Minnesota Pollution Control Agency

Prepared in cooperation with the
Minnesota Department of Natural Resources

St. James Lake

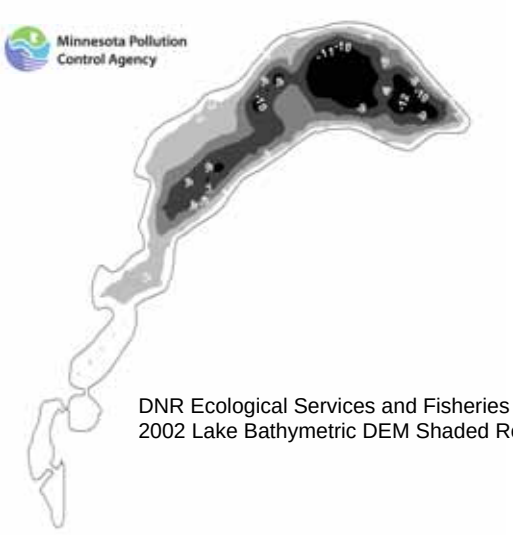
Watonwan County

Sentinel Lakes

Minnesota Lake ID: 83-0043
Area: 252 acres
Watershed Area: 2,337 acres
Ecoregion: Western Corn Belt Plain (WCBP)

Trophic State: Mesotrophic - Eutrophic
Maximum Depth: 16 feet
Mean Depth: 4 feet
Mixing Status: Not Stratified (Polymictic)

Figure 2. St. James Lake bathymetric map



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

Figure 1. St. James Lake Watershed land use

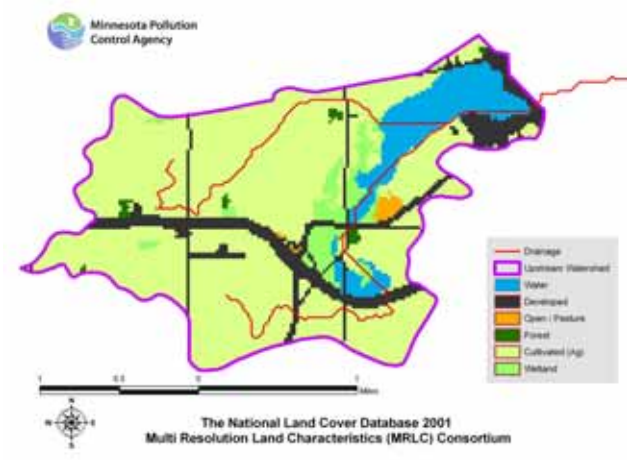


Table 1. Land use compositions

Land use	St. James Lake land use percentage	WCBP typical land use percentage
Developed	12	0 – 16
Cultivated (Ag)	71	42 – 75
Pasture & Open	5	0 – 7
Forest	5	0 – 15
Water & Wetland	2	3-26
Feedlots (#)	1	

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Table 2. St. James Lake 2008 as compared to typical range for WCBP ecoregion reference lakes
MPCA data based on 2008 sample collections

Parameter	St. James 2008	WCBP
Number of reference lakes		16
Total Phosphorus (µg/L)	54	65 – 150
Chlorophyll mean (µg/L)	15.9	30 – 80
Secchi Disk (feet) (meters)	1.5	0.5-1.0
Total Kjeldahl Nitrogen (mg/L)	1.14	1.3 – 2.7
Alkalinity (mg/L)	156	125 – 165
Color (Pt-Co U)	16.6	15 – 25
pH (SU)	8.8	8.2 – 9.0
Chloride (mg/L)	55	13 – 22
Total Suspended Solids (mg/L)	4	7 – 18
Total Suspended Inorganic Solids (mg/L)	1.2	3 – 9
Conductivity (umhos/cm)	535	300 – 650
TN:TP ratio	21: 1	17:1 – 27:1

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. St. James Lake 2008 temperature and dissolved oxygen (DO) profiles

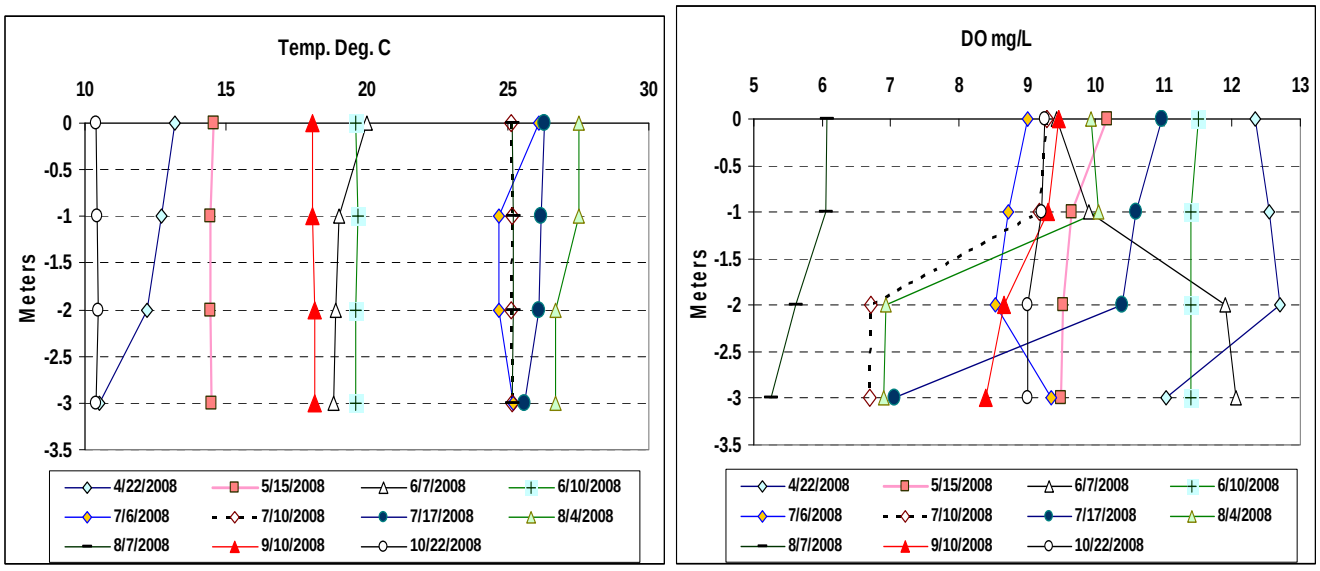


Figure 4. St. James Lake Summer 2008 total phosphorus (TP), chlorphyll-a (Chl-a), and secchi

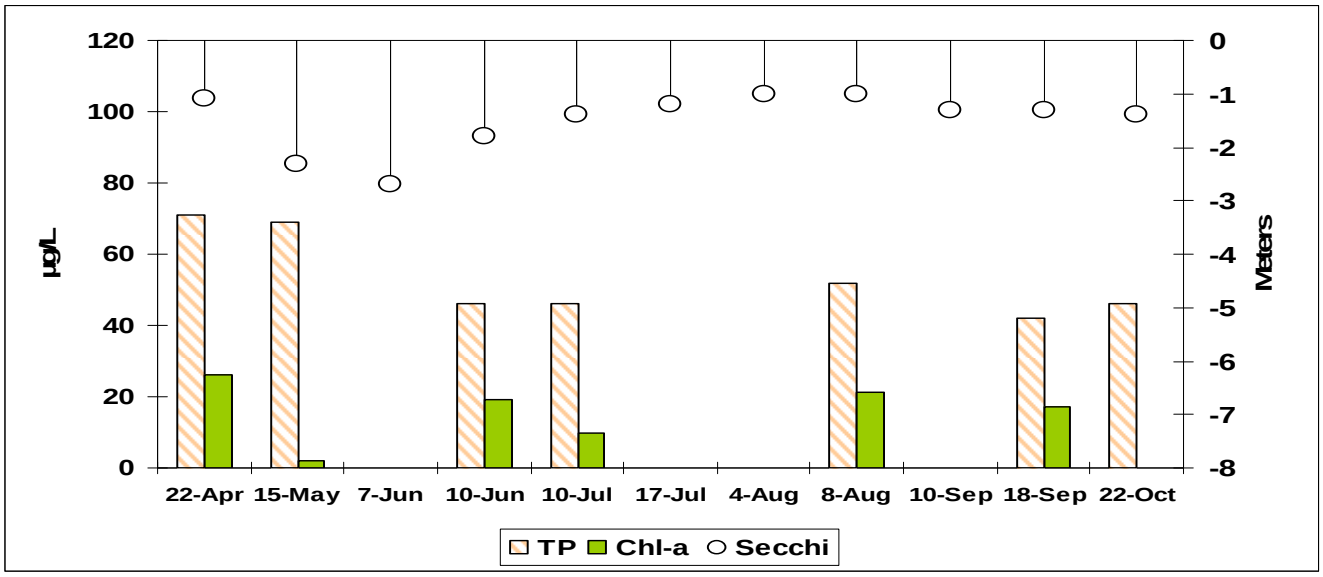
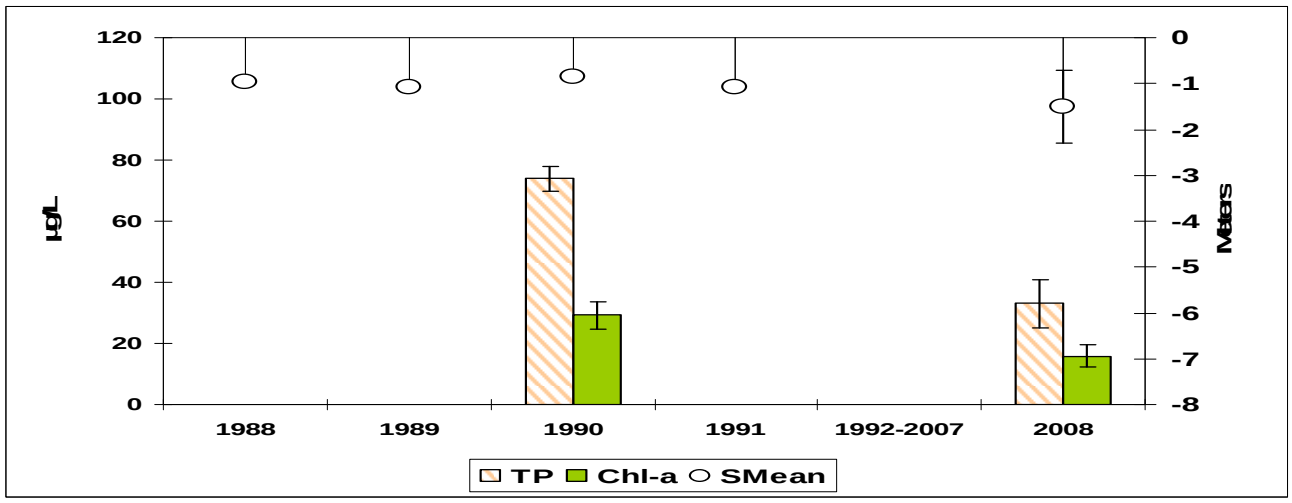


Figure 5. St. James Lake summer-mean TP, chl-a, and secchi



Watershed and Water Quality Summary

St. James Lake is located just south of the city of St. James in Watonwan County. The lake is small and shallow, and is almost 100 percent littoral. The watershed-to-lake ratio is moderate at 11:1 with agriculture as the dominant land use. A dense aquatic plant community was observed during most of the open water season. Plant density made the western portion of the lake very difficult to navigate for most of the monitoring season. Water quality data on the lake is sparse with the exception of a 1990 Lake Assessment Program study available on at http://www.pca.state.mn.us/publications/reports/lar-83-0043.pdf.

Temperature and DO profiles were measured regularly through the summer of 2008 with the help of the Smith family. Water temperatures were uniform from top to bottom on most dates (Figure 3). DO profiles varied throughout the summer in response to changes in temperature and algal and macrophyte photosynthesis – with the latter being quite important in or near the plant beds. All DO measurements were above 5 mg/L which is considered the threshold for successful long term fish survival.

Many of the water chemistry measurements for St. James were within the typical range or better than that observed in WCBP ecoregion reference lakes (Table 2). Chl-*a* and Secchi were better than the typical range and this is likely a reflection of the high macrophyte density that serves to suppress algal growth via competition for nutrients, providing refuge for Daphnia and potentially direct inhibition of algal growth. Chloride levels were approximately 3 times the typical value found in lake in this ecoregion. Similar chloride results were found in 1991. Though chloride levels are well below the water quality standard of 230 mg/L, they are quite high relative to typical lakes in the region and suggest the lakes is likely impacted from urban storm water and road salt.

Transparency in 2008 peaked in St. James in mid-June, following very low Chl-*a* levels in May (Figure 4). TP concentrations were slightly higher in April and May (reflects spring turnover) while from June to October results were fairly stable. TP, Chl-*a* in 2008 were lower and Secchi values were higher than those measured in the 1990 study (Figure 5).

Table 3. Focal species captured during recent surveys and their size and abundance compared with other lakes in its lake class

Species	Stocked	Abundance	Size	Trend
Walleye	Y	High	Average	Stable
Northern Pike	N	Average	Large	Stable
Black Crappie	N	Average	Average	Stable
Largemouth bass*	N	High	Small	Increasing
Bluegill*	N	Average	Average-large	Increasing
Yellow perch	N	Average	Average	Stable

*Management emphasis on these species

Table 4. Aquatic plant summary

Percent cover of aquatic plants ≤ 15 ft deep	71%
Number of common species (i.e., ≥ 10% cover)	4
Lake depth beyond which most vegetation disappeared	5.3ft
Non-native plant infestation	Curly-leaf pondweed (heavily)
Frequency of *Chara*	4%

Narrative

St. James has a storied history of dredging, lake reclamation, and winter aeration to support aquatic plants and sport fish populations. These actions appear to have paid off. St. James supports quality populations of blue gill, walleye, northern pike, and largemouth bass and an above-average score for the community “integrity”, which is a measure of the diversity and balance of the fish community. Currently, abundance of disturbance-tolerant species such as carp and black bullhead are very low. The small size-structure of largemouth bass is likely due to young fish (the lake was reclaimed in 2001) rather than slow-growth. Despite being heavily infested with the non-native curly-leaf pondweed, vegetation in the lake remains remarkably diverse through the period of curly-leaf pondweed senescence in summer. High cover of diverse vegetation is a unique habitat feature compared with other lakes in this region of the state and likely contributes to the balanced fish community in the lake. Further watershed actions that limit nutrient inputs into the lake may bolster Chara, a planktonic algae-filtering plant that is important for fish habitat and maintaining clear water.