

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-48

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 18-20, August 17, 24-26, 2015

Date last surveyed: May 19-21, August 4-6, 8, 2014

Management classification: Warmwater permanent

Primary Species: (game and forage)

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

Secondary and other species:

1. Bluegill
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 60% 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 two boat ramps are available on the largest reservoir west of the Missouri river. Shore access is generally good with public access available around the lake. Water levels often 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 17, 2015 to index gizzard shad reproduction. Electrofishing was done using a boat mounted Smith-Root unit with pulsed-DC. Sampling consisted of ten stations totaling 1.16 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 18-20 and experimental gill nets on August 24-26, 2015 to sample adult fish populations in the reservoir (Figure 1). The trap net sampling consisted of eight net nights. Gill netting consisted of six, 150 foot experimental gill 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.

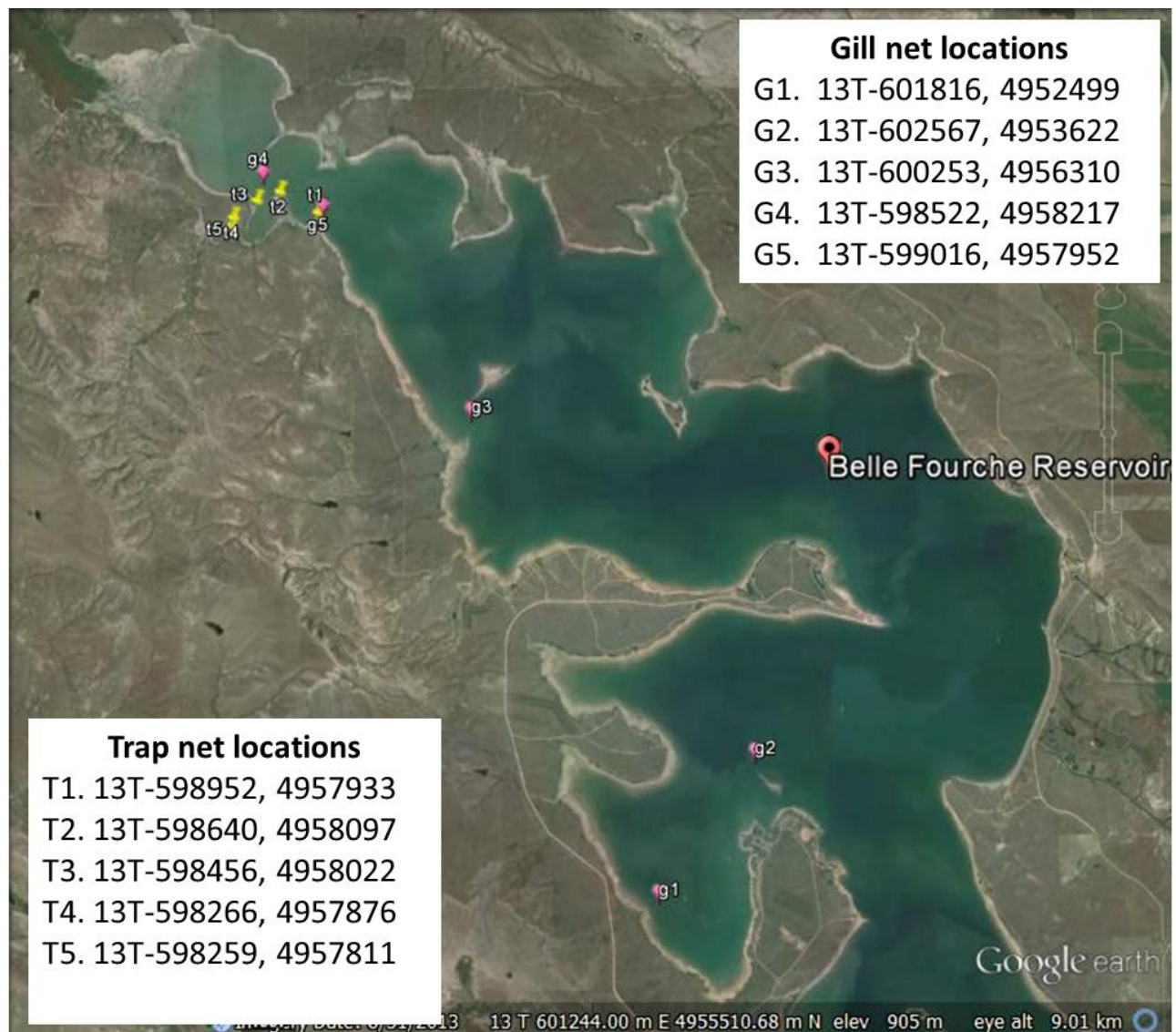


Figure 1. Locations, including GPS coordinates, of experimental gill nets (g1, g2, g3, g4, g5) and trap nets (t1, t2, t3, t4, t5) during the fisheries survey on Belle Fourche Reservoir, Butte County, South Dakota, 2015.

Table 1. Catch data from all species collected in eight trap nets in Belle Fourche Reservoir, Butte County, May 18-20, 2015. 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	$Wr>S$
Channel catfish	1	0.1 (0.2)	0.1 (0.2)	--	--	79.6 (--)
Common carp	10	1.3 (0.9)	1.3 (0.9)	100 (--)	50 (31)	86.6 (3.4)
Walleye	12	1.5 (1.1)	1.5 (1.1)	100 (--)	58 (26)	70.4 (1.6)
White bass	14	1.8 (1.1)	1.8 (1.1)	100 (--)	57 (24)	96.1 (7.8)
White crappie	120	15.0 (10.5)	15.0 (10.5)	100 (--)	100 (--)	97.7 (0.8)
Yellow perch	1	0.1 (0.2)	0.1 (0.2)	--	--	81.3 (--)

Table 2. Catch data from all species collected in six gill nets in Belle Fourche Reservoir, Butte County, August 24-26, 2015. 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	$Wr>S$
Channel catfish	20	3.3 (0.6)	3.3 (0.6)	90 (12)	40 (19)	96.1 (4.5)
Common carp	5	0.8 (0.5)	0.8 (0.5)	--	--	95.0 (6.0)
Freshwater drum	1	0.2 (0.2)	0.2 (0.2)	--	--	86.8 (--)
Shorthead redhorse	4	0.7 (0.6)	0.7 (0.6)	--	--	102.3 (6.0)
Smallmouth bass	5	0.8 (0.5)	0.8 (0.5)	--	--	103.7 (5.5)
Spottail shiner	4	0.7 (0.6)	0.7 (0.6)	--	--	--
Walleye	128	21.3 (6.5)	20.2 (6.9)	18 (6)	1 (1)	84.4 (0.4)
White bass	41	6.8 (4.1)	6.7 (4.1)	100 (--)	100 (--)	103.4 (2.1)
Yellow perch	70	11.7 (6.0)	9.5 (5.9)	16 (8)	2 (3)	89.1 (0.8)

Channel catfish

Channel catfish catch numbers were similar to the past few years with a mean gill net catch per unit effort (CPUE) of 3.3 (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 90. Fish condition was the best in recent years, with a mean relative weight for stock length and larger ($Wr>S$) channel catfish of 96.1.

Table 3. Composite listing of data for channel catfish collected by gill nets in Belle Fourche Reservoir, Butte County 2009-2015. 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)
2015	20	3.3 (0.6)	90 (12)	40 (19)	96.1 (4.5)

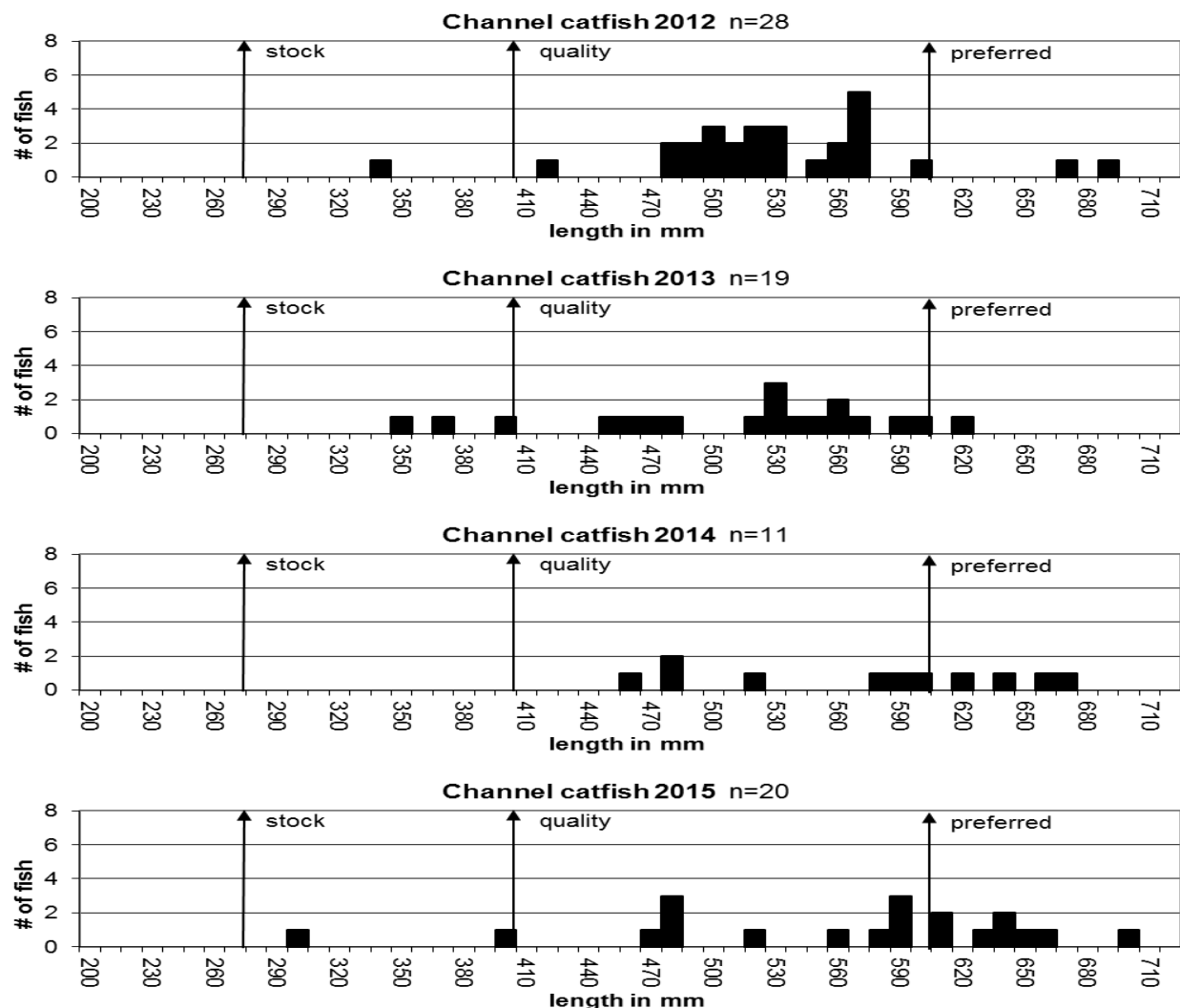


Figure 2. Length frequencies of channel catfish collected in experimental gill nets from Belle Fourche Reservoir, Butte County, South Dakota, 2012-2015.

Gizzard shad

Gizzard shad were re-introduced into Belle Fourche Reservoir in 1997 and adult stockings are accomplished annually, when no adults are observed during spring sampling, 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. 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 400.9, nearly identical to 393.8 last year.

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, 2005-2015.

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
2015	469	1.17	400.9

Walleye

Walleye abundance appears to have increased in 2015, as gill net CPUE rose to 21.3, compared to 16.3 in 2014 (Tables 2 and 5). This year's CPUE was just above the management objective of 20. Size structure decreased from a PSD of 76 in 2014 to 18 in 2015. The number of fish over 510 mm (20 in) also decreased with a PSD-P of 1, compared to 10 in 2014. Size structure numbers are below management objectives, but are heavily influenced by a large year class of young fish. The length frequency histogram indicates a population dominated by age-2 individuals (Figure 3). Fish condition increased with a $Wr \geq S$ of 84.4, compared to 80.7 last year. Growth was good with the average age-3 fish measuring 393 mm at time of capture (Table 6), which is above the management objective.

Table 5. Composite listing of data for walleye collected by gill nets in Belle Fourche Reservoir 2006-2015. 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)
2015	128	21.3 (6.5)	20.2 (6.9)	18 (6)	1 (1)	84.4 (0.4)

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 24-26, 2015. Values are in millimeters.

Age	Minimum total Length	Weighted mean Length at capture	Maximum total length	Number of fish in survey
1	218	225	230	4
2	269	310	350	100
3	393	393	393	1
4	424	440	464	11
5	418	435	451	5
6	443	443	443	1
8	457	472	487	4
9	525	525	525	1

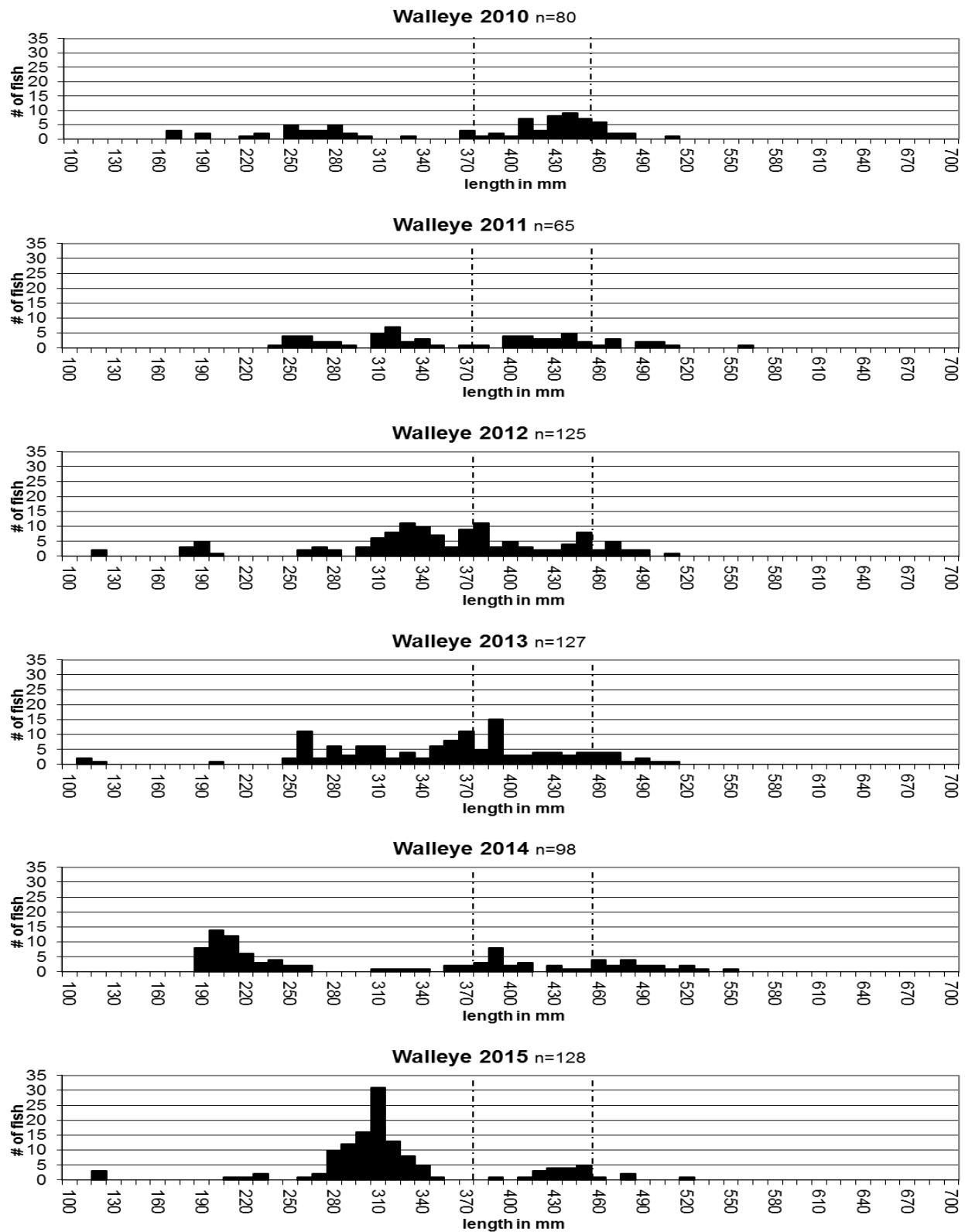


Figure 3. Length frequency histograms for walleye caught in experimental gill nets in Belle Fourche Reservoir, Butte County, South Dakota, 2010-2015. The dashed lines represent the protected slot limit (15 in to 18 in).

White crappie

White crappie trap net CPUE was 15.0 (Table 1). Fish condition was good with average *Wr* at 97.7 for stock-length and larger fish. The length frequency histograms do not show any recruitment in recent years, but a good number of fish between 290-340 mm (Figure 5).

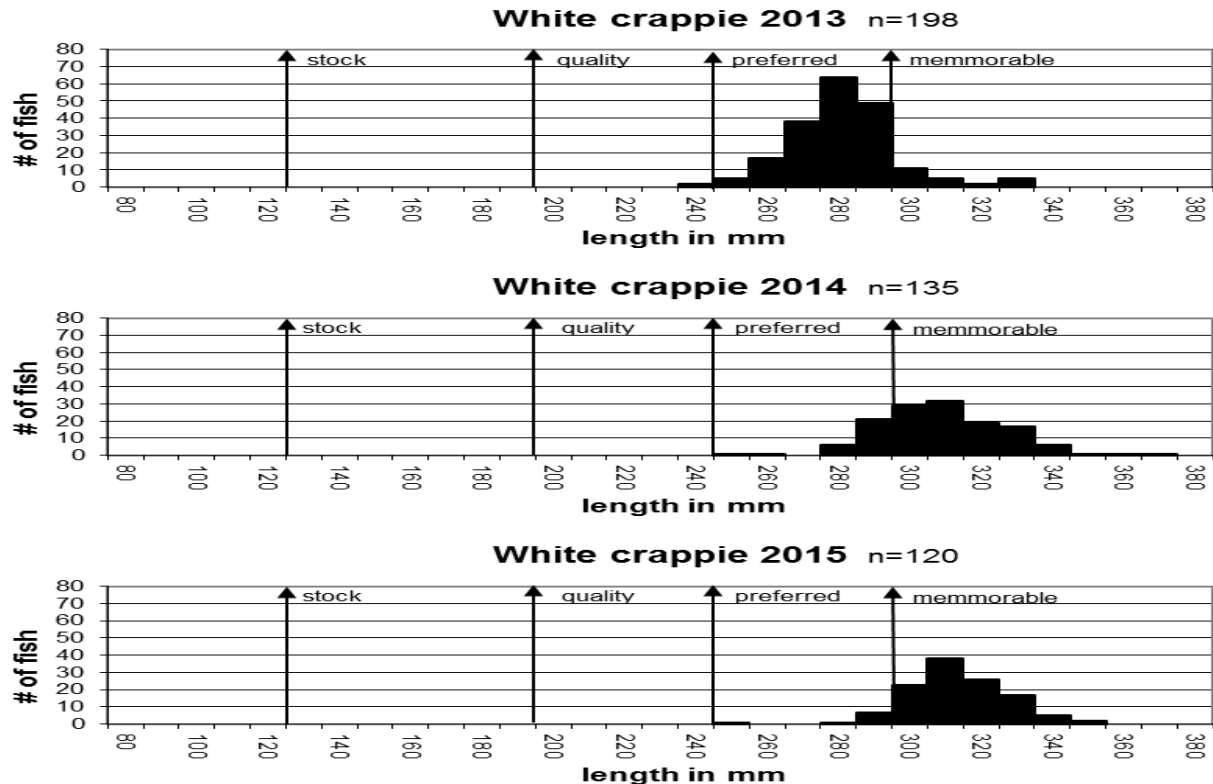


Figure 5. Length frequency histograms of white crappie collected in trap nets from Belle Fourche Reservoir, Butte County, South Dakota, 2013-2015.

Yellow perch

Yellow perch numbers increased slightly from 2014 with a gill net CPUE of 11.7 (Tables 2 and 7). Size structure was low with a PSD of 16 and a PSD-P of 2, compared to 58 and 5 last year, respectively. The length frequency shows recruitment and a balanced population with multiple year classes present (Figure 6). Fish condition was average with a *Wr* of 89.1 (Table 2), up from 84.2 last year.

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, 2009-2015.

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)
2015	70	11.7 (6.0)	9.5 (5.9)

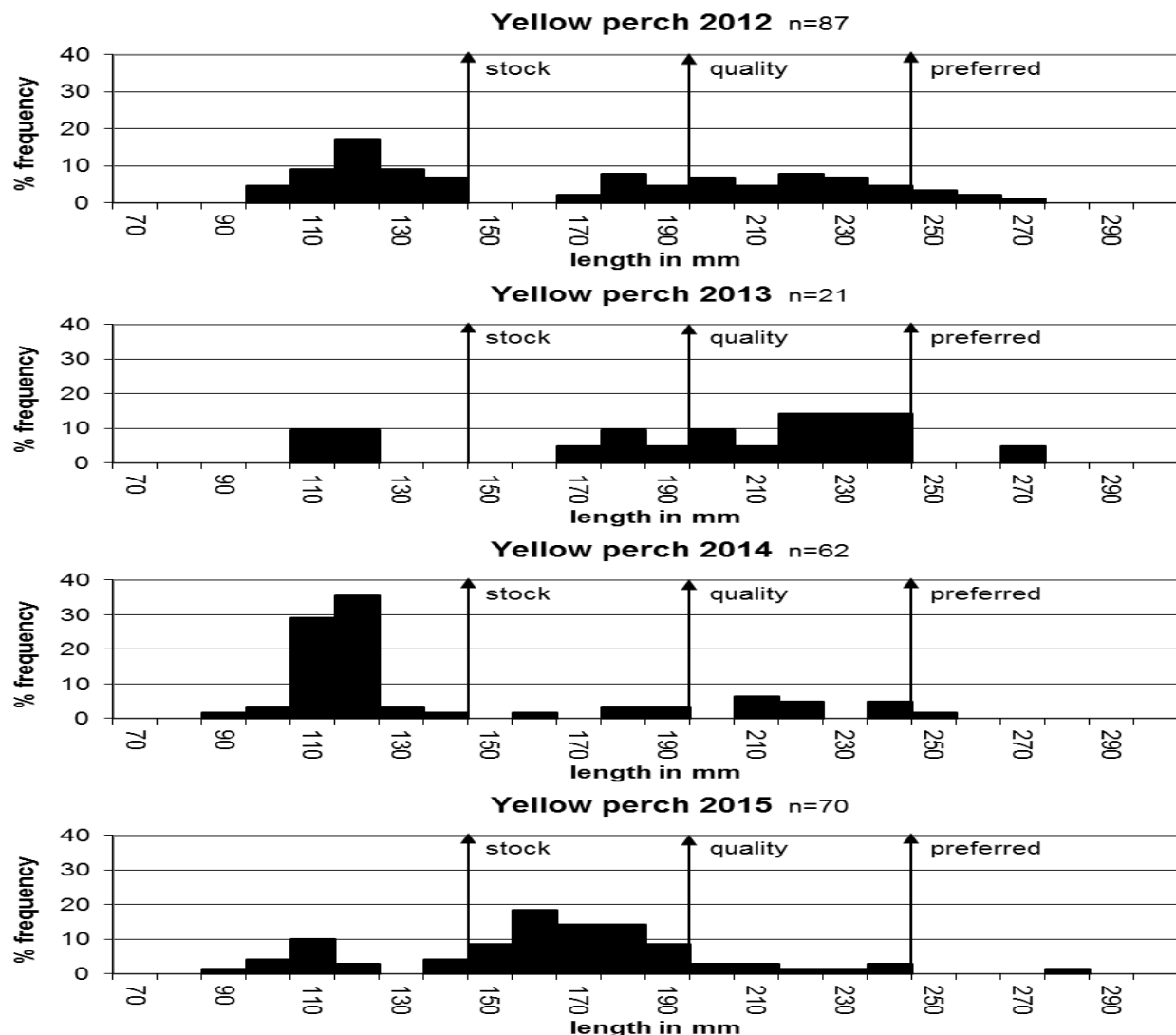


Figure 6. Length frequency histograms of yellow perch collected in experimental gill nets from Belle Fourche Reservoir, Butte County, South Dakota, 2012-2015.

RECOMMENDATIONS

1. Continue conducting lake surveys annually to evaluate fish populations and monitor regulation effects.
2. Stock adult gizzard shad annually, if none are sampled in the spring, 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, 2004-2015.

Year	Number	Species	Size
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
2015	1,600	Yellow perch	Adult