

South Center Lake

Chisago County

Sentinel Lakes

Minnesota Lake ID: 13-0027

Area: 835 acres

Watershed Area: 10,788 acres

Ecoregion: North Central Hardwood Forest (NCHF)

Trophic State: Eutrophic

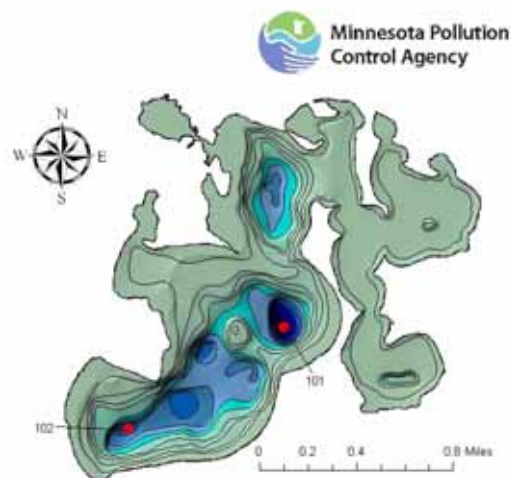
Maximum Depth: 109 feet

Mean Depth: 16 feet

Mixing Status: Dimictic



Figure 1. South Center Lake 3D depth contour



**DNR Ecological Services & Fisheries Division 2002
Lake Bathymetric DEM Shaded Relief Image**

Figure 2. South Center Lake Watershed land use

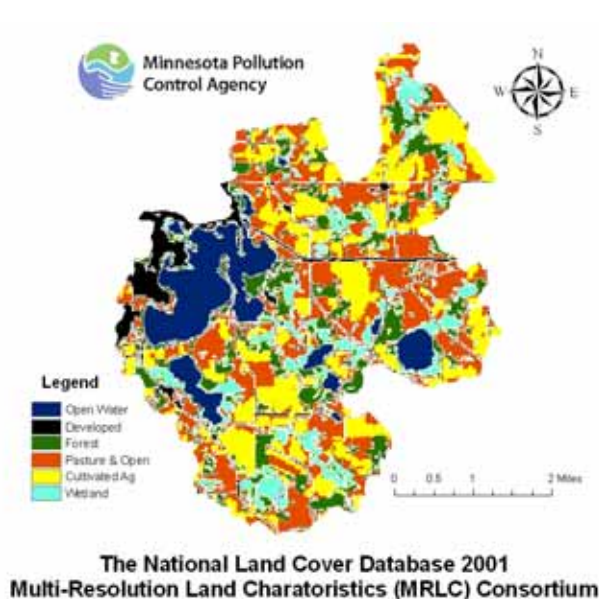


Table 1. South Center land use compositions

Land Use	South Center Lake Land Use %	NCHF Typical Land Use %
Developed	9	2-9
Cultivated (Ag)	23	22-50
Pasture & Open	38	11-25
Forest	19	6-25
Water & Wetland	11	14-30
Feedlots (#)	7	

**Table 2. South Center Lake summer-mean as compared to typical range for NCHF ecoregion reference lakes
MPCA data based on 1985-86 and 2008 sample collections**

Parameter	South Center Site 101 (deepest point, central basin)	South Center Site 102 (southwest basin)	NCHF
Number of reference lakes	-	-	43
Total Phosphorus (µg/L)	42	35	23-50
Chlorophyll mean (µg/L)	19	14	5-22
Secchi Disk (feet) (meters)	1.5	2.1	4.9-10.5 (1.5-3.2)
Total Kjeldahl Nitrogen (mg/L)	1.2	-	<0.60-1.2
Alkalinity (mg/L)	54	-	75-100
Color (Pt-Co U)	7.5	-	10-20
pH (SU)	8.0	7.8	8.6-8.8
Chloride (mg/L)	20	-	4-10
Total Suspended Solids (mg/L)	5	-	2-6
Total Suspended Inorganic Solids (mg/L)	4	-	1-2
Conductivity (umhos/cm)	154	179	300-400
TN:TP ratio	29:1	34:1	25:1 - 35:1

µg/L = micrograms per liter

mg/L = milligrams per liter

umhos/cm = micromhos per centimeter

Pt-Co-U = Platinum Cobalt Units

SU = Standard Units

Figure 3. South Center 2008 temperature and dissolved oxygen profiles and trophic status measurements

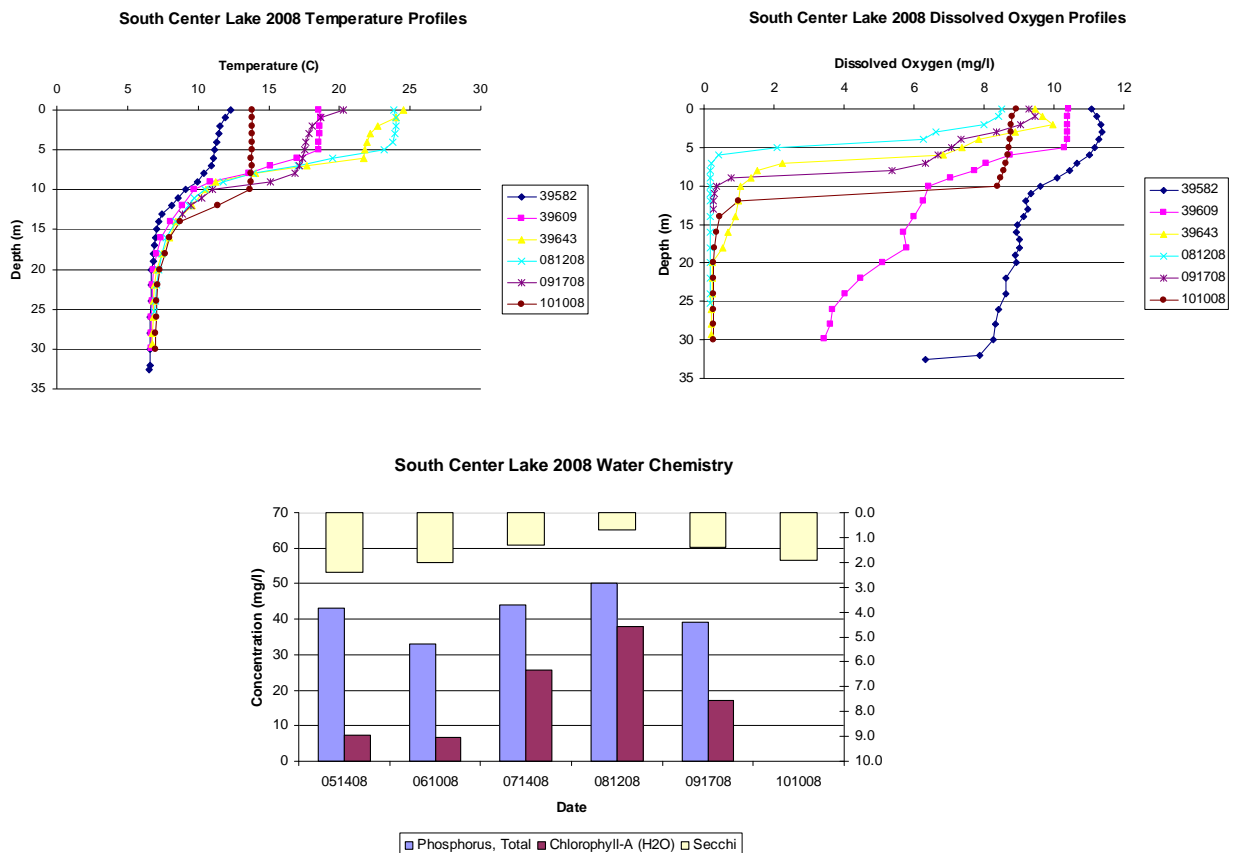
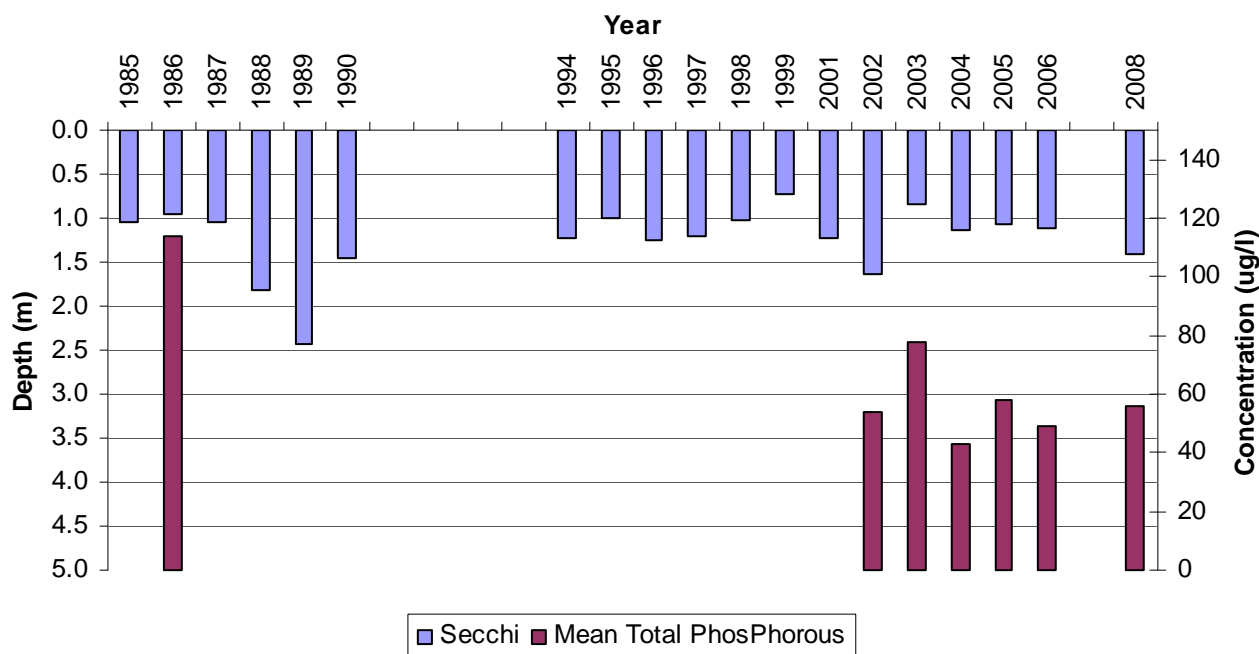


Figure 4.

Summer Mean Phosphorus and Secchi



Watershed, water quality, and fishery summary

South Center is part of a chain of lakes in southern Chisago county and is directly connected to North Center Lake through a navigable channel (Figure 2). The lake has several deep holes, with very sharp breaks (Figure 1) but is also characterized by an extensive littoral area (67%). Land use in the watershed is comparable to the typical range for NCHF ecoregion reference lakes (Table 1). South Center is a popular recreational lake with high summer boat traffic and high fishing pressure throughout the year.

The lake exhibits strong stratification throughout the summer months with low dissolved oxygen levels beneath the thermocline (Figure 3). Most water chemistry variables were within the typical range for NCHF reference lakes (Table 2). Total phosphorus and chlorophyll-a tend to increase from June through August (Figure 3). This pattern is more commonly seen in shallow lakes where internal recycling (phosphorus release from sediments, curly-leaf pondweed senescence, etc.) may be a significant portion of the mid-summer phosphorus load. In South Center the heavy infestation of curly-leaf (Table 3) may be a primary reason for the mid-summer increase.

South Center has some historic data available for comparison. Based on Secchi data gathered through the MPCA's Citizen Lake Monitoring Program, summer mean Secchi transparency typically ranges from 1.0-1.5 m in most summers and there is no apparent trend (Figure 4). There is good recent total phosphorus data for the lake and that suggests concentrations typically range between 40-60 $\mu\text{g/L}$ in most summers (Figure 4).

Table 3. Focal species captured during recent surveys and their size and abundance compared with other lakes in its lake class. The "biotic integrity" score for South Center in 2008 was 53, which was slightly below average compared with other lakes of similar productivity.

Species	Stocked	Abundance	Size
Walleye*	Y	Average	Large
Northern Pike*	Y	Low	Large
Black Crappie	N	High	Small
Largemouth bass	N	High	Small
Pumpkinseed	N	Low	N too small
Bluegill	N	Average	Average-large
Yellow perch	N	Average	Average
White Sucker	N	Average	Large

*Management emphasis on these species

Table 4. Aquatic plant summary

Percent cover of aquatic plants \leq 15ft deep	55%
Number of common species (i.e., \geq 10% cover)	1
Lake depth at which most vegetation disappeared	6.7ft
Infested with non-native plants	Curly-leaf pondweed (heavily) Eurasian watermilfoil (N Center)

Fishery and plant narrative

South Center is a deep, eutrophic lake that is managed primarily for walleye through biennial fingerling stocking. South Center also harbors larger-than-average northern pike, but lower-than-average numbers of them. Northern pike populations may be supplemented in the future with stocking if numbers remain low. Black crappie are abundant but recent surveys only captured one individual greater than 9", suggesting poor size-structure of the crappie population. In contrast, 18 percent of the many bluegills captured in summer nets were greater than 7 inches. Summer and winter angling pressure are both high (this lake receives average annual pressure of 114 angler-hours/acre) and black crappie and bluegill are the most commonly targeted and harvested species. South Center is heavily infested with the non-native curly-leaf pondweed. In 2008, Eurasian watermilfoil was documented for the first time in North Center Lake which is directly connected to, but downstream of, South Center. Curly-leaf pondweed in South Center grows abundantly in spring then senescens in July, followed by an algae bloom that limits summer growth of native submersed aquatic plants. Emergent and floating leaved vegetation in South Center are mostly limited to areas of undeveloped shoreline in shallow bays. Actions that promote higher water clarity (through reduced nutrient loading), reduced cover of non-native plants, and increased cover of native plants should benefit a wide range of fish species in South Center. Policies that remove aquatic plants (non-native or native) without addressing watershed nutrient loads may have harmful consequences to a wide range of fish species.