		0.8	0.7			0.8
	Smallmouth Bass			0.3	0.8	0.9		0.7	0.8			0.7
	Spottail Shiner			0.0	0.0	0.0		0.0	0.0			0.0
	Walleye			9.0	8.0	16.3		8.5	20.3			12.4
	White Bass			2.3	1.1	2.1		3.5	6.7			3.1
	White Crappie				0.4	0.4						0.4
	White Sucker							0.2				0.2
	Yellow Perch			14.9	7.3	8.6		3.2	9.5			8.7
std frame net (3/8 inch)	Black Crappie		2.7									2.7
	Channel Catfish		0.0									0.0
	Common Carp		0.1									0.1
	Green Sunfish		0.0									0.0
	River Carpsucker		2.6									2.6
	Shorthead Redhorse		0.1									0.1
	Smallmouth Bass		0.0									0.0
	Walleye		2.4									2.4
	White Bass		1.7									1.7
	White Crappie		1.0									1.0
	Yellow Perch		1.0									1.0

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	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
frame net (1/2 inch)	Black Crappie	PSD	0		25							
		PSD-P	0		13							
		Wr	114		106							
	Northern Pike	PSD			100							
		PSD-P			100							
		Wr			73							
	Walleye	PSD	57		52							
		PSD-P	4		0							
		Wr	79		76							
	Yellow Perch	PSD	0		38							
		PSD-P	0		0							
		Wr	95		85							
frame net (std 3/4 in)	Black Crappie	PSD				100	92	100	100			
		PSD-P				71	83	80	83			
		Wr				98	99	90	98			
	Walleye	PSD				100	90	100	100	100		
		PSD-P				44	0	31	63	58		
		Wr				73	88	74	74	70		
	Yellow Perch	PSD					25		67	100		
		PSD-P					0		67	0		
		Wr					92		67	82		
std exp gill net	Black Crappie	PSD	0	0							67	100
		PSD-P	0	0							0	0
		Wr	93								129	123
	Walleye	PSD	46	71				44			20	56
		PSD-P	1	0				1			0	0
		Wr	80	83				85			81	83
	Yellow Perch	PSD	30	3				76			29	67
		PSD-P	0	0				6			1	17
		Wr	97	99				97			85	91

			Year									
Gear	Species	Index	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
std exp gill net (150 ft)	Black Crappie	PSD			0							
		PSD-P			0							
	Northern Pike	PSD					67					
		PSD-P					0					
		Wr					83					
	Walleye	PSD			68	50	44		76	18		
		PSD-P			1	3	1		10	1		
		Wr			77	77	78		81	84		
	Yellow Perch	PSD			45	81	55		58	16		
		PSD-P			6	9	10		5	2		
		Wr			96	97	94		86	90		
std frame net (3/8 inch)	Black Crappie	PSD		26								
		PSD-P		21								
		Wr		109								
	Walleye	PSD		82								
		PSD-P		18								
		Wr		82								
	Yellow Perch	PSD		0								
		PSD-P		0								
		Wr		96								

Length at Capture

Mean length at capture by age across years sampled, sample size (N).

Species: Black Crappie

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2012	24		138 (2)		254 (6)	299 (16)					

Species: Walleye

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2017	126	241 (21)	321 (15)	363 (23)	401 (62)	441 (3)			494 (1)		494 (2)
2016	292	241 (26)	318 (75)	365 (174)	397 (4)	437 (13)					
2015	252	226 (8)	310 (200)	393 (2)	440 (21)	435 (9)	441 (2)		473 (7)	525 (2)	
2014	196	217 (102)	331 (8)	390 (36)	413 (4)	466 (17)	476 (11)	538 (6)	513 (4)		482 (9)
2013	242	201 (2)	290 (75)	355 (20)	381 (63)	402 (39)	446 (8)	465 (24)	424 (2)		461 (10)
2012	238	196 (10)	287 (21)	331 (47)	373 (106)	463 (4)	462 (35)			453 (7)	465 (8)
2011	124		259 (10)	312 (54)	417 (9)	440 (30)	404 (3)		488 (12)	473 (2)	504 (4)
2010	150		270 (46)	382 (12)	439 (64)	435 (4)	476 (4)	443 (9)	454 (4)	499 (4)	454 (2)
2009	118	201 (20)	331 (28)	399 (46)	455 (4)		458 (10)	449 (8)	485 (2)		
2008	202	237 (8)	333 (102)	397 (14)	416 (2)	428 (23)	434 (23)	461 (32)			

Species: Yellow Perch

		Mean Length (expanded sample number) at capture by age									
Year	N	1	2	3	4	5	6	7	8	9	10+
2011	128	120 (16)	170 (12)	208 (39)	234 (56)	234 (5)					
2008	70	116 (50)	172 (14)	213 (6)							

Fish Condition

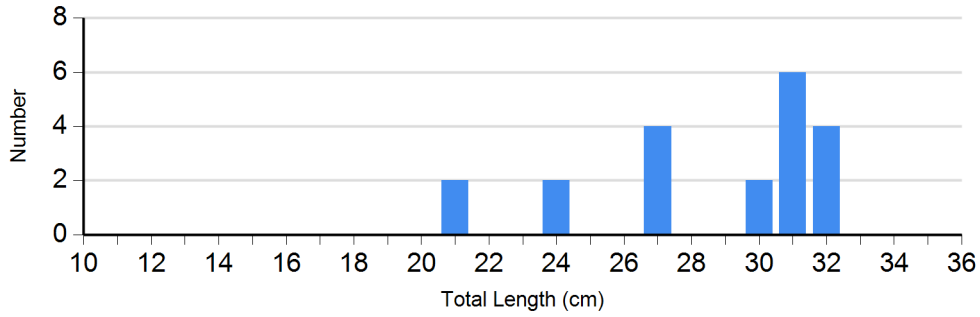
Mean relative weight (Wr) by sample size (N), length category stock to quality (S-Q), quality to preferred (Q-P), preferred to memorable (P-M), and memorable (M) for species collected across survey years with standard error (SE).

		Length Groups							
		S-Q		Q-P		P-M		M	
Species	Year	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)	N	Wr (SE)
Black Crappie Frame Net	2013	0		4	100 (4.2)	4	92 (5.6)	12	86 (1.7)
	2014	0		2	104 (0.0)	4	101 (0.3)	6	94 (1.9)
Walleye Gill Net	2013	138	88 (0.6)	106	81 (0.5)	2	80 (0.0)	0	
	2014	24	85 (1.3)	68	80 (0.6)	10	79 (0.7)	0	
	2015	200	85 (0.5)	42	81 (0.8)	2	76 (0.0)	0	
	2016	222	82 (0.3)	54	79 (0.7)	0		0	
	2017	50	87 (1.1)	64	80 (0.6)	0		0	
Yellow Perch Gill Net	2013	8	91 (0.8)	24	98 (2.2)	2	97 (0.0)	0	
	2014	16	84 (1.9)	20	86 (1.4)	2	98 (0.0)	0	
	2015	96	90 (0.8)	16	87 (0.9)	2	83 (0.0)	0	
	2016	126	87 (0.6)	50	82 (0.7)	2		0	
	2017	4	96 (0.2)	6	90 (2.2)	1	94	1	83

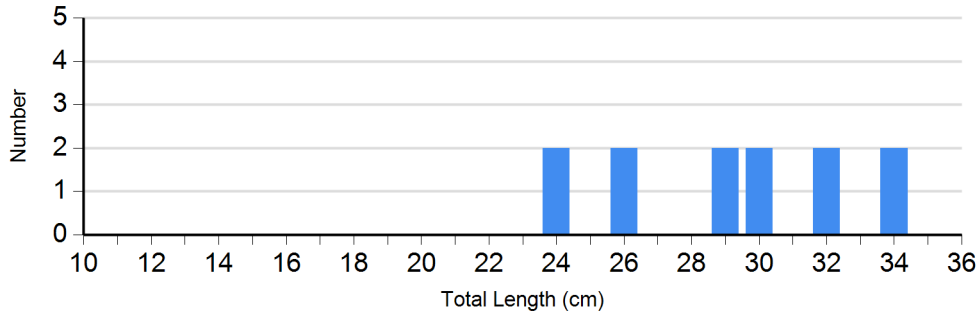
Length Frequency Distribution

Length frequency histogram of species sampled by year.

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

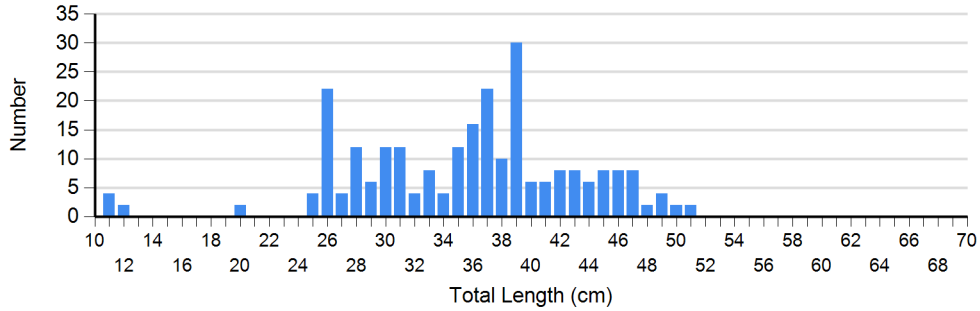


2013

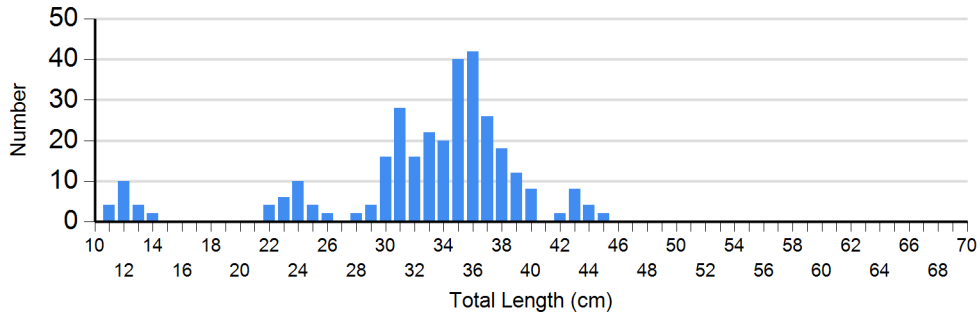


2014

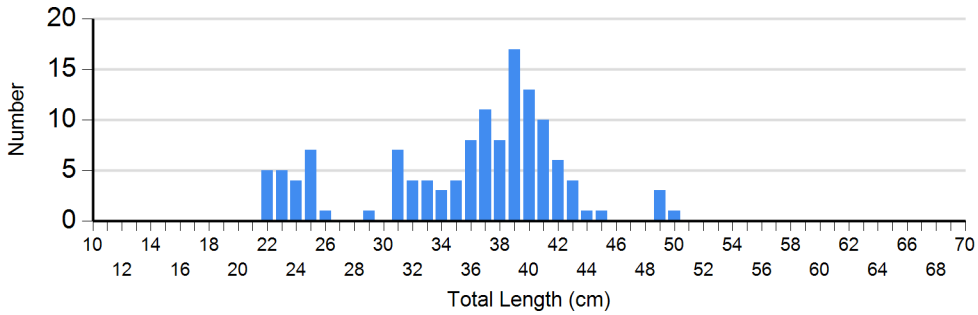
Species: Walleye
Gear: std exp gill net



2013

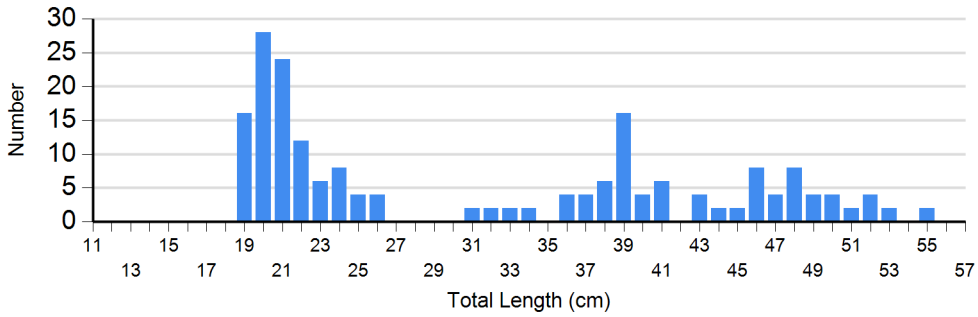


2016

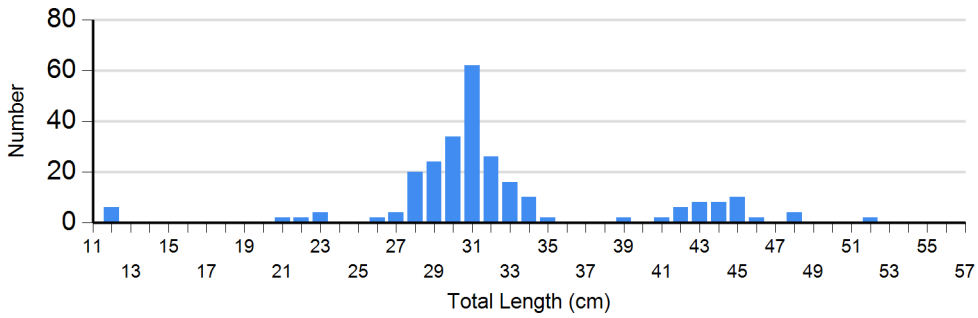


2017

Species: Walleye
Gear: std exp gill net (150 ft)

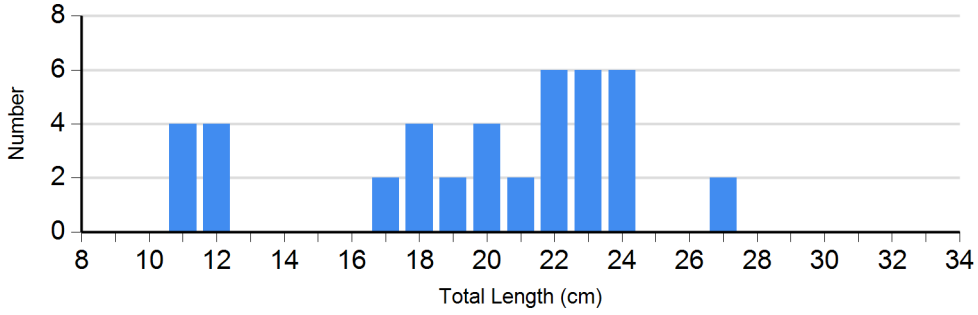


2014

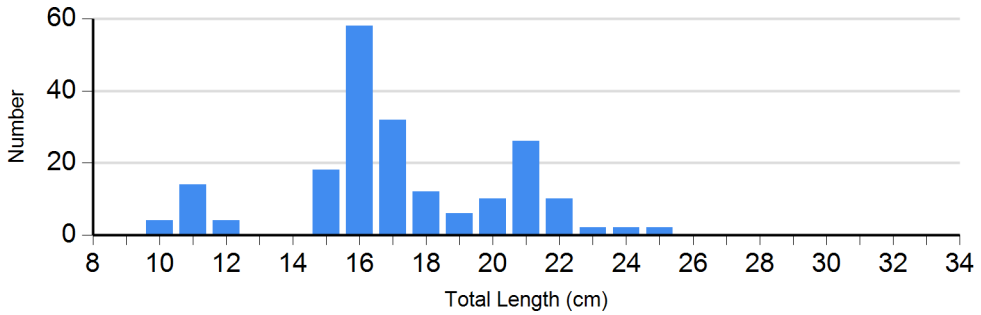


2015

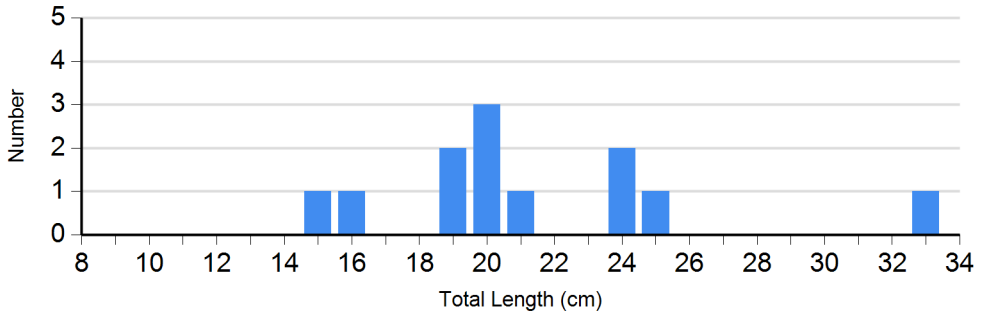
Species: Yellow Perch
Gear: std exp gill net



2013

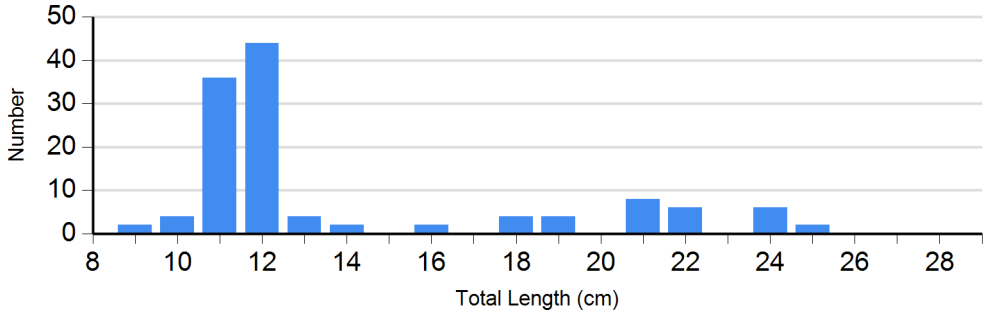


2016

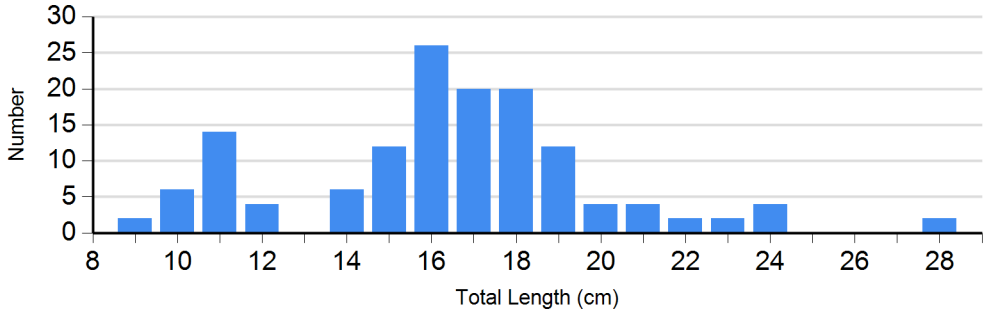


2017

Species: Yellow Perch
Gear: std exp gill net (150 ft)



2014

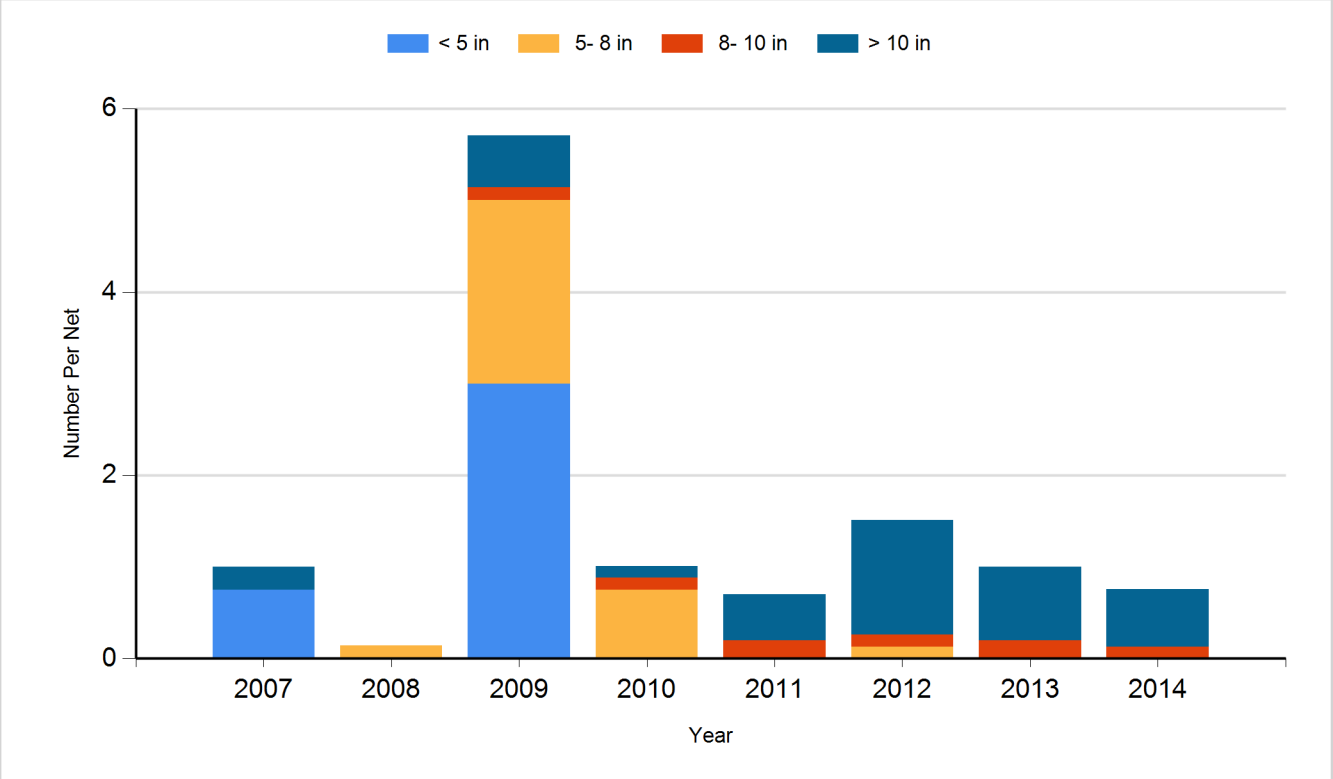


2015

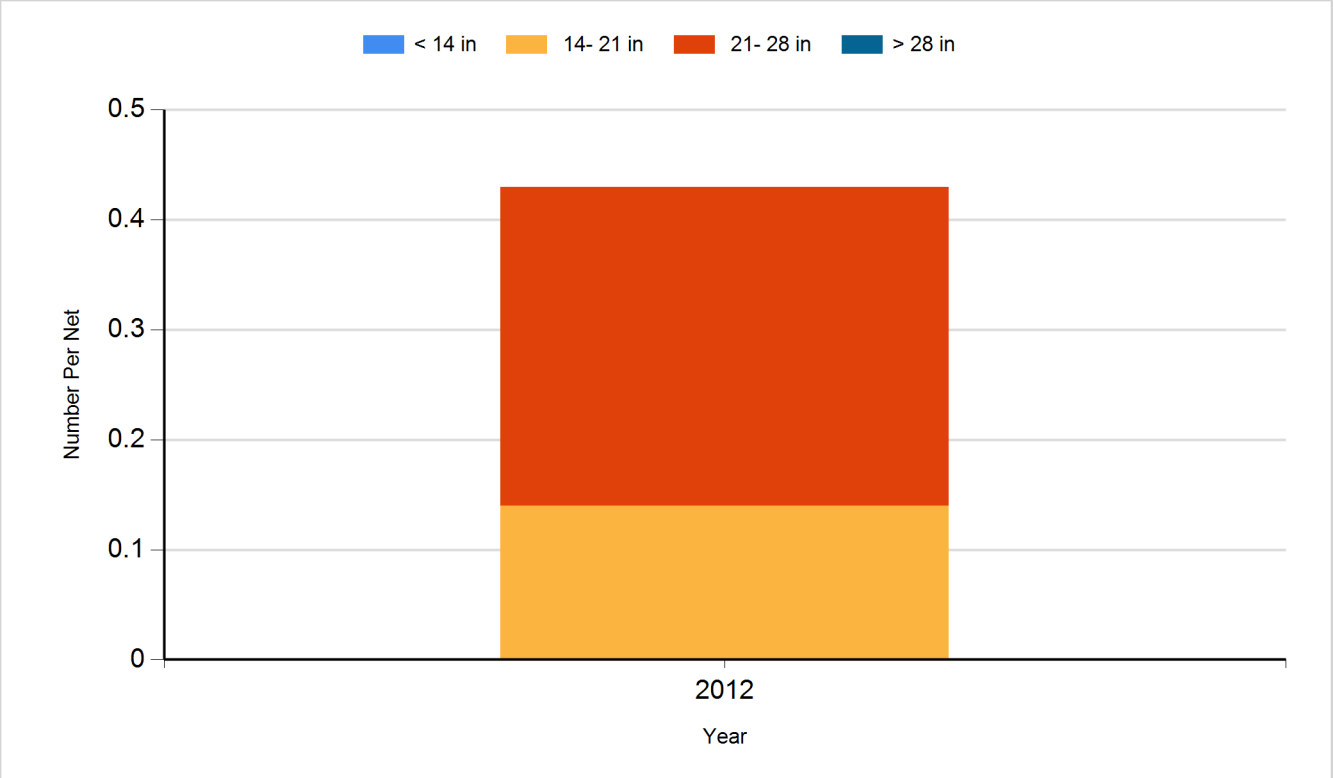
Historic Fish Sizes and Relative Abundance

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

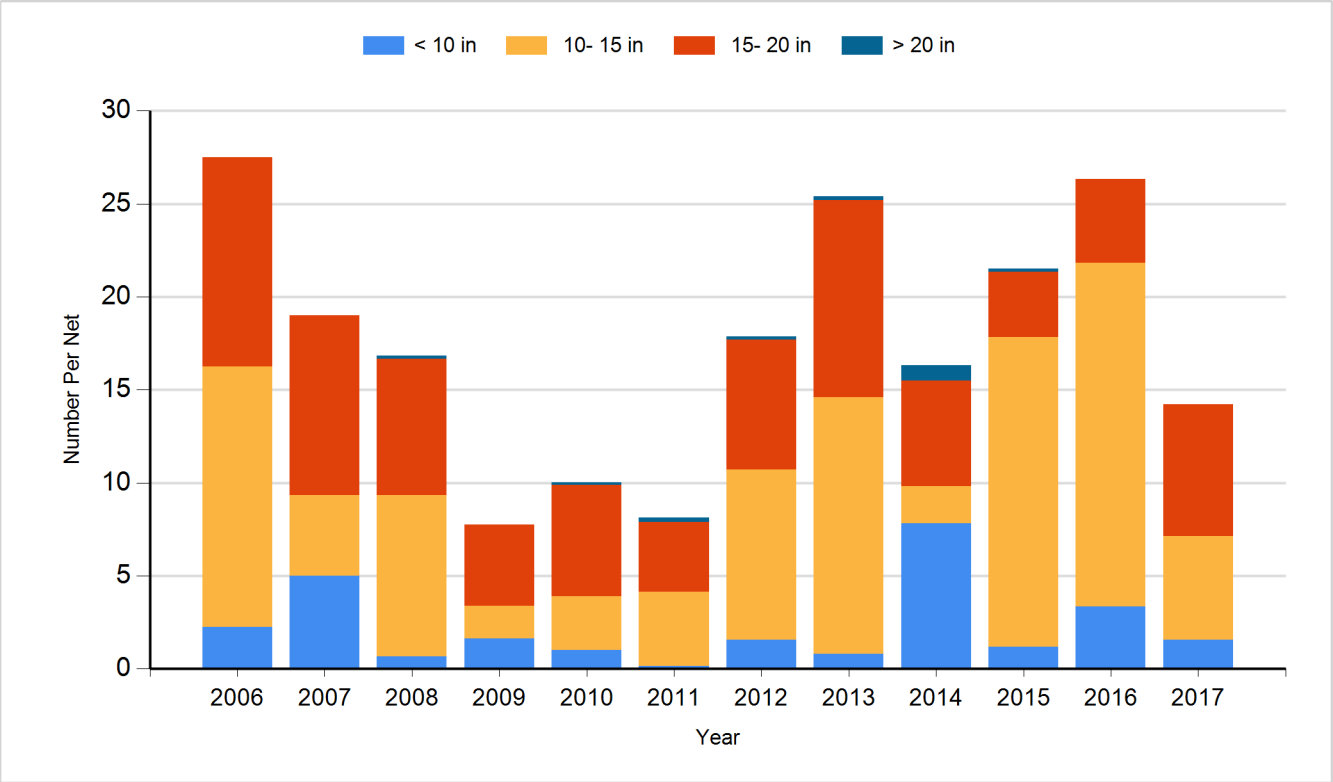
Species: Black Crappie
Gear: Frame Net



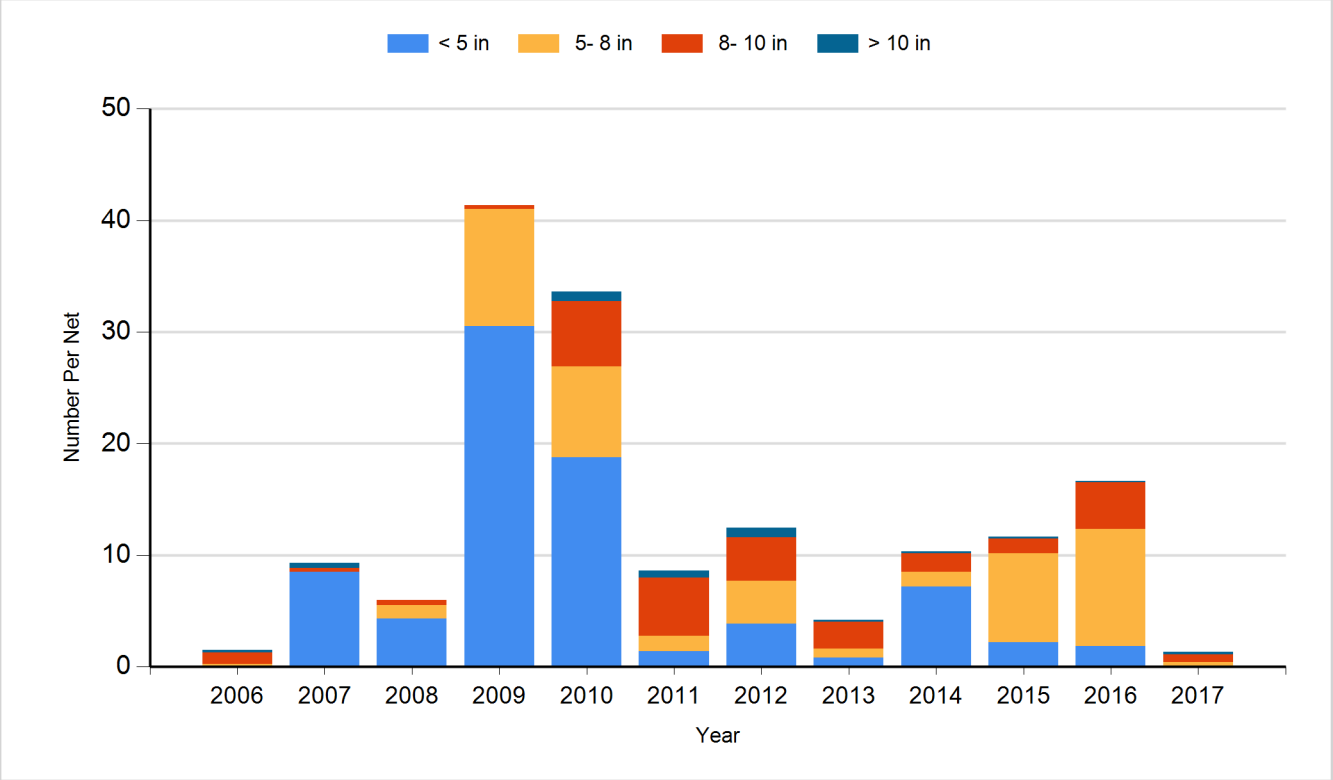
Species: Northern Pike
Gear: Gill Net



Species: Walleye
Gear: Gill Net



Species: Yellow Perch
Gear: Gill Net



Fish Stocking

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

Year	Species	Size	Number
2006	Yellow Perch	Adult	96
2007	Rainbow Trout (McConaugRainbow Trout	Fingerling	33,300
2007	Rainbow Trout (Shasta)	Fingerling	19,500
2008	Gizzard Shad	Adult	59
2008	Rainbow Trout (Shasta)	Fingerling	4,600
2009	Gizzard Shad	Adult	74
2010	Gizzard Shad	Adult	18
2010	Walleye	Fingerling	415,406
2011	Gizzard Shad	Adult	175
2012	Gizzard Shad	Adult	37
2012	Yellow Perch	Adult	2,507
2013	Bluegill	Adult	660
2013	Gizzard Shad	Adult	111
2014	Gizzard Shad	Adult	220
2014	Yellow Perch	Adult	2,150
2015	Yellow Perch	Adult	1,600