



Minnesota Pollution Control Agency

Prepared in cooperation with the
Minnesota Department of Natural Resources

Minnesota Lake ID: 69-0810

Area: 742 acres

Watershed Area: 3,695 acres

Ecoregion: Northern Lakes and Forests (NLF)

Elephant Lake

St. Louis County

Sentinel Lakes

Trophic State: Mesotrophic

Maximum Depth: 30 feet

Mean Depth: ~15 feet

Mixing Status: Polymictic



Figure 2. Elephant Lake bathymetric map

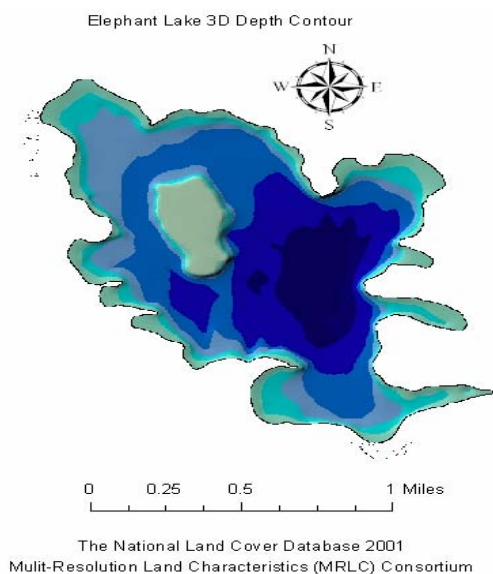


Figure 2. Elephant Lake Watershed map

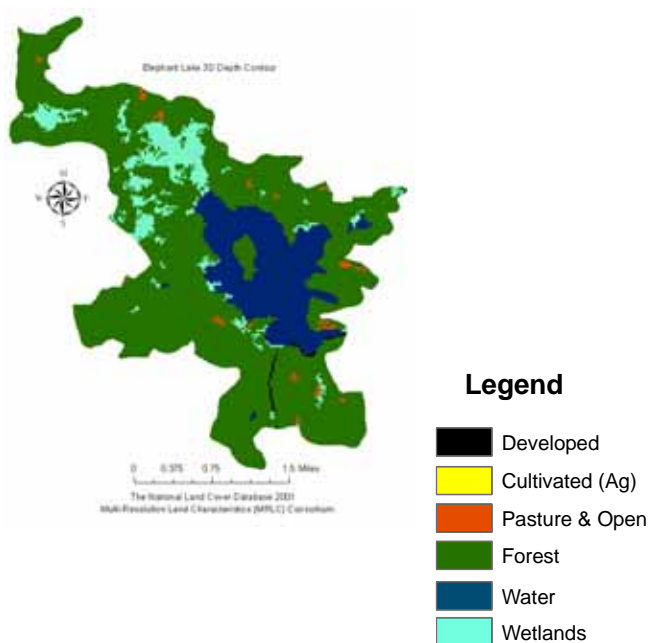


Table 1. Elephant Lake land use as compared to typical range for NLF ecoregion reference lakes

Land use	Elephant Lake land use percentage	NLF typical land use percentage
Developed	<1	0 – 7
Cultivated (Ag)	0	<1
Pasture & Open	<1	0 – 6
Forest	74	54 – 87
Water & Wetland	24	14 – 31
Feedlots (#)	0	

Table 2. Elephant Lake 2008 as compared to typical range for NLF ecoregion reference lakes
Data from Minnesota Department of Health (MDH) laboratory

Parameter	Elephant Lake 2008	NLF
Number of reference lakes		32
Total Phosphorus (µg/L)	24	14 – 27
Chlorophyll mean (µg/L)	6.5	4 – 10
Secchi Disk (feet)	9.6	8 -15
(meters)	2.9	2.4 – 4.6
Total Kjeldahl Nitrogen (mg/L)	0.57	0.4 – 0.75
Alkalinity (mg/L)	38	40 – 140
Color (Pt-Co U)	27	10 – 35
pH (SU)	6.84	7.2 – 8.3
Chloride (mg/L)	1.2	0.6 – 1.2
Total Suspended Solids (mg/L)	1.7	<1 – 2
Total Suspended Inorganic Solids (mg/L)	1.3	<1 – 2
Conductivity (umhos/cm)	86	50 – 250
TN:TP ratio	23:1	25:1 – 35:1

µg/L = micrograms per liter	Pt-Co-U = Platinum Cobalt Units
mg/L = milligrams per liter	SU = Standard Units
umhos/cm = micromhos per centimeter	

Figure 3. Elephant Lake dissolved oxygen (DO) and temperature profile

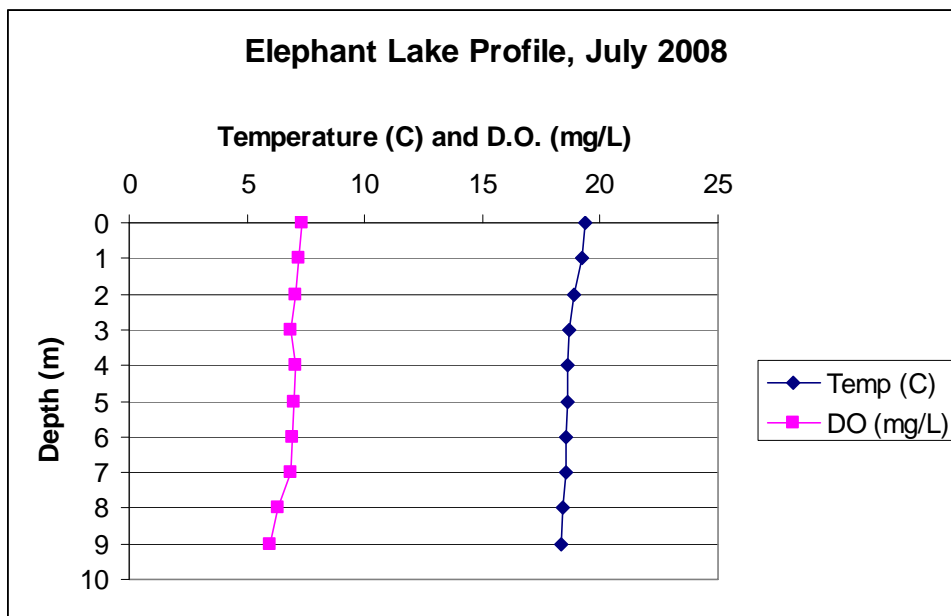
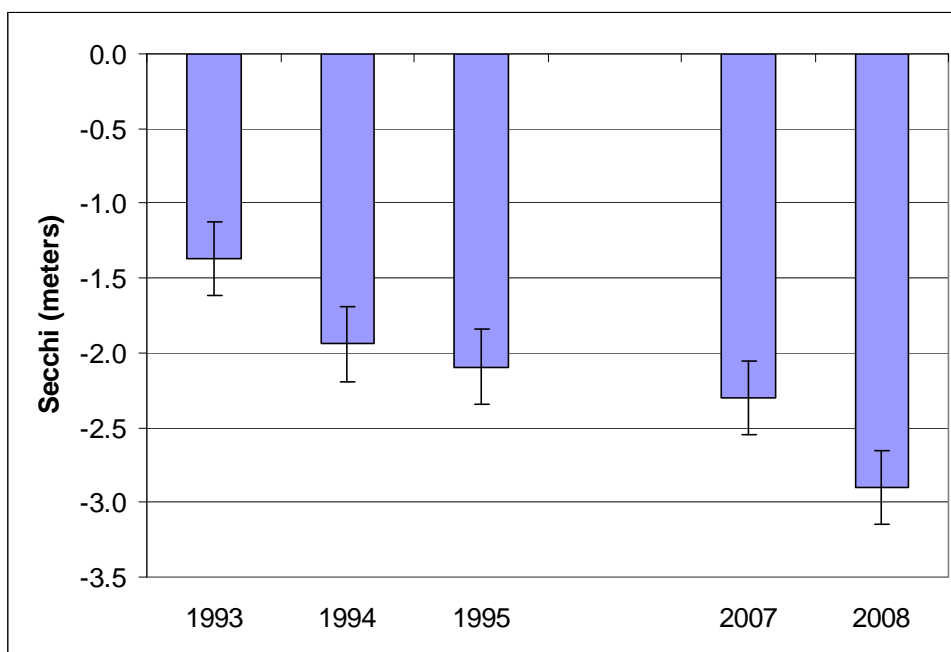


Figure 4. Elephant Lake summer mean secchi transparency data



Water Quality, Fishery and Watershed Management Issues

Elephant Lake, located ten miles northeast of Orr, has a surface area of 742 acres. It forms the headwaters of Elephant Creek, a tributary to the Vermilion River (Figure 1). About 45 percent of the lake area is littoral with an overall average depth of about 15 feet. Water residence time is estimated at 3.5 years. It has a small watershed relative to its surface area (5:1 ratio) that is almost entirely forested and wetland (Table 1); there is a moderate amount of lakeshore development – one resort and about 30 homes or cabins.

Based on DO and temperature profiles from 2008 the lake is well mixed and DO remained above 5 mg/L, a level sufficient to support a warm water fishery (> 5 mg/L), throughout the water column (Figure 3). Total phosphorus (TP), chlorophyll-a, and other water quality variables (Table 2) indicate that Elephant Lake is well within the typical range of Northern Lakes and Forests ecoregion reference ('minimally impacted') lakes. There is limited historical water quality data on Elephant. Citizen Lake Monitoring Program (CLMP) Secchi transparency data indicates summer-mean Secchi has varied from 1.4 - 2.8 meters based on five summers of data. Though the more recent measures are deeper than those reported for the mid-1990's the data record is very short and discontinuous and as such, is insufficient to characterize this as a long-term trend (Figure 4). It will be important that CLMP measurement is continued on the lake as a part of the Sentinel Lake monitoring effort.

Elephant Lake is a nutrient-rich lake with relatively low fish species diversity compared with similar lakes with undisturbed forested watersheds. Elephant maintains a self-sustaining walleye population. The walleye population is currently high (Table 3) with many large individuals, but recruitment has been variable over the years. Like walleye, northern pike populations are currently high quality. Similar to other lakes in the border lakes ecoregion, warm-water centrarchids are becoming increasingly abundant, with abundant populations of black crappie and large smallmouth bass. Climate change should continue to favor warm water fish species perhaps to the detriment of native cool water species. If yellow perch (primary forage of walleye and northern pike) remain abundant, Elephant Lake may be able to support modest populations of cool-water and warm-water species over the long term.

Table 3. Primary species captured during recent surveys and their size and abundance compared with other lakes in the same lake class

Species	Stocked	Abundance	Size	Notes
Walleye*	N	High	Average-large	
Northern Pike	N	Average	Large	
Yellow perch	N	High	Average	
Black Crappie	N	High	Average	
Smallmouth bass	N	High	Large	
Bluegill	N	Average	Average	Discovered in 1977
Pumpkinseed	N	Average	Average	
White sucker	N	Average	Average	

*Management emphasis on this species

Table 4. Aquatic plant summary

Percent cover of aquatic plants \leq 15ft deep	58.6
Lake depth beyond which most vegetation disappeared	7.6ft
Number of common species (i.e., \geq 10% cover)	7
Non-native plant infestation	NA