

Eureka Lake

Location

Water designation number (WDN)	47-0001-00
Legal description	T127N-R73W-Sec. 34,35
County (ies)	McPherson
Location from nearest town	northwest edge of Eureka

Survey Dates and Netting Information

Dates of current survey	September 19-20, 2006
Date of previous survey	June 4-5, 2002
Gill net sets (n)	3
Frame net sets (n)	10

Morphometry (Figure 1)

Watershed area (acres)	N/A
Surface area (acres)	225
Maximum depth (ft)	15
Mean depth (ft)	7

Ownership and Public Access

Eureka Lake is owned by the city of Eureka and managed by the South Dakota Game, Fish and Parks. There are two public access sites with boat ramps, one on the northeast corner of the west lake, the other on the west side of the east lake (Figure 1).

Water Level Observations

Water levels in Eureka Lake were low during the 2006 survey. The western side of Eureka Lake was extremely tough to navigate with a boat. If water levels continue to drop boat traffic on the western portion of the lake will be nearly impossible. The trophic state of Eureka Lake is eutrophic.

Watershed and Land Use

The Eureka Lake watershed is comprised of a mix of municipal (50%), cropland (20%), woodland (10%) and pasture or grassland (20%).

Aquatic Vegetation and Exotics

Emergent and submergent vegetation is extensive in Eureka Lake, however the type and extent has not been documented. No exotic vegetation or wildlife was reported during this survey.

Fish Management Information

Primary species	northern pike, largemouth bass, saugeye, walleye, yellow perch
Other species	black bullhead, bluegill, common carp
Management classification	warm-water semi-permanent
Fish Consumption Advisories	None



Figure 1. Map depicting location of Eureka Lake, McPherson County, SD.

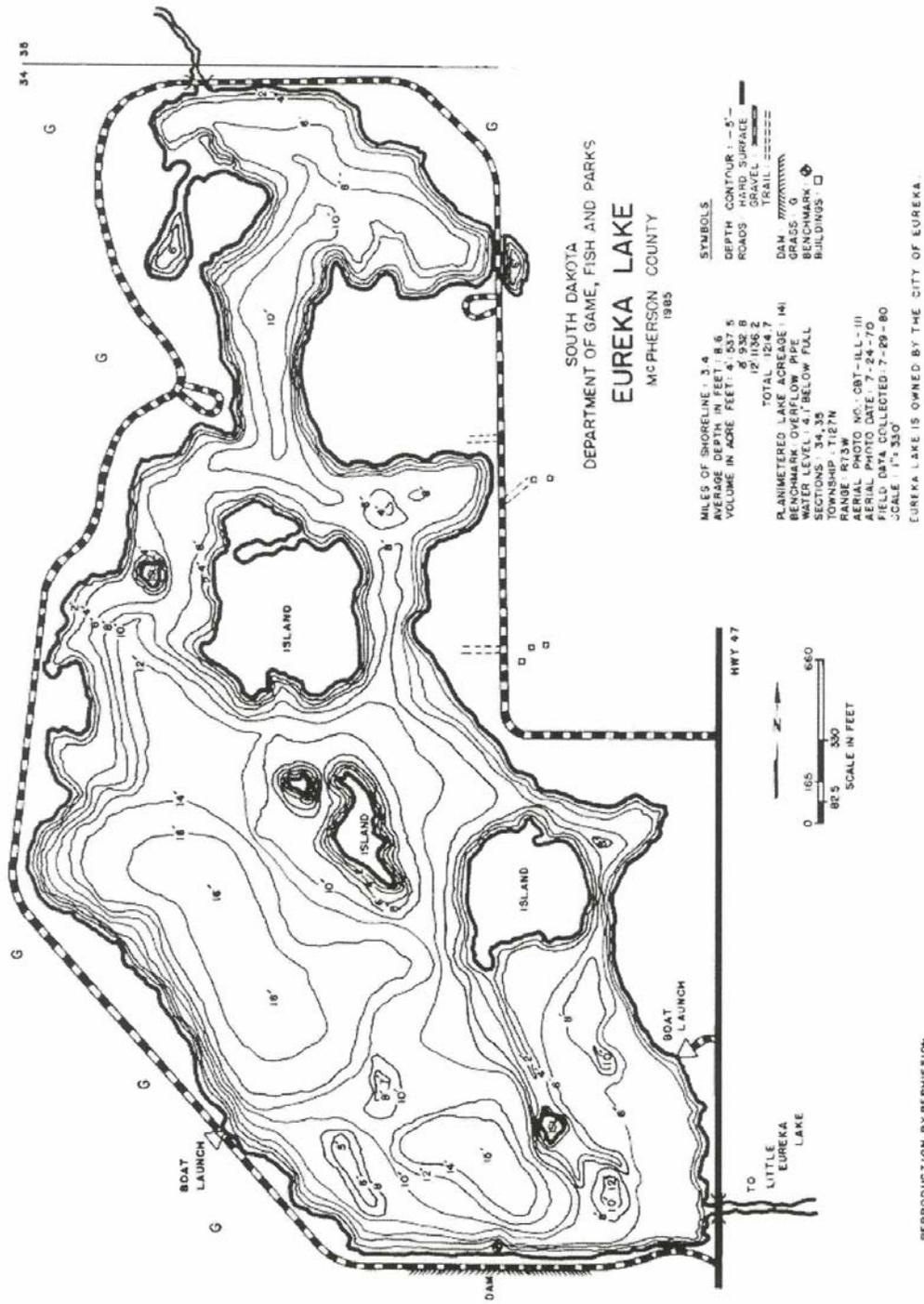


Figure 2. Contour map of Eureka Lake, Mcpherson County, South Dakota.

Management Objectives

- 1) Maintain a mean gill net CPUE of stock-length walleye ≥ 10 , a PSD of 30 – 60 and an RSD-P of 5-10.
- 2) Maintain a mean gill net CPUE of stock-length yellow perch ≥ 25 and a PSD of 30-60 and an RSD-P of 5-10.

Results and Discussion

Primary Species

Walleye: The mean gill net CPUE of stock-length walleye in 2006 was 13.7, a decrease from 20.3 reported in 2002 (Tables 1-3). The 2006 walleye gill net CPUE was above the minimum objective (≥ 10 stock length fish/net night) and is indicative of a moderate density walleye population.

Ermer et al. (2005) reported that recruitment appeared consistent in recent years prior to the 2002 survey with the 1999 and 2000 naturally-produced year classes being relatively strong (Table 6). Examination of the walleye length-frequency histogram, as well as age-structure information from walleyes captured in gill nets during 2006 indicates that recruitment has been variable in recent years, with the 2003 and 2005 year-classes being relatively strong (Figure 4; Table 6). The naturally-produced 2003 year-class comprised 47% of the walleye catch in 2006, while the 2005 year-class accounted for another 33%. It is unknown if the 2005 walleye year-class is naturally produced or the result of a large fingerling stocking made in the fall of 2005 (Table 5; Table 6). No walleye were captured from the 2002 year-class and only two from the 2004 year-class during the 2006, indicating limited recruitment of the 2002 and 2004 year-classes (Table 6).

Walleye captured in gill nets during 2006 ranged in total length from 240 to 710 mm (Figure 4). PSD and RSD-P values for walleye in 2006 were above the objective ranges (PSD 30-60, RSD-P 5-10) with values of 71 and 15, respectively, indicating a population skewed slightly toward larger individuals (Table 1, Figure 4). Presence of larger walleye in the gill net catch in 2006 indicates that angler harvest is likely not having a detrimental effect on the walleye size structure in Eureka Lake.

Growth appears good with weighted mean length at capture of age-3 walleye at 460 mm (Table 4). Condition of walleyes was good with mean W_r values ranging from the lower 90's to over 100 for length groups sampled, indicating ample prey availability

Yellow Perch: The mean gill net CPUE of stock-length yellow perch in 2006 was 26.0, an increase from the 1.0 observed during the 2002 survey (Tables 1-3). The increase in yellow perch relative abundance during the 2006 survey is due to the successful recruitment of yellow perch ranging from 140 to 180 mm into the population (Table 1; Table 3; Figure 3).

During 2006, gill net captured yellow perch ranged in total length from 130 to 270 mm, with a PSD of 29 and an RSD-P of 13 (Table 1, Figure 3). Size structure is

likely minimally impacted by angler harvest as low abundance precludes yellow perch as a target fishery (Ermer et al. 2005). However, if abundance increases, and size structure continues to improve anglers will likely begin targeting yellow perch in Eureka Lake. Yellow perch condition was good with mean relative weight (W_r) values exceeding 90 for all length groups sampled in gill nets during 2006.

Other Species

Other species sampled during the 2006 survey were black bullhead, common carp, northern pike, orange-spotted sunfish, and hybrid sunfish.

Black bullhead: Black bullhead densities were low with a mean frame net CPUE of stock-length fish of 0.2 (Table 1). A substantial decrease from the mean frame net CPUE values reported during the 1997 and 2002 surveys of 138 and 22.3, respectively. Limited recruitment in recent years has led to the decline, an occurrence common to several Region IV waters in recent years.

Bluegill: The mean frame net CPUE of stock-length bluegill in 2006 was 10.9, an increase from the 0.4 observed during the 2002 survey (Table 1; Table 3). Length-frequency analysis of frame net captured bluegills suggests successful recruitment in recent years (Figure 5).

Bluegill captured in frame nets during 2006 ranged in length from 70-170 mm (Figure 5). PSD and RSD-P values were 2 and 0, respectively, indicating a population dominated by smaller fish (Table 1). The low PSD and RSD-P values are likely the result of successful recruitment in recent years, as these fish grow PSD values should improve.

No growth information was collected in 2006. Condition of the frame net caught bluegills was good with mean relative weight (W_r) values over 100 for all length groups sampled (Table 2).

Common carp: Common carp densities appear low with mean gill net and frame net CPUE of stock-length fish of 5.7 and 0.2, respectively (Table 1).

Northern pike: Six northern pike were sampled in 2006, two in frame nets and 4 in gill nets. The mean gill net CPUE stock-length fish was 1.3 in 2006 (Table 1). It appears that abundance is low, but northern pike typically are not sampled effectively using standard lake survey methods; therefore reported values may not accurately represent the at-large population. Neumann and Willis (1995) reported the most reliable time to sample northern pike with gill nets in eastern South Dakota lakes was late spring following the spawn.

Orangespotted sunfish: Orange-spotted sunfish and other hybridized sunfish were sampled in low densities using frame nets in 2006 with mean frame net CPUE of all-size fish of 0.3 and 2.7, respectively (Table 1).

Management Recommendations

- 1) Conduct fish population assessment surveys on an every fourth year basis (next survey scheduled in summer 2010) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.
- 2) Collect otoliths from walleye, bluegill and yellow perch to assess age structure and growth rates of each population.
- 3) Stock walleye (≈ 25 large fingerlings/acre) biennially to add additional year classes to the population
- 4) Encourage commercial harvest of black bullhead to limit bullhead abundance when necessary.
- 5) Monitor water levels and winter/summer kill events. In cases of complete winter/summer kill stock northern pike, walleye and yellow perch to establish a fishery.

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 nets and frame nets in Eureka Lake, 2006. Confidence intervals include 80 percent (\pm CI-80) or 90 percent (\pm CI-90). BLB= black bullhead; BLG= bluegill; COC= common carp; NOP= northern pike; OSF= Orangespotted sunfish; HYB= sunfish hybrid; WAE= walleye; YEP= yellow perch

Species	Abundance		Stock Density Indices				Condition	
	CPUE	CI-80	PSD	CI-90	RSD-P	CI-90	Wr	CI-90
<i>Frame nets</i>								
BLB	0.2	0.2	---	---	---	---	85	37
BLG	10.9	4.9	2	2	---	---	101	1
COC	0.2	0.2	---	---	---	---	104	7
NOP	0.2	0.2	100	0	---	---	85	8
OSF ¹	0.3	0.2	---	---	---	---	---	---
HYB ¹	2.7	1.3	---	---	---	---	---	---
WAE	2.3	0.9	87	12	26	16	88	2
YEP	1.9	1.3	11	12	11	12	78	1
<i>Gill nets</i>								
BLB	0.7	0.6	100	0	50	50	104	61
BLG	1.7	2.2	---	---	---	---	112	5
COC	5.7	7.8	18	16	12	14	104	5
NOP	1.3	0.7	100	0	---	---	92	6
OSF ¹	0.3	0.7	---	---	---	---	---	---
WAE	13.7	6.3	71	12	15	9	94	1
YEP	26.0	11.8	29	9	13	6	96	< 1

¹ 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 nets and frame nets in Eureka Lake, 1999 - 2006.

Species	CPUE								Mean
	1999	2000	2001	2002	2003	2004	2005	2006 ²	
<i>Frame nets</i>									
BLB	---	---	---	21.9	---	---	---	0.2	11.1
BLG	---	---	---	0.4	---	---	---	10.9	5.7
COC	---	---	---	0.3	---	---	---	0.2	0.3
NOP	---	---	---	0.2	---	---	---	0.2	0.2
OSF ¹	---	---	---	0.0	---	---	---	0.3	0.2
HYB ¹	---	---	---	0.0	---	---	---	2.7	1.4
WAE	---	---	---	0.5	---	---	---	2.3	1.4
YEP	---	---	---	1.5	---	---	---	1.9	1.7
<i>Gill nets</i>									
BLB	---	---	---	15.3	---	---	---	0.7	8.0
BLG	---	---	---	0.0	---	---	---	1.7	1.7
COC	---	---	---	0.7	---	---	---	5.7	3.2
NOP	---	---	---	2.7	---	---	---	1.3	2.0
OSF ¹	---	---	---	0.0	---	---	---	0.3	0.2
WAE	---	---	---	20.3	---	---	---	13.7	17.0
YEP	---	---	---	1.0	---	---	---	26.0	13.5

¹ all fish sizes.

² 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 selected species captured in experimental gill nets in Eureka Lake, 1999 - 2006.

Species	1999	2000	2001	2002	2003	2004	2005	2006 ¹	Average	Objective
<i>Gill nets</i>										
WAE										
CPUE	---	---	---	20	---	---	---	14	17	≥ 10
PSD	---	---	---	49	---	---	---	71	60	30-60
RSD-P	---	---	---	2	---	---	---	15	9	5-10
Wr	---	---	---	92	---	---	---	94	93	---
YEP										
CPUE	---	---	---	1	---	---	---	26	14	≥ 25
PSD	---	---	---	67	---	---	---	29	48	30-60
RSD-P	---	---	---	0	---	---	---	13	7	5-10
Wr	---	---	---	84	---	---	---	96	90	---

¹ 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 Eureka Lake, 2002 and 2006. Note: Sampling was conducted approximately three months later in 2006.

Year	N	Age								
		1	2	3	4	5	6	7	8	9
2006 ¹	43	288	404	460	---	513	511	---	526	685
2002	64	230	338	393	426	500	---	---	---	---

¹ Age assignments made using otoliths; scales were used in previous years

Table 5. Stocking history including size and number for fishes stocked into Eureka Lake, 1996 - 2006. (SXW= saugeye; WAE= walleye)

Year	Species	Size	Number
1998	SXW	juvenile	1,232
2005	WAE	large fingerling	8,800

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

Survey Year	Year Class									
	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
2006 ^{1,2}		14	2	20		1	2		2	2
2002						3	25	17	16	3
Number stocked										
juvenile									1	
large fingerling		9								

¹ Fish aged using otoliths, scales were used in previous years.

² 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").

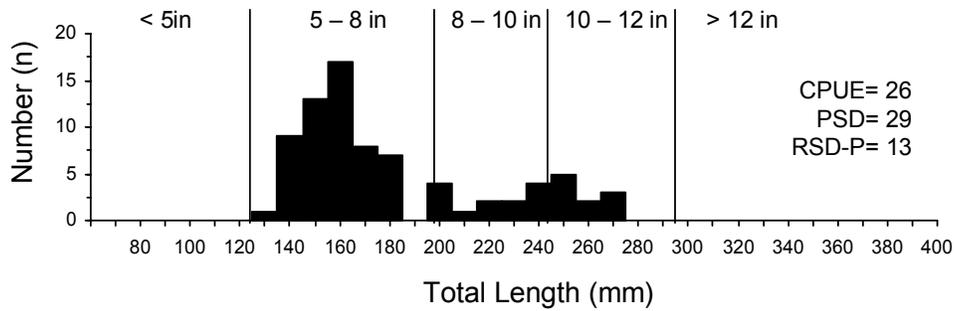


Figure 3. Length-frequency, catch rate of stock-length fish (CPUE), proportional stock density (PSD), and relative stock density of preferred-length fish (RSD-P) for yellow perch captured in gill nets in Eureka Lake 2006.

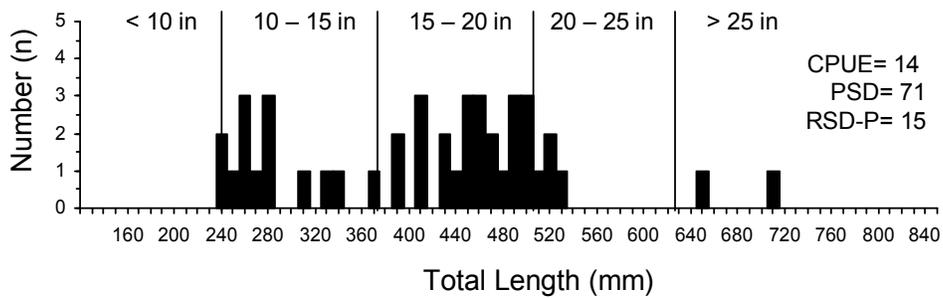


Figure 4. Length-frequency, catch rate of stock-length fish (CPUE), proportional stock density (PSD), and relative stock density of preferred-length fish (RSD-P) for walleye captured in gill nets in Eureka Lake, 2006.

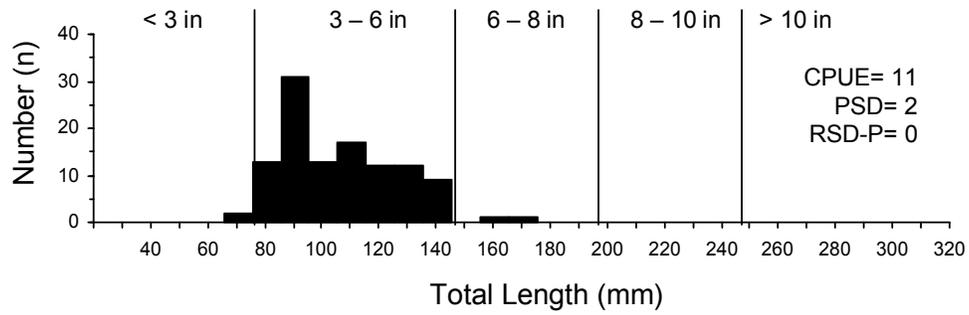


Figure 5. Length-frequency, catch rate of stock-length fish (CPUE), proportional stock density (PSD), and relative stock density of preferred-length fish (RSD-P) for bluegill captured in frame nets in Eureka Lake 2006.