

Antelope Lake

Site Description

Location

Water designation number (WDN)	22-0007-00
Legal description	T121N-R55W-Sec. 17, 18, 19 & R56W-Sec. 13
County (ies)	Day
Location from nearest town	two miles south and two miles east of Webster

Survey Dates and Netting Information

Dates of current survey	July 8-10, 2003; June 29-30, 2004; July 5-6, 2005
Date of most recent survey	May 27 – 28, 1998
Gill net sets (n)	4; 6 (2003)
Frame net sets (n)	18 (2003); 0 (2004); 12 (2005)

Morphometry

Watershed area (acres)	---
Surface area (acres)	1,200
Maximum depth (ft)	25
Mean depth (ft)	---

Ownership and Public Access

Antelope Lake is a meandered lake managed by the SDGFP. Antelope Lake is entirely surrounded by private land. A public access site is located on the north west shore of Antelope Lake and is maintained by the SDGFP (Figure 1).

Watershed and Land Use

The Lake Alice watershed is comprised of approximately 60% cropland and 40% pasture.

Water Level Observations

Water levels remain above the historic average.

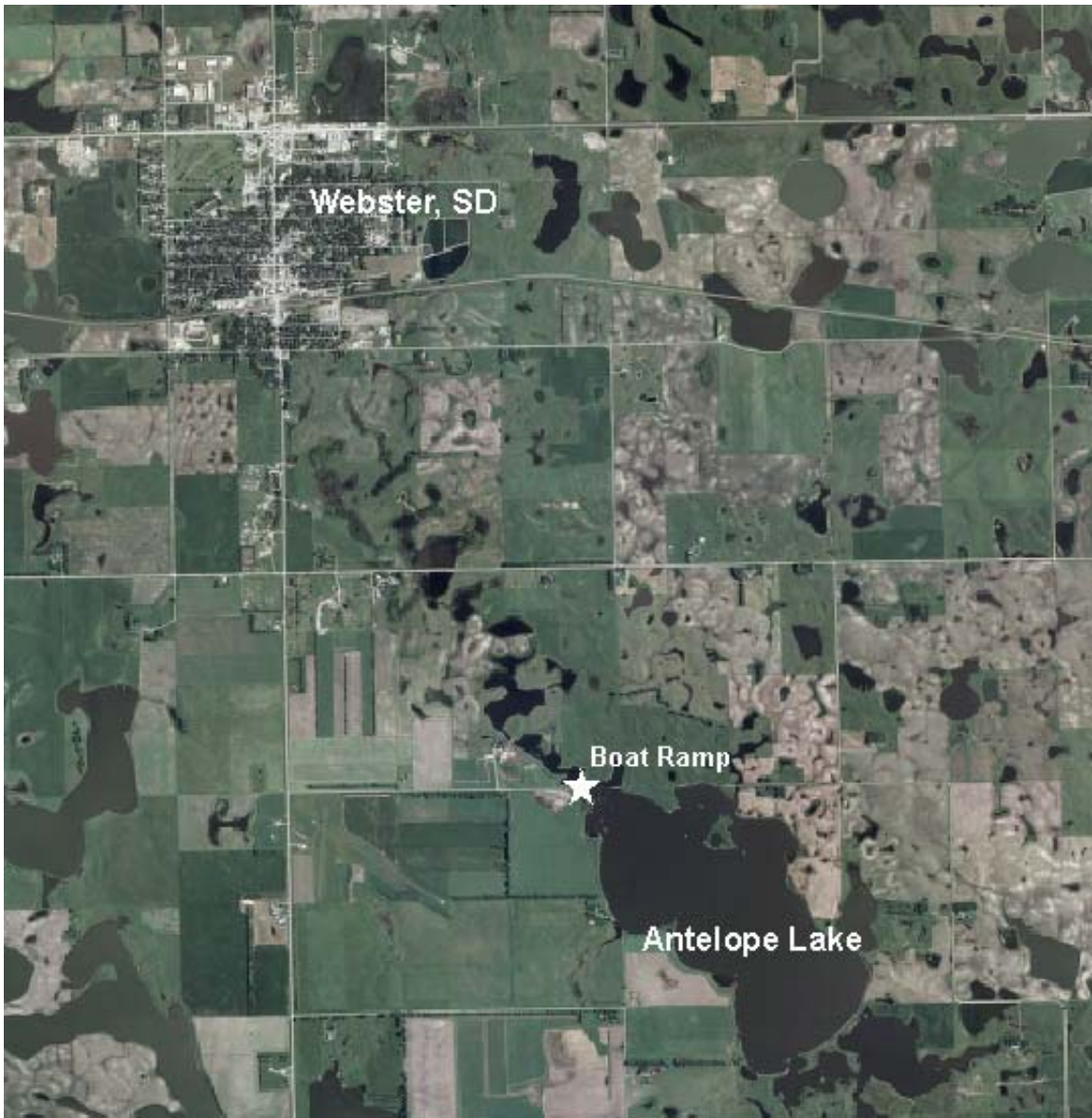
Aquatic Vegetation and Exotics

Aquatic vegetation in Antelope Lake has not been officially documented; however, both emergent and submergent vegetation are common throughout the lake. No un-naturalized exotic vegetation or wildlife was reported during this survey.

Fish Management Information

Primary species	walleye, yellow perch
Other species	bluegill, fathead minnow, northern pike, rock bass, smallmouth bass, yellow perch
Management classification	warm water semi permanent
Fish Consumption Advisories	none

Figure 1. Antelope Lake location map.



Management Objectives

- 1) Maintain a mean gill net CPUE of stock length walleye ≥ 10 , a PSD of 40 – 60, an RSD-P of 5 – 10, and a mean $W_r > 80$.
- 2) Maintain a mean gill net CPUE of stock length yellow perch ≥ 15 and a mean $W_r > 80$.
- 3) Maintain a mean frame net CPUE of stock length bullhead ≤ 100 , a mean $W_r > 80$, and encourage commercial harvest during periods of high abundance.
- 4) Monitor water levels and winterkill events.

Results and Discussion

Prior to 1992 Antelope Lake was only 328 acres and had a maximum depth of 5 feet and a mean depth of 2 feet. Above average precipitation provided an increase in surface area and depth of Antelope Lake during the 1990's. Subsequently, Antelope Lake has been capable of sustaining a sport fishery and is currently managed as a walleye and yellow perch fishery.

Primary Species

Walleye: The mean gill net CPUE of stock length walleye during 2005 was 14.3 (Table 1) and within the objective range (≥ 10 stock length fish/net night) for a moderate density population. Dating back to 2003 abundance in Antelope Lake based on gill net CPUE has ranged from 11.2 to 14.3 stock length walleye/net night with an average of 13.1 (Table 2; Table 3). Therefore, the 2005 gill net CPUE of stock length walleye was above with the 2003 – 2005 average.

Walleye captured in gill nets during 2005 ranged in length from 210 to 590 mm (Figure 2). The PSD of walleye captured in gill nets during 2005 was 30 and the RSD-P was 7 (Table 1; Table 3; Figure 4). The 2005 PSD of 30 was slightly below the objective PSD range (40 – 60). The RSD-P of walleye in 2005 was within the objective range of 5 – 10. Overall, at the time of the 2005 survey a wide range of walleye lengths were present in Antelope Lake. In addition, a high percentage of the walleye population was within the quality (380 mm) and preferred (508 mm) length groups sought by most anglers.

During the 2005 survey all but the 2000 stocking was represented in the walleye catch, which was comprised of 7 year classes overall (1996, 1997, 1998, 2001, 2003, and 2004) (Table 7; Table 8). Natural reproduction by walleye in Antelope Lake was apparently successful during at least 2002 and 2004 as fish from those year classes were captured, but no fish were stocked. It is unknown the success of the 2005 small fingerling stocking at the time of this survey.

During the 2005 survey both growth and condition of walleye in Antelope Lake were exceptional. Growth of walleye in Antelope Lake was similar based on back calculated length at age in 2003 and 2004 with walleye exceeding quality length (380 mm) by age 3 (Table 3; Table 4). Based on mean length at capture of age 3 walleye growth may be slowing slightly in Antelope Lake (Table 6). For example, age 3 walleye in 2003 were 443 mm total length at capture; however, during the 2005 survey age 3 walleye were 405 mm total length. Still, age 3 walleye mean length at capture during 2003 (420 mm), 2004 (425 mm), and 2005 (405 mm) was above the region IV and statewide averages of 367 and 360 mm, respectively. Condition of stock length walleye captured in gill nets in 2005 was 98 and above the objective range of 80. Overall, walleye growth during 2005 was indicative of good condition and apparently sufficient availability of food.

Yellow Perch: The mean gill net CPUE of stock length (200 mm) yellow perch in 2005 was 4.0 and below the objective range (≥ 15 fish/net night) for a moderate density population (Tables 1 – 3). Ermer et al. (2002) reported that the abundance of yellow perch in Antelope Lake was low-density. Since 2002 the gill net CPUE of stock length yellow perch has generally declined (Table 3). During 2005, yellow perch ranged in total length from 130 to 210 mm (Figure 3), had a PSD of 13, and an RSD-P of 14 (Tables 1 – 3). The condition of yellow perch in Antelope Lake was within the objective (≥ 80) with a mean Wr of 108.

Other Species

Northern Pike: The CPUE of stock length northern pike in Antelope Lake during 2005 was 1.5 and 1.2 for gill nets and frame nets, respectively (Table 1). Northern pike were collected that ranged in length from 550 to 840 mm. The PSD was 100 and the RSD-P was 17 for northern pike captured in gill nets (Table 1). No growth information was available; however, the condition of northern pike was acceptable with a mean Wr of 89 for pike captured in both gill nets and frame nets (Table 1).

Northern pike originally were stocked into Antelope Lake in 1997 (Table 7). Since 1998 the abundance of northern pike has generally declined and the 2005 gill net and frame net CPUE were each below the 2003 – 2005 average (Table 2). Northern pike depend on flooded vegetation during the spring for spawning and conditions have not been favorable during recent years for successful northern pike reproduction.

Other: Bluegill, rock bass, and smallmouth bass were other fish species captured during the 2005 survey; however, the abundance of these fish species is considered low density (Table 1, Table 2). Since 2003 the mean CPUE of stock length fish for each bluegill, rock bass, and smallmouth bass has declined and the contribution of these fish species to the fishery at the time of this survey was likely minimal.

Summary

Antelope Lake is managed as a walleye and yellow perch fishery. During 2005, the abundance of stock length (130 mm) yellow perch in Antelope Lake based on mean gill net CPUE indicated that the yellow perch population was moderate-low density and below the objective range of ≥ 15 stock length fish/net. In fact, the abundance of yellow perch has declined since 2003. The decline in the yellow perch abundance is likely due to the expanding walleye population foraging on the perch, and due to the lack of ideal conditions for perch reproduction during recent years.

The abundance of stock length (250 mm) walleye in Antelope Lake based on mean gill net CPUE was indicative of a moderate density population and falls within the objective range of ≥ 10 stock length fish/net. The PSD of 30 for walleye during 2005 was slightly below the objective of 40 – 60. However, the lower than desired PSD was likely attributed to a strong 2003 year class, which was only age 2, but comprised nearly 54 percent of the walleye catch during 2005. In addition, the 1996, 1997, and 1998 year classes which had comprised a large percentage of the population in prior years now appears to be less prevalent in the catch indicating that they may have been removed by anglers. Walleye in Antelope Lake grow exceptionally fast achieving nearly 406 mm (16-inches) in just three years and the condition of walleye in the lake meets the objective range. However, the decrease in availability of yellow perch to walleye for food may result in decreased growth, especially in larger walleye. Overall, Antelope Lake has provided anglers with exceptional walleye fishing with a wide range of fish lengths and the opportunity to capture preferred length (508 mm) fish.

In addition to angling opportunities provided by Antelope Lake, the walleye population has also been an excellent source for walleye eggs during the springs of each 2004 and 2005. A total of 39.2 and 24.1 million eggs were harvested from female walleye in Antelope Lake in 2004 and 2005, respectively. These eggs were incubated and hatched at Blue Dog Lake State Fish Hatchery and the walleye fry were stocked into numerous lakes throughout South Dakota.

Management Recommendations

- 1) Conduct fish population assessment surveys on an every-three-year basis (next survey scheduled in summer 2008) to monitor fish abundance, fish population size structures, fish growth, and stocking success.
- 2) Stock walleye on a biennial basis at 1,000 fry/acre to maintain consistent year classes. Stock northern pike and yellow perch in cases of complete winterkill events to establish a fish population. Monitor water levels and winterkill events to assess stocking strategies.

Table 1. Mean catch rate (CPUE; Catch/net night) of stock length fish, mean relative weight (Wr) of stock length fish, proportional stock density (PSD) and relative stock density of preferred length fish (RSD-P) of various fish species captured in experimental gill net sets or frame net sets in Antelope Lake, 2003 - 2005. Confidence intervals include 80 percent (\pm CI-80) or 90 percent (\pm CI-90).

Survey Year Species	Abundance		Stock Density Indices				Condition	
	CPUE	CI-80	PSD	CI-90	RSD-P	CI-90	Wr	CI-90
2003								
<i>Frame nets</i>								
BLG	7.6	3.9	17	5	1	2	103	5
NOP	1.7	0.8	100	0	27	14	95	1
RKB	0.8	0.5	79	20	36	23	145	17
SMB	0.1	0.1	---	---	---	---	---	---
WAE	5.6	1.4	96	3	87	6	94	1
YEP	0.2	0.2	33	77	---	---	---	---
<i>Gill nets</i>								
BLG	0.2	0.3	---	---	---	---	135	---
NOP	3.3	1.7	90	10	15	14	96	2
RKB	0.7	0.5	75	25	---	---	125	3
WAE	11.2	4.7	66	9	37	10	99	< 1
YEP	22.5	11.3	57	7	13	4	104	< 1
2004								
<i>Gill nets</i>								
NOP	3.5	1.6	100	0	21	21	93	2
RKB	0.3	0.4	100	---	---	---	120	---
WAE	13.8	5.5	95	5	62	11	93	0
YEP	2.3	1.2	22	28	22	28	106	1
2005								
<i>Frame nets</i>								
BLG	0.1	0.1	0	---	0	---	101	---
NOP	1.2	0.5	100	0	14	17	89	4
RKB	0.3	0.2	100	0	67	33	115	14
SMB	0.2	0.2	100	0	100	0	117	27
WAE	4.9	1.8	98	2	92	6	89	1
<i>Gill nets</i>								
NOP	1.5	0.8	100	0	17	33	89	4
WAE	14.3	11.5	30	10	7	6	98	1
YEP	4.0	4.1	13	14	0	---	108	1

Table 2. Historic mean catch rate (CPUE; Catch/net night) for various fish species captured in experimental gill net sets or frame net sets in Antelope Lake, 1999 - 2005.

Species	CPUE							Mean [†]
	1999	2000	2001	2002	2003	2004	2005	
<i>Frame nets</i>								
BLG	---	---	---	---	7.6	---	0.1	3.9
NOP	---	---	---	---	1.7	---	1.2	1.5
RKB	---	---	---	---	0.8	---	0.3	0.6
SMB	---	---	---	---	0.1	---	0.2	0.2
WAE	---	---	---	---	5.6	---	4.9	5.3
YEP	---	---	---	---	0.2	---	0.0	0.1
<i>Gill nets</i>								
BLG	---	---	---	---	0.2	0.0	0.0	0.1
NOP	---	---	---	---	3.3	3.5	1.5	2.8
RKB	---	---	---	---	0.7	0.3	0.3	0.4
WAE	---	---	---	---	11.2	13.8	14.3	13.1
YEP	---	---	---	---	22.5	2.3	4.0	9.6

Table 3. Mean catch rate (CPUE; catch/net night), proportional stock density (PSD), relative stock density of preferred length fish (RSD-P), and relative weight (Wr) for primary management species captured in experimental gill net sets, frame net sets, or electrofishing in Antelope Lake, 1999 - 2005.

Species	1999	2000	2001	2002	2003	2004	2005	Average	Objective
<i>Gill nets</i>									
WAE									
CPUE	---	---	---	---	11	14	14	13	≥ 10
PSD	---	---	---	---	66	95	30	64	40 – 60
RSD-P	---	---	---	---	37	62	7	35	5 – 10
Wr	---	---	---	---	99	93	98	97	≥ 80
YEP									
CPUE	---	---	---	---	23	2	4	10	≥ 15
PSD	---	---	---	---	57	22	13	31	---
RSD-P	---	---	---	---	13	22	0	12	---
Wr	---	---	---	---	104	106	108	106	≥ 80

[†] Historic data from all surveys conducted since 1999.

Table 4. Mean back-calculated length (mm) at age and standard error (SE) for walleye captured in experimental gill net sets in Antelope Lake, 2003.

Year	Age	N	Age						
			1	2	3	4	5	6	7
2002	1	4	213	---	---	---	---	---	---
2001	2	22	123	304	---	---	---	---	---
2000	3	6	132	285	411	---	---	---	---
1998	5	13	189	322	407	461	499	---	---
1997	6	13	192	349	422	466	502	523	---
1996	7	9	205	355	438	486	518	541	559
Mean	---	67	176	323	420	471	506	532	559
SE	---	---	16	13	7	7	6	9	0
<i>Mean Comparison</i> ¹									
Small lakes/impoundments			176	271	384	431	483	---	---
Large lakes/impoundments			169	280	358	425	494	---	---
Region IV			161	281	367	433	497	---	---
Statewide			168	279	360	425	490	---	---

¹ Willis et al. 2001.

Table 5. Mean back-calculated length (mm) at age and standard error (SE) for walleye captured in experimental gill net sets in Antelope Lake, 2004.

Year	Age	N	Age							
			1	2	3	4	5	6	7	8
2003	1	19	196	---	---	---	---	---	---	---
2002	2	4	201	367	---	---	---	---	---	---
2001	3	13	127	308	428	---	---	---	---	---
2000	4	1	134	284	407	472	---	---	---	---
1998	6	6	195	338	424	476	514	537	---	---
1997	7	17	178	343	437	489	523	549	568	---
1996	8	14	191	336	431	484	520	545	568	586
Mean	---	74	175	329	425	480	519	544	568	586
SE	---	---	12	12	5	4	3	3	0	0
<i>Mean Comparison</i> ¹										
Small lakes/impoundments			176	271	384	431	483	---	---	---
Large lakes/impoundments			169	280	358	425	494	---	---	---
Region IV			161	281	367	433	497	---	---	---
Statewide			168	279	360	425	490	---	---	---

¹ Willis et al. 2001.

Table 6. Weighted mean length at capture (mm) for walleye age-1 through age 9 captured in experimental gill net sets in Antelope Lake, 1999 – 2004. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends.

Year	N	Age								
		1	2	3	4	5	6	7	8	9
2005	73	236	356	405	465	---	---	529	522	594
2004	74	232	388	442	479	---	540	569	586	---
2003	67	277	356	443	---	515	534	569	---	---

Table 7. Stocking history (10-year) including size and number for fishes stocked into Antelope Lake, 1986 - 2005.

Year	Species	Size	Number
1996	WAE	fry	500,000
1997	NOP	fry	1,550,000
	WAE	fingerling	6,000
1998	WAE	fingerling	121,800
2000	WAE	fry	1,000,000
2001	WAE	fry	2,800,000
2003	WAE	fingerling	114,920
2005	WAE	fingerling	200,100

Table 8. Numbers of walleye sampled (n) by year class and associated stocking history (Number stocked x 1,000) for walleye captured in Antelope Lake, 1999 - 2004.

Survey Year	Year Class								
	2004	2003	2002	2001	2000	1999	1998	1997	1996
2005	19	39	6	5			1	2	1
2004	---	19	4	13	1		6	17	14
2003	---	---	4	22	6		13	13	9
Number stocked									
fry				2,800	1,000				500
small fingerling		115					122	6	
large fingerling									

Figure 2. Length frequency, catch rate of stock length fish (CPUE), proportional stock density (PSD), and relative stock density of preferred length fish (RSD-P) for walleye captured in gill net sets in Antelope Lake, 2003 – 2005.

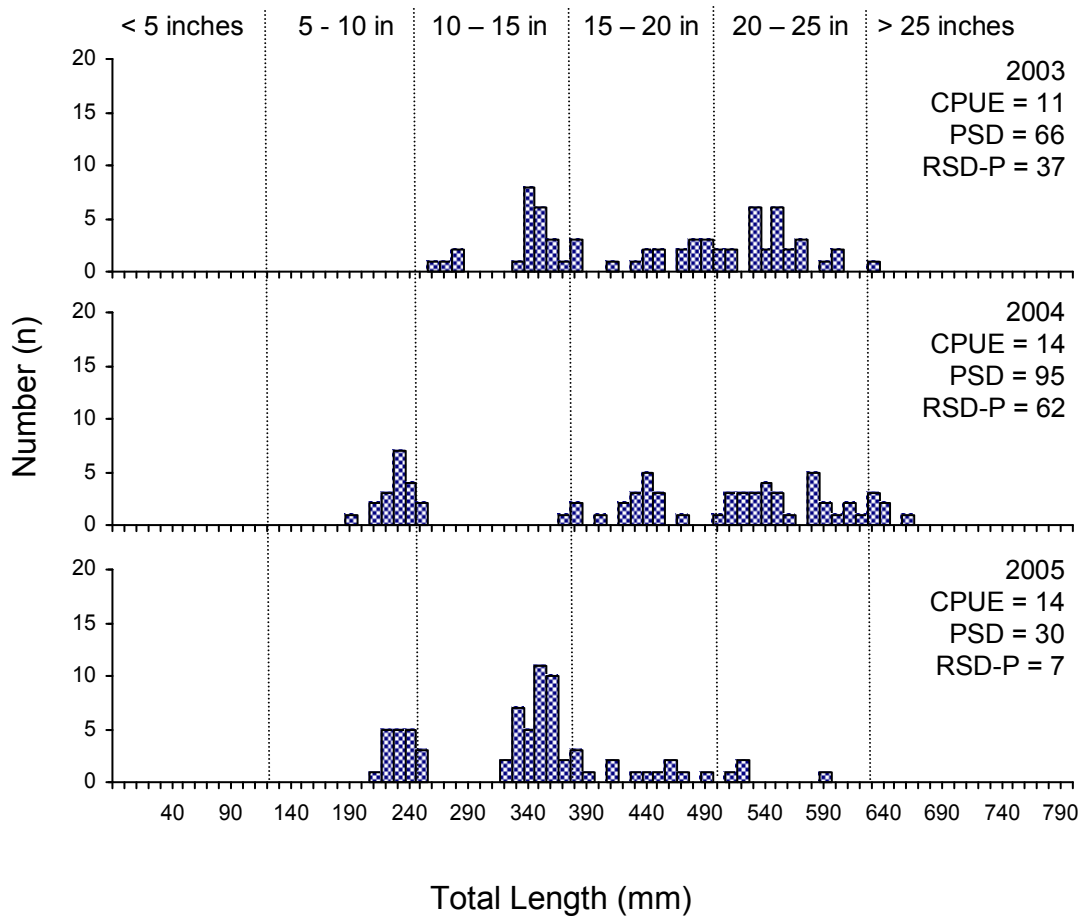


Figure 3. Length frequency, catch rate of stock length fish (CPUE), proportional stock density (PSD), and relative stock density of preferred length fish (RSD-P) for yellow perch captured in gill net sets in Antelope Lake, 2003 – 2005.

