Twin Lake

Lake Status Report

Prepared for
Ramsey-Washington Metro Watershed District

April 2007

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Twin Lake
Lake Status Report

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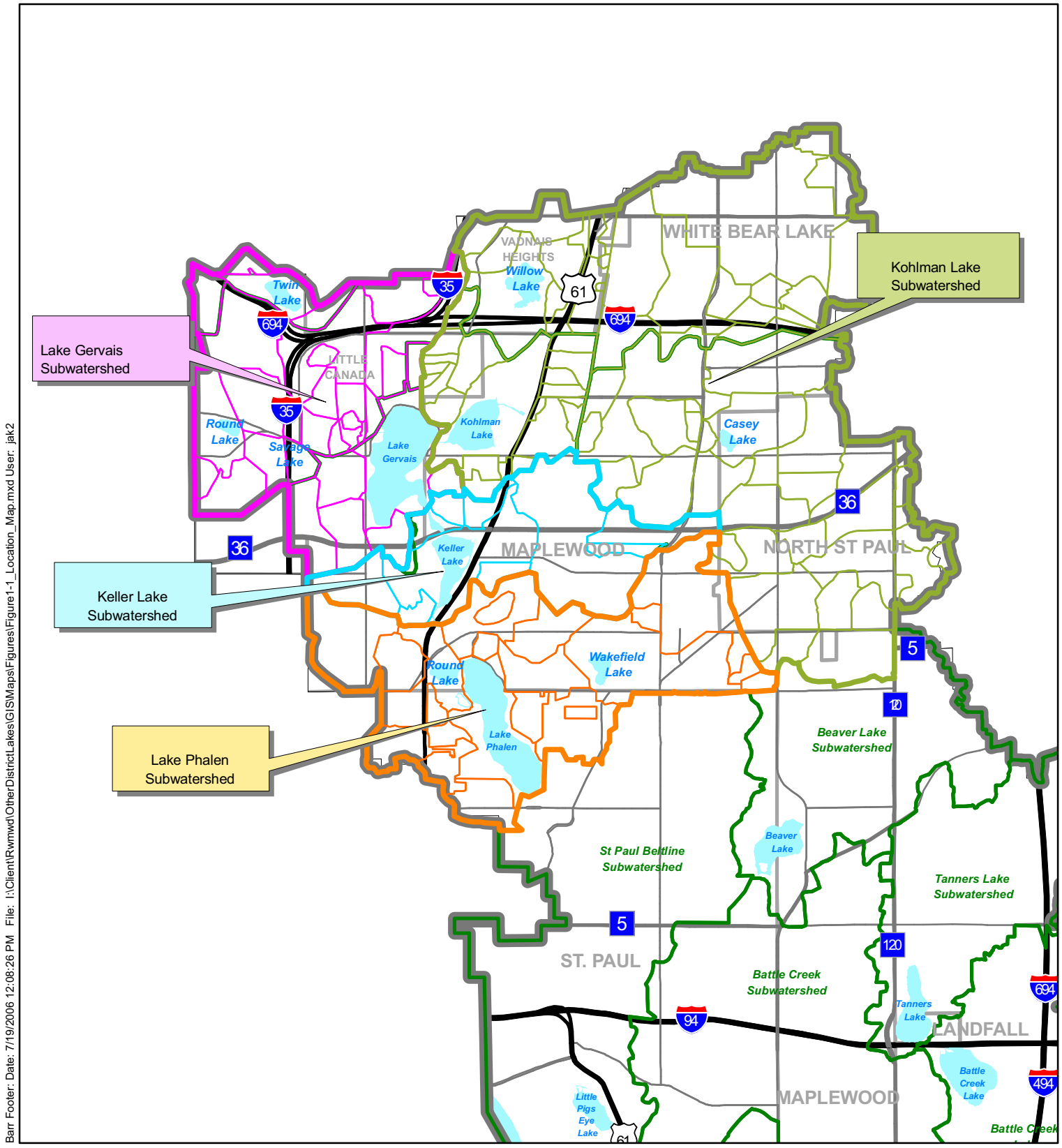
1.0 Introduction

One of the primary goals of the Ramsey-Washington Metro Watershed District (District) is to maintain or improve the quality of surface waters to meet or exceed the water quality necessary to support the District's designated beneficial uses. In 1997 the District established beneficial use categories based on desired recreational activities for a waterbody; and revisited again with the 2006 update as part of the development of the *Ramsey-Washington Metro Watershed District Watershed Management Plan* (Plan) (Barr, 1997; Barr, 2006 [draft]),. The recreational-use categories are ranked from Level 1 through Level 5, with Level 1 water bodies having the highest number of recreational uses and best water quality.

In order to help achieve desired water quality goals established in Plan, many of the lakes within the District have been studied in Strategic Lake Management Plans (SLMPs). However, for many of the smaller lakes within the District, SLMPs have not yet been completed and District water quality goals have not been re-evaluated. Because of limited lake information and water quality data, the development of a complete SLMP would not be possible for many of these small water bodies. Instead, a Lake Status Report (LSR) will be developed and recommendations will be made to outline future studies for these lakes.

The purpose of this LSR is to summarize and evaluate the available information for Twin Lake which has not been previously studied and to determine appropriate water quality goals based on the current and desired recreational uses, as outlined in the Plan, and through discussion with District staff. The watershed areas tributary to Twin Lake has already been modeled as part of the development of the larger Phalen Chain of Lakes SLMP (Barr, 2004 [Draft]). Figure 1-1 shows the location of Twin Lake.

The Plan (Barr, 2006 [draft]) includes preliminary water quality goals and management classes for each of the District-managed lakes. The water quality goals are defined in terms of total phosphorus (TP), chlorophyll *a* (Chl *a*), and Secchi disc (SD). The goals outlined in the Plan will remain preliminary until an SLMP or other similar study, such as this LSR, is completed and appropriate goals are determined. The preliminary goals are consistent with either the Minnesota Pollution Control Agency's (MPCA) proposed draft criteria for shallow lakes in the North Central Hardwood Forests (CHF) ecoregion (MPCA, 2005), or the goals listed in the 1997 Plan.



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Feet
6,000 0 6,000

Figure 1-1

Location Map

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Ramsey-Washington Metro Watershed District

For lakes, the District management classes are identified as either "Improvement" or "Prevent further degradation." An "Improvement" class is warranted if the public perceives a need for water quality improvement and there are feasible management options that will accomplish water quality improvement. A "Prevent further degradation" class is assigned when current water quality meets the goals set for the lake. A "Prevent further degradation" class does not, however, imply inaction. Rather, development requirements, fisheries, shoreline, and macrophyte management; as well as additional water quality improvement projects; are pursued for the lake as opportunities and budgets allow.

For wetlands, the District has developed management Classes A, B, and C, based on a recent inventory and assessment of wetlands within the District. The wetland classification is based on the estimated quality of the wetland, with management Class A being the highest quality wetlands. Water bodies classified as "Water Quality Pond" are constructed treatment ponds only.

Additional classifications of the water bodies based on water quality include the Impaired Waters List under Section 303(d) of the *Federal Clean Water Act* (CWA). Those water bodies that do not meet the water quality standards established under the CWA are included on this list and future development of total maximum daily loads (TMDL) is required. The Minnesota Department of Natural Resources (MDNR) has developed another ecological management classification system for Minnesota lakes (Schupp, 1992) that is based on parameters such as lake size, depth, chemical fertility, and growing season length.

Table 1-1 summarizes the goals and classifications of Twin Lake. Note that for District-managed wetlands there are no water quality goals established. Additionally, note that the 2006 Preliminary RWMWD Water Quality Goals are those listed in the Plan (Barr, 2006 [draft]). The 2006 Proposed RWMWD Water Quality Goals are the result of this LSR and evaluation of the information available for the Lake.

Table 1-1 Summary of RWMWD Recreational-Use Level (2006 Draft Plan), Preliminary RWMWD Water Quality Goals (2006 Draft Plan), Proposed RWMWD Goals (Result of LSR), and Management Class (2006 Draft Plan) as well as 303(d) Impaired Waters and MDNR Ecological Management Class

Water Body	RWMWD Use Level	2006 Preliminary RWMWD Water Quality Goal	2006 Proposed RWMWD Water Quality Goal	RWMWD Management Class	303(d) Impaired Waters Pollutant	MDNR Ecological Class
Twin Lake	2	45-75 µg/L TP 20-40 µg/L Chl*a* 2-3 ft SD	40 µg/L TP[1] 14 µg/L Chl*a*[1] 4.6 ft SD[1]	Prevent further degradation	N/A	30

1- Water quality goals are consistent with the MPCA's draft criteria for non-shallow lakes in the North Central Hardwood Forests (CHF) ecoregion (Minnesota Lake Water Quality Assessment Report: Developing Nutrient Criteria. Third Edition, September, 2005)

2.0 Lake Status Summary

2.1 Twin Lake

2.1.1 Lake and Watershed Characteristics

2.1.1.1 Description of Twin Lake

Twin Lake is located just south of Lake Vadnais and Vadnais Boulevard in Little Canada (Township 30, Range 22, Section 31) and is a 35.5-acre District-managed lake. It is classified as Protected Public Water in the MDNR Public Waters Inventory (62-39P), and is a non-shallow lake based on criteria as outlined by MPCA (MPCA, 2005).

It has a maximum depth of 33 feet, and there is lake bathymetry data available from the MDNR. Twin Lake's approximate bathymetry can be seen in Figure 2-1. There is, however, no historic lake level data available for Twin Lake. Twin Lake is a land-locked lake with no primary surface outlet although a high water level discharge pipe will be added to Twin Lake as part of the "Unweave the Weave" project at the I35E/I694 interchange. This pipe will discharge to Gervais Creek. For a photo of Twin Lake, see Figure 2-2. The maximum NWL used in all studies and modeling of Twin Lake is estimated to be 870.7 feet MSL. The critical 100-year flood elevation for Twin Lake was determined to be 873.7 feet MSL (Barr, 1997; Barr, 2006 [Draft]). The extent of the 100-year critical flood is mapped in Figure 2-3.

2.1.1.2 Watershed Characteristics

The Twin Lake watershed (including the lake surface area) covers a 201-acre area north of the junction of I-694 and I-35E and south of Vadnais Boulevard and Vadnais Lake, and it is part of the larger Lake Gervais watershed. The breakdown of land use in the watershed is as follows: Agricultural (6.7%), Highway (0.4%), Institutional (1.4%), Low-density residential development (44.7%), Natural/park/open (28.4%), Open water (16.0%), and Wetland (2.4%). Figure 2-4 shows the distribution of land uses within the Twin Lake watershed.

Drainage from the watershed flows from both the east and the west into Twin Lake (see Figure 2-5) and three storm sewer outfalls to the lake were identified. Additionally, several past studies (Barr, 1975; Barr, 1988; SEH, 1989) of Twin Lake and the surrounding area suggest that during severe rainstorms and flooding conditions, Twin Lake may also receive overflow drainage from Vadnais Lake. Overflow to Twin Lake begins when Vadnais Lake reaches an elevation of 884.6 feet MSL

(Barr, 1993). There are a few small stormwater treatment ponds located within the residential areas of the Twin Lake watershed.

As previously mentioned, Twin Lake is a land-locked basin. However, during extremely high flood conditions, the lake backs-up through the 48-inch culvert located under the railroad tracks on the southeast side of the lake, which, under normal conditions, acts as an inlet to Twin Lake. If flood conditions are severe enough, water backing up through this culvert could eventually flow through the culvert under I-694 and discharge to Gervais Creek (formerly County Ditch 16) located south of the lake (Barr, 1993).

2.1.1.3 Recreational Uses

There is currently no public access to Twin Lake, as most of the land adjacent to the lake includes private residential development. Therefore, the recreational use of the lake is typically limited to residents living along the lake. A number of private docks on the lake were observed. Twin Lake has been assigned a District recreational-use level of 2 which includes uses such as canoeing, wildlife habitat, and aesthetic viewing with occasional jet skiing and fishing on the Lake. Additionally, there have not been any citizens expressing concern to the District about lake water quality.

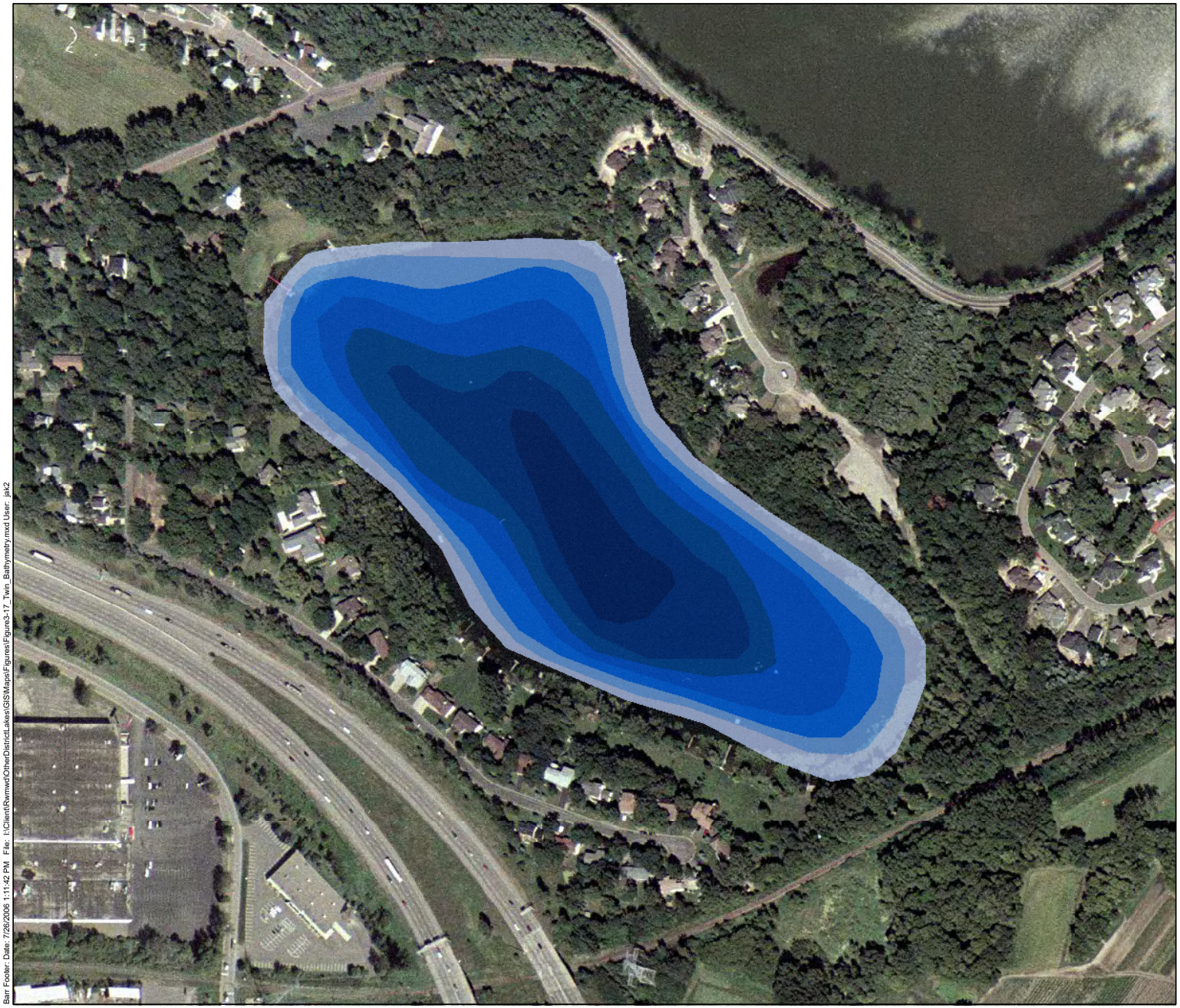

Figure 2-1

Twin Lake
Approximate Bathymetry

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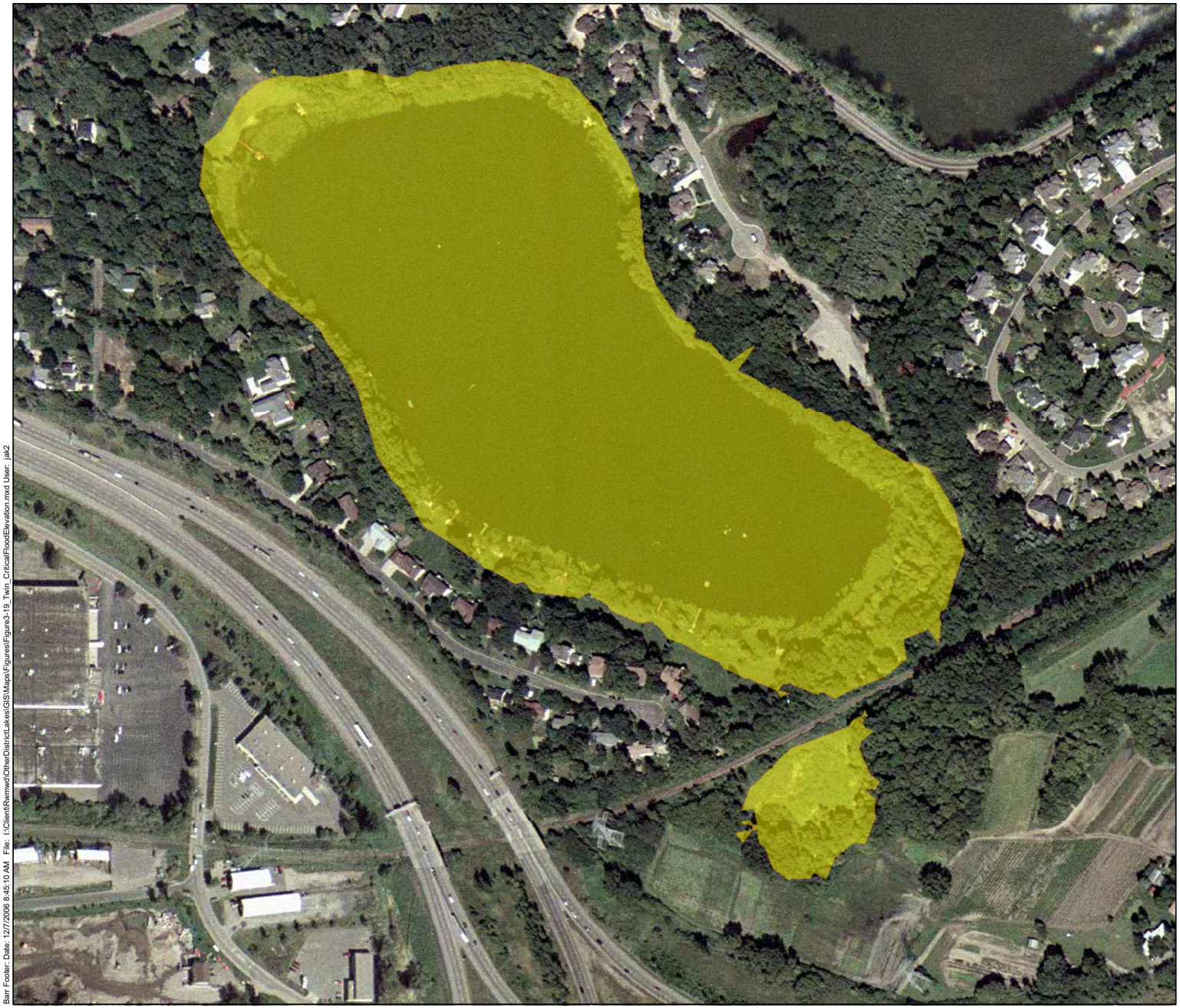
Figure 2-2
Twin Lake
(Photo Taken 5/11/2006)



Legend

Flood Elevation = 873 ft MSL

N

Feet
250 0 250

Figure 2-3

Twin Lake
Critical Flood Elevation

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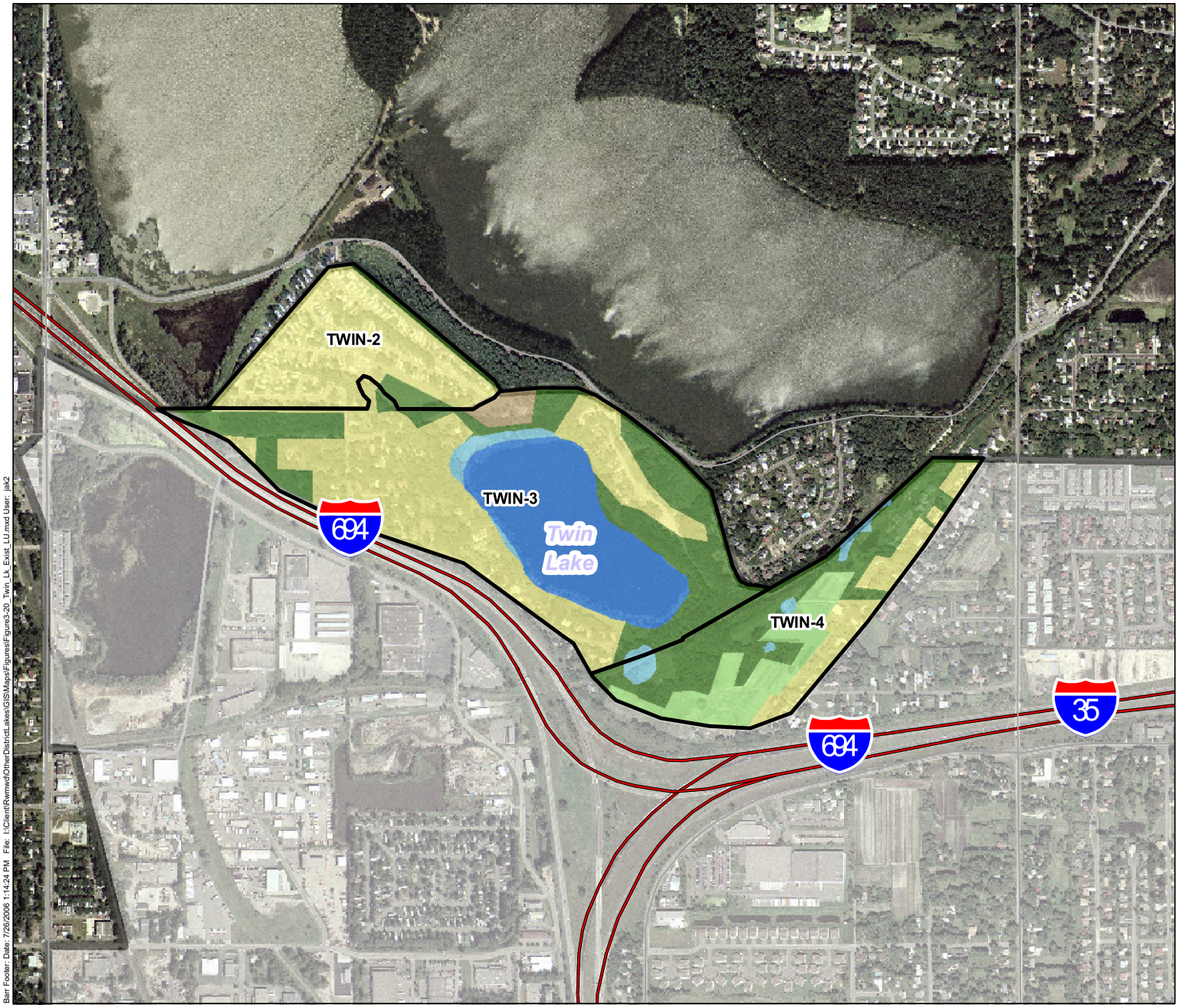

Legend

Land Use

- Natural/Park/Open
- Developed Parkland
- Golf Course
- Agricultural
- Very Low Density Residential
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Institutional
- Institutional - High Imperviousness
- Airport
- Highway
- Commercial
- Industrial/Office
- Other
- Open Water
- Wetland
- Twin Lake Subwatersheds
- RWMWD Boundary

N

Feet

750 0 750

Figure 2-4

Twin Lake Watershed
Land Use

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Legend

- Twin Lake Subwatersheds
- Flow Direction
- RWMWD Boundary

N

Feet
750 0 750

Figure 2-5

Twin Lake Watershed
Subwatersheds & Drainage

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2.1.2 Water Quality Data

2.1.2.1 Water Quality Analysis

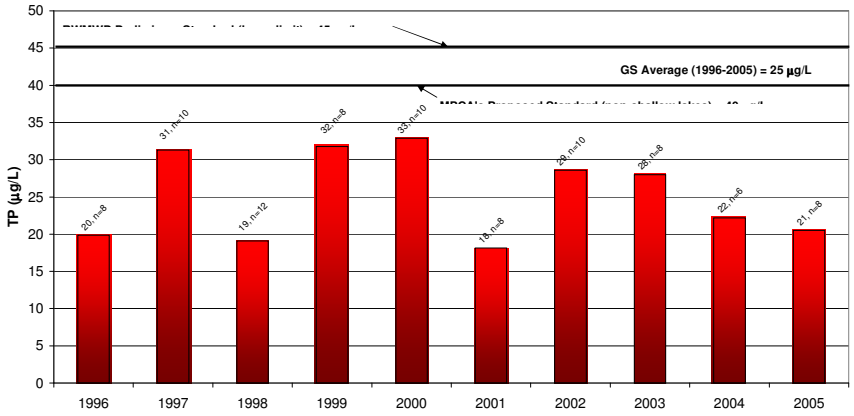
Water quality data is available for Twin Lake from 1996—2005, including data for TP and Chl *a* concentrations as well as SD transparencies. The mean summer average TP and Chl *a* concentrations for Twin Lake were 25 µg/L and 6 µg/L, respectively. The summer average SD transparency was 9.4 feet.

Based on the available data, Twin Lake has a TSI index of 57 for TP, 51 for Chl *a*, and 47 for SD. Overall, Twin Lake would be classified as a mesotrophic to borderline eutrophic lake.

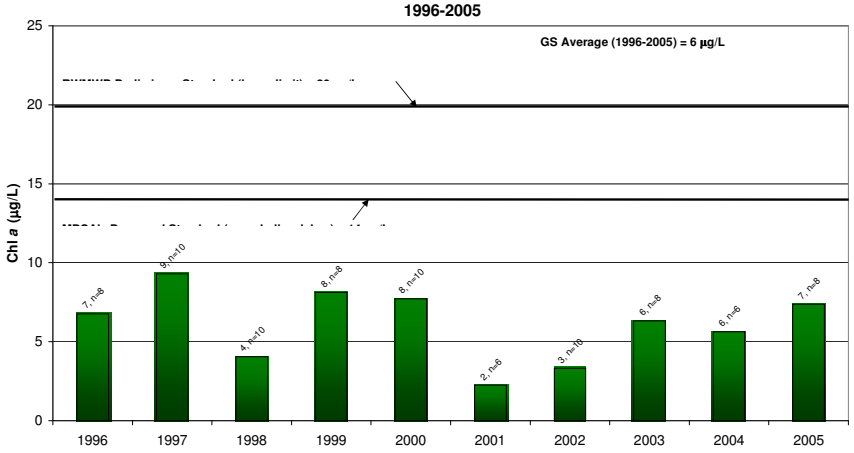
A trend analysis was done on the water quality data available for Twin Lake. The results of this trend analysis suggest that there was neither significant degradation nor improvement in lake water quality over the period of 1996-2005. Twin Lake water quality data is displayed in Figure 2-6. Figure 2-7 shows the relationships between TP, Chl *a*, and SD transparencies for Twin Lake.

The most recent fishery survey was completed in 1996 by the MDNR. The most abundant species surveyed was bluegill. Low to moderate numbers of black crappie were sampled as well as a moderate number of northern pike. Largemouth bass were also sampled in low numbers. Other species present included yellow perch, hybrid sunfish, pumpkinseed, and green sunfish. Review of the past decade of MDNR fishery stocking reports suggests that Twin Lake has not recently been stocked with fish. Additionally, Twin Lake was given an MDNR ecological classification of 30 which suggests a good, permanent fishery. No macroinvertebrate, phytoplankton, or zooplankton surveys have been done for Twin Lake.

TWIN LAKE
Growing Season (June through September) Average
Total Phosphorus Concentrations
1996-2005



TWIN LAKE
Growing Season (June through September) Average
Total Chlorophyll *a* Concentrations
1996-2005



TWIN LAKE
Growing Season (June through September) Average
Secchi Disc Transparencies
1996-2005

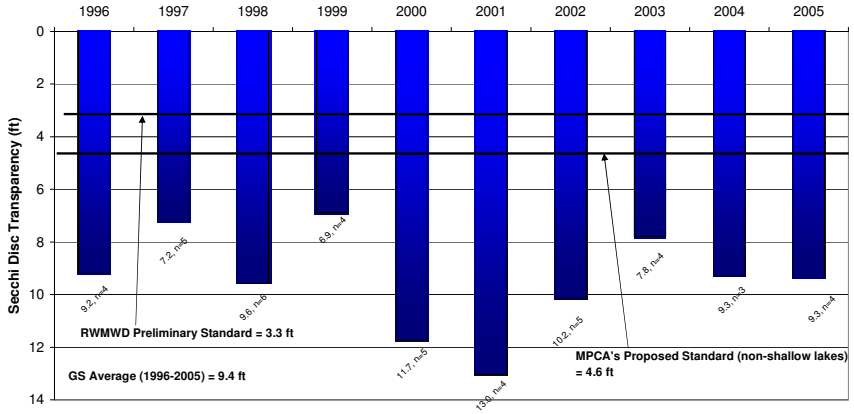
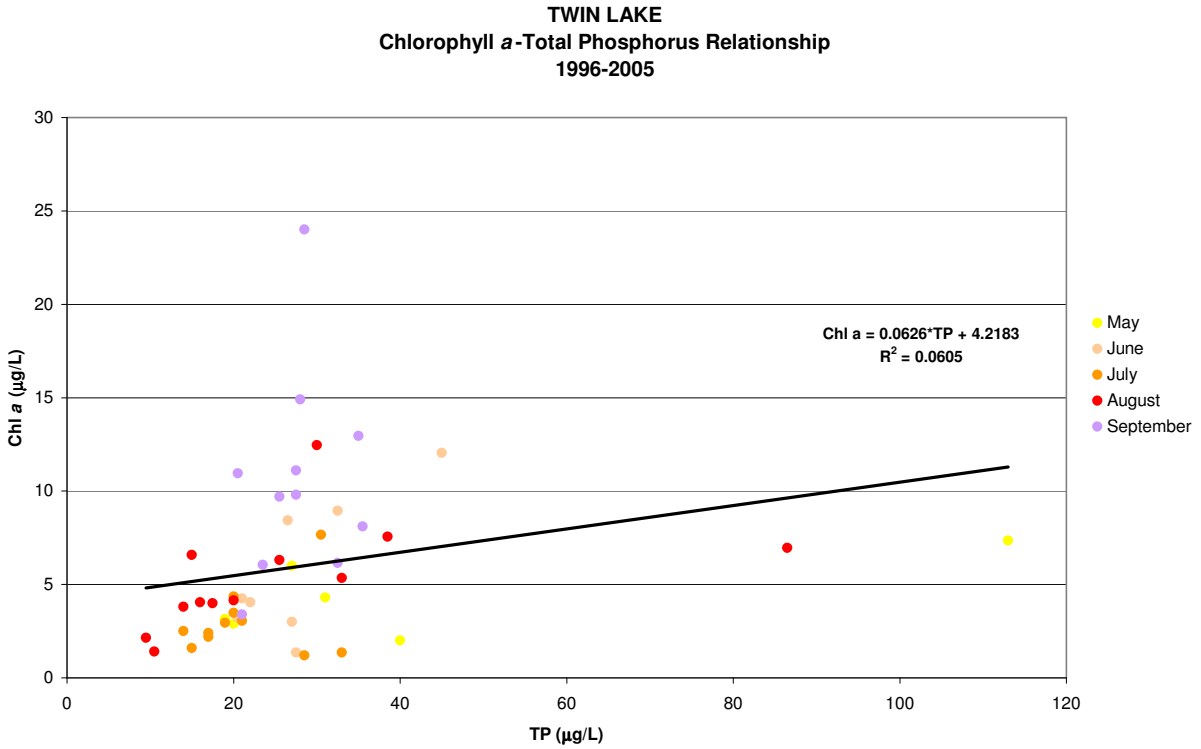


Figure 2-6
Twin Lake Growing Season (June through September) Averages for Total Phosphorus and Chlorophyll *a* Concentrations and Secchi Disc Transparency



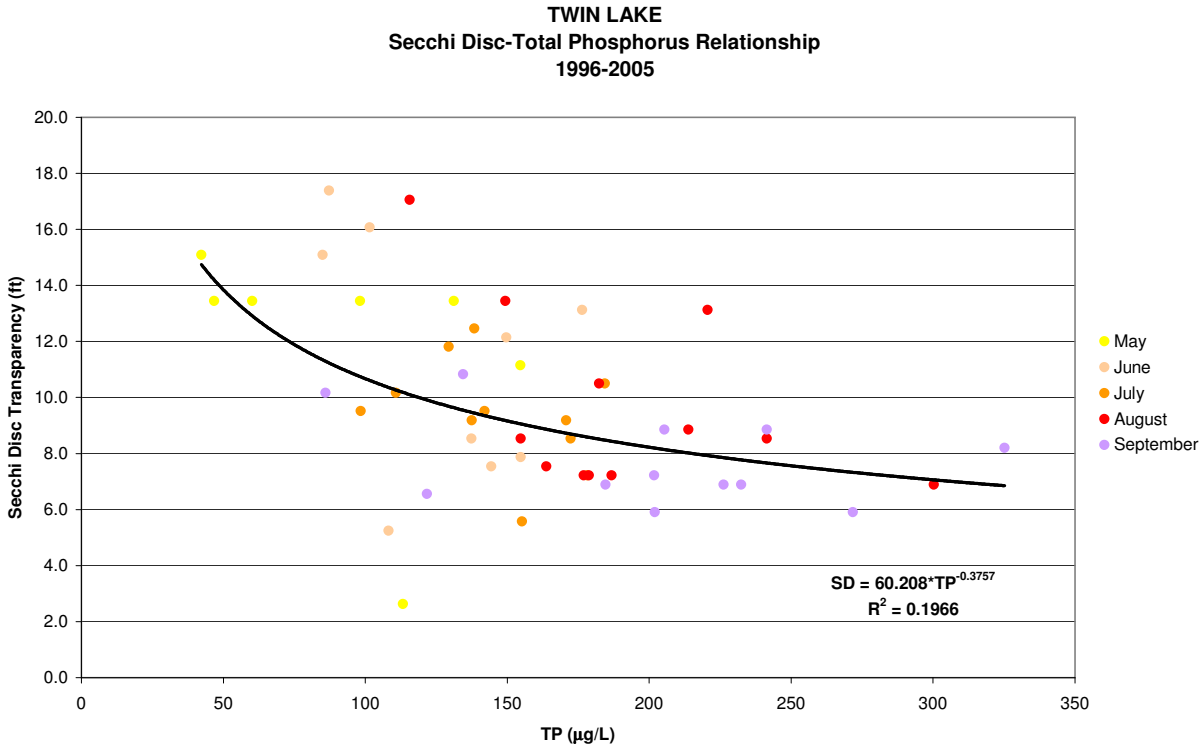


Figure 2-7
Twin Lake Relationship between Total Phosphorus, Chlorophyll *a*, and Secchi Disc Transparency

2.1.2.2 P8 Modeling Results

The P8 Model of the Twin Lake watershed was run for wet, dry, and average climatic conditions. Water and total phosphorus loads to Round Lake were determined for each climatic period. The results of this modeling are summarized in Table 2-1.

Table 2-1 P8 Estimated Watershed Runoff and TP Loads to Twin Lake under Wet, Dry, and Average Climatic Conditions

Climatic Condition (Water Year)	Parameter		Load
Wet (10/1/01-9/30/02)	Flow	ac-ft	68.95
	TP	lbs	68.71
Average (10/1/00-9/30/01)	Flow	ac-ft	105.95
	TP	lbs	70.39
Dry (10/1/88-9/30/89)	Flow	ac-ft	59.75
	TP	lbs	47.93

It is important to note that climatic condition periods were selected based on depths of precipitation over a 17-month period that included the summer before the water year of interest because it is assumed that the water and TP load to the lake during this period affects the following year's spring TP concentration. During the 12-month period from October through September (the water year), however, the water and phosphorus loads to the lake were slightly higher during the average year than the wet year.

2.1.3 Recommendations

2.1.3.1 Water Quality Goals

Preliminary District water quality goals for TP, Chl *a*, and SD are listed in the updated *Watershed Management Plan* (Barr, 2006 [draft]) and are the same as those listed in the 1997 Plan, and the district management class is listed as "Prevent further degradation." Twin Lake is not listed on the CWA 303(d) Impaired Waters List and it has MDNR ecological class of 30 assigned, suggesting a good, permanent fishery.

See Table 1-1 for a summary of applicable classifications and goals established for Twin Lake.

Analysis of the available water quality data suggests that Twin Lake meets or exceeds the preliminary District standards for all three parameters to be considered. Twin Lake also meets the MPCA standards for (non-shallow) lakes in the North Central Hardwood Forest ecoregion. See Figure 2-6.

The Minnesota Lake Eutrophication Analysis Procedure (MINLEAP) is a screening tool for estimating lake conditions and for identifying "problem" lakes. In addition, MINLEAP modeling has been done in the past to identify Minnesota Lakes which may be better or worse than they "should be" based on their location, watershed area and lake basin morphometry.

Results from MINLEAP suggest that the expected water quality in a minimally impacted lake, similar to Twin Lake (based on its location within the Central Hardwood Forest ecoregion and with its basic basin and watershed characteristics), would be within the following ranges for TP, Chl *a*, and SD; respectively: 24 to 54 µg/L, 5 to 23 µg/L, and 0.9 to 2.4 meters. In each of these cases, the observed values fall within or exceed (in the case of SD transparency) these ranges, suggesting that the water quality within Twin Lake is as good as or better than could be expected.

Because Twin Lake has continuously exceeded the proposed MPCA standards for non-shallow lakes, it is recommended that the 2006 District Water Quality Goals for Twin Lake be modified to reflect the MPCA proposed non-shallow lake criteria.

2.1.3.2 Further Studies

Because Twin Lake already has high water quality and meets and exceeds the 2006 District preliminary water quality standards, a prevention of further degradation management approach for this lake seems appropriate.

A prevention of further degradation goal for Twin Lake would involve:

- Enforcement of rules to ensure that new developments do not increase the sediment and phosphorus leaving their sites.
- Monitoring of the fishery, specifically focusing on the presence of benthivorous fish such as carp.
- Monitoring of macrophytes.
- Evaluation of shoreline conditions.

3.0 Conclusions

In summary, Twin Lake has water quality data available and has good water quality, satisfying the proposed MPCA water quality criteria for non-shallow lakes.

Table 3-1 below summarizes the proposed District recreational-use levels, water quality goals, and management classes based on evaluation of the data available for Twin Lake.

Table 3-1 Summary of the Proposed RWMWD Recreational-Use Level, Water Quality Goals, and Management Class

Water Body	RWMWD Use Level	2006 RWMWD Water Quality Goal	RWMWD Management Class
Twin Lake	2	40 µg/L TP[1] 14 µg/L Chla[1] 4.6 ft SD[1]	Prevent further degradation

1- Water quality goals are consistent with the MPCA's draft criteria for non-shallow lakes in the North Central Hardwood Forests (CHF) ecoregion (Minnesota Lake Water Quality Assessment Report: Developing Nutrient Criteria. Third Edition, September, 2005)

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Appendix A

Fisheries and Biological Data

Name: TWIN

Nearest Town: LITTLE CANADA
Primary County: Ramsey

Survey Date: 07/24/1996
Inventory Number: 62-0039-00

Lake Characteristics

Lake Area (acres): 35.50
Littoral Area (acres): 15.50
Maximum Depth (ft): 33.00
Water Clarity (ft): N/A

Dominant Bottom Substrate: muck, marl, detritus
Abundance of Aquatic Plants: abundant
Maximum Depth of Plant Growth (ft): 9.00

Fish Sampled up to the 1996 Survey Year

Species	Gear Used	Number of fish per net Caught	Normal Range	Average Fish Weight (lbs)	Normal Range (lbs)
Black Crappie	Gill net	0.5	1.9 - 18.0	0.13	0.1 - 0.3
	Trap net	5.2	1.8 - 18.1	0.16	0.2 - 0.3
Bluegill	Gill net	1.5	N/A - N/A	0.06	N/A - N/A
	Trap net	21.1	6.5 - 59.6	0.07	0.1 - 0.2
Golden Shiner	Gill net	0.5	0.7 - 3.9	0.08	0.1 - 0.1
Green Sunfish	Trap net	0.2	0.3 - 2.0	0.09	0.1 - 0.1
Hybrid Sunfish	Gill net	0.5	N/A - N/A	0.04	N/A - N/A
	Trap net	4.2	N/A - N/A	0.04	N/A - N/A
Largemouth Bass	Trap net	0.4	0.3 - 0.8	0.16	0.2 - 1.1
Northern Pike	Gill net	5.0	2.5 - 7.9	4.03	1.8 - 3.3
	Trap net	0.1	N/A - N/A	2.84	N/A - N/A
Pink Salmon	Gill net	0.5	N/A - N/A	0.04	N/A - N/A
Pumpkinseed Sunfish	Trap net	1.6	0.8 - 5.3	0.08	0.1 - 0.2
Snapping Turtle	Trap net	0.2	N/A - N/A	ND	N/A - N/A
Yellow Perch	Gill net	4.5	1.5 - 12.8	0.10	0.1 - 0.2
	Trap net	0.9	0.3 - 1.5	0.11	0.1 - 0.2

Normal Ranges represent typical catches for lakes with similar physical and chemical characteristics.

Length of Selected Species Sampled for All Gear for the 1996 Survey Year

Species	Number of fish caught in each category (inches) 0-5	6-8	9-11	12-14	15-19	20-24	25-29	>29	Total
Black Crappie	1	47	0	0	0	0	0	0	48
Bluegill	182	11	0	0	0	0	0	0	193
Green Sunfish	2	0	0	0	0	0	0	0	2

Hybrid Sunfish	39	0	0	0	0	0	0	0	39
Largemouth Bass	2	1	1	0	0	0	0	0	4
Northern Pike	0	0	0	0	0	4	7	0	11
Pink Salmon	1	0	0	0	0	0	0	0	1
Pumpkinseed Sunfish	13	1	0	0	0	0	0	0	14
Yellow Perch	4	13	0	0	0	0	0	0	17

Fish Consumption Advisory

No fish consumption information is available for this lake. For more information, see the "Fish Consumption Advice" pages at the Minnesota Department of Health.

Status of the Fishery (as of 07/24/1996)

Twin Lake does not appear to have winterkilled sevrely in the past five or more years. Thus, populations of several species offer angling opportunities to lake residents. However, there is no public access. Bluegill were the most abundant specices sample, but are small with an average size of 4.5 inches and fewer than 10% being over 6 inches. Low to moderate numbers of small (5 to 8 inch) black crappie are also present. Moderate numbers of northern pike were sampled with lengths ranging from 23 to 30 inches. Largemouth bass were also sampled, but not in high numbers. However, the sampling techniques used were not effective on bass, so numbers could be higher than sampling results indicate. Bass were small - lengths ranged from 5 to 9 inches. Low to moderate numbers of yellow perch, hybrid sunfish, pumpkinseed, and green sunfish are also present, but are generally small.

For Additional Information

Area Fisheries Supervisor:

1200 WARNER ROAD
ST. PAUL, MN 55106
(651) 772-7950

Lake maps can be obtained from:

Minnesota Bookstore
660 Olive Street
St. Paul, MN 55155
(651) 297-3000 or (800) 657-3757
To order, use C1220 for the map-id.

General DNR Information:

DNR Information Center
500 Lafayette Road
St. Paul, MN 55155-4040
(651) 296-6157 or (888) MINNDNR
TDD: (651) 296-5484 or (800) 657-3929
E-Mail: info@dnr.state.mn.us

Turn in Poachers (TIP):

Toll-free: (800) 652-9093