

Minnesota Lake ID: 34-0032

Area: 91 acres

Watershed Area: 4,042 acres

Ecoregion: Western Corn Belt Plains (WCP)

Trophic State: Mesotrophic - Eutrophic

Maximum Depth: 26 feet

Mean Depth: 10.4 feet

Mixing Status: Thermally Stratified (Dimictic)



Figure 1. Lake Carrie 3D depth contour

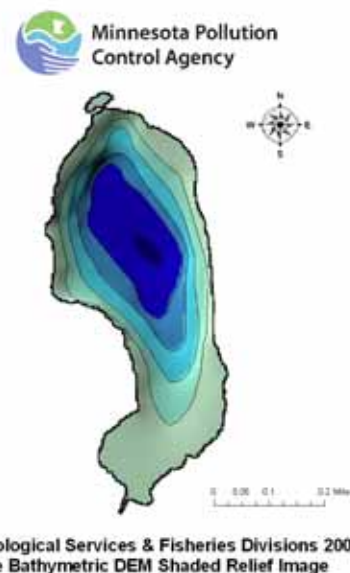


Figure 2. Lake Carrie Watershed land use

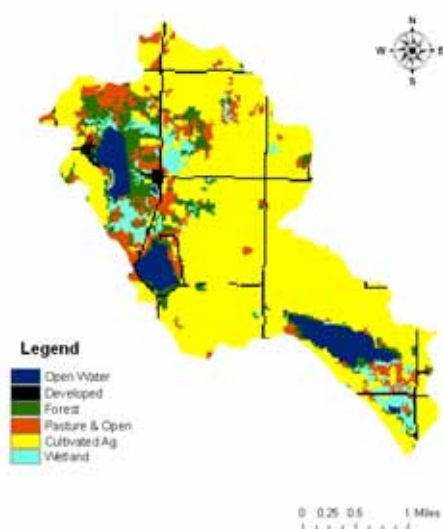


Table 1. Lake Carrie land use compositions

Land use	Lake Carrie land use percentage	WCP typical land use percentage
Developed	4	0-16
Cultivated (Ag)	65	42-75
Pasture & Open	10	0-7
Forest	8	0-15
Water & Wetland	13	3-26
Feedlots (#)	1	

Table 2. Lake Carrie 2008 summer-mean as compared to typical range for WCBP ecoregion reference lakes

Parameter	Lake Carrie	WCBP
Number of reference lakes		16
Total Phosphorus (µg/L)	21	65-150
Chlorophyll mean (µg/L)	5	30-80
Secchi Disk (feet)		
(meters)	1.4	0.5-1.0
Total Kjeldahl Nitrogen (mg/L)	0.8	1.8-2.3
Alkalinity (mg/L)	200	125-165
Color (Pt-Co U)	5	15-25
pH (SU)	7.9	8.2-9.0
Chloride (mg/L)	11	13-22
Total Suspended Solids (mg/L)	5	7-18
Total Suspended Inorganic Solids (mg/L)	3	3-9
Conductivity (umhos/cm)	461	300-650
TN:TP ratio		17:1-27:1

µg/L = micrograms per liter

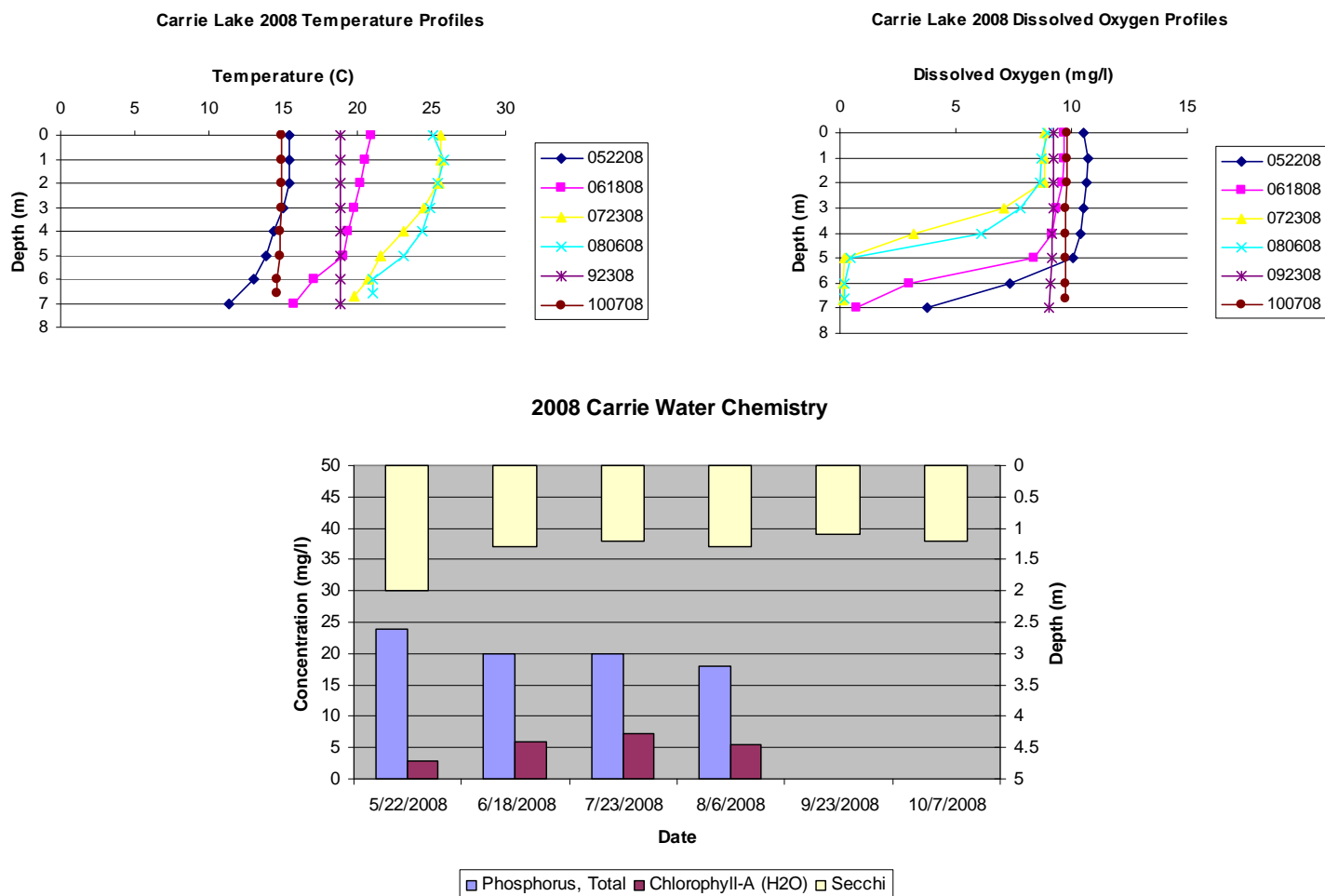
mg/L = milligrams per liter

umhos/cm = micromhos per centimeter

Pt-Co-U = Platinum Cobalt Units

SU = Standard Units

Figure 3. Lake Carrie 2008 temperature and dissolved oxygen (DO) profiles and trophic status measurements



Watershed, water quality and fishery summary

Lake Carrie is a small lake (Figure 1) at only 91 acres. It has a mean depth of 10.4 feet, which is deeper than the surrounding lakes in the area. It has a relatively large watershed (44:1 ratio) characterized by agricultural uses (Figure 2). Due to the absence of severe algal blooms, Lake Carrie has exceptional water clarity compared to other lakes in close proximity. The bottom substrate consists mainly of fine sediments which can be mixed up from heavy boat activity or storms. Such events affect water clarity.

Carrie exhibited weak stratification in June through August 2008 (Figure 3). When it was stratified, dissolved oxygen (DO) fell below 2 mg/L rapidly in the lower waters, and anoxic conditions were noted for July and August. Total Phosphorus (TP) was stable to declining from May through August, and chlorophyll-a remained at relatively low levels (Figure 3). In general, Lake Carrie's water quality measurements are much better than the typical range for WCBP lakes, and are more typical of NCHF ecoregion reference lakes (Table 2).

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 Lake Carrie in 2008 was 75.0, which is above average compared with other lakes of similar productivity and indicates a balanced fish community.

Species	Stocked	Abundance	Size	Trend	Notes
Walleye*	Y	Average	Average	Stable	
Northern Pike	N	Average	Large	Stable	
Black Crappie*	N	Average	Average	Decreasing	Status has varied over time
White Crappie	N	Average	Average	Increasing	Status has varied over time
Largemouth bass*	N	Average	Large	Stable	Status has varied over time
Bluegill	N	Average	Average	Stable	
Yellow perch	N	Average	Average	Stable	
White Sucker	N	Average	Average	Stable	

*Management emphasis on these species

Table 4. Aquatic plant summary

Percent cover of aquatic plants \leq 15ft deep	27%
Number of common species (i.e., \geq 10% cover)	1
Lake depth beyond which most vegetation disappeared	1.5 ft
Non-native plant infestation	Curly-leaf pondweed (variable)

Narrative

Lake Carrie is a popular lake with local anglers for crappie, bass, northern pike, and bluegill. Carrie is connected during high to normal water levels via the outlet to Lake Elizabeth (DOW#: 34-0022), which is a moderately large (1,054 acres), shallow (nine feet maximum depth), eutrophic, and periodically aerated lake. Fish movement between these two lakes is possible during high water conditions. Walleye populations are sustained through biennial yearling/adult stocking and immigration from Lake Elizabeth, which is periodically stocked with walleye fry. The population status of most managed species is generally within the management goals of Carrie Lake. Although recruitment has been variable through the years, northern pike size is currently above-average compared with lakes similar to Carrie. Benthivorous carp and bullhead, and light-medium agricultural runoff can contribute to turbid water conditions and low aquatic plant growth in the lake. Still, aquatic plant growth in Carrie has been variable in the past, with northern watermilfoil and curly-leaf pondweed covering much of the 60 acres of lake area that has a water depth less than 15 feet. Hardstem bulrush and cattail stands consistently line most of the shoreline. Shoreline development (ten homes/cabins) is relatively low compared to other area lakes due to a higher percentage of low wetland areas adjacent to the shoreline and long-term ownership of surrounding farmland.