

# SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-46

**Name:** Angostura Reservoir

**County:** Fall River

**Legal description:** Sec. 1-12,17,19, 20,21,28-33; T 8S, R 5,6 E

**Location from nearest town:** 7 miles southeast of Hot Springs, SD.

**Dates of present survey:** May 20-23, August 1, 5-7, 2013

**Date last surveyed:** May 14-16, August 9, 22-24, 2012

**Management classification:** Warmwater permanent

Primary Species: (game and forage)

1. Walleye
2. Channel Catfish
3. Smallmouth Bass
4. Gizzard Shad
5. Largemouth Bass
6. Black Crappie
7. Spottail Shiner
8. Emerald Shiner
9. \_\_\_\_\_

Secondary and other species:

1. Bluegill
2. Common Carp
3. Green Sunfish
4. Northern Pike
5. Northern Redhorse
6. River Carpsucker
7. White Sucker
8. Yellow Perch
9. Freshwater Drum

## PHYSICAL CHARACTERISTICS

**Surface Area:** 4,612 acres

**Watershed:** 5,824,000 acres

**Maximum depth:** 70 feet

**Mean depth:** 29.3 feet

**Lake elevation at survey (from known benchmark):** unknown

### Ownership of lake and adjacent lakeshore property:

The U.S. Bureau of Reclamation performs the maintenance of Angostura Reservoir and Dam. The South Dakota Department of Game, Fish and Parks manages much of the adjacent land as recreation/campground area and as a Game Production Area. The local irrigation district controls the water level and irrigation releases.

### Fishing Access

Angostura Reservoir has excellent access for boat and shore anglers. Seven boat ramps are located around the reservoir and a marina with store is located at the northeast corner of the lake. Shore anglers can access around the reservoir by paved roads and on the southern portion through two track trails. A state park sticker is required for all public access to the reservoir.

### Observations of Water Quality and Aquatic Vegetation

Department personnel identified no pollution problems during the 2013 survey. Submergent vegetation, curlyleaf pondweed and sago pondweed were observed in the bays and shallow water areas of Angostura. Emergent vegetation consisted of cattail and smartweed.

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

No apparent problems were identified on either the dam or spillway. The boat ramps and other facilities were in excellent condition.

## **MANAGEMENT OBJECTIVES**

**Objective 1.** To maintain a Walleye fishery with a minimum gill net catch for stock-length (15 in) and longer of 20 per net, a PSD range of 30-60, PSD-P 10 or greater, and maintain a mean growth rate of no less than 35.5 cm (14 in) by age-3.

**Objective 2.** Maintain the Gizzard Shad population.

**Objective 3.** Maintain an angler satisfaction rate of 64.5% or greater.

## **BIOLOGICAL DATA**

### **Sampling Effort and Catch**

#### *Age-0 Fish Survey*

Daytime boat electrofishing was used on August 1, 2013 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 20-23 and experimental gill nets on August 5-7, 2013 to sample adult fish populations in the reservoir (Figure 1). Trap nets were modified fyke nets consisting of a 1.3 X 1.5 m frame, 19.1 mm (0.75 in) mesh and a 1.2 X 23 m (3.9 X 75.5 ft) lead. The gill nets were experimental-type measuring 45.7 m (150 ft) long and 1.8 m (6 ft) deep with six 7.6 m (25 ft) panels with bar mesh sizes: 12.7 mm (0.5 in), 19.1 mm (0.75 in), 25.4 mm (1.0 in), 31.8 mm (1.25 in), 38.1 mm (1.5 in), and 50.8 mm (2.0 in). The net sampling consisted of eight trap net nights and four gill net nights and catch data is displayed in Tables 1 and 2. Discussion on selected fish species follows and completes this report.

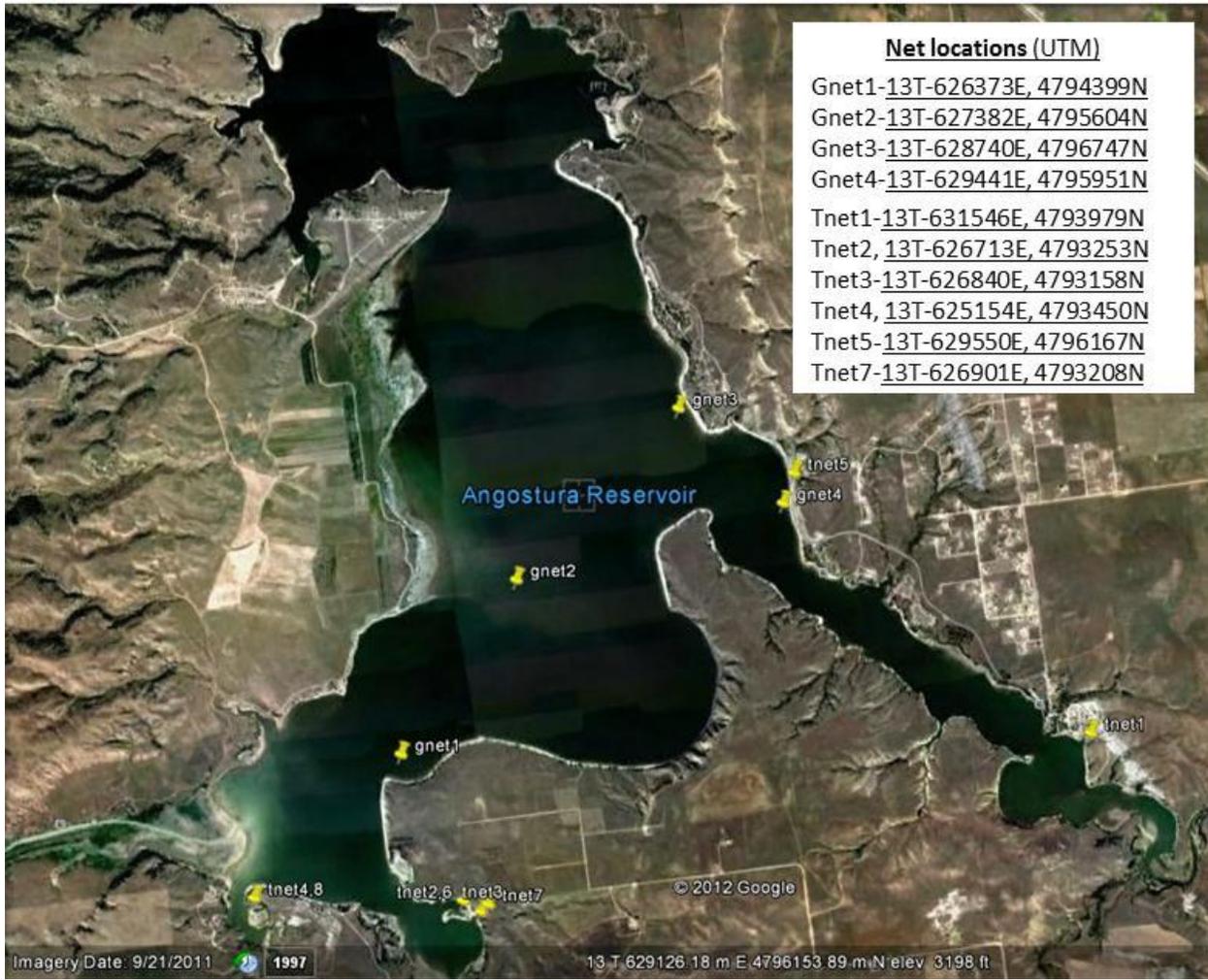


Figure 1. Locations, including GPS coordinates, of experimental gill (gnet) and trap (tnet) nets during the fisheries survey of Angostura Reservoir, Fall River County, 2013.

Table 1. Catch data from all species collected in eight trap nets in Angostura Reservoir, Fall River County, May 20-23, 2013. 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	93	11.6 (5.9)	11.3 (6.0)	73 (8)	26 (8)	94.0 (0.9)
Bluegill	65	8.1 (9.3)	8.1 (9.3)	52 (11)	2 (2)	91.4 (0.8)
GSF x BLG	2	0.3 (0.2)	0.3 (0.2)	--	--	--
Channel Catfish	2	0.3 (0.2)	0.3 (0.2)	--	--	--
Common Carp	3	0.4 (0.4)	0.4 (0.4)	--	--	83.5 (10.0)
Freshwater Drum	2	0.3 (0.2)	0.3 (0.2)	--	--	--
Green Sunfish	7	0.9 (0.8)	0.9 (0.8)	--	--	--
River Carpsucker	2	0.3 (0.4)	0.3 (0.4)	--	--	--
Rock Bass	6	0.8 (1.1)	0.8 (1.1)	--	--	90.9 (4.3)
Walleye	6	0.8 (0.9)	0.8 (0.9)	--	--	89.0 (4.2)

Table 2. Catch data from all species collected in four gill nets in Angostura Reservoir, Fall River County, August 5-7, 2013. 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	5	1.3 (1.2)	1.3 (1.2)	--	--	107.8 (5.1)
Channel Catfish	114	28.5 (23.4)	13.5 (9.1)	15 (8)	0	86.6 (0.9)
Common Carp	24	6.0 (2.4)	6.0 (2.4)	63 (18)	0	84.1 (1.7)
Freshwater Drum	17	4.3 (3.6)	2.3 (2.2)	11 (21)	0	89.2 (2.8)
Gizzard Shad	12	3.0 (1.3)	2.8 (1.0)	9 (17)	0	93.2 (3.8)
Northern Pike	1	0.3 (0.4)	0.3 (0.4)	--	--	90.7 (--)
River Carpsucker	10	2.5 (1.4)	2.5 (1.4)	100	100	91.4 (3.2)
Shorthead Redhorse	20	5.0 (2.8)	5.0 (2.8)	45 (20)	25 (17)	88.3 (2.4)
Smallmouth Bass	21	5.3 (4.9)	5.3 (4.9)	67 (19)	10 (11)	95.5 (2.0)
Spottail Shiner	1	0.3 (0.4)	--	--	--	--
Walleye	105	26.3 (9.5)	25.3 (8.8)	55 (9)	9 (5)	84.5 (0.5)
Yellow Perch	13	3.3 (3.3)	3.0 (3.3)	25 (23)	0	88.6 (1.8)

### Black Crappie

Last year, trap net catch per unit effort (CPUE) was 4.0 per net (Table 3). Size structure showed a population dominated by large fish with a proportional stock density of quality-length (PSD) of 94 and of preferred-length (PSD-P) of 31. This year size structure was similar to 2012, with a PSD of 73 and a PSD-P of 26. Fish condition was good with a mean relative weight for stock length and larger fish (*Wr*>S) of 94.0 (Table 1). The length frequency histogram shows a larger number of fish under quality length than last year, indicating some recruitment (Figure 2).

Table 3. Composite listing of data for Black Crappie collected by trap nets in Angostura Reservoir 2006-2013. CPUE's with 80% confidence intervals in parentheses. PSD and PSD-P with 90% confidence intervals in parentheses.

Year	N	CPUE	PSD	PSD-P
2006	40	5.0 (1.9)	19 (12)	6 (8)
2007	23	2.9 (0.9)	39 (20)	11 (13)
2008	93	11.6 (3.8)	43 (9)	9 (6)
2009	58	7.3 (2.4)	65 (12)	14 (9)
2010	32	4.0 (1.9)	61 (18)	22 (15)
2011*	211	26.4 (15.4)	100 (1)	50 (6)
2012*	32	4.0 (2.0)	94 (8)	31 (14)
2013*	93	11.6 (5.9)	73 (8)	26 (8)

\*spring sample

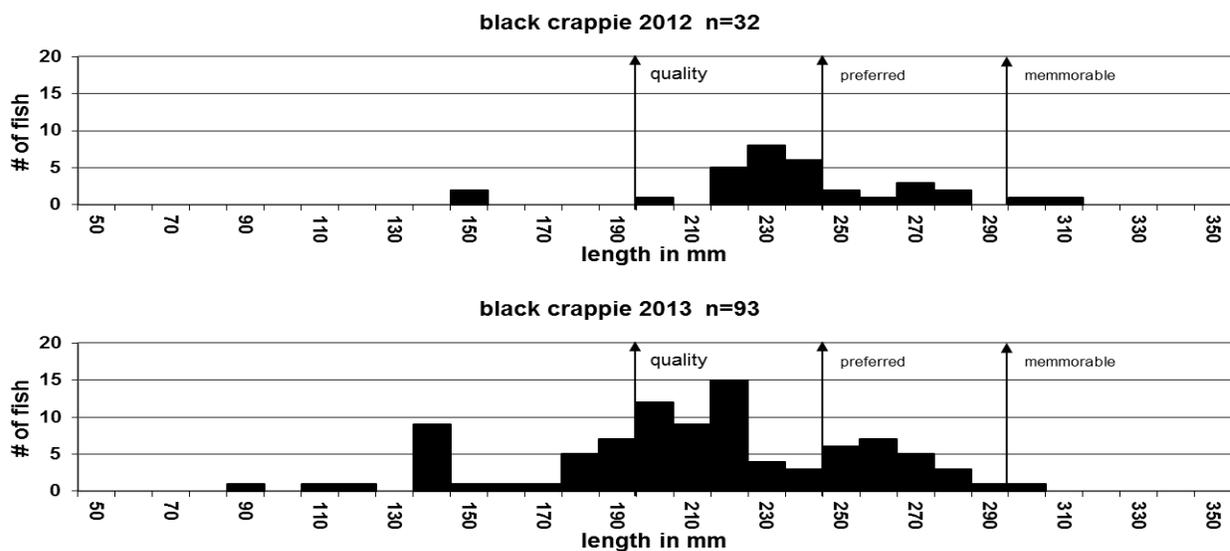


Figure 2. Length frequency histograms of Black Crappies collected by trap nets from Angostura Reservoir, Fall River County, 2012-2013.

### Bluegill

Bluegill catch was higher in 2013 with a CPUE of 8.1 (Tables 1 and 4). Stock density indices indicate good size structure with a PSD of 52 and a PSD-P of 2, indicating a balanced population. The length frequency histogram also indicates good recruitment by showing a good number of fish under quality length (Figure 3).

Table 4. Composite listing of data for Bluegill collected by trap nets in Angostura Reservoir 2006-2013. CPUE's with 80% confidence intervals in parentheses. PSD and PSD-P with 90% confidence intervals in parentheses.

Year	N	CPUE	PSD	PSD-P
2007	17	2.1 (1.6)	53 (22)	0
2008	152	19.0 (8.3)	3 (3)	0
2009	130	16.3 (5.7)	15 (6)	0
2010	47	5.9 (3.7)	43 (13)	0
2011*	6	0.8 (0.7)	67 (43)	0
2012*	36	4.5 (1.7)	83 (11)	0
2013*	65	8.1 (9.3)	52 (11)	2 (2)

\*spring sample

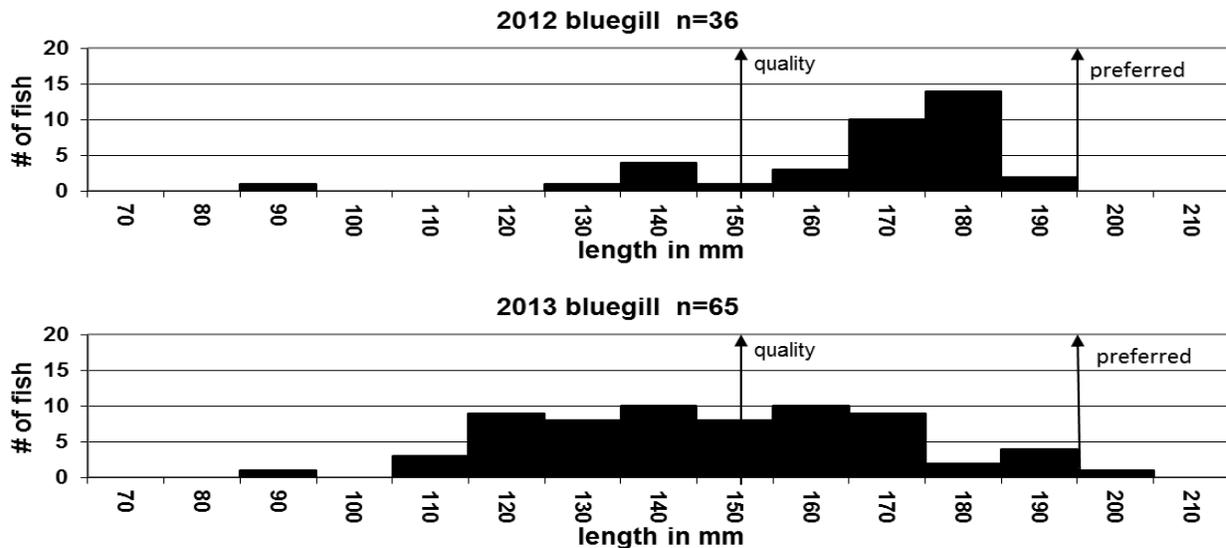


Figure 3. Length frequency histograms of Bluegill collected from Angostura Reservoir, Fall River County, 2012-2013.

### Channel Catfish

Channel Catfish were the most abundant fish collected in gill nets (Table 2). Mean gill net CPUE for Channel Catfish was 28.5, and for fish stock length and greater catch (CPUE-S) was 13.5, which is a bit higher than last year (Table 5). Stock density indices remain low; PSD=15, PSD-P=0. Mean Channel Catfish  $Wr>S$  was about average at 86.6. The length frequency histogram (Figure 4) is similar to last year with few fish over 400 mm.

Table 5. Composite listing of data for Channel Catfish collected by gill nets in Angostura Reservoir 2007-2013. CPUE's with 80% confidence intervals in parentheses. PSD and PSD-P with 90% confidence intervals in parentheses.

Year	N	CPUE	CPUE-S	PSD	PSD-P
2007	138	34.5 (7.5)	10.0 (4.6)	10 (8)	3 (4)
2008	99	33.0 (8.5)	19.0 (10.4)	5 (5)	0
2009	137	34.3 (16.7)	26.5 (11.4)	2 (2)	0
2010	60	15.0 (5.3)	13.8 (5.1)	11 (7)	0
2011	120	30.0 (4.6)	24.0 (2.9)	21 (7)	0
2012	65	16.3 (8.0)	9.8 (5.4)	13 (9)	0
2013	114	28.5 (23.4)	13.5 (9.1)	15 (8)	0

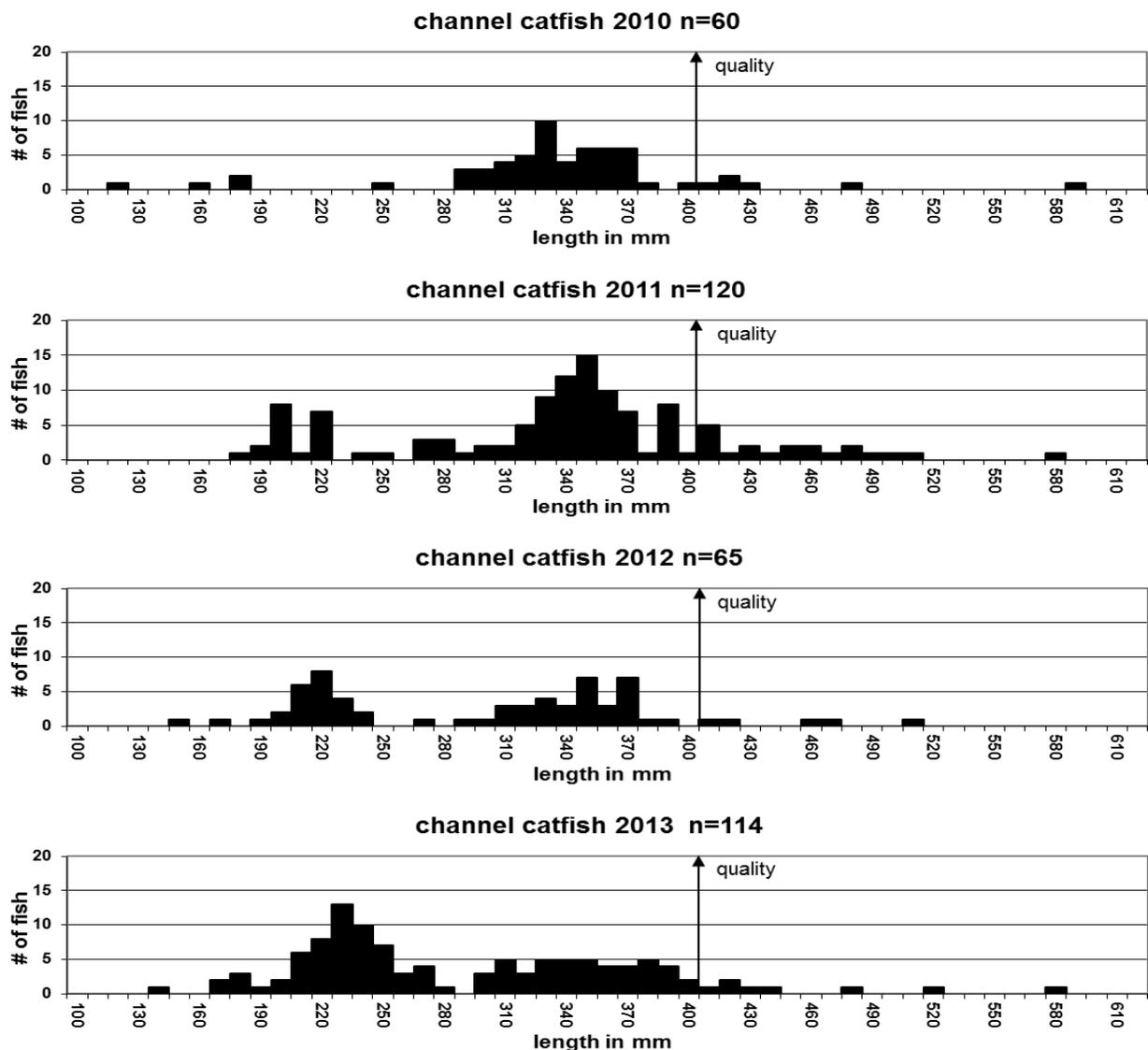


Figure 4. Length frequency histograms of Channel Catfish collected in experimental gill nets from Angostura Reservoir, Fall River County, 2010-2013.

## Gizzard Shad

Gizzard Shad were introduced to Angostura Reservoir in 1990 to provide additional forage for game fish, particularly Walleye which were experiencing slow growth and low relative weights. The first age-0 Gizzard shad were collected in 1994 during a ¼ arc seine survey, showing successful natural reproduction. No adult Gizzard Shad have been stocked in Angostura Reservoir since 1994.

Daytime boat electrofishing was completed during August 1, 2013 and a total of 985 age-0 Gizzard Shad were captured in 1.25 hours of electrofishing. Catch per hour was 788.0 per hour compared to 320.2 last year, with five of the ten sites sampled containing Gizzard Shad (Figure 5).

The northern latitude of South Dakota and subsequent cold winter water temperatures likely causes some over-winter mortality of Gizzard Shad on an annual basis. Limited winter mortality of Gizzard Shad is desirable to keep densities of adults low, while maintaining high reproductive potential due to the high fecundity of the species. The continued presence of age-0 Gizzard Shad indicate that adult survival is occurring, and often results in years of large reproduction.

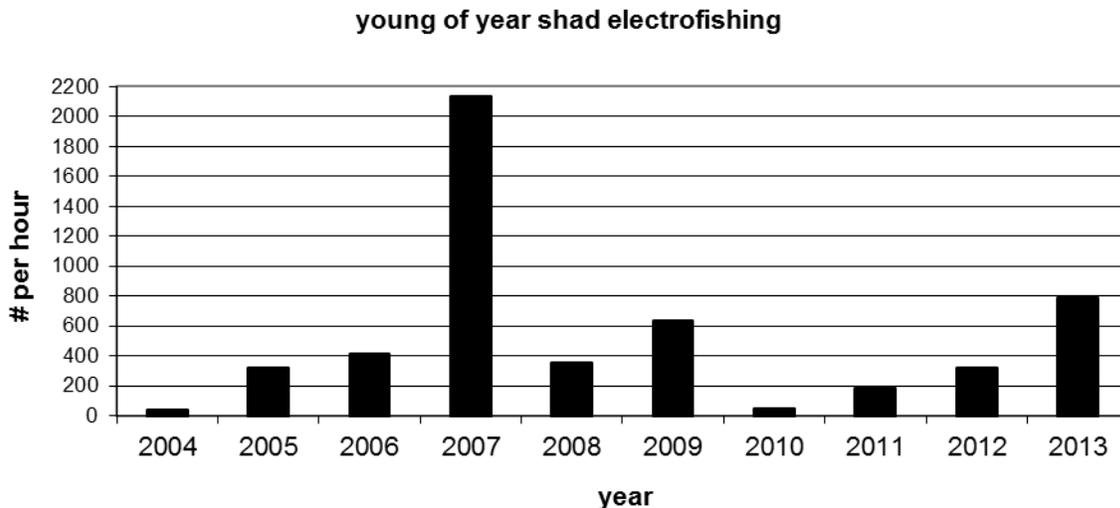


Figure 5. Daytime electrofishing results for age-0 (young of year) Gizzard Shad from Angostura Reservoir, 2004-2013.

## Smallmouth Bass

Gill net CPUE for Smallmouth Bass was 5.3 (Table 2). Stock indices indicate a balanced population with a PSD of 67 and a PSD-P of 10. Fish condition for stock length and larger fish was 95.5. Growth was excellent with fish reaching 350 mm at age four (Table 6). Length frequency and age data indicate good recruitment (Figure 6).

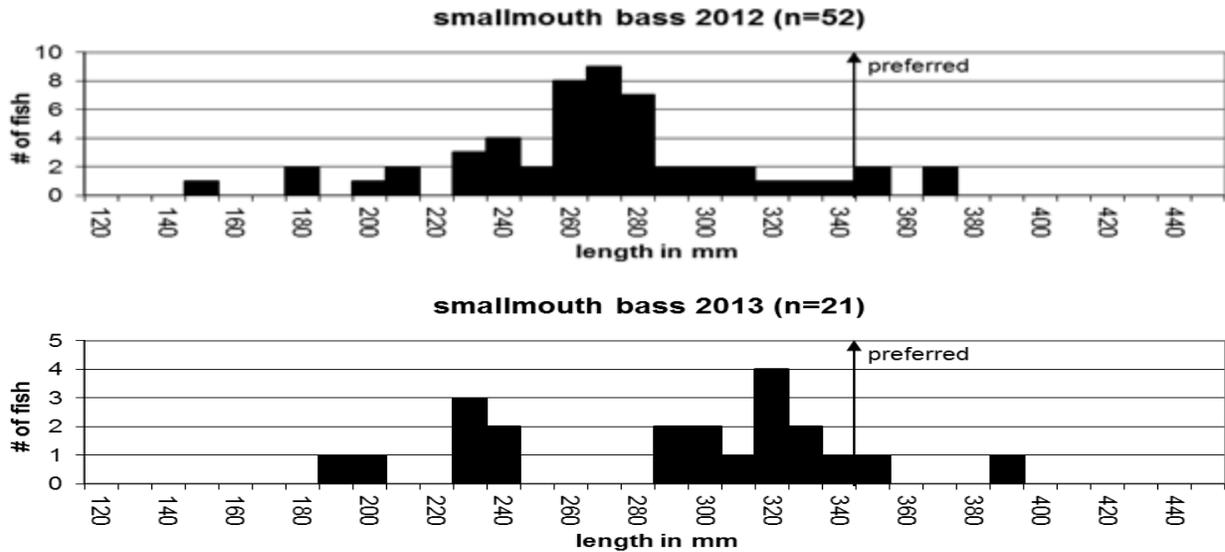


Figure 6. Length frequency histograms of Smallmouth Bass collected in experimental gill nets from Angostura Reservoir, Fall River County, 2012-2013.

Table 6. Estimated age, minimum, maximum and weighted mean length (mm) at capture for Smallmouth Bass by otoliths from the Angostura Reservoir gill net sample, August 5-7, 2013.

Age	Minimum length range @ capture	Weighted mean length @ capture	Maximum length range @ capture	N
1	198	198	198	1
2	205	248	290	8
3	301	319	335	9
4	348	350	352	2

### Walleye

Angostura Reservoir remains a popular Walleye fishery in western South Dakota. Despite high fishing pressure, Walleye abundance remains good with a gill net CPUE of 26.3 (Tables 2 and 7). In 2012, CPUE was a little lower at 21.5. CPUE for stock length and larger fish (CPUE-S) was 25.3 in 2013, in comparison to 20.0 last year. The 2005 lake management plan sets the target CPUE for stock length and longer walleye to be at least 20 per gill net, which is where it is at most years.

Sizes of fish and condition have also remained stable over the past few years with only small changes. Stock density indices indicate a slightly higher proportion of quality size Walleye in comparison to 2012, with a PSD of 55 this year versus 48 last year. Both years fall within the current management objective of PSD between 30 and 60. Fish over twenty inches increased slightly with this survey yielding a PSD-P of nine, compared to six last year. Walleye condition was down slightly from a mean  $Wr>S$  87.7 in 2012 to 84.5 this survey (Table 7). Growth continues to look excellent with fish surpassing 15 inches between age-2 and age-3 (Table 8). The length frequency histogram resembles a balanced population with several strong year classes present (Figure 7).

Table 7. Composite listing of data for Walleye collected by gill nets in Angostura Reservoir 2006-2013. CPUE's with 80% confidence intervals in parentheses. PSD, PSD-P and  $W \geq S$  with 90% confidence intervals in parentheses.

Year	N	CPUE	CPUE-S	PSD	PSD-P	$W \geq S$
2006	98	24.5 (6.8)	23.3 (6.0)	27 (8)	3 (3)	82.8 (0.1)
2007	82	20.5 (4.0)	20.5 (4.0)	23 (8)	5 (4)	83.3 (0.7)
2008	123	41.0 (10.9)	39.0 (10.9)	65 (7)	2 (2)	84.7 (0.1)
2009	88	22.0 (2.3)	21.8 (2.4)	53 (9)	8 (5)	86.0 (0.7)
2010	94	23.5 (6.1)	21.5 (4.8)	53 (9)	6 (4)	83.3 (0.4)
2011	71	17.8 (7.0)	16.5 (6.4)	70 (10)	9 (6)	84.8 (0.2)
2012	86	21.5 (9.1)	20.0 (8.1)	48 (10)	6 (5)	87.7 (0.8)
2013	105	26.3 (9.5)	25.3 (8.8)	55 (9)	9 (5)	84.5 (0.5)

Table 8. Estimated age, minimum, maximum and weighted mean length (mm) at capture for Walleye by otoliths from the Angostura Reservoir gill net sample, August 5-7, 2013.

Age	Minimum length range @ capture	Weighted mean length @ capture	Maximum length range @ capture	N
1	264	264	264	1
2	306	358	423	55
3	388	442	490	26
4	525	525	525	1
5	461	514	576	12
12	662	662	662	1

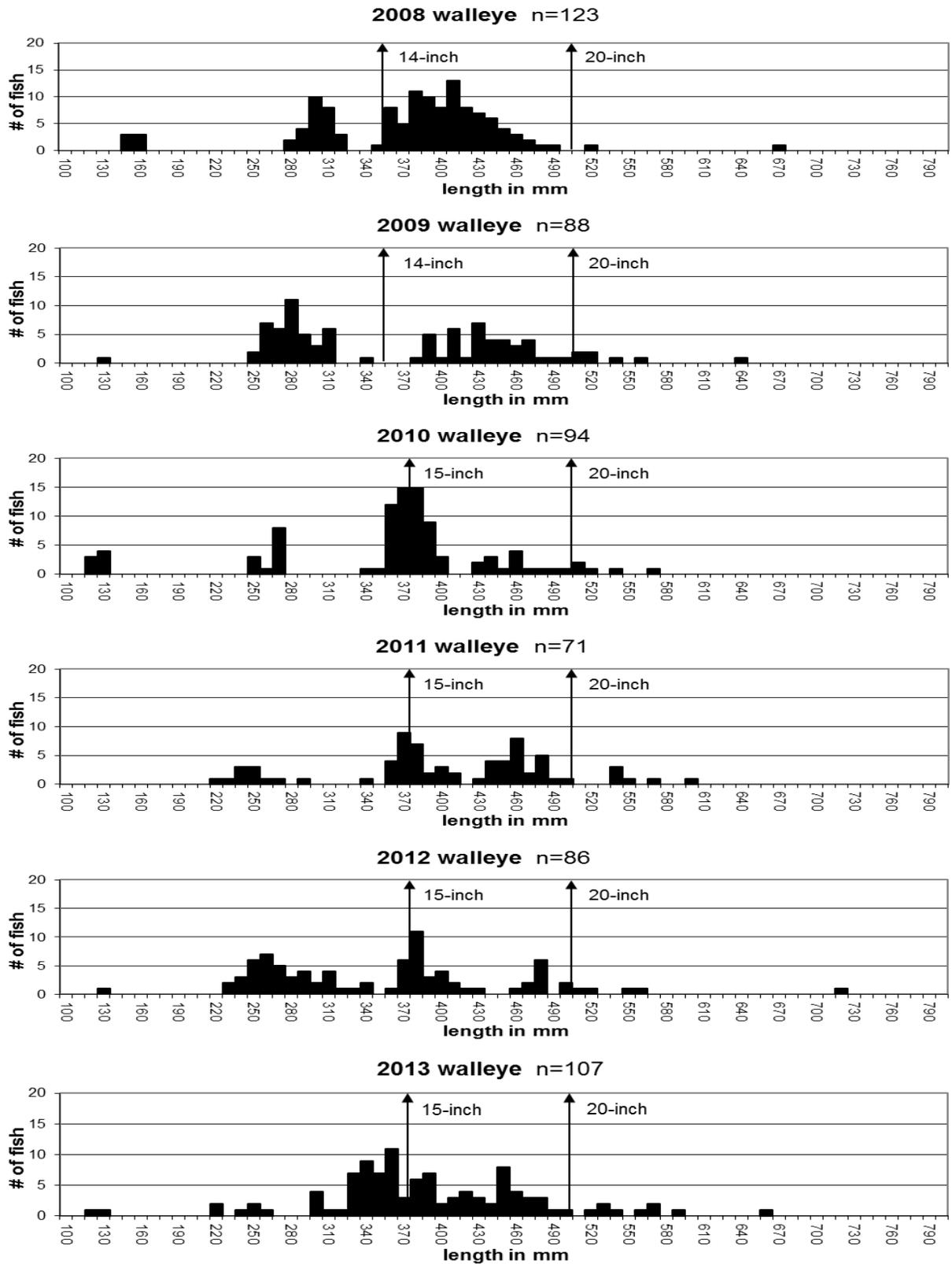


Figure 7. Length frequency histogram of Walleye collected in experimental gill nets from Angostura Reservoir, Fall River County, South Dakota, 2008-2013.

## RECOMMENDATIONS

1. Continue conducting annual lake surveys to evaluate fish populations and regulation success.
2. Stock 100 to 200 pre-spawn adult Gizzard Shad the following spring if no adult or few age-0 shad are found during sampling.

## APPENDIX

Appendix A. Stocking history, including year a stocking occurred, number stocked, species and size of fish for Angostura Reservoir, Fall River County, South Dakota, 2000-2013.

Year	Number	Species	Size
2000	97,133	Rainbow Trout	Fingerling
	207,779	Walleye	Fingerling
2001	12,638	Largemouth Bass	Fingerling
	37,000	Rainbow Trout	Fingerling
2002	50,100	Walleye	Fingerling
	30,000	Smallmouth bass	Fingerling
2003	218,791	Walleye	Fingerling
	80,000	Rainbow trout	Fingerling
2005	381,045	Walleye	Fingerling
2008	479,900	Walleye	Fingerling
2010	289,340	Walleye	Fingerling
2011	310,199	Walleye	Fingerling
2012	476,423	Walleye	Fingerling