

# Blue Dog Lake

## Site Description

---

### **Location**

Water designation number (WDN)	22-0005-00
Legal description	T122N-R53W-Sec. 9,10,15,16; T122N-R54W-Sec. 21,27,28
County (ies)	Day
Location from nearest town	one half mile north of Waubay

### **Survey Dates and Netting Information**

Dates of current survey	June 27 – June 29, 2006
Date of most recent survey	June 28 – July 1, 2004
Gill net sets (n)	6
Frame net sets (n)	18

### **Morphometry (Figure 1)**

Watershed area (acres)	73,811
Surface area (acres)	1,502
Maximum depth (ft)	8
Mean depth (ft)	6

### **Ownership and Public Access**

Blue Dog Lake is a meandered lake managed by the SDGFP. A public access site is located on the south shore off Highway 12 and is maintained by the SDGFP (Figure 1). Public shore access may also be obtained through a state managed GPA located at the west shore of Blue Dog Lake. Blue Dog State Fish Hatchery (BDH) which is operated by the SDGFP is located on the northwest shore of Blue Dog Lake.

### **Watershed and Land Use**

The Blue Dog Lake watershed is comprised of a mix of pasture (61%) and cropland (39%).

### **Water Level Observations**

Water levels remain at the historic average.

### **Aquatic Vegetation and Exotics**

Less than 5% of the shoreline of Blue Dog Lake has emergent vegetation. At high water levels the lake connects with sloughs on the east and north-west side of the lake. Limited submergent vegetation exists in Blue Dog Lake. No un-naturalized exotic vegetation or wildlife was reported during this survey.

### **Fish Management Information**

Primary species	northern pike, walleye, yellow perch
Other species	black crappie, common carp, emerald shiner, fathead minnow, lake herring, rock bass, smallmouth bass, white bass, white sucker
Management classification	warm-water permanent
Fish Consumption Advisories	none

---



## Management Objectives

- 1) Maintain a mean gill net CPUE of stock length walleye  $\geq 10$ , 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  $\geq 15$  and a mean  $W_r > 80$ .
- 3) Maintain a mean frame net CPUE of stock length bullhead  $\leq 100$ , a mean  $W_r > 80$ , and encourage commercial harvest during periods of high abundance.
- 4) Monitor water levels and winterkill events.

## Results and Discussion

Blue Dog Lake is a large, permanent, natural lake situated in the Coteau des Prairie, a plateau formed by glacier action in northeast South Dakota. Blue Dog Lake, along with the majority of the Coteau lakes, was formed during successive subadvances of the Late Wisconsin glaciation more than 10,000 years ago. The primary tributary to Blue Dog Lake is Owen's Creek, which begins in Roberts County on the western slope of the Waubay Moraine. The outlet of Enemy Swim Lake/Campbell Slough is the other main tributary for Blue Dog Lake. Enemy Swim Lake is located approximately 5 miles north of Blue Dog Lake and is considered one of the best water quality lakes in the state (Stueven and Bren 1999). Blue Dog Lake supports a relatively high level of development with a large portion of the southern shoreline with residential housing and cabins. In addition, Blue Dog Lake has Blue Dog State Fish Hatchery located on the northwest shore. Currently Blue Dog Lake is primarily managed as a northern pike, walleye and yellow perch fishery. Overall, as many as 13 species of fish contribute to the fishery in Blue Dog Lake.

### *Primary Species*

Northern Pike: The CPUE of stock length northern pike in Blue Dog Lake during 2006 was 1.0 for gill nets (Table 1). Northern pike typically are not sampled consistently using standard lake survey methods; however, northern pike in Blue Dog Lake have generally been considered moderate density with a 1999 – 2006 mean gill net CPUE of 3.1 stock length fish (Table 1; Table 2). In 2006, northern pike were collected from Blue Dog Lake that ranged in length from 440 to 750 mm. The PSD was 50 and the RSD-P was zero for northern pike captured in gill nets (Table 1). No growth information was available; however, the condition of northern pike was within the objective range with a mean  $W_r$  of 87 for pike captured in gill nets. Overall, it appears that Blue Dog Lake contains sufficient food availability for acceptable northern pike condition. Large northern pike are reportedly captured by anglers in Blue Dog Lake. The

lakes connection to Rush Lake, a well known pike lake, to the south and west likely provides additional spawning habitat that aids in maintaining the population.

Walleye: The mean gill net CPUE of stock length walleye during 2006 was 12.2 (Table 1) and within the objective range ( $\geq 10$  stock length fish/net night) for walleye in Blue Dog Lake. Dating back to 1999 walleye abundance in Blue Dog Lake based on gill net CPUE has ranged from 8.6 to 20.2 stock length walleye/net night with an average of 14.6 (Table 2; Table 3). The gill net CPUE of stock length walleye during 2006 indicated moderate density.

Walleye captured in gill nets during 2006 ranged in length from 240 to 600 mm (Figure 2). The PSD of walleye captured in gill nets during 2006 was 42 and the RSD-P was 18 (Table 1; Table 3; Figure 2). The 2006 PSD of 42 was within the objective range (40 – 60). Similarly, the RSD-P of 18 was near the objective range of 5 – 10 indicating a relatively balanced walleye population. Of the walleye captured a large proportion were within the quality (380 mm) and preferred (508 mm) length groups sought by most anglers, and young year classes were also apparent. Roughly 18 percent of the walleye population in Blue Dog Lake at the time of the 2006 survey exceeded 20 inches in length.

During the 2006 survey a total of 7 year classes of walleye were represented in the catch (Table 4; Table 6). Most year classes present at the time of this survey were relatively small, resulting in the moderate density. The 2003 and 2004 year classes comprised the majority of the fish population. The contribution of stocked fish to the walleye population in Blue Dog Lake is relatively unknown due to the escapement of walleye from Blue Dog State Fish Hatchery through the effluent. Walleye fry likely are indirectly stocked into Blue Dog Lake each year from the hatchery. In addition, some small fingerling walleye likely are stocked into Blue Dog Lake during successful production years. Management of the walleye fishery is difficult due to the inability to control the number of walleye stocked into Blue Dog Lake on an annual basis. Natural reproduction by walleye in Blue Dog Lake is unknown due to the escapement of unmarked walleye from the hatchery annually.

Growth of walleye during 2006 was slightly slower than the regional and statewide average (Table 4). In fact, growth of walleye in Blue Dog Lake slowed considerably from 2004 with walleye achieving quality length (380 mm) between age-4 and age-5. However, the 2006 aging was conducted using otoliths instead of scales which most likely resulted in more accurate age assessments. Condition of stock length walleye captured in gill nets in 2006 was acceptable with a mean  $W_r$  value of 86. There was no apparent change in condition of walleye over the spectrum of fish lengths collected, indicating appropriate forage availability regardless of fish length. Overall, walleye growth during 2006 was indicative of slow to moderate growth with fair condition and sufficient availability of food. The extremely large 2003 and 2004 year classes may have resulted in slowed growth. Ermer et al. (2006) reported that high densities of age-0 walleye

were seen in August 2005, during other sampling activities, but were relatively small and may not have achieved good over-winter survival due to size limitations. Indeed, there was a lack of a 2005 year class in this survey so survival was apparently low. Hypothetically, the small size of age-0 walleye during the fall may be due to the high abundance of fish stocked into Blue Dog Lake resulting in poor over-winter survival.

Yellow Perch: The mean gill net CPUE of stock length (200 mm) yellow perch in 2006 was 0.7 and well below the objective range ( $\geq 15$  fish/net night) for Blue Dog Lake (Tables 1 – 3). Since 1999 the gill net CPUE has fluctuated with a low of 0.4 (2004) and a high of 15.0 (1999) (Table 2; Table 3). Overall, the yellow perch population in Blue Dog Lake has been classified as low density with a 1999 – 2005 mean gill net CPUE of 5.4. The abundance of yellow perch in Blue Dog Lake has apparently declined during each survey from 1999 through 2004, and subsequently changed little in 2006.

During 2006, yellow perch ranged in total length from 150 to 250 mm (Figure 7), had a PSD of 75, and an RSD-P of 25 (Tables 1 – 3; Figure 2). A total of only four yellow perch were captured in all gear types during 2006 so assessment of the perch population was difficult. The condition of yellow perch in Blue Dog Lake was within the objective ( $\geq 80$ ) with a mean Wr of 96. Overall, the yellow perch population in Blue Dog Lake has declined in abundance considerably over the past seven years.

#### *Other Species*

Black bullhead: The mean frame net CPUE of stock length black bullhead during 2006 was 6.1 (Table 1) and within the objective range ( $\leq 100$ ) for black bullhead in Blue Dog Lake (Table 3). Dating back to 1999, black bullhead abundance in Blue Dog Lake has been considered low density and the CPUE has not exceeded 25 stock length fish/net night (Table 2; Table 3).

Black bullhead captured in frame nets during 2006 suggested the presence of several weak year classes, with the total length ranging from 280 to 390 mm (Figure 2). The PSD of black bullhead captured in frame nets during 2006 was 100 and the RSD-P was 94 (Table 1; Table 3; Figure 2). The high PSD indicates a population dominated by quality and preferred length black bullhead. The condition of black bullhead in Blue Dog Lake during 2006 was above the objective of 80 with a mean Wr of 88 (Table 1; Table 3; Figure 2). Black bullheads do not likely impose any direct negative impact on sport fish in Blue Dog Lake at the current abundance levels.

Other: Black crappie, bluegill, common carp, rock bass, smallmouth bass, white bass and white sucker were other fish species captured during the 2006 survey; however, the abundance of these fish species was considered moderate or low density (Table 1, Table 2). The contribution of species other than walleye,

northern pike and yellow perch to the fishery at the time of this survey was likely minimal.

### *Management Recommendations*

- 1) Conduct fish population assessment surveys on a biennial basis (next survey scheduled in summer 2008) to monitor fish abundance, fish population size structures, fish growth, and stocking success.
- 2) Encourage commercial harvest of black bullhead and common carp to limit abundance if the abundance exceeds the management objective. At the time of this survey, the abundance of black bullhead or common carp in Blue Dog Lake did not necessitate the need for commercial harvest.

### *General Fishing Report*

Anglers can be successful targeting walleye and northern pike in Blue Dog Lake. Catch rates vary depending on the season with the highest success most likely occurring during early spring through early summer when water temperatures are cooler. Shoreline angling is considered good during the spring near the outlet structure on the southwestern shore and along the entire Blue Dog Lake State Fish Hatchery and adjacent GPA. Walleye and northern pike are the most frequently captured fish species reported by anglers in Blue Dog Lake. In the immediate future anglers can expect most walleye to be in the 10 to 15 inch length range; however, walleye may be captured in excess of 24 inches. In addition, larger northern pike are present in Blue Dog Lake that exceed 30 inches in length. Other fish species are captured less frequently but include black bullhead, black crappie, bluegill, common carp, smallmouth bass, and white bass. Due to the limited abundance anglers should expect lower catch rates of larger fishes for fish species other than walleye and northern pike.

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 Blue Dog Lake, 2006. Confidence intervals include 80 percent ( $\pm$  CI-80) or 90 percent ( $\pm$  CI-90).

Species	Abundance		Stock Density Indices				Condition	
	CPUE	CI-80	PSD	CI-90	RSD-P	CI-90	Wr	CI-90
<i>Gill nets</i>								
BLB	0.2	0.2	100	---	0	---	94	---
COC	1.7	1.2	100	0	90	10	88	5
NOP	1.0	0.7	50	45	0	0	87	3
WAE	12.2	1.8	42	10	18	7	86	< 1
WHB	1.2	1.0	0	---	0	---	105	8
WHS	0.7	0.6	100	0	100	0	100	3
YEP	0.7	0.3	75	25	25	59	96	20
<i>Frame nets</i>								
BLB	6.1	1.2	100	0	94	4	88	1
BLC	0.6	0.4	70	28	70	28	96	1
BLG	0.2	0.1	100	0	100	0	122	0
COC	0.2	0.1	100	0	100	0	90	---
NOP	1.1	0.3	95	5	10	12	73	3
RKB	0.4	0.2	86	14	29	35	---	---
SMB	0.4	0.3	88	12	75	25	88	15
WAE	3.2	0.7	79	9	54	12	83	2
WHB	2.8	1.0	100	0	100	0	97	1
WHS	0.7	0.2	100	0	100	0	88	2

<sup>1</sup> all fish sizes.

Table 2. Historic mean catch rate (CPUE; Catch/net night) of stock length fish for various fish species captured in experimental gill net sets, frame net sets, or electrofishing in Blue Dog Lake, 1999 - 2006.

Species	CPUE								Mean
	1999	2000	2001	2002	2003	2004	2005	2006 <sup>1</sup>	
<i>Gill nets</i>									
BLB	0.0	---	---	3.5	---	2.0	---	0.2	1.4
BLC	0.4	---	---	0.5	---	0.0	---	0.0	0.2
COC	0.0	---	---	0.0	---	0.4	---	1.7	0.5
EMS	0.0	---	---	0.0	---	0.6	---	0.0	0.2
NOP	5.4	---	---	3.3	---	2.8	---	1.0	3.1
SPS	0.4	---	---	0.0	---	0.0	---	0.0	0.1
WAE	20.2	---	---	17.5	---	8.6	---	12.2	14.6
WHB	0.4	---	---	0.0	---	0.0	---	1.2	0.4
WHS	2.8	---	---	3.0	---	2.8	---	0.7	2.3
YEP	15.0	---	---	5.5	---	0.4	---	0.7	5.4
<i>Frame nets</i>									
BLB	0.4	---	---	15.4	---	23.5	---	6.1	11.4
BLC	1.0	---	---	9.5	---	0.3	---	0.6	2.9
BLG	0.0	---	---	0.9	---	0.1	---	0.2	0.3
COC	0.0	---	---	0.0	---	0.2	---	0.2	0.1
NOP	0.3	---	---	0.7	---	0.6	---	1.1	0.7
RKB	0.3	---	---	2.2	---	1.6	---	0.4	1.1
SMB	0.0	---	---	0.4	---	0.1	---	0.4	0.2
WAE	0.3	---	---	0.3	---	1.9	---	3.2	1.4
WHB	0.2	---	---	1.8	---	2.1	---	2.8	1.7
WHS	0.5	---	---	0.6	---	0.5	---	0.7	0.6
YEP	0.3	---	---	1.2	---	0.2	---	0.0	0.4

<sup>1</sup> Monofilament gill net mesh size change (.75", 1", 1.25", 1.5", 2" and 2.5"), previous years (.5", .75", 1", 1.25", 1.5" and 2").

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 Blue Dog Lake, 1999 - 2006.

Species	1999	2000	2001	2002	2003	2004	2005	2006 <sup>1</sup>	Average	Objective
<i>Frame nets</i>										
BLB										
CPUE	< 1	---	---	15	---	24	---	6	12	≤ 100
PSD	60	---	---	94	---	82	---	100	84	---
RSD-P	0	---	---	30	---	13	---	94	34	---
Wr	95	---	---	89	---	84	---	88	89	≥ 80
<i>Gill nets</i>										
WAE										
CPUE	20	---	---	18	---	9	---	12	15	≥ 10
PSD	30	---	---	85	---	86	---	42	61	40 – 60
RSD-P	4	---	---	13	---	30	---	18	16	5 – 10
Wr	84	---	---	91	---	85	---	86	87	≥ 80
YEP										
CPUE	15	---	---	6	---	< 1	---	1	6	≥ 15
PSD	71	---	---	21	---	50	---	75	54	---
RSD-P	27	---	---	12	---	0	---	25	16	---
Wr	99	---	---	104	---	84	---	96	96	≥ 80

<sup>1</sup> Monofilament gill net mesh size change (.75", 1", 1.25", 1.5", 2" and 2.5"), previous years (.5", .75", 1", 1.25", 1.5" and 2").

Table 4. Weighted mean length at capture (mm) for walleye captured in experimental gill net sets in Blue Dog Lake, 1999 – 2006. 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	10
2006 <sup>2</sup>	72	---	266	324	363	425	---	---	515	515	533
2004	46	136	315	382	440	489	512	535	564	---	---
2002	113	186	316	396	433	460	490	495	609	---	---
1999	111	178	273	330	380	456	---	620	---	---	---
<i>Mean Comparison</i> <sup>1</sup>											
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	---	---	---	---	---

<sup>1</sup> Mean back calculated length at age (Willis et al. 2001).

<sup>2</sup> Age assignments made using otoliths; scales were used in previous years

Table 5. Stocking history including size and number for fishes stocked into Blue Dog Lake, 1996 - 2006.

Year	Species	Size	Number
1997	WAE	large fingerling	552
1998	SXW	large fingerling	171
2002	BLG	adult	200
2003	WAE	fry	1,000,000
	WAE	fingerling	2,160
2005	WAE	fry	1,000,000

Table 6. Numbers of walleye sampled (n) by year class and associated stocking history (Number stocked x 1,000) for walleye captured in Blue Dog Lake, 1999 - 2006.

Survey Year	Year Class									
	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996
2006		17	27	5	4			5	6	8
2004	---	---	2	2	9	7	1	10	10	5
2002	---	---	---	---	7	11	14	18	28	16
1999	---	---	---	---	---	---	---	6	17	39
Number stocked <sup>1</sup>										
fry	1,000		1,000							
small fingerling			2							
large fingerling								< 1	< 1	

<sup>1</sup> Note: the actual number of fry and small fingerlings stocked into Blue Dog Lake are unknown because uncounted numbers of walleye escape Blue Dog State Fish Hatchery through the effluent and enter Blue Dog Lake.

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 various fish species captured in frame net or gill net sets from Blue Dog Lake, 2006.

