

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-47

Name: Belle Fourche Reservoir

County: Butte

Legal description: Sec. 1, 2, 3, 7, 11-14, 19, 23-26, 29, T 9N, R 3E

Location from nearest town: 9 miles east of Belle Fourche, SD

Dates of present survey: May 19-21, August 4-6, 8, 2014

Date last surveyed: May 22-24, July 29-31, August 16, 2013

Management classification: Warmwater permanent

Primary Species: (game and forage)

1. Walleye
2. Channel catfish
3. Gizzard shad
4. Black crappie
5. _____
6. _____
7. _____

Secondary and other species:

1. Yellow perch
2. Smallmouth bass
3. White bass
4. Longnose sucker
5. Spottail shiner
6. Common carp
7. Tiger muskellunge

PHYSICAL CHARACTERISTICS

Surface Area: 8,063 acres

Watershed: 2,867,200 acres

Maximum depth: 55 feet

Mean depth: 25 feet

Lake elevation at survey (from known benchmark): approximately 50% capacity

Ownership of lake and adjacent lakeshore property

The United States Bureau of Reclamation (BOR) and the Belle Fourche Irrigation District perform the operation and maintenance of Orman Dam and Belle Fourche Reservoir water levels. The South Dakota Department of Game, Fish and Parks, Division of Wildlife manages the reservoir's fish populations and 164 acres of land below the dam grade for wildlife production and the Division of Parks manages 350 acres around the boat ramp (Sec. 24, 25 T9N R3E). The BOR also manages 6,617 acres around the reservoir as wildlife habitat and for public access although irrigation has priority for water rights.

Fishing Access

Boat access is good, though crowded conditions have existed as only one boat ramp has been available on the largest reservoir west of the Missouri river. An additional ramp was installed in the fall of 2013 on the northwest shore of Rocky Point which will help boat access and parking. Shore access is generally good with public access available around the lake. Water levels do recede in summer and fall due to irrigation, and the slow tapering shoreline can become muddy and not conducive to good shore fishing. The inlet, however, does provide good shoreline access most of the year.

Observations of Water Quality and Aquatic Vegetation

Aquatic vegetation is limited to smartweed in shallow areas in the bays and inlets areas.

Observations on conditions of structures (i.e. spillway, boat ramps and docks, roads)

All structures appear to be in excellent condition. The boat ramps, campground area and fish cleaning facilities are maintained by Rocky Point State Park.

FISH POPULATION MANAGEMENT OBJECTIVES

Objective 1. Maintain a walleye fishery with a minimum of 20 fish per gill net, a PSD range of 30-60, increase PSD-P to 10 or greater, and maintain a mean growth rate near 35.5 cm (14 in) at age-3.

Objective 2. Maintain or supplement the gizzard shad population through annual adult stockings of approximately 100 adults.

Objective 3. Maintain a population of yellow perch as another potential walleye forage and sportfish for anglers through adult stockings every two to three years.

Objective 4. Reintroduce bluegill, as a potential forage source for walleye and sportfish for anglers, by summer of 2013.

BIOLOGICAL DATA

Sampling Effort and Catch

Age-0 Fish Survey

Daytime boat electrofishing was used on August 8, 2014 to index gizzard shad reproduction. Electrofishing was done using a boat mounted Smith-Root unit with pulsed-DC. Sampling consisted of ten stations totaling 1.25 hours of electrofishing. No other age-0 fish were collected during this survey so all further discussion is included with the gizzard shad section of this report.

Adult Fish survey

Trap nets were used on May 19-21 and experimental gill nets on August 4-6, 2014 to sample adult fish populations in the reservoir (Figure 1). The trap net sampling consisted of eight net nights. Gill netting consisted of six net nights. Catch data for trap nets is in Table 1 and for gill nets in Table 2. Discussion on selected fish species follows and completes this report.

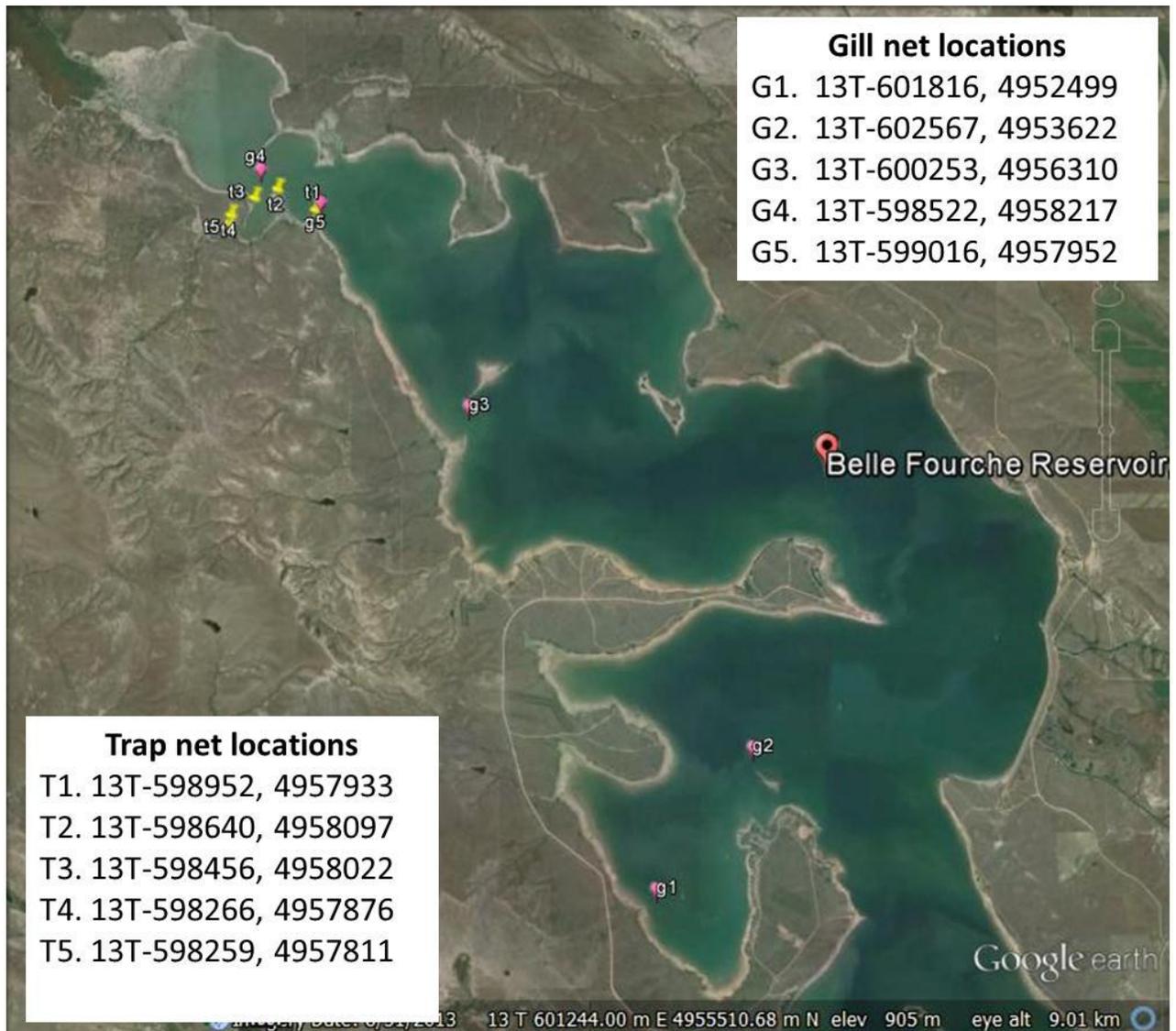


Figure 1. Locations, including GPS coordinates, of experimental gill nets (g1, g2, g3, g4, g5) and trap nets (t1, t2, t3, t4,) during the fisheries survey on Belle Fourche Reservoir, Butte County, South Dakota, 2013.

Table 1. Catch data from all species collected in eight nets in Belle Fourche Reservoir, Butte County, May 19-21, 2014. CPUE's with 80% confidence intervals in parentheses. PSD, PSD-P and *Wr* with 90% confidence intervals in parentheses.

Species	N	CPUE	CPUE-S	PSD	PSD-P	<i>Wr</i> >S
Black crappie	6	0.8 (0.4)	0.8 (0.4)	100	83 (33)	98.1 (4.6)
Channel catfish	1	0.1 (0.2)	0.1 (0.2)	--	--	88.5 (--)
Common carp	49	6.1 (3.8)	6.1 (3.8)	100	33 (12)	81.5 (8.5)
Gizzard shad	2	0.3 (0.2)	0.3 (0.2)	--	--	86.0 (19.8)
Green sunfish	2	0.3 (0.2)	0.3 (0.2)	--	--	92.1 (23.9)
Rainbow trout	1	0.1 (0.2)	0.1 (0.2)	--	--	66.3 (--)
River carpsucker	3	0.4 (0.3)	0.4 (0.3)	--	--	78.4 (15.9)
European rudd	1	0.1 (0.2)	0.1 (0.2)	--	--	--
Shorthead redhorse	1	0.1 (0.2)	0.1 (0.2)	--	--	83.2 (--)
Smallmouth bass	1	0.1 (0.2)	0.1 (0.2)	--	--	88.3 (--)
Walleye	18	2.3 (0.8)	2.0 (0.8)	100	63 (22)	73.8 (2.4)
White bass	88	11.0 (10.5)	11.0 (10.5)	99 (2)	99 (2)	95.7 (0.9)
White crappie	135	16.9 (4.2)	16.9 (4.2)	100	100	98.0 (0.5)
Yellow perch	1	0.1 (0.2)	0.1 (0.2)	--	--	66.4 (13.9)

Table 2. Catch data from all species collected in five gill nets in Belle Fourche Reservoir, Butte County, August 4-6, 2014. CPUE's are listed with 80% confidence intervals in parentheses. PSD, PSD-P and *Wr* are listed with 90% confidence intervals in parentheses.

Species	N	CPUE	CPUE-S	PSD	PSD-P	<i>Wr</i> >S
Channel catfish	11	1.8 (0.7)	1.8 (0.7)	100	36 (28)	89.2 (4.7)
Common carp	3	0.5 (0.3)	0.3 (0.3)	--	--	84.3 (31.6)
Freshwater drum	12	2.0 (1.8)	2.0 (1.8)	100	33 (26)	97.1 (2.3)
Gizzard shad	4	0.7 (0.8)	0.7 (0.8)	--	--	96.0 (8.8)
River carpsucker	4	0.7 (0.8)	0.7 (0.8)	--	--	104.7 (3.5)
Shorthead redhorse	5	0.8 (0.5)	0.8 (0.5)	--	--	101.9 (7.1)
Smallmouth bass	4	0.7 (0.3)	0.7 (0.3)	--	--	90.7 (4.6)
Spottail shiner	5	0.8 (0.5)	--	--	--	--
Walleye	98	16.3 (8.7)	8.5 (6.0)	76 (10)	10 (7)	80.7 (0.8)
White bass	21	3.5 (2.1)	3.5 (2.1)	81 (15)	52 (20)	96.1 (1.7)
White sucker	1	0.2 (0.2)	0.2 (0.2)	--	--	81.5 (--)
Yellow perch	62	10.3 (4.9)	3.2 (2.0)	58 (20)	5 (11)	84.2 (2.7)

Channel catfish

Channel catfish catch numbers were similar to the past few years with a mean gill net catch per unit effort (CPUE) of 1.8 (Tables 2 and 3). The length frequency histogram shows a larger size structure with few smaller fish indicating very little recruitment (Figure 2). Stock density values indicated similar findings with a proportional stock density (PSD) of 100. Fish condition was

below average, with a mean relative weight for stock length and larger ($Wr_{\geq S}$) channel catfish of 89.2.

Table 3. Composite listing of data for channel catfish collected by gill nets in Belle Fourche Reservoir, Butte County 2009-2014. CPUE's are listed with 80% confidence intervals in parentheses. PSD and PSD-P and $Wr_{\geq S}$ are listed with 90% confidence intervals in parentheses.

Year	N	CPUE	PSD	PSD-P	$Wr_{\geq S}$
2009	14	1.8 (0.9)	77 (22)	0	91.2 (2.7)
2010	32	4.0 (1.1)	84 (--)	6 (--)	88.2 (1.7)
2011	23	2.9 (0.9)	87 (12)	13 (12)	85.6 (2.8)
2012	28	4.0 (1.2)	96 (6)	7 (9)	86.8 (1.9)
2013	19	3.8 (1.1)	84 (15)	5 (9)	89.8 (2.0)
2014	11	1.8 (0.7)	100	36 (28)	89.2 (4.7)

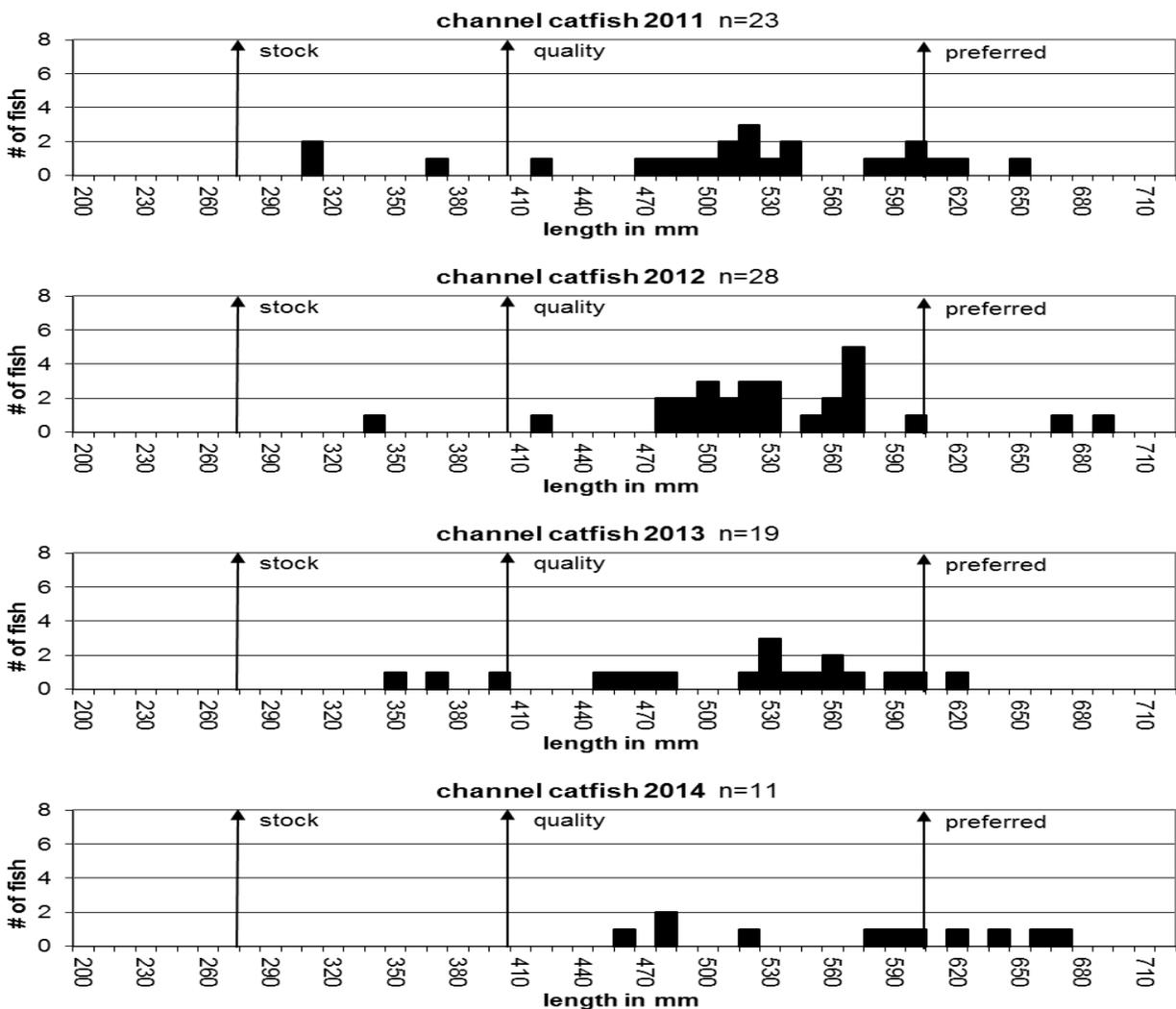


Figure 2. Length frequencies of channel catfish collected in experimental gill nets from Belle Fourche Reservoir, Butte County, South Dakota, 2011-2014.

Gizzard shad

Gizzard shad were re-introduced into Belle Fourche Reservoir in 1997 and adult stockings are accomplished annually to promote natural reproduction in expectation that adult biomass will be reduced by winter conditions. Gizzard shad were re-introduced in attempt to provide an additional forage fish and improve walleye growth rates.

In 2013, gill net catch per unit effort for stock length and larger (CPUE-S) gizzard shad was 0.7 (Table 2). Age-0 gizzard shad are collected through daytime boat electrofishing and numbers have been highly variable during sampling (Table 4). Daytime boat electrofishing yielded a mean CPUE of 393.8, down from 1,229.9 last year (Table 4).

Table 4. Year, number captured (N), time in hours (hrs), and catch per unit effort (CPUE) for daytime electrofishing catch of age-0 gizzard shad from the Belle Fourche Reservoir, Butte County, South Dakota, 2005-2014.

Year	N	Time (hrs)	CPUE
2005	763	0.83	919.3
2006	3,112	0.83	3,749.4
2007	1,179	0.83	1,420.5
2008	185	1.00	185.0
2009	319	1.30	255.2
2010	41	1.70	24.1
2011	81	1.25	64.8
2012	54	1.42	38.0
2013	1,439	1.17	1,229.9
2014	443	1.25	393.8

Walleye

Walleye abundance appears to have decreased in 2014 as gill net CPUE fell to 16.3, compared to 25.4 last year (Tables 2 and 5). These numbers are slightly below the management objective of a CPUE of 20. Size structure increased from 44 the last two years to 76 this survey. The number of fish over 510 mm (20 in) also increased with a PSD-P of 10, up from 1 the last two years. The length frequency histogram and stock density values indicate a fairly balanced population with good recruitment (Figure 3). Fish condition decreased with a $Wr_{\geq S}$ of 80.7, compared to 84.8 last year. Growth was good with the average three year old fish measuring 390 mm at time of capture (Table 6). Size structure and walleye growth are above the management objectives for walleye in Belle Fourche Reservoir.

Table 5. Composite listing of data for walleye collected by gill nets in Belle Fourche Reservoir 2006-2014. CPUE's are listed with 80% confidence intervals in parentheses. PSD, PSD-P and $Wr \geq S$ with 90% confidence intervals in parentheses.

Year	N	CPUE	CPUE-S	PSD	PSD-P	$Wr \geq S$
2006	110	27.5 (15.7)	25.3 (14.9)	45 (9)	0	81.5 (0.2)
2007	114	19.0 (10.5)	14.0 (8.4)	69 (8)	0	80.2 (0.6)
2008	101	16.8 (6.7)	16.2 (6.1)	46 (9)	1 (2)	79.8 (0.1)
2009	62	7.8 (2.4)	6.1 (1.9)	71 (11)	0	82.5 (0.8)
2010	80	10.0 (4.0)	9.0 (3.7)	68 (9)	1 (3)	76.5 (0.6)
2011	65	8.1 (2.2)	8.0 (2.2)	50 (10)	3 (4)	77.1 (0.2)
2012	125	17.9 (5.0)	16.3 (4.8)	44 (8)	1 (1)	78.2 (0.2)
2013	127	25.4 (8.0)	24.6 (8.0)	44 (7)	1 (1)	84.8 (0.1)
2014	98	16.3 (8.7)	8.5 (6.0)	76 (10)	10 (7)	80.7 (0.8)

Table 6. Age, minimum, maximum total length at capture and weighted mean length-at-age, determined from otoliths collected from walleye in experimental gill nets in Belle Fourche Reservoir, Butte County, South Dakota, August 4-6, 2014. Values are in millimeters.

Age	Minimum total Length	Weighted mean Length at capture	Maximum total length	Number of fish in survey
1	197	218	269	51
2	317	331	345	4
3	363	390	411	18
4	414	415	415	2
5	430	466	510	8
6	430	476	502	5
7	528	539	550	3
8	500	512	523	2
10	480	480	480	1
11	491	491	491	1
13	479	479	479	2

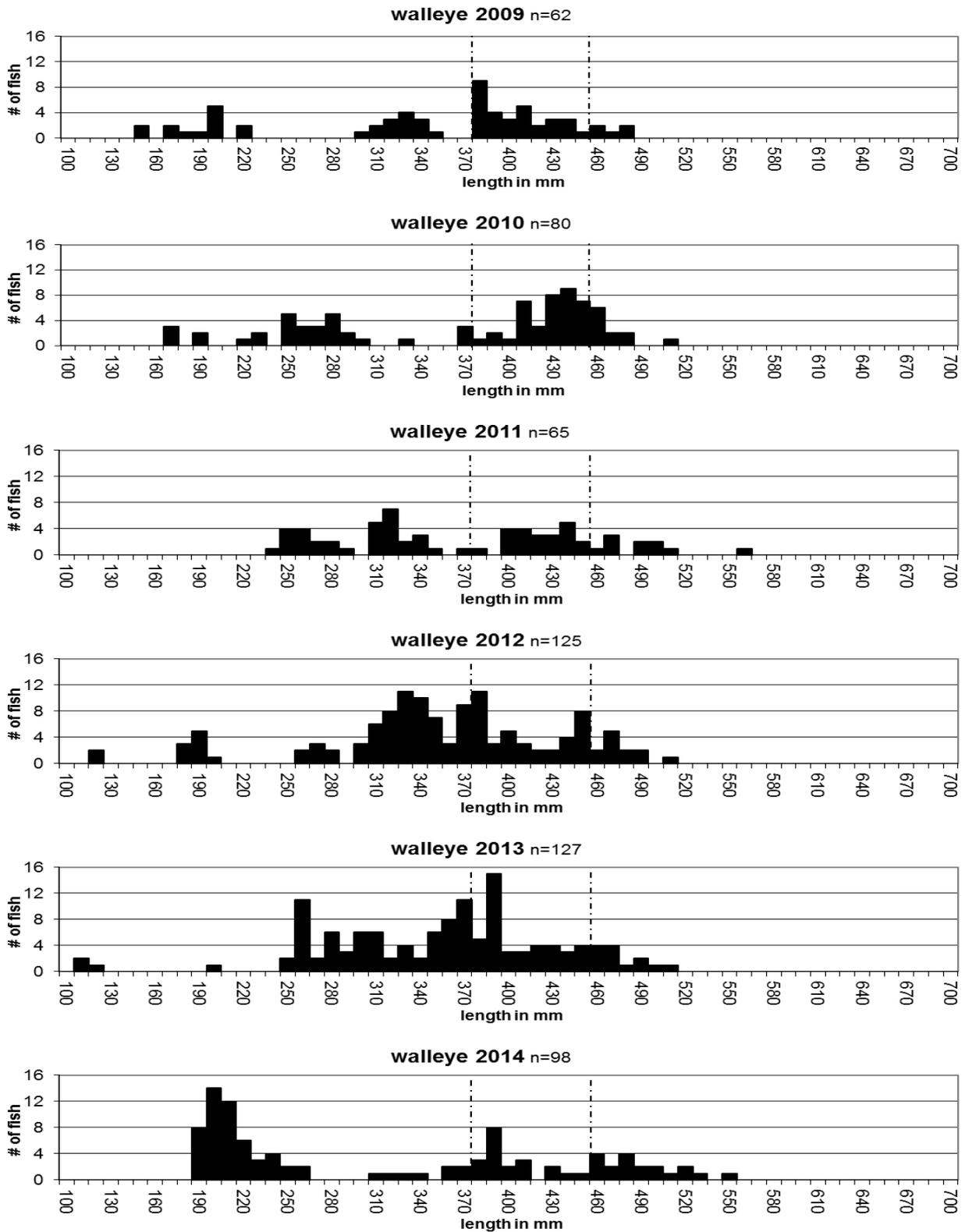


Figure 3. Length frequencies for walleye caught in experimental gill nets in Belle Fourche Reservoir, Butte County, South Dakota, 2009-2014. The arrows represent the protected slot limit (15 in to 18 in).

White bass

During our spring trap net sample, white bass CPUE was 11.0 (Table 1). Stock densities were high with a PSD and a PSD-P of 99. Fish condition was excellent with a *Wr* of 95.7. Last year, CPUE was 1.7, with a *Wr* of 86.8.

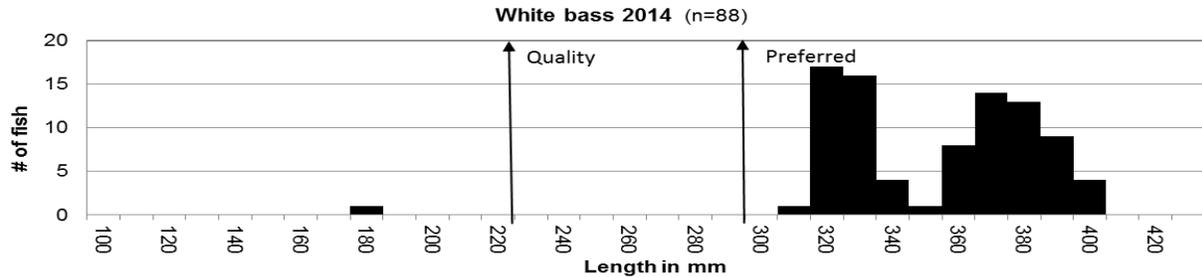


Figure 4. Length frequencies for white bass caught in trap nets in Belle Fourche Reservoir, Butte County, South Dakota, May 19-21, 2014.

White crappie

White crappie trap net CPUE was 16.9 (Table 1). Fish condition was good with average *Wr* at 98.0 for stock-length and larger fish. The length frequencies do not show recruitment in recent years with a good number of fish between 280-340 mm (Figure 5). Last year, CPUE was 19.8.

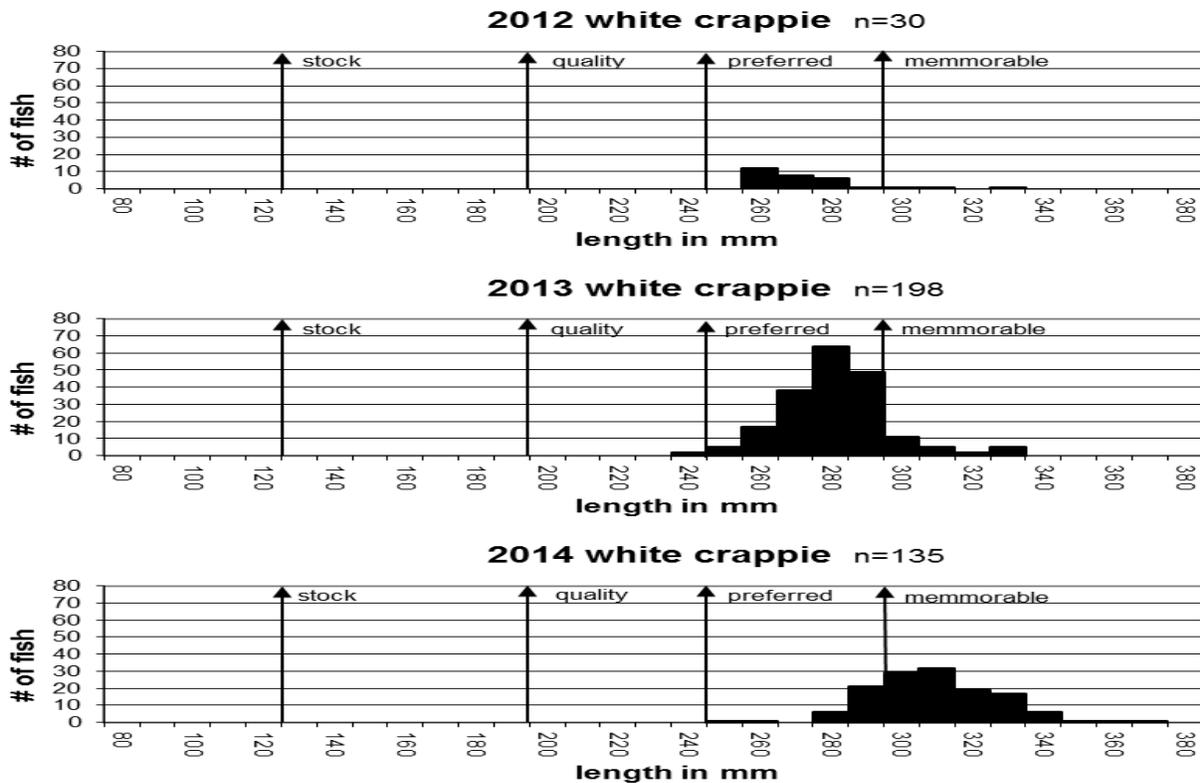


Figure 5. Length frequencies of white crappie collected in trap nets from Belle Fourche Reservoir, Butte County, South Dakota, 2012-2014.

Yellow perch

Yellow perch numbers increased from last year with a gill net CPUE of 10.3 (Tables 2 and 7). The length frequency shows recruitment and a balanced population with multiple year classes present (Figure 6). Fish condition was average with a *Wr* of 84.2 (Table 2).

Table 7. Year, number sampled (N), catch per unit effort (CPUE) and catch per unit effort of fish stock size and larger (CPUE-S) for yellow perch collected by experimental gill net in Belle Fourche Reservoir, Butte County, South Dakota, 2009-2014.

Year	N	CPUE	CPUE-S
2009	331	41.4 (13.0)	10.9 (3.8)
2010	269	33.6 (17.2)	14.9 (7.7)
2011	69	8.6 (4.2)	7.3 (3.6)
2012	87	12.4 (3.2)	8.6 (2.7)
2013	21	4.2 (1.6)	3.4 (1.5)
2014	62	10.3 (4.9)	3.2 (2.0)

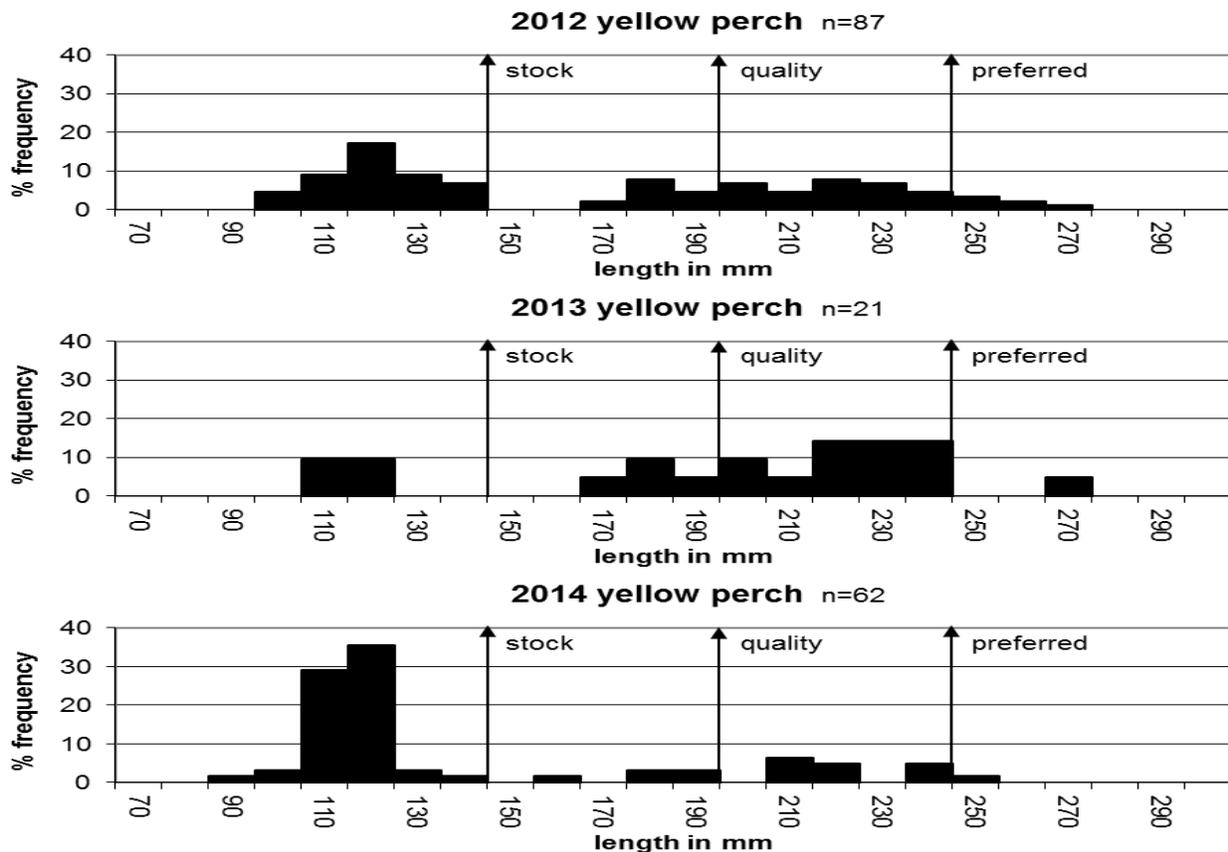


Figure 6. Length frequencies of yellow perch collected in experimental gill nets from Belle Fourche Reservoir, Butte County, South Dakota, 2012-2014.

RECOMMENDATIONS

1. Continue conducting lake surveys annually to evaluate fish populations and monitor regulation effects.
2. Stock adult gizzard shad annually to maintain a forage population for walleye as over winter survival of gizzard shad can be poor.
3. Place Christmas tree reefs in the reservoir to provide yellow perch spawning habitat and fish cover when low water exists.

APPENDIX

Appendix A. Stocking history, including year, number, species and size of fish for Belle Fourche Reservoir, Butte County, South Dakota, 2003-2014.

Year	Number	Species	Size
2003	171,893	Walleye	Fingerling
	18,436	Rainbow trout	Fingerling
	1,500	Tiger muskellunge	Large fingerling
	102	Gizzard shad	Adult
2004	1,605	Tiger muskellunge	Large fingerling
	120	Gizzard shad	Adult
2005	182	Gizzard shad	Adult
	2,263	Splake trout	Fingerling
2006	96	Yellow perch	Adult
2007	52,800	Rainbow trout	Fingerling
2008	4,600	Rainbow trout	Fingerling
	59	Gizzard shad	Adult
2009	74	Gizzard shad	Adult
2010	18	Gizzard shad	Adult
	415,406	Walleye	Fingerling
2011	175	Gizzard shad	Adult
2012	37	Gizzard shad	Adult
	2,507	Yellow perch	Adult
2013	111	Gizzard shad	Adult
	660	Bluegill	Adult
2014	2,150	Yellow perch	Adult
	220	Gizzard shad	Adult