Mud Lake

Site Description

Location

Water designation number (WDN)	57-0013-00
Legal description	T115N-R64W-Sec. 15
County (ies)	Spink
Location from nearest town	6.0 miles south of Redfield

Survey Dates and Sampling Information

Survey dates	September 10, 2015 (FN, GN)
Frame net sets (n)	12
Gill net sets (n)	3

Morphometry

Watershed area (acres)	26,367
Surface area (acres)	400
Maximum depth (ft)	unknown
Mean depth (ft)	unknown

Ownership and Public Access

Mud Lake is a non-meandered lake; however, a significant amount of land bordering the lake is owned by the State of South Dakota and managed as a Game Production Area (GPA). The fishery is managed by SDGFP. A single public access site, useable during high water periods is located on the north shore. Lands adjacent to the lake are under mixed ownership including the State of South Dakota and private individuals.

Watershed and Land Use

Mud Lake lies within the 26,367 Twin Lakes sub-watershed (HUC-12), which is located within the larger Lower Turtle Creek (HUC-10) watershed. Land use within the watershed is primarily agricultural including rangeland and cropland.

Water Level Observations

Mud Lake has no established OHWM and an outlet elevation was not available. On April 19, 2015 the elevation of Mud Lake was 1297.3 fmsl; 1.7 ft lower than the fall 2014 elevation of 1299.3 fmsl. By October 5, 2015 water levels had risen slightly to an elevation of 1298.8 fmsl.

Fish Management Information

Primary species	black crappie, walleye
Other species	black bullhead, common carp, green sunfish, largemouth bass, northern pike, white sucker, yellow perch
Lake-Specific regulations	none
Management classification	none
Fish consumption advisories	none

Figure 1. Map depicting geographic location of several lakes in the Redfield, Spink County, South Dakota area including Mud Lake (top). Also noted is the public access area and standardized net locations (bottom) for Mud Lake. MUDFN= frame net; MUDGN= gill net

Management Objectives

1) Maintain a mean frame net CPUE of stock-length black crappie ≥ 10, a PSD of 30-60, and an RSD-P of 5-10.

2) Maintain a mean gill net CPUE of stock length walleye ≥ 10, a PSD of 30-60, and an RSD-P of 5-10.

3) Maintain a mean frame net CPUE of stock length bullhead ≤ 100.

Results and Discussion

Mud Lake is a shallow-natural lake located near Highway 281 south of Redfield, South Dakota. The lake is primarily managed as a black crappie and walleye fishery, but at times the lake provides angling opportunities for other species (e.g., northern pike, yellow perch). Unfortunately, during dry years the lake becomes relatively-shallow and susceptible to winterkill events which affect the quality of the fishery. A partial winterkill was reported following the 2006-07 winter at Mud Lake and water levels remained low through 2009, before rising in the spring of 2010 (SDDENR 2015). Based on the 2011 netting results, it appeared that the lake suffered winterkill during this time period, as nearly all walleye captured during the 2011 fish community survey were from the 2010 (age-1) cohort (Table 6).

Primary Species

Black Crappie: The mean frame net CPUE for stock-length black crappie was 4.2 (Table 1) and below the minimum objective (≥ 10 stock-length crappie/net night; Table 3). The 2015 mean frame net CPUE represented an increase from the 2011 CPUE of 0.1(Table 2) and suggested low to moderate relative abundance.

Black crappie in the frame net catch ranged in TL from 16 to 30 cm (6.3 to 11.8 in), had a PSD of 98 and PSD-P of 60 (Table 1; Figure 2). Both the PSD and PSD-P were above management objective ranges (PSD 30-60 and PSD-P 5-10; Table 3). Cohorts produced in 2011 and 2012 comprised nearly the entire sample and most individuals exceeded quality (20 cm; 8 in) and preferred (25 cm; 10 in) lengths resulting in the high size structure (Table 4; Figure 2).

Based on the 2015 sample, black crappies in Mud Lake appear to grow slightly slower than their counterparts at Twin Lake. The weighted mean TL at capture of age 3 and 4 black crappie in Mud Lake was 231 and 271 mm (9.1 and 10.7 in), respectively (Table 5); compared to TL at capture values of 244 and 290 mm (9.6 and 11.4 in) at those same ages from Twin Lake in 2015. A slight decreasing trend in condition was apparent as TL increased, but mean Wr values were ≥ 100 for all length categories (i.e., stock-quality) represented. The mean Wr of stock-length individuals was 105 (Table 1).

Walleye: In 2015, walleyes were the most abundant fish species in the frame net catch and the second most abundant species in the gill net catch (Table 1). The mean gill net CPUE of stock-length individuals was 6.0 and below the minimum objective (≥ 10 stock-length walleye/net night; Table 3). Although below the minimum objective, the 2015 gill net CPUE represented an increased from the 2011 CPUE of 1.8 (Table 2) and indicated moderate relative abundance.

Gill net captured walleye ranged in TL from 21 to 31 cm (8.3 to 12.2 in); no quality (38 cm; 15 in) or preferred (51 cm; 20 in) length individuals were captured (Table 1; Figure 3). Age estimates obtained from otoliths suggested that year classes produced in 2012 and 2014 comprised the entire sample and both coincided with fry stockings (Table 5; Table 6; Table 8). The 2012 (age-3) and 2014 (age-1) cohorts had weighted mean TL at capture values of 296 and 237 mm (11.7 and 9.3 in), respectively (Table 7). The mean Wr of stock-length walleye was 78 (Table 1) and no length-related trends in condition were apparent.

Other Species

Black Bullhead: The mean frame net CPUE for stock-length black bullhead of 4.7 (Table 1) was within the management objective (≤ 100 stock-length black bullhead/net night) and the lowest recorded in surveys conducted from 2003-2015 (Tables 1-3). Currently, relative abundance is low and their impact on the sport fishery is likely minimal.

Yellow Perch: No yellow perch were captured during the 2011 netting survey (Table 2). As a result of their absence, adult yellow perch were stocked in the spring of 2015 (Table 8). While the stocking contribution is unknown, yellow perch were sampled in the 2015 gill net catch; the mean gill net CPUE of stock-length individuals was 13.7 (Table 1) and indicated moderate relative abundance.

Gill net captured yellow perch ranged in TL from 16 to 21 cm (6.3 to 8.3 in), had a PSD of 20 and a PSD-P of 0 (Table 1; Figure 4). Age estimates obtained from otoliths suggested the presence of three year classes (2012-2014). The 2013 cohort was the most represented and comprised 90% of yellow perch in the gill net catch (Table 9). Given that sampled yellow perch may not have originated in Mud Lake no inferences will be made concerning other population parameters (e.g., growth; Table 10).

Other: Bluegill, common carp, green sunfish, and white sucker were other fish species captured in low numbers during the 2015 survey (Table 1).

Management Recommendations

1) Conduct fish population assessment surveys utilizing gill nets and frame nets on an every fourth year basis (next survey scheduled in summer 2019) to monitor fish relative abundance, fish population size structure, fish growth, and stocking success.

2) Collect otoliths from black crappie and walleye to assess age structure and growth rates of each population.

3) Stock walleye (≈500 fry/acre) on a biennial basis (even years) to supplement the walleye population when water levels are adequate.

4) Monitor winter and summer kill events. In cases of substantial winter or summerkill the need to re-establish a fishery in Mud Lake should be evaluated. If water levels are sufficient, walleye and black crappie should be stocked to re-establish a fish community.

Table 1. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length fish (PSD-P), and mean relative weight (Wr) of stock-length fish for various fish species captured in frame nets experimental gill nets from Mud Lake, 2015. Confidence intervals include 80 percent (± CI-80) or 90 percent (± CI-90). BLB= black bullhead; BLC= black crappie; BLG= bluegill; COC= common carp; GSF= green sunfish; WAE= walleye; WHS= white sucker; YEP= yellow perch

	Abundance		Stock Density Indices				Condition	
Species	CPUE	CI-80	PSD	CI-90	PSD-P	CI-90	Wr	CI-90
Frame nets								
BLB	4.7	2.0	86	8	0	---	79	1
BLC	4.2	1.1	98	3	60	12	105	1
BLG	1.1	0.5	100	0	46	26	118	5
COC	0.2	0.2	100	0	100	0	77	---
GSF	0.2	0.2	100	0	0	---	111	8
WAE	8.2	2.1	1	2	0	--	77	<1
WHS	0.1	0.1	100	---	100	---	97	---
YEP	0.4	0.3	20	43	0	---	101	3
Gill Nets								
BLB	10.3	5.1	84	0	0	---	88	1
BLC	0.7	0.6	100	0	100	0	107	<1
COC	2.7	1.7	100	0	75	31	91	4
WAE	6.0	2.9	0	---	0	---	78	1
WHS	0.3	0.6	100	---	100	---	112	---

Table 2. Historic mean catch rate (CPUE; catch/net night) of stock-length fish for various fish species captured in frame nets and experimental gill nets from Mud Lake, 2003-2015. BLB= black bullhead; BLC= black crappie; BLG= bluegill; COC= common carp; GSF= green sunfish; LMB= largemouth bass; NOP= northern pike; WAE= walleye; WHS= white sucker; YEP= yellow perch

	CPUE		
Species	2003	2011	2015
Frame nets			
BLB	79.8	40.8	4.7
BLC	117.8	0.7	4.2
BLG	0.0	0.0	1.1
COC	1.1	14.9	0.2
GSF	0.2	0.0	0.2
LMB	0.1	0.0	0.0
NOP	1.5	0.0	0.0
WAE	0.2	3.4	8.2
WHS	0.0	0.0	0.1
YEP	7.2	0.0	0.4
Gill nets			
BLB	33.3	42.8	10.3
BLC	6.3	0.0	0.7
COC	13.8	1.0	2.7
NOP	0.3	0.0	0.0
WAE	4.8	1.8	6.0
WHS	0.0	0.0	0.3
YEP	2.3	0.0	13.7

Table 3. Mean catch rate (CPUE; catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and mean relative weight (Wr) for selected species captured in frame nets and experimental gill nets from Mud Lake, 2003-2015. BLB= black bullhead; BLC= black crappie; WAE = walleye perch

Species	2003	2011	2015	Objective
Frame nets				
BLB				
CPUE	80	41	5	≤ 100
PSD	6	7	86	---
PSD-P	0	0	0	---
Wr	78	95	79	---
BLC				
CPUE	118	1	4	≥ 10
PSD	0	14	98	30-60
PSD-P	0	0	60	5-10
Wr	107	121	105	---
Gill nets				
WAE				
CPUE	5	2	6	≥ 10
PSD	100	0	0	30-60
PSD-P	21	0	0	5-10
Wr	92	97	78	---

Table 4. Year class distribution based on the expanded age/length summary for black crappie sampled in frame nets from Mud Lake, 2015.

	Year Class				
Survey Year	2015	2014	2013	2012	2011
2015		1		19	30

Table 5. Weighted mean TL (mm) at capture for black crappie sampled in frame nets (expanded sample size) from Mud Lake, 2015.

	Age			
Year	1	2	3	4
2015	163(1)	---	231(19)	271(30)

Table 6. Year class distribution based on the expanded age/length summary for walleye sampled in gill nets and associated stocking history (# stocked x 1,000) from Mud Lake, 2011-2015.

	Year Class					
Survey Year	2015	2014	2013	2012	2011	2010
2015		14		15		
2011	---	---	---	---		7
# stocked						
fry		200		200		400
sm. fingerling						
lg. fingerling						

Table 7. Weighted mean TL at capture (mm) for walleye sampled in experimental gill nets (expanded sample size) from Mud Lake, 2011-2015. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

	Age				
Year	1	2	3	4	5
2015	237(14)	---	296(15)	---	---
2011	299(7)	---	---	---	---

Table 8. Stocking history including size and number for fishes stocked into Mud Lake, 2010-2015. WAE= walleye

Year	Species	Size	Number
2010	WAE	fry	400,000
2012	WAE	fry	201,496
2014	WAE	fry	200,000
2015	YEP	adult	4,125

Table 9. Year class distribution based on the expanded age/length summary for yellow perch sampled in gill nets from Mud Lake, 2015.

	Year Class				
Survey Year	2015	2014	2013	2012	2011
2015		3	37	1	

Table 10. Weighted mean TL (mm) at capture for yellow perch sampled in gill nets (expanded sample size) from Mud Lake, 2015.

	Age			
Year	1	2	3	4
2015	182(3)	189(37)	208(1)	---

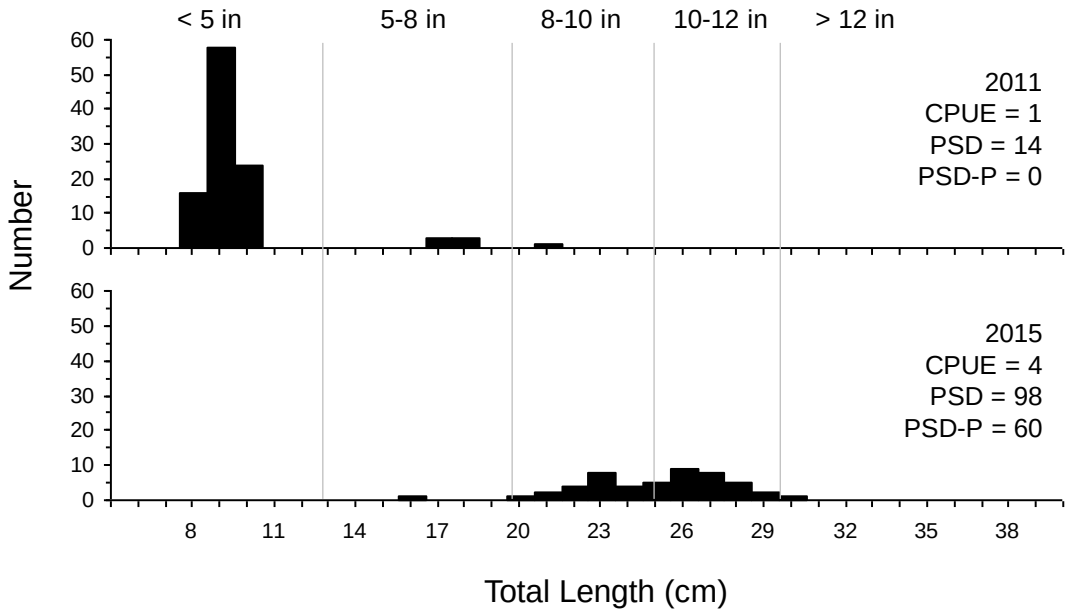

Figure 2. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for black crappie captured using frame nets in Mud Lake, 2011-2015.

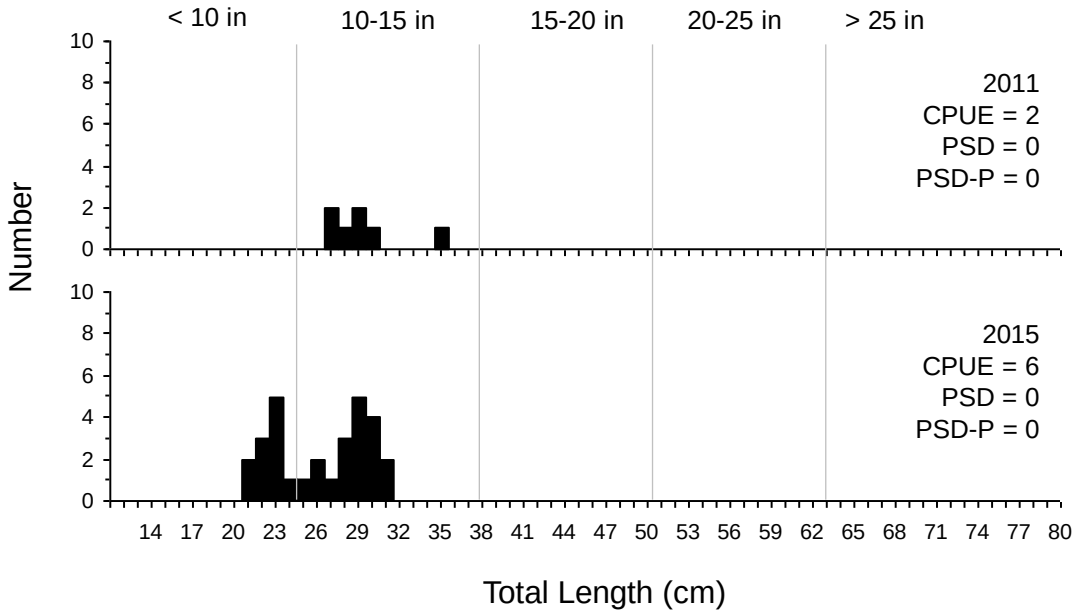

Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured using experimental gill nets in Mud Lake, 2011-2015.

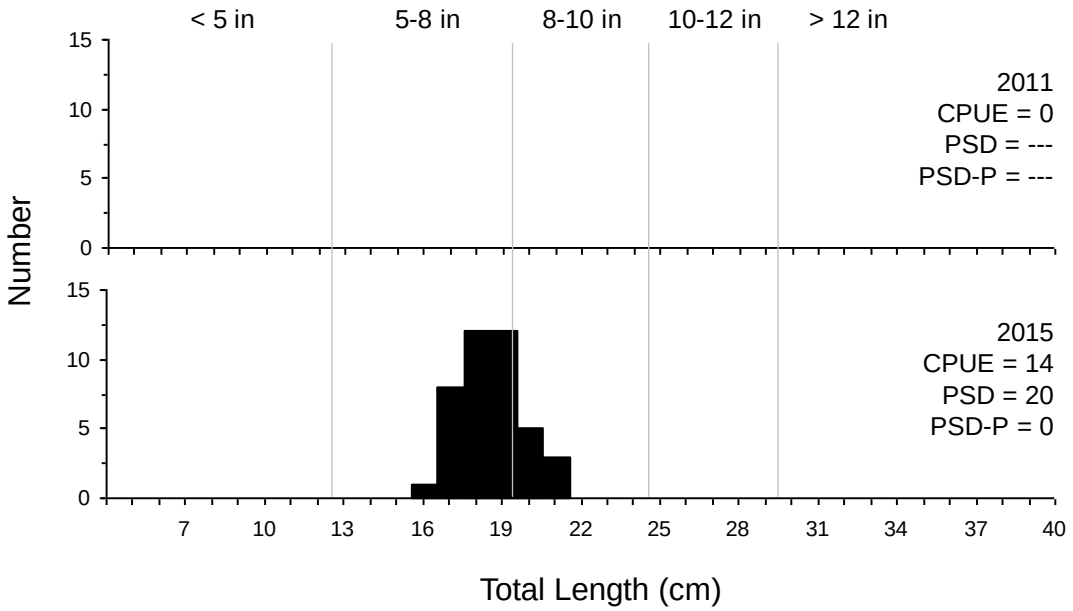

Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for yellow perch captured using experimental gill nets in Mud Lake, 2011-2015.