SEPTEMBER '93

Summary

509 PLAN AMENDMENTS

Section	Plan Amendment
General	The plan has been consolidated by transferring the base management plan text from antiquated word processing equipment to microcomputer software. The text will be repaginated using smaller font. Each page will have a revision date noted so that future amendments can be easily tracked. Each copy of the final plan will be indexed so that periodic updates of plans can be coordinated more efficiently than historically has occurred. The final document is a compilation of information included in both the original 1974 Overall Plan for Water Management and the Water Resource Management Plan currently in use by the District. Large deviations from previously documented programs have not been pursued at this time, as the plan is required to undergo a major revision in 1995.
Section 1 - Introduction	This section was altered by moving and expanding the Executive Summary now found in the Foreword for the plan. A tabulation of past Rice Creek Managers was also included. The plan development history for the 1974 and 1986 plans was also compiled.
Section 2 - Existing and Future Conditions	This section was expanded to include additional geologic information. A list of hydric soils commonly found in the Watershed District was also included to assist in implementing wetland regulations. A detailed history of the "human environment" was included which chronicled the settlement of the watershed area. An expanded table of feedlots was included based upon the research done on the Centerville/Peltier Diagnostic Study.

Section	Plan Amendment
Section 3 - Hydrologic Systems	This section was greatly expanded using available data to substantially comply with pending BWSR rules for plan content. Sections describing precipitation trends, lake levels, and water quality were added to lessen dependence upon a separate technical appendix (used with the 1986 plan). An expanded discussion of the St. Paul Water Utility system was included as their operation plays a role in District resources management. Deleted from the text was a lengthy description of the operating characteristics of the TR-20 hydrology model. Text was added concerning the results of the District's three-phase runoff study and the hydrologic response characteristics of the watershed. Also deleted were the brief descriptions of hydrologic features in each of the 27 subwatersheds used for (1986) planning purposes.
Section 4 - Objectives and Policies	This section originally outlined the Board's objectives and policies, and then discussed them on a subwatershed basis. This section has been rewritten to integrate policy discussion with the hydrologic descriptions deleted from Section 3. In order to minimize the changes to the plan by these amendments, the District has refrained from making revisions to the objectives and policies. Minor changes made include clarification of existing policies or documenting of already existing Board policies not included in the 1986 plan.
Section 5 - Management Plan	This section of the 1986 plan was split into the following elements: general management strategies, problem identification, management classification, and strategic implementation plan. The strategic implementation plan was divided into 13 management areas. Section 5 has now been amended to put an increased emphasis on the District's strategic implementation plan. Portions of other elements were consolidated into Section 4, and the strategic implementation plan was expanded to provide detail for assuring implementation. We have refrained from full-scale rewriting of this section in order to minimize the extent of changes. We have retained all 13 previously approved management areas and added three additional management areas for maintenance responsibilities, public information/education, and channel management.

509 PLAN AMENDMENTS
(Continued)

	Section	Plan Amendment
1.	Runoff Management	This text was revised to meet Metropolitan Council guidelines for water quality ponding. These requirements are more restrictive but are being required of each city in the metropolitan area. Thus, inclusion at this time is warranted. Water quantity text was altered to reflect results of the three-phase runoff study conducted by the District. In general, the "blanket" rate control policies have been eased to reflect the hydrologic response of the watershed (i.e., reduce water management costs by eliminating need for rate control ponds where they are not required).
2.	Public Ditch Management	This section had an inspection schedule added to aid the Managers' implementation of annual inspections. The use of *ad valorem* financing is specified to reduce administrative costs to cities, landowners, and the District for performing maintenance.
3.	Potable Surface Water Supply	Minor text was added to reflect the District's role in managing the use of treated groundwater from TCAAP.
4.	Water Quality Monitoring	The District has revised this section to reflect a change in monitoring philosophy. The District has shifted to a more intense rotating schedule which gives the District the ability to perform "diagnostic studies" for the lakes in the District at a reduced cost. This method will reduce future expenditures needed for large-scale water quality studies and aid in attracting state grant money. Sampling reflects a greater emphasis on stream (versus in-lake) data collection.
5.	Individual Sewage Treatment Systems	This section remains relatively unchanged.
6.	Wetland Management	This section was revised in to meet minimum requirements of the State Wetland Conservation Act of 1991, and other changes in the wetland permitting program.
7.	Shoreland Management	This section was amended to include the Metropolitan Council's directive for mandatory shoreland ordinance adoption. This also complies with MN/DNR rule changes.

509 PLAN AMENDMENTS
(Continued)

	Section	Plan Amendment
8.	Floodplain Management	This section received a large amount of clarifying text. As previously written, ambiguous policies tended to be confusing to other governmental units and developers. The Board's long-time (undocumented) policies preventing construction of building footprints over former floodplain area has been chronicled. Allowable floodway velocities have been increased from 2 to 2.5 fps. The Board's intent to have a larger role in disseminating updated hydrologic information to the communities was discussed.
9.	Agricultural Erosion	The 1986 plan called for the District to perform duties which have historically been more efficiently conducted by the County SWCDs. This text has been deleted. Text was added based upon the District's intent to address nonpoint source pollution as part of the Clean Water Partnership Grant Project for Centerville/Peltier Lakes.
10.	Construction Erosion	This text now references the MPCA BMP Manual and notes the need for projects with greater than 5 acres of disturbed area to notify the MPCA for an NPDES permit.
11.	Groundwater Protection	Text was added to reflect the District's involvement in producing the Ramsey and Washington County Geologic Atlases, and their participation in the Ramsey and Anoka County Groundwater Planning Committees. The Board's desire for an active role in lake level management/ groundwater issues is also highlighted.
12.	Roughfish Control	Minor text additions noting 1993-94 coordination with DNR for Howard and Mud Lakes control program.
13.	Flood Management Profiles	This section described the three-phase runoff study conducted by the District. Text has been reformatted to discuss results of the study and briefly discuss its intended use and future calibration efforts using recently installed continuous flow gauges on Rice Creek.
14.	Inspection and Maintenance	This is a new section added to clarify the various responsibilities of the District, and give guidance on other governmental unit roles for inspecting and maintaining conveyance structures and routes. The primary purpose is to document the existing programs of the District and new expenditures are not anticipated.

509 PLAN MINOR AMENDMENTS
(Continued)

Section	Plan Amendment
15. Channel Management	This new section was added due to the many cities who have commented on the District's role in maintaining creeks and streams. The section discusses the Streambed and Bank Stabilization program and outlines the District's intent to address major bank failures along Rice Creek.
16. Public Information and Education	The District is mandated to produce various documents describing annual activities. In addition, the Board is moving to a prominent nonpoint source education program using state funds. This effort is a result of diagnostic/feasibility studies conducted over the past three years.
Section 6 - Local Responsibilities	This section was greatly expanded to include BWSR-mandated matrices outlining levels of compliance by member communities. Clarifying text was added to ease the transition of regulatory programs to local units of government that choose to perform this function.
Section 7 - Capital Improvements Program	New capital improvement projects have not been incorporated at this time. The Locke Lake Project was amended in December 1992 following public hearings. The primary change to this project was the scope of work and method of financing. The Streambed and Bank Stabilization Program was authorized by the District in 1991 and is an on-going program funded through M.S. 103D. Of the two remaining projects, ditch repair will be funded outside of the capital improvements program through M.S. 103B and the Long Lake sedimentation basin was historically approved for funding in 1991 and 1992.
Section 8 - Amendment Process	Text was added to indicate future amendments being considered by the Board or mandated by the State. It was the Board's consensus these amendments would be pursued as part of the 1995 update.
Appendices	The appendices were enlarged to include an assessment of the District's success in meeting the 1974 and 1986 Management Plan objectives, an update of permitting guidelines, clarification of District easement policies, and other technical design materials.

OVERALL PLAN
FOR WATER MANAGEMENT

November 1993

Prepared For:

RICE CREEK WATERSHED DISTRICT
Arden Hills, Minnesota

Prepared By:

MONTGOMERY WATSON
545 Indian Mound
Wayzata, Minnesota 55391

RICE CREEK WATERSHED DISTRICT
BOARD OF MANAGERS

PRESIDENT
Gerald A. Sande

FIRST VICE PRESIDENT
Herbert G. Lancaster

SECOND VICE PRESIDENT
Eugene L. Peterson

SECRETARY
Andrew J. Cardinal, Sr.

TREASURER
Roger L. Oberg

ACKNOWLEDGEMENTS

The Board of Managers of the Rice Creek Watershed District wish to express their appreciation to the members of the Technical Advisory Committee and the Citizens 509 Task Force for their support and input through the Watershed Management Plan development process. These groups provided the technical advice and public input necessary to produce a comprehensive and usable Watershed Management Plan. Without their help, the initial 1986-1990 plan would not have been possible.

The Technical Advisory Committe held 11 meetings from February 10, 1984 through November 15, 1985.

Active Members

Arden Hills	Donald G. Christoffersen
Birchwood	Jack Anderson
Blaine	Robert Wiegert
Circle Pines	John Thiel
Centerville	Peter Buesseler
Columbia Heights	Tom Madigan
Columbus	Richard N. Sobiech
Dellwood	Richard N. Sobiech
Forest Lake	Richard N. Sobiech
Forest Lake Township	Curtis Sparks
Fridley	Mark Burch
Hugo	Phil Behrend, Eric Wharton
Lino Lakes	Richard N. Sobiech
Mahtomedi	Mark Lenz
Mounds View	Steven Thatcher
New Brighton	Leslie Proper
Roseville	Charles Honchell
St. Anthony	Larry Hamer
Shoreview	Julian Fenendael
White Bear Lake	Dennis Welsch
White Bear Township	Richard N. Sobiech

Corresponding Members

Falcon Heights	Robert Schunicht
Grant Township	Eugene Eastlund
Ham Lake	Doris Nivala
Lauderdale	LaVanche Peterson
Lexington	Brian Kranz
May Township	Cyd Young
Minneapolis	Milton Christensen
New Scandia Township	Charles Nordin
Spring Lake Park	Donald Busch
Willernie	Sheila Davis

The Citizens 509 Task Force held six meetings from September 18, 1984 through December 17, 1985.

Active Members

Arden Hills	Nancy Kay Hansen, Marvin Sorvala
Birchwood	Elizabeth Nordling, Gretchen Davidson
Blaine	Francis Fogerty, Harley Flor
Circle Pines	Ed Steenberg, Christopher Wilker
Centerville	Michael Ayers, Glenn Carpenter
Columbia Heights	Arden Hovland, William Land
Columbus Township	James Proulx, Jesse Preiner
Dellwood	C. Robert Binger, George St. Germaine
Forest Lake	Judith Bull, Paul Solum
Forest Lake Township	David Copham, Roger Johnson
Fridley	Edward Fitzpatrick, Carrol Hauge
Hugo	Michael McAllister, Arthur Potts
Lauderdale	Paul Villella
Lino Lakes	Vernon Reinert, Gary Barott
Mahtomedi	Jeanie Olson, Peter Santi
Mounds View	Bill Doty, Peter Sargent, Charlotte Forslund
New Brighton	Steven Schmidt, Edwin Ross
Roseville	Vernon Johnson, Thor Bank
St. Anthony	Richard Enrooth, Erling Weiberg
Shoreview	Roberta Weltzin
White Bear Lake	Gerald Briggs
White Bear Lake Conservation District	Bryan McGinnis
White Bear Township	Robert Hamilton, Paul Boening, Roger Carlson
Willernie	Mark Bohnan

Corresponding Members

Falcon Heights	Dewan Barnes
Grant Township	Eugene Eastlund
Ham Lake	Doris Nivala
May Township	Cyd Young
Minneapolis	Milton Christensen
New Scandia Township	Charles Nordin
Spring Lake Park	Donald Busch

TABLE OF CONTENTS

	PAGE
EXECUTIVE SUMMARY	ES-1
SECTION 1 - INTRODUCTION	1-1
Combined 103D/103B Plan Development	1-1
Statutory Authority Under M.S. 103D	1-1
Formation of the District	1-4
Additional Watershed Planning Under M.S. 103B	1-5
Plan Format	1-6
SECTION 2 - INVENTORY OF EXISTING AND FUTURE CONDITIONS	2-1
Introduction	2-1
Rice Creek Watershed District	2-1
Governmental Units with District Boundaries	2-2
Physical Environment	2-4
Geology	2-5
Geomorphology	2-6
Soil Associations	2-7
Biological Environmental	2-15
Important Plant and Animal Communities	2-16
Human Environment	2-23
Historical Background	2-23
Present Land Use	2-27
Recreation	2-29
Potential Environmental Hazards	2-34
Feedlots	2-34
Potential Groundwater Contamination	2-34
Pipelines	2-34
SECTION 3 - INVENTORY OF HYDROLOGIC SYSTEMS	3-1
Introduction	3-1
Precipitation	3-1
Design Storms	3-1
Evaporation	3-2
Topography and Drainage	3-4
Public Ditches	3-6
Lakes	3-6
Wetlands	3-6
Floodplain	3-13
St. Paul Water Utility	3-13
Water Quantity	3-15
Lake Levels	3-16
Flow Gauging	3-16
Water Quality	3-17
Parameters	3-18
Comparison of 1991 Data with Historic Data	3-18
Total Phosphorus	3-18

Secchi Transparency 3-22
Trophic Status 3-22
Macrophytes 3-24
Additional References 3-27
MPCA Water Quality Standards 3-30
Groundwater Resources 3-30

SECTION 4 - OBJECTIVES AND POLICIES 4-1

Introduction 4-1
Policy Development 4-2
Objectives and Policies 4-2
Subwatershed Objectives and Policies 4-7

SECTION 5 - MANAGEMENT PLAN 5-1

Introduction 5-1
General Water Management Strategies 5-1
Water Management Problem Identification 5-2
Strategic Implementation Plan 5-4
Cost Summary 5-75

SECTION 6 - LOCAL RESPONSIBILITIES 6-1

Local Planning 6-1
Local Plan Contents 6-1
Watershed District Review 6-2
Coordination 6-5

SECTION 7 - CAPITAL IMPROVEMENT PROGRAM 7-1

Introduction 7-1
Locke Lake Restoration and Improvements 7-1
Need 7-1
Scope of Project 7-2
Alternatives Considered 7-2
Cost 7-2
Financing 7-3
Streambed and Bank Stabilization Program 7-3
Financial Information 7-3
Schedule 7-4
Rice Creek Sedimentation Basin 7-4
Description and Need 7-4
Financial Information 7-4
Schedule 7-4

SECTION 8 - AMENDMENTS 8-1

Amendment Procedures 8-1
Future Amendments 8-1

APPENDIX

LIST OF TABLES

TABLE NO.	TITLE	PAGE
1-1	Rice Creek Watershed District Managers	1-2
2-1	Governmental Units in the Rice Creek Watershed District	2-3
2-2	General Soil Associations	2-8
2-3	Soil Drainage and Texture Terms	2-11
2-4	Hydric Soil Map Unit List - Anoka County	2-13
2-5	Hydric Soil Map Unit List - Washington-Ramsey Counties	2-14
2-6	Oak Savanna Community	2-17
2-7	Bluestem Prairie Community	2-18
2-8	Maple-Basswood Forest Community	2-19
2-9	Wetland-Aquatic Community	2-20
2-10	Key to Map 4 - Occurrence of Rare and/or Sensitive Species	2-21
2-11	Existing Land Use and Land Use Plan Maps for Communities	2-30
2-12	Public Boat Launches	2-31
2-13	Permitted Animal Feed Lots	2-35
2-14	Potential Sources of Groundwater Contamination	2-40
3-1	St. Paul Campus Climatological Observatory Monthly Precipitation 1961-1991 Summary	3-2
3-2	Rainfall in Minneapolis-St. Paul Metropolitan Area for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years	3-3
3-3	Approximate Monthly Evaporation from Shallow Lakes and Reservoirs	3-4
3-4	Existing Legal Drainage Ditches in District by County	3-7
3-5	Lake Characteristics	3-8
3-6	Total Phosphorus Concentrations for RCWD Lakes, 1974-1991	3-19
3-7	Secchi Transparencies for RCWD Lakes, 1972-1991	3-20
3-8	Trophic Status Based on Mean Summer TP Concentration for RCWD Lakes, 1974-1991	3-23
3-9	Comparison by Trophic Status of RCWD Lakes with All Minnesota Lakes	3-24
3-10	Average Total Phosphorus in 1991 vs Previous Years' Monitoring Results	3-25
3-11	Average Total Suspended Solids in 1991 vs Previous Years' Monitoring Results	3-26
3-12	MPCA Water Quality Standards	3-28
3-13	Ambient Groundwater Monitoring Stations	3-29
4-1	Objectives, Policies, and Overall Management Strategies	4-8
4-2	Subwatershed Objectives and Policies	4-14
5-1	Water Management Concerns Questionnaire	5-13
5-2	Subwatershed Rate Control Policies	5-9
5-3	Proposed Ditch Inspection Schedule	5-19
5-4	Lake Monitoring Schedule	5-25

LIST OF TABLES

TABLE NO.	TITLE	PAGE
5-5	Lakes Monitored by Ramsey County	5-25
5-6	Community Status in the National Flood Insurance Program	5-48
5-7	Regulation of Activities for Groundwater Protection	5-56
5-8	Maintenance Responsibilities by Hydrologic Feature	5-66
6-1	Status of Local Planning	6-3
6-2	Status of Local Controls	6-4
7-1	Summary of Funding of Capital Improvement Program	7-5
8-1	Future Amendments to the RCWD Management Plan	8-2

LIST OF FIGURES

FIGURE NO.	TITLE	FOLLOWING PAGE
2-1	Geologic Column	
2-2	Geologic Cross-Section of District	
3-1	High Water and Bed Profiles for Rice Creek	
3-2	St. Paul Water Utility System	
3-3	Runoff Hydrograph Survey Summary	
3-4	Long and Silver Lake Levels	
3-5	White Bear and Turtle Lake Levels	
3-6	Lake Johanna Lake Levels	
3-7	Rice Creek Flows: April 9-July 31, 1993 Flow Rates	
5-1	Floodplain Schematic	

LIST OF MAPS

MAP NO.	TITLE	FOLLOWING PAGE
1	Municipalities	
2	Surficial Geology and Soils	
3	Potential Natural Vegetation	
4	Occurrence of Rare and/or Sensitive Species	
5	Existing Land Use	
6	Metropolitan Urban Service Area	
7	Projected Land Use	
8	Regional Recreation	
9	Permitted Animal Feed Lots	
10	Potential Sources of Groundwater Contamination	
11	Oil and Gas Pipelines	
12	Drainage Pattern	
13	Wetland Vegetation	
14	Protected Waters and Wetlands	
15	100-Year Flood Plain	
16	Water Quality Monitoring Stations	
17	Groundwater Recharge Areas	

EXECUTIVE SUMMARY

This document is a compilation of the District Management Plans required under M.S. 103D and M.S. 103B. The Rice Creek watershed encompasses 201 square miles of urban and rural land and water within the Minneapolis-St. Paul metropolitan area. Rice Creek is a multiple resource: it drains an extensive area of sod and truck farms; provides a substantial water supply source to the City of St. Paul; serves as a recreational resource for adjoining residences and public parks; is a natural habitat for waterfowl and other wildlife; is an open space and greenbelt resource of unique value; and an attractive locale for new development. Rice Creek also floods along its lower reaches and is a conduit for carrying runoff to the Mississippi River at Fridley.

The Rice Creek Watershed District (District) was formed in 1972 as a means of conserving and making provident use of the waters and natural resources of the area. An overall plan for water management was prepared in 1974 as required under Minnesota Statute 112 (Watershed Act). The 1974 plan focused on flood control, drainage, water quality, erosion/sedimentation, land development, and the preservation of open spaces for recreation and wildlife.

With the passage of the Metropolitan Surface Water Management Act, the District completed a second management plan to satisfy the intent of the legislation. The "509 Plan," produced from efforts made between 1983 and 1990, constitutes the majority of this document. It concentrated on many of the same issues as the original management plan, but allowed for a transition to more local control.

The District has addressed the above interrelated water issues by administering regulatory programs and undertaking projects. The District's permit program has served as the primary vehicle for the protection of drainage systems, water quality, and open spaces associated with floodplain areas. Uncompensated encroachment into floodplain areas has been nearly eliminated through review of development plans and a vigorous inspection program. Substantial improvements in lake water quality have been realized through the Long Lake Chain of Lakes Project in the southwestern portion of the District. Large land developments have been required to provide rate control and treatment of stormwater runoff either through centralized ponding or through detention facilities incorporated within the developing area. These detention ponds have subsequently been

shown to provide an effective means for reducing the degradation of downstream water quality and are becoming common throughout the metropolitan area.

This management plan utilizes the information and data generated through these past District actions to provide updated management strategies for addressing a wide variety of issues which continue to be, or have become, significant. As outlined on the preceding pages, the plan provides a basic inventory of the District and an outline of the Board of Managers' objectives. Of primary importance, however, is the Management Plan (Chapter V) which details the methods by which the District's objectives and policies will be implemented. The 13 areas are summarized below:

Runoff Management

Runoff management will be accomplished through an increased emphasis on larger, centralized detention facilities where feasible. It is anticipated that the local water management plans will provide the impetus for municipal-scale comprehensive planning thereby de-emphasizing the use of numerous on-site basins. The District has, on the basis of studies performed by the Environmental Protection Agency, upgraded detention pond design to include permanent pools which have been shown to reduce nutrient export.

Public Ditch Management

Public ditch management is guided by M.S. 103E. The District will continue to be the drainage authority which oversees public ditch systems and, in that capacity, will require permits for any alterations or development occurring within or adjacent to a public ditch. Funding for major repairs will be provided through a District-wide *ad valorem* tax.

Potable Water Supply

Policy dictates that the District's role is to serve in a review and comment capacity on any water quality problems or developments which could affect potable water supplies. The District is currently undertaking a diagnostic/feasibility study of water quality in Centerville and Peltier Lakes which serve as reservoirs for the St. Paul Water Utility. Additional studies have been completed which dealt with groundwater contamination at the Twin Cities Army Ammunition Plant in Arden Hills.

Water Quality Monitoring

Water quality monitoring has been a priority of the District since its inception. Monitoring programs will continue in coordination with other governmental agencies and citizen groups. The District has compiled an impressive baseline data set and is embarking on a new program which will place an added emphasis on stream gauging and more frequent sampling on a smaller, rotating set of lakes.

Individual Sewage Treatment Systems

Individual sewage treatment systems will be allowed under Minnesota Rules Chapter 7080, however, no new (or replacement) systems will be allowed in sewered areas unless sewer connections are not practical.

Wetland Management

Wetland management continues to be a priority issue with the Board of Managers. Historically, the Board pioneered the protection of wetland areas using the Wetland Preservation Guidelines. As public perception of the benefits associated with wetland areas are realized and additional scientific results become known, the Board is strengthening their preservation policies. The general management strategy of the Board states that when there are no feasible or practical alternatives to avoiding wetland impacts, wetlands must be replaced by restoring or creating equivalent wetland areas (no net loss). The District intends to serve as the LGU for administration of the Wetland Conservation Act of 1991.

Shoreland Management

Shoreland management regulations promulgated by the Minnesota Department of Natural Resources have recently been revised. The State is making grant monies available for local adoption of the regulations. Historically, the District has enforced the setback requirements of the State and recently has eliminated regulatory overlap in areas of the District where shoreland ordinances are enforced by local governing authorities.

Floodplain Management

Floodplain management will be accomplished through the permitting program and the flood profiling being conducted in Section 13 of Chapter V. District project work will identify current and future flood profiles and encroachment into the floodplain will continue to be carefully reviewed.

Agricultural Erosion

Agricultural erosion can have a significant impact on surface water quality. The District will work with county and state government to optimize control of agricultural erosion and provide an increased understanding within the agricultural community of the effects of sedimentation on water quality through an educational program.

Construction Erosion

Construction erosion is currently addressed within the District's permitting program. All developments are required to submit a detailed erosion control plan to contain all sediment on the site. Erosion control measures are required to conform with the erosion control handbooks prepared by the Board of Soil and Water Resources and the Ramsey County Soil and Water Conservation District. Future plan amendments may require local authorities to adopt an erosion control ordinance based upon the model ordinance contained in the Ramsey County Handbook.

Groundwater Protection

Groundwater protection is overseen by a number of governmental agencies. The District's role will be to promote the gathering of groundwater data (such as the cooperative program for the Ramsey County Geologic Atlas), and serve in a review and comment capacity on developments that may contaminate groundwater recharge areas.

Rough Fish Control

Rough fish control is needed to prevent the degradation of water quality and fisheries associated with unchecked rough fish populations. The Department of Natural Resources has been, and will continue to be, the primary agency overseeing rough fish control. The

District will function in a review and comment capacity and coordinate project activities with the Department.

Flood Management Profiles

Flood management profiles will be developed to serve as a guide for implementing reasonable runoff management strategies throughout the District. The proposed study is the result of a December 1987 meeting of the Technical Advisory Committee and will address flooding concerns along Rice Creek and Clearwater Creek. The final management profiles determined by the District and the District's Technical Advisory Committee will then be used to finalize allowable discharge rates for municipal subwatersheds.

This document is intended to be a guide to member communities in managing water resources of the District. It is understood that it will be updated as the needs and accomplishments of the District dictate.

Objectives, policies, management strategies, and improvements indicate the intent of the Board of Managers at the time the document is assembled. The cost summaries and scheduling outlined in the plan are merely an estimate of the amount of money and emphasis to be placed upon various plan contents, and in fact, the Board of Managers will determine each year which programs and projects will be performed.

In order for the Metropolitan Surface Water Management Act to be successful, it is imperative that the member communities adopt and enforce requirements of the Rice Creek plan. Chapter VI outlines the local responsibilities stipulated in the plan and will guide the formation of a local plan by setting forth the minimum criteria to be met.

The Board recognizes the creation of a watershed district provides a government organization not only with the responsibility to prevent deleterious effects but with the duty to undertake beneficial projects. The residents or municipalities within the District can, by petition, initiate projects to enhance both the natural and manmade resources of the watershed.

As a final area of planning emphasis, the necessity for coordination and cooperation with other governmental units should be stressed. The District cannot possibly muster sufficient resources to carry out its plan without closely coordinating its efforts with numerous local, county, regional, state and federal agencies. The District Managers will actively pursue all means to achieve its objectives by utilizing, as appropriate, the information resources, study capabilities, and implementative mechanisms of other governmental agencies.

SECTION 1

INTRODUCTION

Both the Watershed Act (Minnesota Statute M.S. 103D) and the Metropolitan Surface Water Management Act (M.S. 103B) require the Rice Creek Watershed District (District) to revise its Overall Water Management Plan. The District is required to update the plan at least at five year intervals. The plan, which is the subject of this document, is a consolidation of the 1974 and 1986 watershed plans. A brief discussion of these individual plans is provided prior to discussion of the consolidated plan.

The District's policies, objectives, and historic accomplishments have been directed by the people who have served on the Board of Managers. The Managers of the District are appointed by their respective County Commissioners. The Board consists of two representatives from Anoka County, two residents of Ramsey County, and one representative from Washington County. Due to the extremely small percentage of the District within Hennepin County, Hennepin County is not represented on the Board.

Combined 103D/103B Plan Development

As outlined previously, this plan consolidates the two previous planning efforts of the District in accordance with directives of the Minnesota Board of Water and Soil Resources (BWSR). Portions of the plan which have undergone substantial revision have been reviewed by a Technical Advisory Committee (TAC) comprised of the members of participating communities (or their representatives) who have attended meetings in 1991 and 1992. Following completion of the draft plan, it will be reviewed according to the procedures set forth in M.S. 103B.

M.S. 103B required management plans to extend through years evenly divisible by five. The first edition of the District's 103B Plan extended through 1990. Due to delays in review of the plan, the District was unable to adopt the plan until 1990. This plan extends to 1995 and thus will include the actual cost associated with plan implementation for 1992-93.

Statutory Authority Under M.S. 103D

A watershed district is a special district approximating natural watershed boundaries, established by the BWSR (after a nominating petition has been filed) in accordance with the

TABLE 1-1

RICE CREEK WATERSHED DISTRICT MANAGERS

ANOKA COUNTY			
Andrew J. Cardinal, Sr.	January 1972	-	
Eugene L. Peterson	January 1993	-	
Ernest A. Petrangelo	January 1972	-	January 1987
C. Wade Savage	January 1987	-	January 1993
RAMSEY COUNTY			
George V. Dimke	January 1972	-	April 1980
Arndt J. Duvall	February 1989	-	September 1990
Robert R. Hamilton	January 1972	-	April 1981
Diane N. Harstad	January 1981	-	January 1985
Herbert G. Lancaster	February 1991	-	
Gerald A. Sande	January 1985	-	
Lloyd H. Scott, Sr.	April 1981	-	October 1988
WASHINGTON COUNTY			
Wilbur L. Goyer	January 1972	-	January 1980
Charles T. King	January 1980	-	January 1986
	May 1990	-	January 1992
Roger L. Oberg	January 1992	-	
Arthur J. Potts	January 1989	-	May 1990
Donald E. Willcoxen	January 1986	-	January 1989

Watershed Act (M.S. 103D) (formerly Chapter 112). The BWSR cannot initiate petitions for establishing a watershed district. The Board must give adequate notice and hold a public hearing prior to acting upon the nominating petition.

Even though the BWSR does not actively supervise the districts in their projects and activities, the Board has responsibility to 1) hold hearings on all petitions and plans filed by the districts, 2) conduct biennial review of overall district plans and projects, and 3) provide some administrative and educational services to districts.

The Watershed Act contains the following declaration of general policy: In order to carry out conservation of the natural resources of the state through land utilization, flood control and other needs upon sound scientific principles for the protection of the public health and welfare and provident use of the natural resources, the establishment of a public corporation (watershed district), as an agency of the state for the aforesaid purposes, is provided. Under the provisions of the above policy, a watershed district may be established for any or all of the following conservation purposes:

- Control or alleviation of damage by flood waters
- Improvement of stream channels for drainage, navigation, and any other public purpose
- Reclaiming or filling wet and overflowed lands
- Providing water supply for irrigation
- Regulating the flow of streams and conserving the waters thereof
- Diverting or changing watercourses in whole or in part
- Providing and conserving water supply for domestic, industrial, recreational, agricultural, or other public use
- Providing for sanitation and public health and regulating the use of streams, ditches or watercourses for the purpose of disposing of waste
- Repair, improvement, relocation, modification, consolidation, and abandonment, in whole or in part, of drainage systems within a watershed district
- Imposition of preventive or remedial measures for the control or alleviation of land and soil erosion and siltation of watercourses or bodies of water affected
- Regulating improvements by riparian landowners of the beds, banks, and shores of lakes, streams, and marshes by permit or otherwise in order to preserve the same for beneficial use

Formation of the District

After considerable study and discussion by various governmental and civic organizations, a nominating petition was submitted to the Water Resources Board (WRB) for watershed district establishment. Nine local groups of the League of Women Voters spearheaded the study and subsequent petition drive. The League's study consensus of May 25, 1970 defined the need for comprehensive long-range planning and water resources management. The League's position statement recommended a watershed district-form of governmental organization.

Late in 1970, Ramsey, Anoka, and Washington Counties formally petitioned the WRB to establish a watershed district. Hennepin County indicated concurrence in its petition effort. The WRB held a public hearing in June 1971 regarding establishment of the District. Following review of public testimony, the WRB established the Rice Creek Watershed District in 1972.

In July 1972, the Board of Managers of the District adopted rules and regulations. These rules and regulations were established on key policy elements, including:

- Conserving and provident use of natural resources through proper land utilization, adequate flood control, and other means
- Protection of the public health and welfare
- Plans, programs, and decisions based on sound scientific principles
- Providing advice to municipal officials in preparation of drainage plans and land development guides
- Concurrent review with municipalities of land developments and permit applications
- Requirement that all those undertaking improvement adjacent to streams, ditches, lakes, and tributary marshes submit a permit application, engineering data, and other information with respect to the effects on water bodies
- Review and comment on highway construction plans, including adequacy of stormwater drainage
- Maintain control over the proposed development only to the extent necessary
- Insure needed natural water storage areas, watercourses, and their shorelines
- Protect the natural topography and vegetative setting of land in water areas

In late 1974, the District prepared an overall water management plan which served as the framework for the past 18 years. The plan which is the subject of this document is an updating of the 1974 plan and a refocusing of watershed objectives through the planning process outlined by the Metropolitan Surface Water Management Act. A discussion of original plan's effectiveness and accomplishments is included in the appendix.

Additional Watershed Planning Under M.S. 103B

Under the Metropolitan Surface Water Management Act (Chapter 509, Laws of 1982, M.S. 103B) requirements are set for preparing watershed management plans within the Twin Cities metropolitan area. Pursuant to the requirements of the law, the plan must focus on preserving and using natural water storage and retention systems in order to:

- Reduce, to the greatest possible extent, the public expenditures necessary to control excessive volumes and rates of runoff
- Improve water quality
- Prevent flooding and erosion from surface flows
- Promote groundwater recharge
- Protect and enhance fish and wildlife habitat and water recreation facilities
- Secure the other benefits associated with the proper management of surface water

To insure that these objectives are realized, the Metropolitan Surface Water Act further specifies the basic contents of the water resource management plan. According to the law, the plan shall:

- Describe the existing physical environment, land use, and development in the area as well as the environment, land use, and development proposed in existing local and metropolitan comprehensive plans
- Present information on the hydrologic system and its components, including any drainage systems previously constructed under M.S. 103E and existing and potential problems related thereto
- State objectives and policies, including management principles, alternatives and modifications, water quality, and protection of natural characteristics
- Set forth a management plan, including the hydrologic and water quality conditions that will be sought and the significant opportunities for improvement
- Describe the effect of the plan on existing drainage systems

- Describe conflicts between the watershed plan and existing plans of local government units
- Set forth an implementation program consistent with the management plan, including a capital improvement program; standards and schedules for amending the comprehensive plans; and official controls of local government units in the watershed to bring about conformance with the watershed plan
- Set out and delineate a procedure for amending the plan

In developing the original 103B plan for the District, the Board of Managers utilized input from local elected officials, city staffs, and concerned citizens as part of two advisory committees: the Citizens 509 Task Force and the TAC. The Citizens Task Force was comprised of local elected officials and interested citizens while the TAC includes city staff members from each of the affected communities. The final plan was reviewed by the communities, counties, Metropolitan Council, Minnesota Pollution Control Agency (MPCA), Minnesota Department of Health (MDH), and the Minnesota Department of Natural Resources (DNR) prior to receiving the approval of the BWSR.

Plan Format

This water management plan is divided into eight major sections:

- Introduction
- Inventory of existing and future conditions
- Inventory of hydrologic systems
- Objectives and policies
- Management plan
- Local responsibilities
- Watershed Management Plan amendment process
- Capital improvement program

The plan's inventory of existing and future conditions includes a brief profile of the district's physical environment. This profile contains descriptions of the area's geomorphology, surface geology, soils, and biological communities. This section extends beyond the physical to the cultural environment as well. Further discussion includes a catalog of current land use, metropolitan systems, and projected growth areas. Sources of potential surface and groundwater contamination will also be noted, including feedlots, open dumps, and pipelines.

The inventory of the hydrologic systems includes subwatershed delineation, meteorological data, and a listing of wetlands, drainage systems, lakes, water quality, and groundwater characteristics. These inventories will be used in the planning process to develop implementation strategies and programs.

The subsection on determining objectives and policies outlines watershed objectives and policies on a subwatershed basis.

The management plan section is divided into the 13 areas of concern. These strategies reflect the objectives of the law to control runoff, reduce flooding, increase water quality, protect wildlife, and enhance recreational resources.

The local responsibility and amendment process sections of the plan restate procedure as prescribed by the law.

SECTION 2

EXISTING AND FUTURE CONDITIONS

INTRODUCTION

This section of the Water Management Plan is an inventory of existing conditions and future development. The section is divided into four subsections: Rice Creek Watershed District, Physical Environment, Biological Environment, and Human Environment. The subsection on the Rice Creek Watershed District is a general description of the District itself. The Physical Environment subsection describes the District's geomorphology, surficial geology, and soils. The Biological Environment subsection summarizes the major biological communities and inventories the important plant and animal species. The Human Environment subsection describes land use and growth patterns, recreational resources, and potential environmental hazards.

Rice Creek Watershed District

The Rice Creek Watershed District covers an area of 201 square miles on the northeastern side of the Twin Cities metropolitan area. The District is a complex configuration similar to an inverted "V." Land in the District is relatively flat, particularly in the north-central portion where the Rice Creek Chain of Lakes is the dominant feature. In the southern half, the land has somewhat more relief. The southern half of the watershed is primarily urban in nature while the northern half is predominantly rural.

Rice Creek is the principal stream of the watershed. It originates in Clear Lake just south of Forest Lake and meanders southwestward through a chain of lakes to the Mississippi River at Fridley. The water which drains into it and its two tributaries, Hardwood Creek and Clearwater Creek, comes from portions of four counties: Anoka, Ramsey, Washington, and Hennepin.

There are numerous lakes and marshes in the District with associated wetlands and wildlife areas. Soils over a large central portion have a high peat content and are poorly drained. Water stored in the Rice Creek Lake complex is a source of supply to the City of St. Paul and suburban communities serviced by the St. Paul Water Department.

Governmental Units within District Boundaries

Within the Rice Creek Watershed District, there are 41 separate governmental units: 4 counties, 24 cities, 6 townships, 5 special purpose districts, and the Water Commission of the City of St. Paul. These governmental units are shown on Map 2 and listed in Table 2-1.

There are 10 cities entirely located in the watershed; substantial portions of 11 cities and minor portions of two other cities. In terms of townships, there are significant portions of five townships in the watershed plus minor portions of two other townships. The five special purpose districts include four soil conservation districts and a lake conservation district. The Board of Water Commissioners of the City of St. Paul, a governmental unit created under Special Laws of Minnesota for 1885, owns fee title to and has obtained easements for a considerable amount of property in the Rice Creek watershed.

The District extends over the counties of Washington, Anoka, Ramsey, and Hennepin. The breakdown of area within each county is as follows: Washington, 77 square miles (sq mi); Anoka, 76 sq mi; Ramsey, 48 sq mi; and Hennepin, less than 0.1 sq mi. Map 1 shows the location of the District. There are 30 cities and townships within the District (Table 2-1, Map 1).

The District is bounded on the northwest by the Coon Creek Watershed District and numerous minor tributaries to the Mississippi River organized as the Six Cities Watershed Management Organization (WMO). The District is bounded on the north and northeast by the Sunrise River WMO, a tributary of the St. Croix River, and the Forest Lake WMO.

The east side of the District borders the Carnelian-Marine Watershed District. These lakes rarely overflow but when they do, they are tributary to the St. Croix River. The southeast part of the District borders Browns Creek WMO which flows into the St. Croix River at Stillwater.

The Valley Branch Watershed District adjoins the District along its southeastern border. The Vadnais Lake Area WMO shares a long common border with the District and it is centered around the lakes managed by the St. Paul Water Utility.

TABLE 2-1

GOVERNMENTAL UNITS IN THE RICE CREEK WATERSHED DISTRICT

Anoka County

Centerville
Circle Pines
Columbia Heights
Fridley
Ham Lake
Lexington
Lino Lakes
Columbus Township

Anoka/Ramsey Counties

Blaine
Spring Lake Park

Hennepin/Ramsey Counties

St. Anthony

Ramsey County

Arden Hills
Falcoln Heights
Lauderdale
Mounds View
New Brighton
Shoreview
Roseville
White Bear Township

Ramsey/Washington Counties

White Bear Lake

Washington County

Birchwood Village
Dellwood
Forest Lake
Forest Lake Township
Grant Township
Hugo
Mahtomedi
May Township
New Scandia Township
Willernie

Special Purpose Districts

White Bear Lake Conservation District
Anoka County Soil & Water Conservation District
Hennepin County Soil & Water Conservation District
Ramsey County Soil & Water Conservation District
Washington County Soil & Water Conservation District

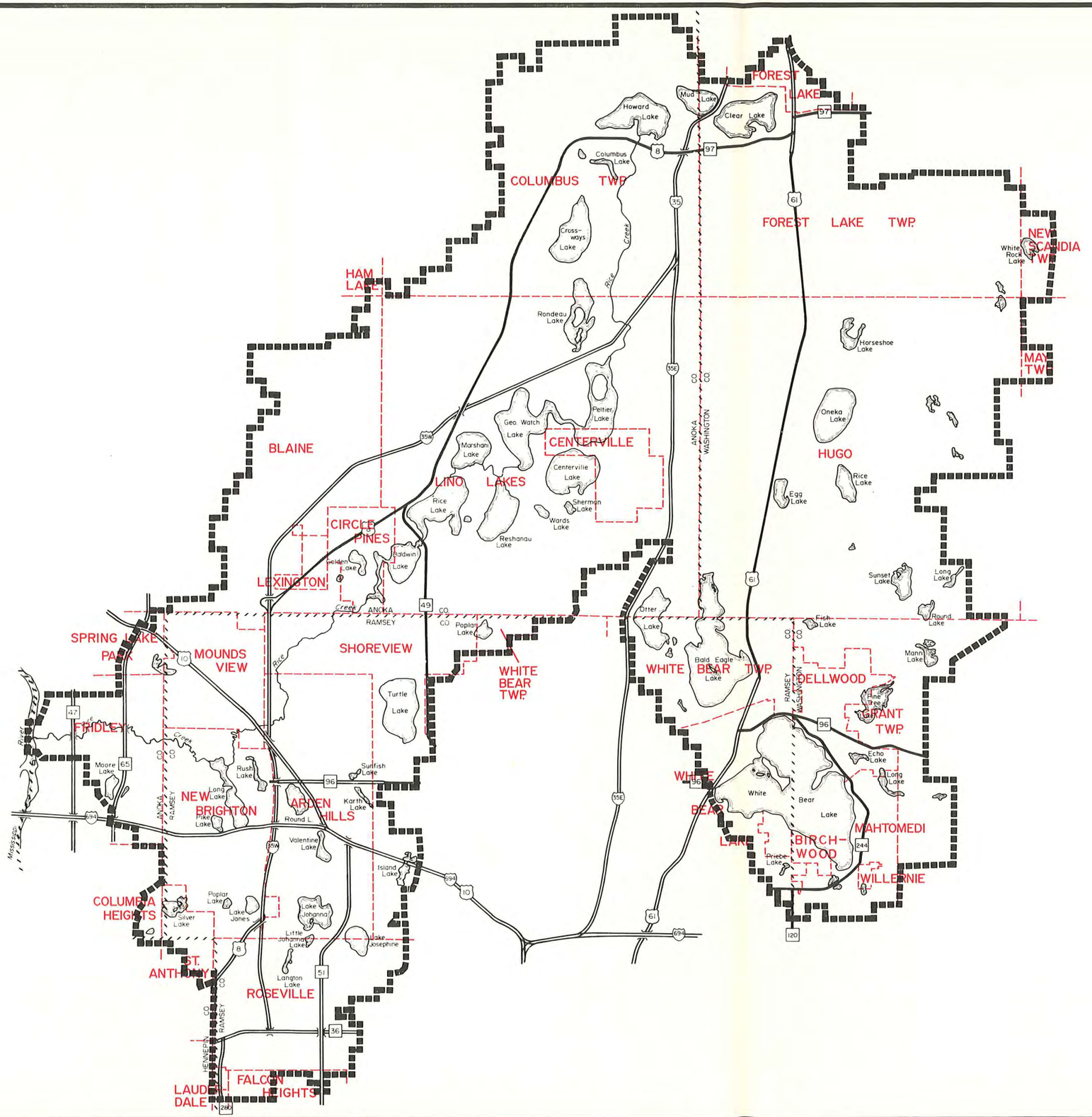
Other

Board of Water Commissioners of the City of St. Paul

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

MUNICIPALITIES



MAP 1

1 0 2

1/2 1

Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES

WAYZATA, MINNESOTA

The Ramsey-Washington-Metro Watershed District, Grass Lake WMO, Middle Mississippi River WMO, Central Ramsey WMO, and Southwest Ramsey WMO also share small portions of the Rice Creek watershed boundary along the southern part of the District.

District water resources management has been the focal point for the northern suburban area of the Twin Cities. The District has been active in watershed plan preparation and in water resources management based on the planning process. The intent of this plan is to update the existing plan and refocus the efforts of the District through an increase of local participation.

Effective coordination must be maintained with adjacent watershed districts and other cognizant government units, particularly in the case of those larger municipalities which lie only partially within the District.

The District's Board of Managers will provide assistance to municipalities to develop rules and regulations for implementing the watershed management plan. The Board of Managers will assist in developing uniform and equitable standards for land and water use regulation to promulgate local ordinances for lake levels, stream flow, wetland conservation, water quality maintenance, and land use.

The Board of Managers recognizes that it is not its function to determine the actual use of lands within municipalities and townships; rather, it is to provide well-supported advice and recommendations to local governmental units regarding building elevations and setbacks, designated floodplain, greenbelt and easement areas, wetland conservation, and other water or land use factors that would enhance future development within individual communities and the overall watershed.

PHYSICAL ENVIRONMENT

The physical environment is generally considered to be the geomorphology, geology, soils, and water resources of a particular area. The topics of this subsection are geology, geomorphology, and soil associations. Water resources will be described in a separate section.

Geology

The geology of the District comprises a significant portion of the regional geology of the Twin Cities metropolitan area. The sequence of geologic formations in the area is shown in the general geologic column.

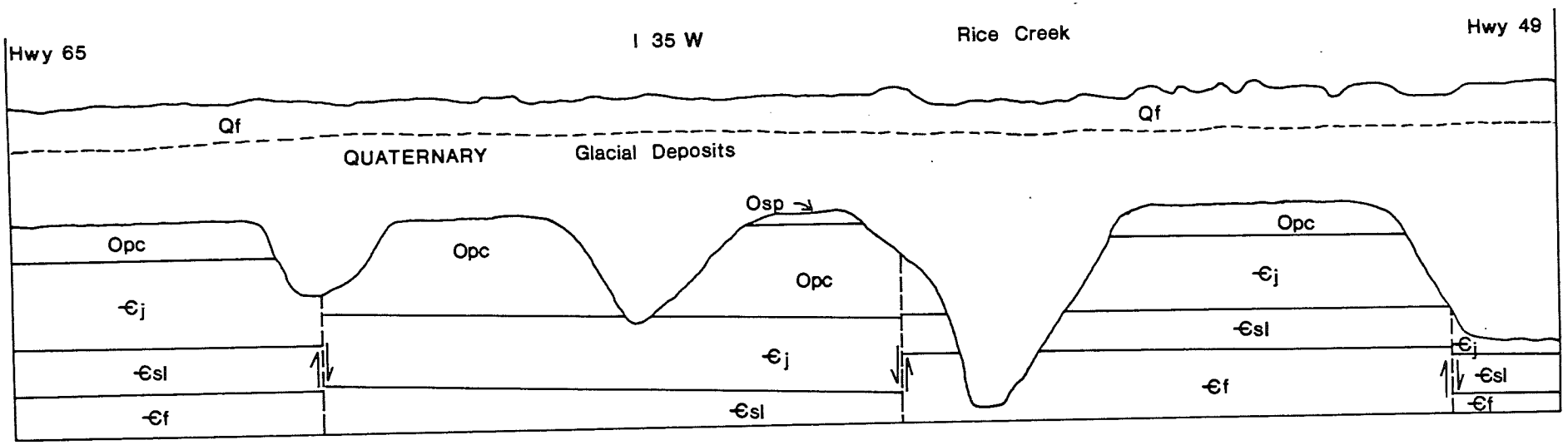
The Rice Creek watershed is covered by glacial and post glacial deposits to depths of as much as 400 feet except along parts of the bluffs of the Mississippi River. "Glacial drift" is a term applied to any of the unconsolidated gravel, sand, silt, and clay material deposited by glacial action that occurred in the region.

The southeastern portion of the District is underlain by glacial deposits of the Superior Lobe which had flowed into the area from the north and northeast, bringing a reddish-brown drift and then retreated about 14,000 years ago. Most of the District is underlain by deposits of the Grantsburg Sublobe, which flowed into the area from the southwest as an offshoot of the Des Moines Lobe and then retreated approximately 12,500 years ago.

The Grantsburg Sublobe brought gray drift from Manitoba and the Red River Valley.

The quality of the surface water and groundwater is related to the source of the glacial material deposited millennia ago. The reddish-brown drift from the Superior Lobe, which originated in the Lake Superior Basin, contains rock fragments of crystalline, igneous, and metamorphic origin. The Des Moines Glacial Lobe, which originated west of Hudson Bay in Canada, contains rock fragments of highly calcareous limestone and shale that results in hard water.

The Grantsburg Sublobe was instrumental in the formation of much of the present day surface topography of the District. Much of western side of the District consists of a series of lake plains formed by the westward retreat of the Grantsburg Sublobe. As the glacial ice sheet retreated, three major glacial lakes were formed. Glacial Lake Turtle was located in the same vicinity as the present Turtle Lake. Adjacent to Glacial Lake Turtle was Glacial Lake New Brighton located in the present day location of Long Lake/Pike Lake and extending south through Jones Lake to the southeast. Glacial Lake Fridley existed north of Glacial Lake Turtle and Glacial Lake New Brighton. Glacial Lake Fridley, the last of the glacial lakes to drain, was drained by the development of Rice Creek. As the ice



QUATERNARY

Fridley Formation — Qf

ORDOVICIAN

St Peter Sandstone — Osp

Prairie du Chien — Opc

CAMBRIAN

Jordan Sandstone — Cj

St Lawrence — Csl

Franconia — Cf

J. E. Stone 1964

FIGURE 2-1

GEOLOGIC CROSS-SECTION ALONG RAMSEY/ANOKA COUNTY LINE

retreated and the Mississippi River cut deeper into its present day channel, Rice Creek did likewise, cutting deeper and lowering the groundwater table.

Blocks of ice in the drift began melting to produce numerous kettle holes, many of which are now occupied by lakes and swamps. Some of the kettles are aligned above bedrock valleys indicating that ice blocks filled substantial portions of these valleys.

Long Lake and Pike Lake are aligned above Calhoun Valley which runs due south under present day Lake Calhoun and Lake Harriet. Lake Johanna and Lake Josephine are also aligned above bedrock valleys.

The buried bedrock surface, a rolling upland with about 80 feet of relief, is cut by several relatively steep-sided, narrow valleys as much as 400 feet deep. The Calhoun Valley is presently recognized as the deepest bedrock valley in the Twin Cities area. A striking feature of the bedrock topography in the District as well as in the Twin Cities area, as well as in the Twin Cities area as a whole, is the remarkably straight segments of the bedrock valleys. The generally abrupt changes in direction from one straight segment to the next was controlled at least in part by fractures in the bedrock.

The bedrock is warped into a roughly circular, shallow basin locally known as the Twin Cities artesian basin. The basin has been eroded so that the beveled edges of the strata encircle the metropolitan area.

The rock formations underlying the District vary as much as the surface profiles. The bedrock in much of the watershed consists of the Prairie du Chien group, including the Oneota Dolomite, Root Valley Sandstone, and Shakopee Dolomite. However, because of the erosional valleys in the bedrock surface, geologic formations as deep as the Franconia Sandstone are exposed to the glacial drift.

Geomorphology

The District may be divided into two geomorphic areas: the Anoka Sandplain and the Eastern St. Croix Moraine. The northwestern portion of the District is considered to be part of the Anoka Sandplain geomorphic area (Map 2). The Anoka Sandplain is an outwash plain formed during the retreat of the Grantsburg Lobe. The material making up the plain is principally fine sand. Depressions are common in the plain and were formed when

isolated blocks of ice later melted. They are now filled with peat deposits or are marshes and lakes. The landscape within the Anoka Sandplain is generally considered to be a gently undulating plain. Water tables are near the surface in depressions and from 2 to 10 or more feet deep in rises. The Anoka Sandplain region within the District can be divided into two areas: the furthest northerly portion is considered poorly drained and marshy in nature, while the eastern portion is considered to be better drained.

The remainder of the District is in the Eastern St. Croix Moraine geomorphic area. This area was formed at the southern limit of the Superior and Rainy Lobes, which brought red drift into the Twin Cities area. The drift of the St. Croix Moraine is often mixed with that of the high-lime gray moraine associated with the Owatonna Moraines and Grantsburg Lobe. The moronic lobe consists of regular and terminal moraines, and ice-disintegration features of sandy and loamy textures.

The moraines in the District are a complex mixture of gray till and reddish-brown till. It is a heterogeneous mixture of sand, silt, clay, pebbles, cobbles, and sometimes boulders. The water table in the area is near the surface in depressions but is deeper than 10 feet in the hill areas. Kames and eskers are commonly found among the hills and are sources of sand and gravel. One large kame area is in the Twin City Army Ammunition Plan area, northeast of the intersection of U.S. Highway 10 and State Highway 96.

The surficial geologic formations within the District are of three types: glacial outwash, glacial till, and glacial lacustrine deposits. Glacial outwash in the District area is generally well-drained, but there are areas that have some organic soils which are less well drained. The glacial tills are in the eastern portion of the District and, as previously described, are more heterogeneous than the outwash areas. There are also small areas of glacial lake deposits. In the glacial lake deposits, soils tend to be very well-sorted with nearly level topography.

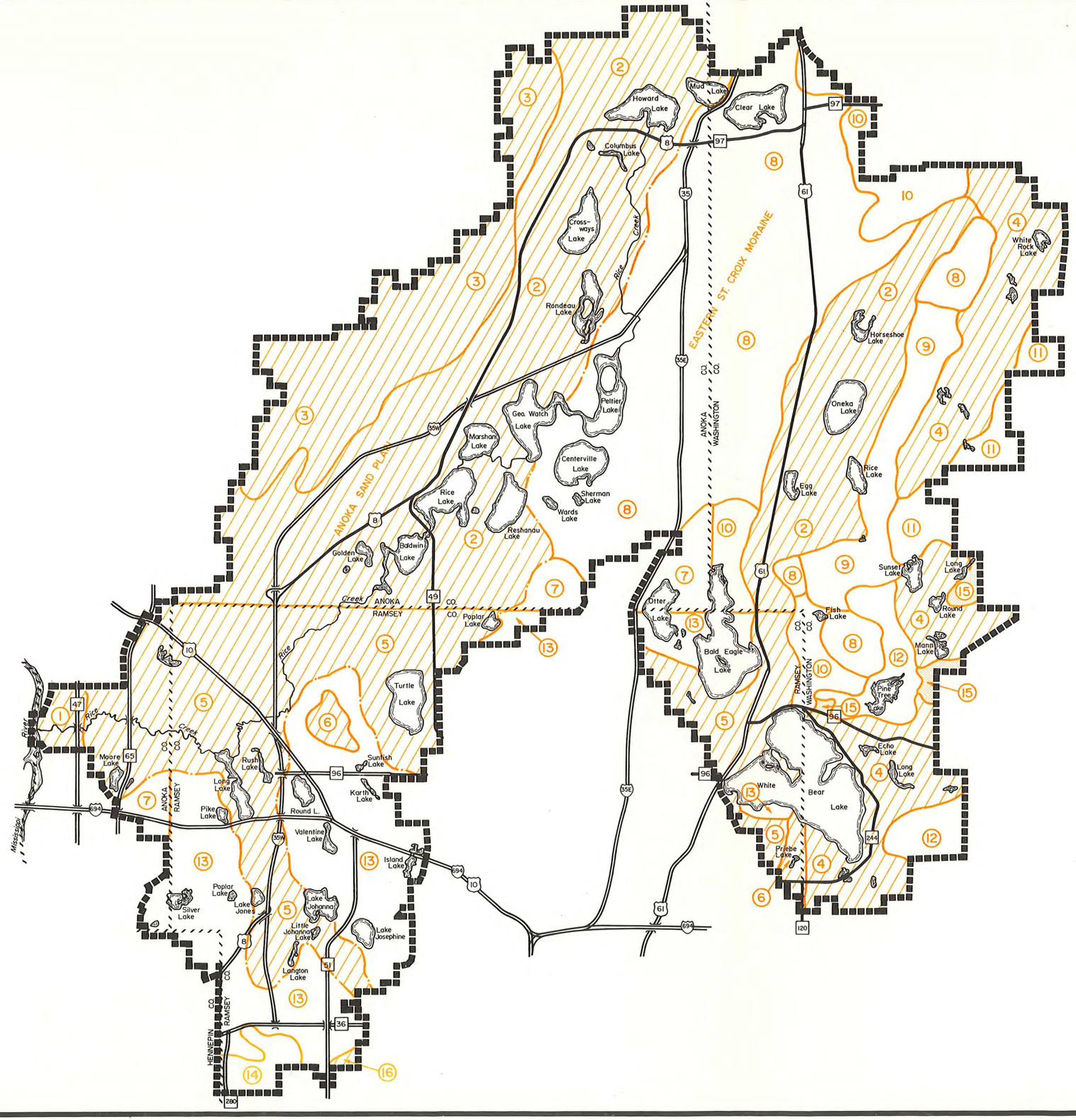
Soil Associations

There are 15 different soil associations within the District (Map 2, Table 2-2). The soil associations were determined during two separate soil surveys, so the results tend to be somewhat different from county to county. Table 2-2 names the particular soil

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

SURFICIAL GEOLOGY AND SOILS



Glacial Outwash Deposits

Glacial Till Deposits

Lucustrine Deposits

(8) Soil Association Number

MAP 2

SOURCE: USDA SCS SOIL SURVEY of ANOKA COUNTY MINNESOTA, 1972

USDA SCS SOIL SURVEY of WASHINGTON and RAMSEY COUNTIES of MINNESOTA, 1977

1 0 2

1/2 1

Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES

WAYZATA, MINNESOTA

TABLE 2-2

GENERAL SOIL ASSOCIATIONS

Mapping Number	Soil Association	County*	Topography	Drainage	Texture	Parent Material
1	Hubbard-Nymore	A	Nearly level to gently sloping	Excessively drained	Sandy throughout	Outwash
2	Zimmerman-Isanti-Lino	A,W	Nearly level to undulating	Excessively drained	Fine sand	Outwash
3	Rifle-Isanti	A	Nearly level	Very poorly drained	Organic material and fine sand	Outwash
4	Antigo-Chetek-Mahtomedi	W	Nearly level to steep	Well drained to excessively drained	Moderately coarse and coarse	Outwash terraces
5	Zimmerman-Urban and Rifle	R	Level to gently rolling	Excessively drained and very poorly drained	Coarse and organic	Outwash
6	Urbanland-Chetek Mahtomedi	R	Level to very steep	Somewhat drained to excessively drained	Moderately coarse and coarse	Outwash
7	Hayder-Kingsley-Hayden	A	Gently undulating to steep	Well drained	Loamy	Glacial till

TABLE 2-2

GENERAL SOIL ASSOCIATIONS
(Continued)

Mapping Number	Soil Association	County*	Topography	Drainage	Texture	Parent Material
8	Nessel-Dundas-Webster	A,W	Nearly level to gently sloping	Moderately well drained to poorly drained	Loamy	Glacial till
9	Hayden-Kingsley	W	Undulating to steep	Well drained	Coarse	Glacial till
10	Hayden-Nessel-Dundas	W	Level to gently rolling	Moderately well drained to poorly drained	Moderately coarse	Glacial till
11	Santiago-Kingsley	W	Undulating to steep	Well drained	Medium to moderately coarse	Glacial till
12	Demontreville-Kingsley	W	Undulating to steep	Well drained	Coarse to moderately coarse	Glacial till
13	Hayden-Urbanland	R	Undulating to steep	Well drained	Moderately coarse	Glacial till
14	Kingsley-Urbanland	R	Undulating to steep	Well drained	Moderately coarse	Glacial till

TABLE 2-2

GENERAL SOIL ASSOCIATIONS
(Continued)

Mapping Number	Soil Association	County*	Topography	Drainage	Texture	Parent Material
15	Antigo-Comstock	W	Level to moderate	Well drained to somewhat poorly drained	Medium	Lacustrine
16	Urbanland-Waukegan	R	Nearly level to very steep	Well drained and somewhat excessively drained	Medium	Outwash

* A - Anoka
W - Washington
R - Ramsey

TABLE 2-3

SOIL DRAINAGE AND TEXTURE TERMS

DRAINAGE	Refers to the frequency and duration of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking or drainage outlets. Seven classes or natural soil drainage are recognized:
Excessively Drained	Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat Excessively Drained	Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well Drained	Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately Well Drained	Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat Poorly Drained	Water is removed slowly enough that the soil is wet for significant periods during the growing seasons. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly Drained	Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depths. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

TABLE 2-3

SOIL DRAINAGE AND TEXTURE TERMS
(Continued)

Very Poorly Drained	Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing seasons. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."
TEXTURE, SOIL	This measure indicates the relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silt clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Source: USDA, SCS Soil Survey.

TABLE 2-4

HYDRIC SOIL MAP UNIT LIST
ANOKA COUNTY

Map Symbol	Map Unit Name
Af	Fluvaquents, Frequent Flooded
Bm	Blomford Loamy Fine Sand
Bx	Brickton Silt
Cb	Cathro Muck
Du	Talpon Loam
Gc	Bluffton Loam
Is	Isan Silt Loam
I	Isanti Loamy Fine Sand
Kr	Kratka Loamy Fine Sand
Lb	Lake Beaches (Isan-Rushlake Complex)
Lw	Bluffton Loam
Ma	Markey Muck
Mc	Histosols
Mk	Millerville MK-Peat
No	Nowen Silt Loam
Rf	Rifle Muck, Peat
Rg	Rifle Muck, Woody
R	Rifle Soils, Ponded
Ru	Rondeau Muck
Se	Seeleyville Muck
Wb	Bluffton Loam

TABLE 2-5

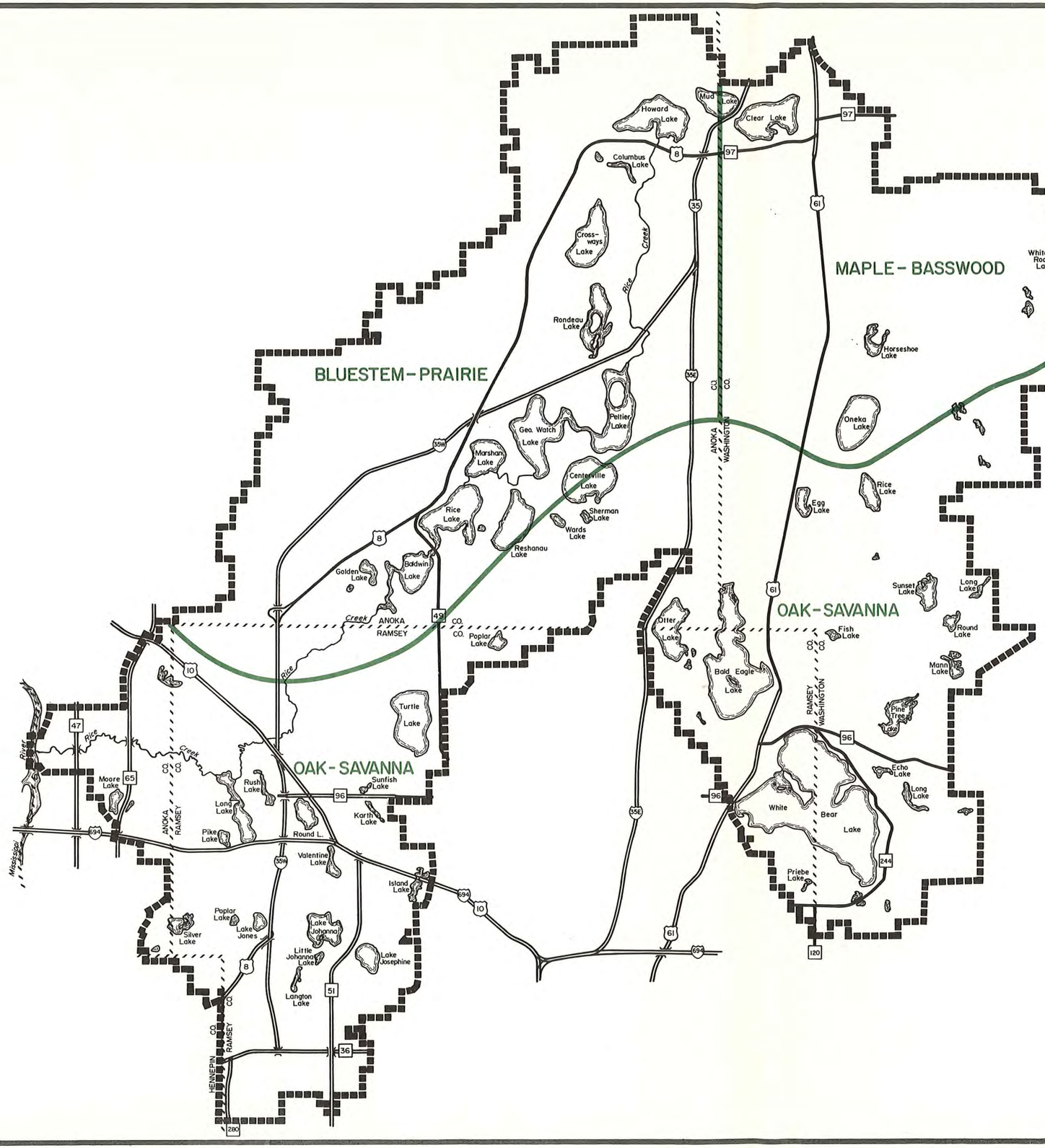
HYDRIC SOIL MAP UNIT LIST
WASHINGTON-RAMSEY COUNTIES

Map Symbol	Map Unit Name
75	Bluffton Loam
113	Webster Loam
123	Dundas Fine Sandy Loam
161	Isanti Loamy Fine Sand
170	Blomford Loamy Fine Sand
189	Auburndale Silt Loam
266	Freer Silt Loam
325	Prebish Loam
408	Faxon Silt Loam
456	Barronett Silt Loam
481	Kratka Fine Sandy Loam
540	Seelyeville Muck
541	Rifle Muck
543	Markey Muck
544	Cathro Muck
552	Kerston Muck
1033	Undifluvents
1055	Aquolls and Histisols, Ponded
1821	Algansee Loamy Sand
1847	Barronett Silt Loam

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

POTENTIAL NATURAL VEGETATION



MAP 3

SOURCE: KUCHLER, 1964
"POTENTIAL NATURAL VEGETATION of MINNESOTA and PORTIONS of ADJACENT STATES"

1 0 2
1/2 1
Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES
WAYZATA, MINNESOTA

association and describes the topography, drainage, texture, and parent material of each soil association. Table 2-3 is a definition of the terminology used to describe drainage and texture characteristics of each soil association.

There are two dominant geomorphic and soils types within the District: sandy soils of the Anoka Sandplain in the northwestern area and more clay-rich heterogeneous soils within the southwestern portion of the District in the area of the Eastern St. Croix Moraine.

BIOLOGICAL ENVIRONMENT

The biological environment of the District is discussed in terms of biological communities. Each biological community is discussed in terms of tees, shrubs, herbs, mammals, birds, and fish. The District's rare and endangered plant and animal species are described as well.

The potential natural vegetation is shown on Map 3. This map shows the general location of the oak savanna community, the bluestem prairie community, and the maple-basswood community. The wetland aquatic communities will be shown on a separate map in Section 3 of this plan. It should be noted that there are only a few remnants left of the original vegetation because of agriculture and urban development. Only isolated stands of natural vegetation remain. The map shows only the potential for finding this natural vegetation.

The oak savanna community most likely inhabits the southern portions of the Watershed District (Map 3). The oak savanna communities are characterized by isolated oak trees surrounded by open areas of low shrubs and grassy expanses. Table 2-6 is a list of species in the oak savanna community.

The bluestem prairie community has a potential for occurrence in the northwest portion of the District (Map 3). The bluestem prairie community is characterized by complex grasses dispersed with low shrubs in areas where moisture tends to be maintained in the soils, either in gullies or along protected slopes. Table 2-7 lists the dominant plant and animal species in this community.

The maple-basswood forest community potentially occurs in the northeastern portion of the District (Map 3). This community is characterized by a dense forest environment with a mixture of several types of deciduous trees including sugar maple and basswood. A dense

understory is characteristic of this community. In areas that are considerably shaded, there are numerous herbs replacing the shrubs. Table 2-8 shows some of the plant and animal species which may occur in this community.

Portions of the wetland aquatic community are generally interspersed throughout the other three communities, and are predominantly in the northwest and west-central portions of the District. This community is the most complex natural vegetation community as wetlands can vary from nearly lakes (Type V Wetlands) to areas that are periodically flooded (Type I Wetlands). Vegetation types range from aquatic plants to trees that emerge along wetland boundaries. Table 2-9 is a list of some potential plant and animal species found in the wetland aquatic communities. (A more detained description of wetland communities and their locations can be found in Section 3.)

Important Plant and Animal Communities

Colonial water birds rank among the District's more visible wildlife. Two large heron colonies are located within its boundaries. The Howard Lake Colony in the Lamprey Pass Wildlife Management Area is among the larger and more diverse colonies in Minnesota. A 1982 inventory listed nearly 1,100 active nests occupied by one of four different species: great blue herons, great egrets, black-crowned night herons, and double-crested cormorants. Although a severe summer storm in 1983 downed some nesting trees, the colony remains large and healthy (Map 4).

The Howard Lake site was only recently (1979) discovered. The District's other colony at Rice Lake has been known to Minnesota birders since the 1940s. Though much smaller in size (approximately 100 nests), the Rice Lake colony remains one of the larger sites in the Twin Cities area and has been the focus of major research studies. The colony supports primarily great blue herons, but great egrets, black-crowned night herons, and cormorants also nest there.

The sandy outwash plain that characterizes the Rice Creek watershed also provides ideal habitat for the Blanding's Turtle. This species of turtle is limited in distribution and vulnerable to overcollecting. Preserving wetland areas in the watershed is important to the specie's survival.

TABLE 2-6

OAK SAVANNA COMMUNITY

Trees	Mammals
Bur Oak	Cottontail Rabbit
White Oak	Gopher
Northern Pin Oak	Red Fox
Aspen	Thirteen-lined Ground Squirrel
Shrubs	**Birds**
Hazelnut	Crow
Dogwood	Western Meadowlark
Wildrose	Brewer's Blackbird
Prickly Ash	Goldfinch
	Indigo Bunting
Herbs	Lark Sparrow
	Ring-neck Pheasant
Meadow Rue	
Goldenrod	
Burdock	
Yarrow	
Meadowgrass	
Sweet Clover	
Big Bluestem	
Little Bluestem	
Porcupine Grass	
Hoary Puccoon	
New Jersey Tea	

Source: Hickok, 1977.

TABLE 2-7

BLUESTEM PRAIRIE COMMUNITY

Dominant Tree Species	Mammals
None	Thirteen-lined Ground Squirrel
	Pocket Gopher
Dominant Shrubs and Herbs	Badger
	Red Fox
Little Bluestem	Spotted Skunk
June Grass	
Big Bluestem	**Birds**
Switch Grass	
Grama Grass	Western Meadowlark
Sedge	Horned Lark
Porcupine Grass	Pheasant
Sand Grass	Savanna Sparrow
Dogwood	
Bluebell	
Paint Brush	
Thistle	
Draba	
Prairie Smoke	
Sunflower	
Prairie Phlox	
Rose	
Indian Grass	
Wolfberry	
Lead Plant	

Source: Hickok, 1977.

TABLE 2-8

MAPLE-BASSWOOD FOREST COMMUNITY

Trees	Mammals
Sugar Maple	Vole
Basswood	Chipmunk
Ironwood	Squirrel
American Elm	Cottontail Rabbit
Slippery Elm	Red Fox
Shrubs	**Reptiles and Amphibians**
Hazelnut	Frog
Chokecherry	Garter Snake
Juneberry	
American Elder	**Birds**
Herbs	Woodpeckers
	Black-capped Chickadee
Hepatica	House Wren
Violet	American Redstart
Virginia Creeper	Least Flycatcher
Climbing Bittersweet	Ovenbird
Sweet Cicley	Rose-breasted Grosbeak
Large-flowered Bellwort	

Source: Hickok, 1977.

TABLE 2-9

WETLAND-AQUATIC COMMUNITY

Submerged Plants

Sago Pondweed
Clasping Pondweed
Floating Leaf Pondweed
Bushy Pondweed
Wild Celery
Canada Waterweed
Coontail
Milfoil

Floating Plants

Water Lily
Duckweed

Emergent Plants

Common Cattail
Biant Burreed
Hardstem Bulrush
River Bulrush

Trees

Black Spruce
Paper Birch
Trembling Aspen
Willow
Tamarack

Shrubs

Alder
Dogwood
Willow
Bog Laurel
Bog Birch

Herbs

Sedges
Horsetail
Cattail
Sphagnum Moss

Mammals

Muskrat
Mink

Birds

Ducks
Redwinged Blackbird
Marsh Hawk
Heron
Mudhen/Coot
Common Snipe
Swamp Sparrow
Canada Goose

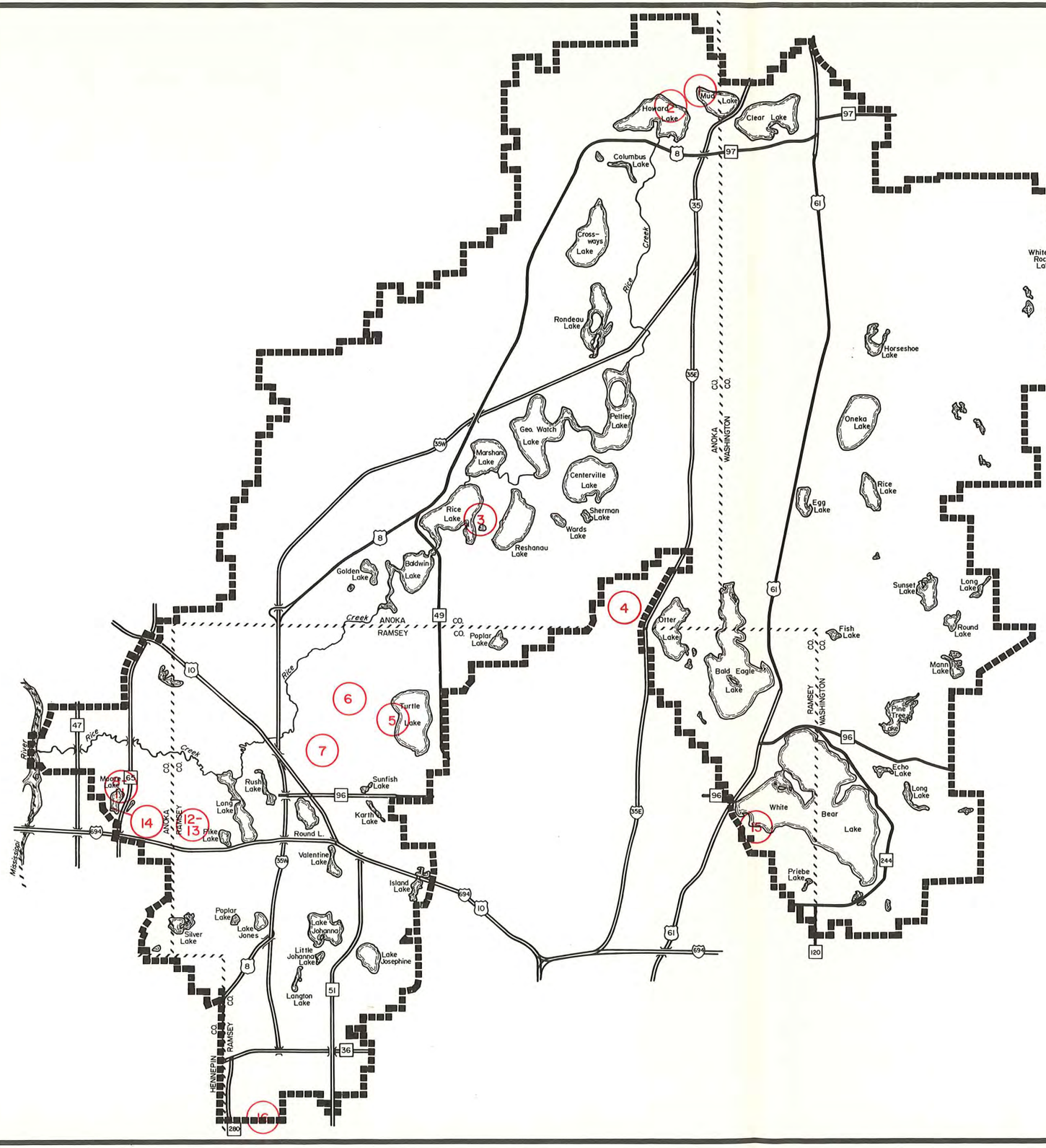
Reptiles and Amphibians

Turtle
Newt
Salamander
Frog

Fish

German Carp

Source: Hickok, 1977.



WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

OCCURRENCE OF RARE AND / OR SENSITIVE SPECIES

MAP 4

1 0 2
1/2 1
Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES
WAYZATA, MINNESOTA

TABLE 2-10

KEY TO MAP 4

OCCURENCE OF RARE AND/OR SENSITIVE SPECIES

No.	Feature	Description
1.	Lamprey Pass Wildlife Management Area	
2.	Colonial Nesting Site	Great Blue Heron, Great Egret, Black-crowned Night Heron
3.	Colonial Nesting Site	Great Blue Heron, Great Egret, Black-crowned Night Heron
4.	*Emydoidea blandingi*	Blanding's Turtle
5.	*Sagittaria graminea*	Grass-like Arrowhead
6.	*Emydoidea blandingi*	Blanding's Turtle
7.	Kame quaternary	Geologic Feature
8.	*Scleria triglomerata*	Tall Nut-rush
9.	*Juncus marginatus*	Rush species
10.	*Viola lanceolata*	Lance-leaved Violet
11.	*Xyris torta*	Twisted Yellow-eyed Grass
12.	*Potamogeton diversifolius*	Pondweed species
13.	*Najas gracillima*	Naiad
14.	*Aristida tuberculosa*	Sea-beach Needlegrass
15.	*Juncus articulatus*	Jointed Rush
16.	*Liparis lilifolia*	Lilia-leaved Twayblade

Source: Natural Heritage Program, 1984.

In addition to these of particular interest, many small birds, mammals, and reptiles are present in their respective biological communities (Tables 2-6 through 2-9).

Several rare plants have been identified in the District, but these records are dated and have not been verified in recent years. There is no way to determine from this data where these plants were found or whether they still exits. The records provide at best a means to indicate the possible presence of rare species in a given area.

Many such records are of the sand dune habitat on the west side of Moore Lake in Fridley. Most of this habitat has been destroyed by residential development and the building of Fridley High School. The remaining habitat of this type is located in the West Moore Lake Dunes Natural History Area. It is not known if any of the rare plants survive there. The recorded species and their status are: *Scleria triglomerata* (tall nut-rush), Endangered; *Juncus marginatus* (a species of rush feared extirpated from Minnesota); *Viola lanceolata* (lance-leaved violet), Special Concern; *Xyris torta* (twisted yellow-eyed grass), Threatened; *Aristida tuberculosa* (sea-beach needlegrass), Special Concern.

Other rare plants on record include *Sagittaria graminea* (grass-like arrowhead). Though not officially stated, this species is under close watch. It was found along the edge of Turtle Lake at T30N, R23W, Section 11 in 1972. In current status of the species at this site is unknown.

Potamogeton diversifolius (a species of pondweed) has been found in a small lake 1.5 miles northeast of Columbia Heights at T30N, R23W, section 19 in 1945. The species has no official designation regarding its status and the current status of the species at this site is unknown.

Najas gracillima (naiad) was found in a small pond on the west side of Fairchild Avenue, about one mile west of New Brighton and two miles north of Silver lake in 1936. It has been proposed that this species be included as "threatened."

Juncus articulatus (jointed rush) was found on the shore of White Bear Lake, near the village (exact location unknown) in 1920. Current status of the species at this site is unknown.

Liparis lilifolia (lilia-leaved twayblade) was found in 1969 south of Larpenteur Avenue near Fulham Street at NW1/4, NE1/4 of Section 20, T29, R23W. Current status of the species at this site is unknown. This species is on the unofficial watch list.

HUMAN ENVIRONMENT

This section of the inventory is divided into three subsections: Land Use, Recreational Resources, and Potential Environmental Hazards. The Land Use subsection describes metropolitan services, wastewater transport systems in particular, and profiles of current District land use with attention to areas of potential growth. The Recreation Resources subsection focuses primarily on regional recreational resources such as regional parks, trails, and boat landings. The Potential Environmental Hazards subsection contains a description of areas that have the potential for surface and groundwater contamination. There is a description of feed lots and other sources of potential groundwater contamination.

Historical Background

Centuries before the first Europeans visited the chain-of-lakes now called "Lino Lakes," this area was inhabited by Native Americans whose livelihood depended upon an ample supply of wild rice and game from the lakes, marshes, prairies and forest. Mounds, artifacts, and middens from this area, which are still being discovered and analyzed, tell of civilizations dating back to perhaps the dawn of mankind. Father Hennepin, Jonathan Carver, and other early explorers found the Dakota Indians occupying the Centerville area and supplementing their wild food diet with corn, squash, and beans. White men introduced fur trading to the Indian, and furs were another natural resource in which the lakes area excelled.

There is archaeological evidence that a primitive woodland ancestor of the Dakota Indians hunted and fished around Bald Eagle Lake in the vicinity of the Albert Iverson farm as early as 2000 B.C. Anthropologists agree that their summer village was at Centerville on an elevated field overlooking Centerville Lake.

Intruders came from the southeast around 1400 A.D. These middle Mississippian people brought with them the art of making mounds and shell-tempered pottery. Nine conical or rectangular mounds from this period have been found in the 1880s on the north side of

Centerville Lake in Section 15, Township 31, Range 22. Also in the 1880s, human skulls and bones, flint arrowheads, pottery, and charcoal were found near Long Lake.

The 1600s. In the 1640s, a Jesuit priest recorded the movement of a hundred Huron Indians from a camp on Prairie Island into the lakes around Centerville in order to gather wild rice. The Huron killed some Dakota who were collecting wild rice and were in turn hunted down in the lakes and marshes of the Rice Creek watershed. The Dakota surrounded the Huron who submerged themselves in the lake. Nets were spread to catch them when they came out. Attached to the nets were small bells that rang when the Huron tried to escape at night.

The Dakota captured all of the Huron except one named La Froid who escaped the net and ran to the St. Croix River. The Dakota sent fifty Huron back to the Ottawa at La Pointe, Wisconsin, and used the other 50 to hone battle skills.

The Mdewakaton Dakota had a small village on the rapidly flowing Rice Creek called Wakpaton. A larger village of the Dakota overlooked the wild rice grounds on Centerville Lake before 1700. It was to this village in 1688 that Father Louis Hennepin was led by the Dakota on his way to Mille Lacs Lake.

The 1700s. In 1740 the Dakota abandoned Mille Lacs Lake and all but one of the villages north of the Mississippi River. In 1766 Jonathan Carver met the Dakota at a large village at Anoka. After 1766 the Dakota moved to Kaposia in South St. Paul, however, they continued hunting for bear and deer in the area as late as the 1850s.

The 1800s. The area comprising the Rice Creek watershed was originally acquired by the United States in 1803 as part of the Louisiana Purchase. The establishment of a United States Army reservation at Fort Snelling in 1819 and the incorporation of Minneapolis in 1865 (with a population of 1,555 people) were initial steps in the eventual development of a large metropolitan center which in 1970 contained a seven-county population of 1.9 million.

In 1825, the United States government, in order to keep the peace between the Ojibway and Dakota, drew a line through Forest Lake to the cedars on the St. Croix. The Chippewa were supposed to stay north of the line and the Dakota south of the line. However, newspaper articles in St. Paul in the 1850s indicated that the Chippewa came into St. Paul and killed a

number of Dakota including One-Legged Jim, brother of Old Betts, the last of the Dakota who lived in the Rice Creek watershed. Old Betts died in 1875 and was buried in Mendota.

This friction continued into 1855 when a Dakota hunting party found a Chippewa party at Lake Oneka near Hugo and fought a battle, after which the Dakota carried their wounded to the shores of Goose Lake.

In the 1850s, the Dakota killed 1,000 black bears around Rice Lake in Anoka County. In the 1853-1854 time period alone, the Dakota killed 1,265 deer. These early Indians probably traded their furs beginning in the early 1800s with Anderson and Cameron on Pike Island in the Mississippi. Early trails west of Otter Lake going north to Madelaine Island were used by the Indians and fur traders and settlers until about 1870.

In 1847, Jacob Fahlstrom of Lakeville, a traveling lay minister of the Methodist Church, tapped the maple trees on Manitou Island. In 1849, a claim cabin of Isaac B. Dewebber was built on the northeast side of White Bear Lake.

The French Canadians who lived in Little Canada moved north in the 1850s into Centerville; F.W. Taves erected the first building in 1850. In the spring of 1852 came Francis Lamott and in the fall, Charles Peltier, Peter Cardinal, and F.X. Lavalle; the four settled in Section 23. Joseph Houle joined them later, along with Oliver Dupre, and Oliver Peltier.

The first white settler in Forest Lake was a German revolutionary, Louis Schiel. He built his house in the northwestern corner of the town in 1855. Other families who came to Forest Lake in 1855 included the Rices and the Wilsons.

The first white settler in Hugo was Villeroy B. Barnum in 1868. In the 1860s, Father Joseph Goiffon, the "frozen priest" of Pembina, served the Catholic churches of Centerville, White Bear Lake, and Little Canada.

The first post office in the Rice Creek watershed was at Mahnomen; it was situated in Fridley.

During the Sioux uprising in 1862 in Minnesota, the farmers in Anoka and Washington Counties were moved to Stillwater for protection from the wandering bands of Indians.

With the beginning of the building of the Lake Superior and Mississippi Railroad to Duluth in 1868, Irish, German, and Scandinavian farmers began moving into the area and buying up the land owned by the railroad. As the railroad building continued, towns blossomed all along the lines. Among theses were Dellwood, Mahtomedi, Willernie, Bald Eagle Lake, Hugo, and Centerville.

About 1886, a Mr. Elwell purchased 8,500 acres from Montgomery and Morley in eastern Ham Lake. Mr. Elwell purchased all the land from the Great Northern Railroad and Jay Cooke estate in the towns of Linwood, Bethel, Columbus, and Ham Lake. Mr. Elwell also purchased 6,000 acres in Blaine from Packer and Johnson. At his own expense, Mr. Elwell built an eight-mile road from his farm in Ham Lake to Blaine at a cost of $1,000 a mile. Mr. Elwell built two stock farms on Oak Leaf and Golden Lakes and constructed barbed wire fences around a reported 52,700 acres.

The early communities in the Twin Cities area were small and self-sufficient farm towns. The agricultural economy of the region depended upon the natural fertility of the soil, which produced wheat and other grains in great abundance.

The 1900s. During World War I, the area north of White Bear Lake was mostly farming land. The area raised oats, rye, potatoes, corn, hay, wheat, vegetables, and fruits. The St. Paul-Duluth Railroad provided access to St. Paul markets. At this time Belgian horses and polled angus and Guernsey cattle were also raised in Washington County. Five large cooperative creameries existed at this time for the milk needed in St. Paul; Dellwood and Forest Lake also had large dairy farms.

During World War II some of this farming was abandoned. In the 1950s, large suburban homes were built on large tracts of the one-time farms. This building has continued north of St. Paul into the 1970s, affecting the areas now as far north as Forest Lake, Centerville, Hugo, and into the Reshanau Lake area.

The St. Paul Water Department has long been concerned with developments adjacent to their property. Due to this concern, Lino Lakes today retains much of the natural charm which made it so attractive to Indians and Frenchmen. Gone are the fields of wild rice, prairie chickens, and some plants and animals that played an important part in the past. However, the Lino Chain of Lakes and Rice Creek which meanders through them, the oak

and aspen groves, the heron colony, the waterfowl, the deer and reintroduced Canada geese still maintain a tenuous link to the past.

In the area south of the Rice Creek watershed, the cities of Minneapolis and St. Paul reached their population peaks around 1950. Then, in common with many other metropolitan core cities in the United States, their populations leveled off and began to decline as the exodus to the suburbs came into full swing. Land within 10 to 15 miles of the downtown city areas was available on most reasonable terms even after speculative markups; construction costs, by current standards, were extremely cheap and the availability of low-interest GI and FHA home loans was the real estate sales person's dream. Land which had been previously used for truck farming and pasturage was subdivided into lots for residential houses. Convenience retail stores in the suburbs were followed by major shopping centers, corporate headquarters were relocated from core city to new suburban locations, and simple stop signs were superseded by sophisticated electronic signal systems.

Present Land Use

Land use within the District reflects five basic location mechanisms: proximity to Minneapolis and St. Paul, transportation systems, lakes, wastewater transport systems, and local controls.

To a degree, the area within most of the District was not as ready for development as other land in the southern and western suburbs of Minneapolis and St. Paul. Anoka County, located on an extensive, easily developed sand plain, was one of the prominent exceptions. The 1950 population of Anoka County was 35,579; by 1970, it had increased by over 330% to 154,556. During this 20-year period, the City of Fridley, at the southwestern edge of the watershed, grew by over 660% from 3,796 to 28,993 people.

Much of the substantial industrial and commercial development in the watershed has been centered within the southwestern area of Fridley, New Brighton, and Roseville. As inner suburbs, they had the advantages of convenient access to client business and suppliers. Concomitant development of residential areas naturally produced an extensive range of retail service operations. Construction of new freeways (i.e., I-35W, I-35E, and I-694) provided more convenient linkages to the entire metropolitan area. The City of White

Bear Lake at the southeastern end of the watershed also grew explosively (i.e., from a 1950 population of 3,646 to 23,313 in 1970).

Map 5 shows the land use within the District. It can be seen from the map that the most urbanized areas are in the southwest and the southeast. This growth is primarily a result of expansion in Minneapolis and St. Paul. Land-use types are fairly typical of suburban areas: commercial areas adjacent to major transportation routes. The Rosedale Shopping Center near the intersection of I-35W and State Highway 36 is a primary example.

The bulk of the developed land within the District is single-family housing, which is again typical of a suburban setting. Besides proximity to Minneapolis and St. Paul, the presence of lakes and transportation have been among the driving forces for development. The proximity of water resources has attracted many people for recreational purposes. White Bear Lake and the smaller communities of Birchwood, Willernie, Mahtomedi, and Dellwood show how a high-quality water resource such as White Bear Lake has induced growth around its shores. There has also been considerable local control over the development of the District in the form of zoning ordinances and other controls such as bonding mechanisms.

The northern portion of the District is less developed and more agricultural in character than the southern portion, except for some urban development along the major transportation routes such as Old Highway 8 and Highway 61.

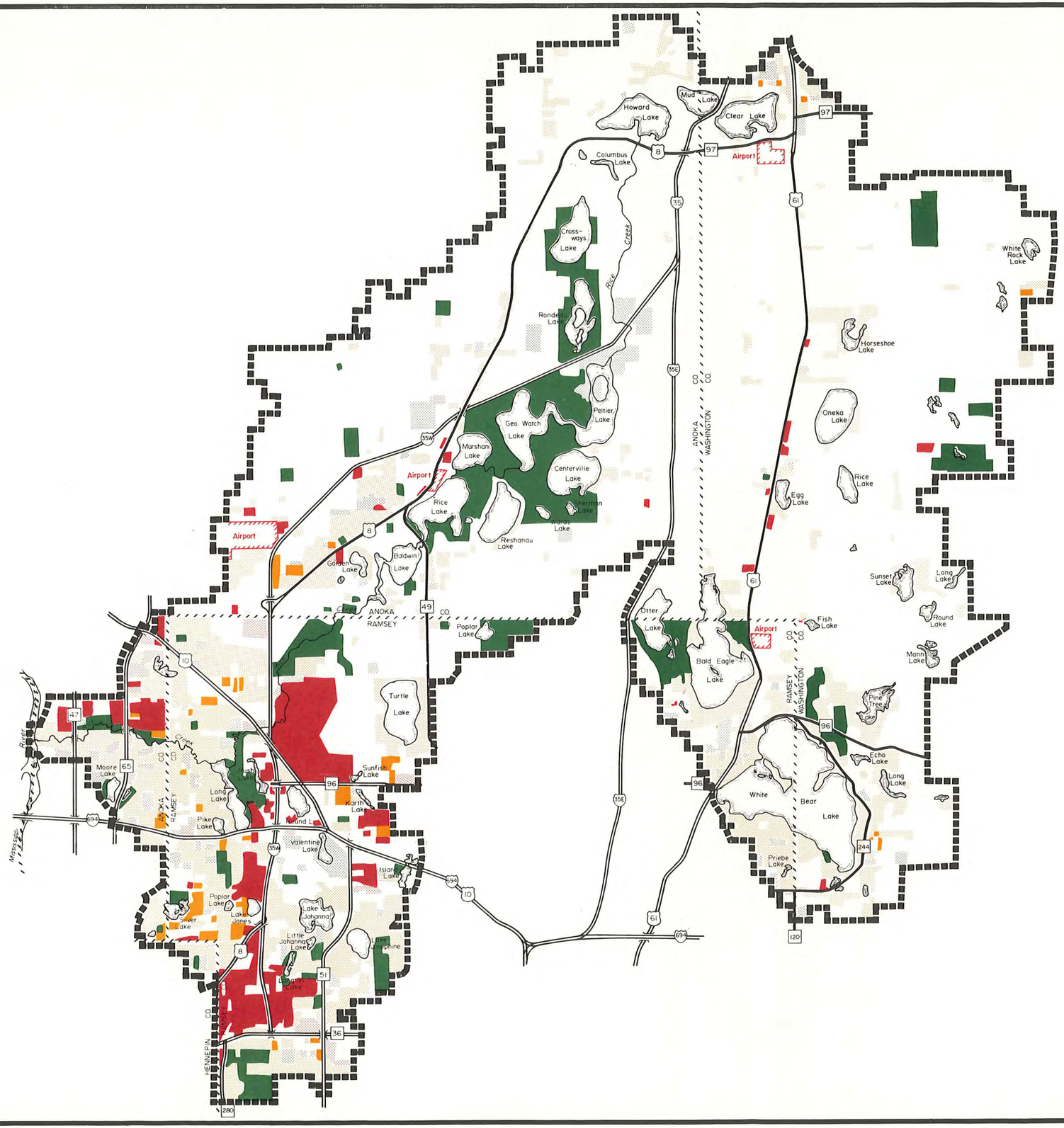
The Metropolitan Waste Control Commission and Metropolitan Council affect the development of the District through the location of wastewater transport systems. There are no wastewater treatment plants within the District; however, there are numerous wastewater interceptors within the District. Map 6 shows the boundary of the Metropolitan Urban Service Area (MUSA) in 1990. The MUSA also includes several free-standing areas outside the contiguous metropolitan service area at Lino Lakes, Centerville, Hugo, and Forest Lake Township.

Under the Metropolitan Land Planning Act, the 30 communities of the District were required to prepare land management plans projecting to the year 2000. These plans were completed in the late 1970s and early 1980s. Map 7 is a compilation of the project growth from these comprehensive plans. The map indicates that during the next 15 years there will be a decline in open space in the southern portion of the District and additional new

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

EXISTING LAND USE



- Single Family Housing
- Multi-Family Housing
- Commercial / Retail Service
- Industrial / Manufacturing
- Public & Semi-Public
- Parks & Recreation
- Agricultural & Vacant

MAP 5

SOURCE: CITY PLANS

1 0 2

1/2 1

Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES

WAYZATA, MINNESOTA

growth in the District, particularly in areas around Centerville, Hugo, and Forest Lake Township.

Table 2-8 indicates the availability of land use information on local communities within the District. The table indicates which potential growth areas within the District have detailed maps available.

Recreation

There are numerous water and land-based recreational opportunities within the District. There are three regional parks, three wildlife management areas, various trails and canoe routes, and several public boat-launching areas (Map 8).

The Long Lake-Rush Lake Regional Park in New Brighton, Rice Creek Chain of Lakes Regional Park in Lino Lakes and Centerville, and Bald Eagle Lake-Otter Lake Regional Park in White Bear are the three regional parks within the District. These parks are 260, 2,500, and 1,290 acres, respectively. These parks have various water resources and provide opportunities for boating, fishing, swimming, and other water-related activities. Numerous smaller parks are located along the lakes and Rice Creek which are too small for inclusion on Map 8.

There is a major recreational canoeing route in the District from George Watch Lake to Long Lake and from Long Lake to the Mississippi River. At present, there is one major break in the route where Rice Creek goes through the Twin Cities Army Ammunition Plant in the vicinity of Highway 10 and I-35W. In addition, Locke Lake requires a substantial portage from the lake to East River Road. Both breaks are currently being addressed by the counties and the District.

There are also several proposed regional trail corridors within the District. These are shown on Map 8. These corridors are located to connect lakes and waterways to the regional park system.

There are 13 public boat-launching sites within the Watershed District. Table 2-12 provides a description of each site with information on the operating agency and regulations.

TABLE 2-11

EXISTING LAND USE AND LAND USE PLAN MAPS FOR COMMUNITIES

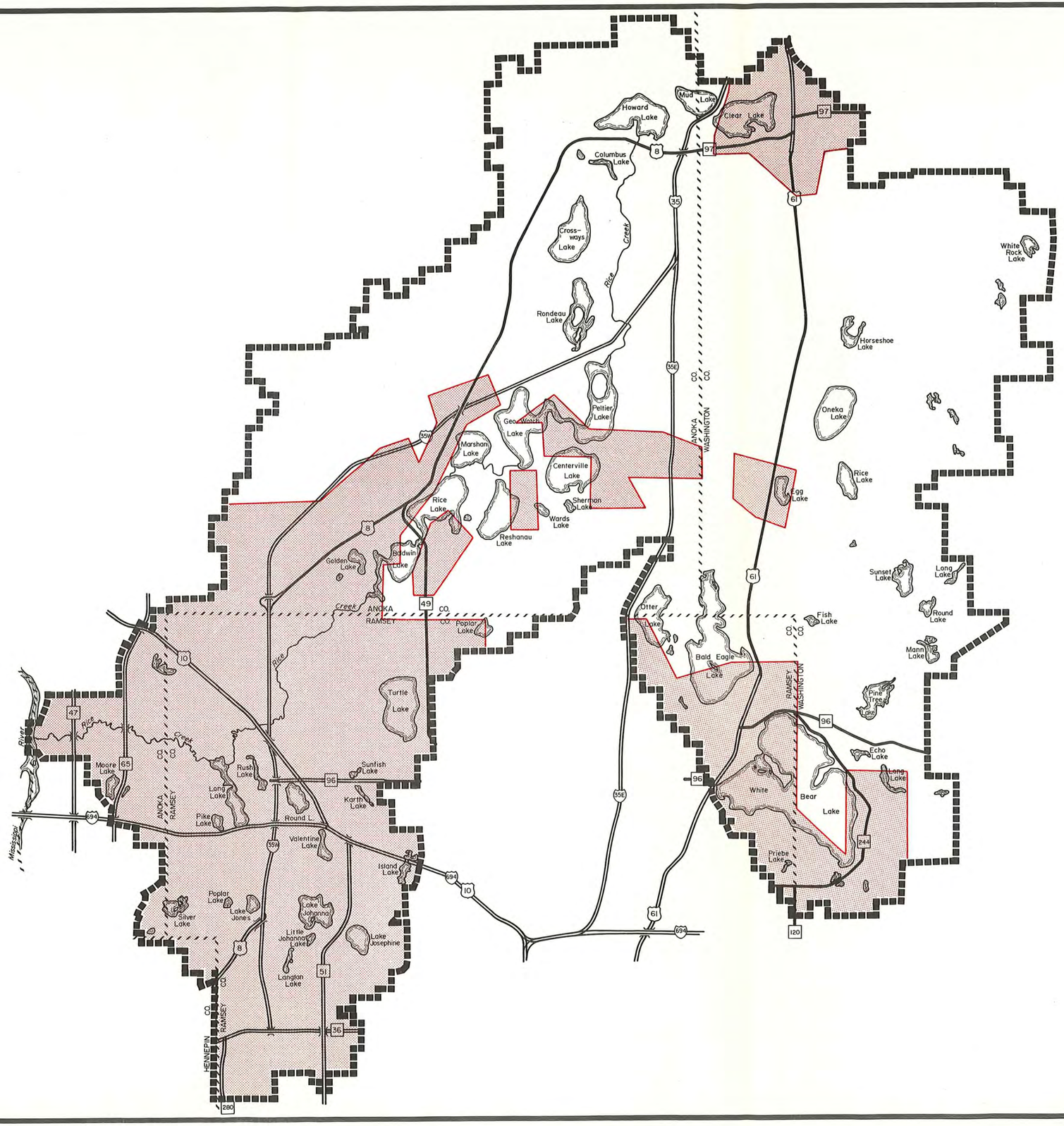
Community	Existing Land Use Map	Date	Land Use Plan Map	Date
Arden Hills	--	--	x	1981
Birchwood Village	--	--	x	1980
Blaine	x	1979	--	--
Centerville	--	--	x	1980
Circle Pines	x	1980	x	1980
Columbia Heights	x	1968	x	1980
Columbus Township	x	1980	x	1980
Dellwood	x	1980	--	--
Falcoln Heights	--	--	x	1980
Forest Lake	x	?	--	--
Forest Lake Township	--	--	x	?
Fridley	x	1981	--	--
Grant Township	x	1981	x	1981
Ham Lake	x	1975	x	1975
Hugo	x	1981	--	--
Lauderdale	--	--	x	1980
Lexington	x	?	x	?
Lino Lakes	--	--	x	1981
Mahtomedi	--	--	x	1979
May Township	x	?	--	--
Mounds View	--	--	x	1982
New Brighton	x	1978	x	1979
New Scandia Township	x	1980	x	1980
Roseville	--	--	x	1980
St. Anthony	x	1980	x	1980
Shoreview	--	--	x	1980
Spring Lake Park	x	1983	--	--
White Bear Lake	x	1980	--	--
White Bear Township	x	1982	x	1982
Willernie	x	1979	x	1979

Source: Hickok, 1977.

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

METROPOLITAN URBAN SERVICE AREA

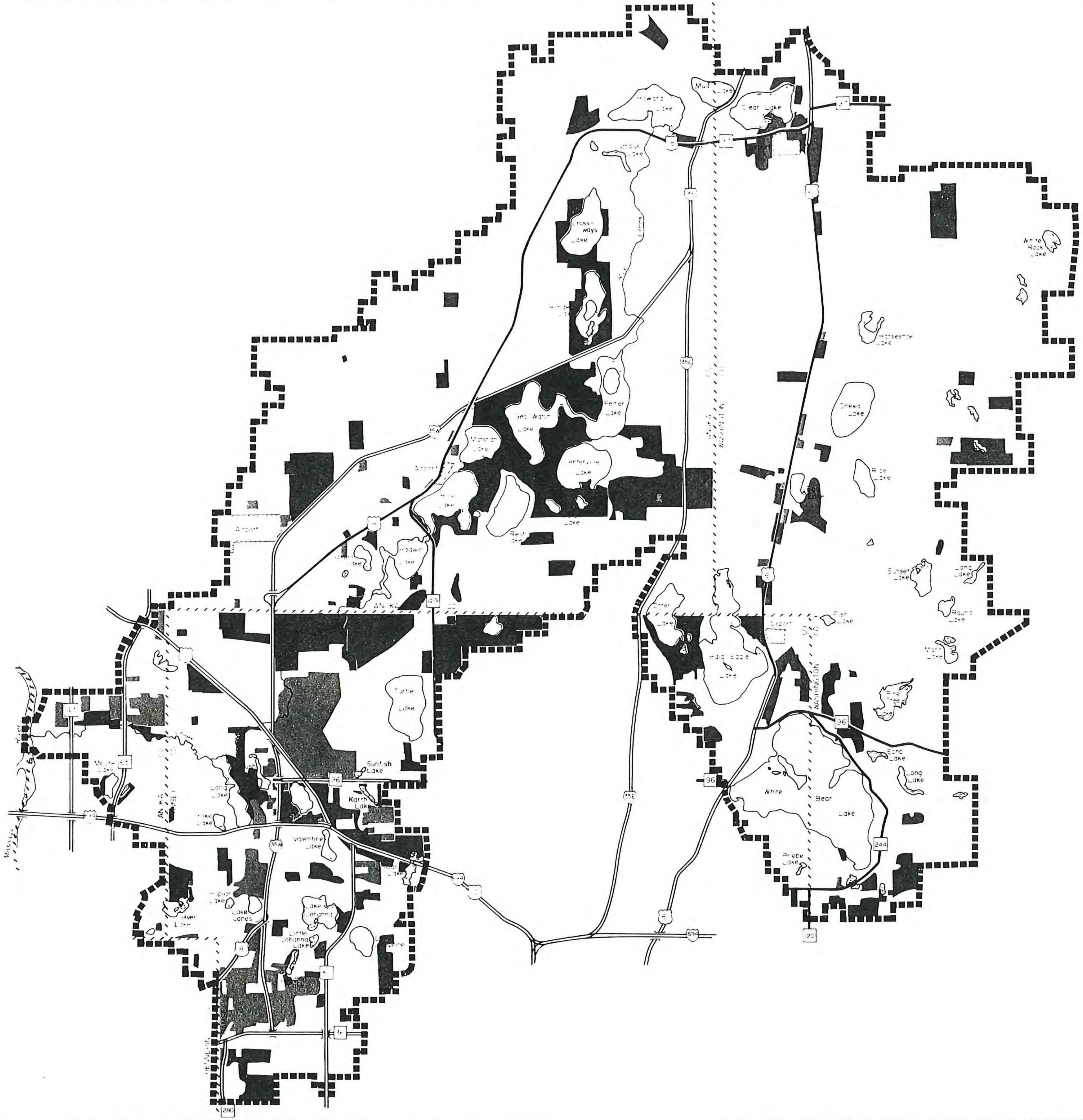


MAP 6
SOURCE: MWCC

1 0 2
1/2 1
Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES
WAYZATA, MINNESOTA



WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

PROJECTED LAND USE

- Single Family Housing
- Multi-Family Housing
- Commercial / Retail Service
- Industrial / Manufacturing
- Public & Semi-Public
- Parks & Recreation
- Agricultural & Vacant
- Urbanized Land Additions, 1980 - 2000

MAP 7

SOURCE: CITY PLANS

1 0 2
1/2 1
Scale in Miles

NORTH

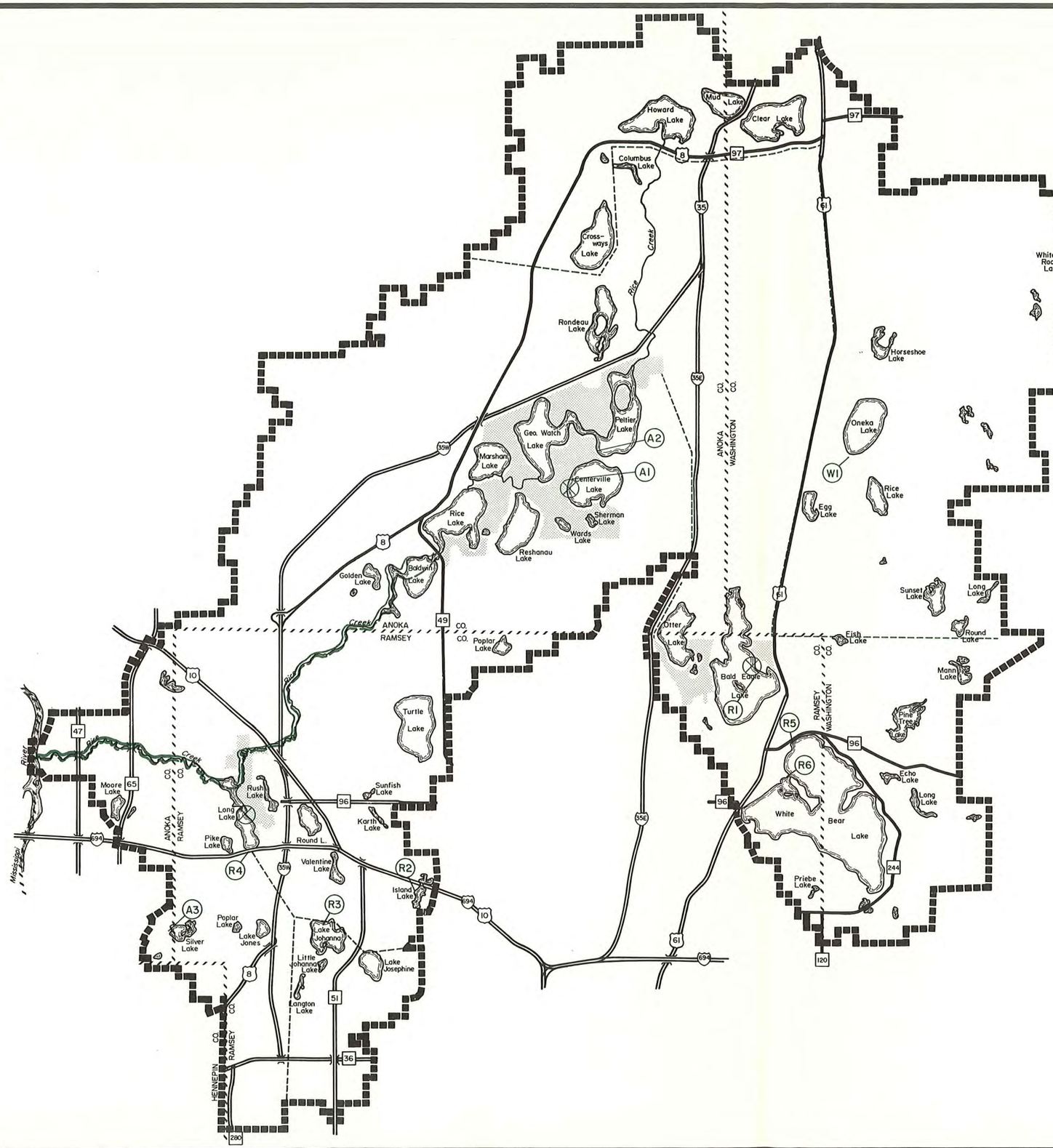
E. A. HICKOK AND ASSOCIATES

WAYZATA, MINNESOTA

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

REGIONAL RECREATION



Regional Recreation Open Space, Existing or with an Approved Boundary - 1980

Regional Trail Corridors Developed or Funded for Development

Regional Trail Corridors to be Aquired or Developed, 1980-1985

Potential Regional Trail Corridors

Canoe and/or Motorboat Routes

(R5) Public Boat Launches

Regional Beaches

MAP 8

SOURCE: METROPOLITAN COUNCIL

1 0 2
1/2 1
Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES

WAYZATA, MINNESOTA

TABLE 2-12

PUBLIC BOAT LAUNCHES

Lake or River Access Name	Map Location	Hours Open	Permit Required	Ramp Types	Parking Spaces	Fish* Types	Operating Agency	Notes/Directions to Launch Site
Anoka County								
Centerville	A-1	7:30 am 9:30 pm	No	Concrete	29	C,W,NP, P, BLH WK (A)	Anoka County 757-3920	In regional county park reserve. Two miles west of Highway I-35E on County Road 14.
Peltier	A-2	24	No	Concrete	29	NP,C,P, BLH (WK)	Anoka County 757-3920	In regional county park reserve. Two miles west of Highway I-35E on County Road 14.
Silver	A-3	8:00 am	No	Earth	8	NP,B,C, BLH (WK)	Columbia Heights 788-9221	In city park. One mile east of Highway 65 on 37th Avenue N.E., then north.
Golden	Not shown	7:30 am 9:30 pm	No	Earth	10	LMB,B,W, NP,WK (A)	Circle Pines	
Ramsey County								
Bald Eagle	R-1	Daylight	No	Concrete	24	NP,LMB,C, B,W,M	Ramsey County 771-1361	In regional county park. West of Highway 61. Exit west on North 120th Street and go South on Hugo Road one mile.
Island	R-2	Daylight	No	Earth	10	C,B,LMB (WK-A) TM	Ramsey County 777-1361	In county park. Exit south on Victoria Avenue South from Highway I-694.

TABLE 2-12

PUBLIC BOAT LAUNCHES (CONTINUED)

Lake or River Access Name	Map Location	Hours Open	Permit Required	Ramp Types	Parking Spaces	Fish* Types	Operating Agency	Notes/Directions to Launch Site
Johanna	R-3	Daylight	No	Asphalt	12	LMB,C,B, TM,W	Ramsey County 777-1361	In county park. Water use regulations. Exit east on County Road D from Highway I-35W and north one and one-half miles on Lake Johanna Boulevard.
Josephine	Not shown	5:00 am 9:00 pm	No	Concrete	6	C,B,LMB, NP	Ramsey County 777-1361	County Park
Long	R-4	5:00 am 11:00 pm	No	Earth	30	NP,B,C, W,TM	New Brighton 633-8906	In regional city park. Water use regulations. Exit north on Long Lake Road from Highway I-694, then east on frontage road.
Otter Lake	Not shown	Daylight	No	Concrete	10	BLH,NP,C, B,WK	Ramsey County 777-1361	County Park
Turtle Lake	Not shown	Daylight	No	Concrete	25	LMB,B,C,	Ramsey County 777-1361	County Park
White Bear	R-5	Daylight	No	Concrete	37	LMB,NP,W, SMB,C,B	Ramsey County 777-1361	In county park. Water use regulations. Five blocks east of Highway 61 on Highway 96, then south on Lake Avenue.

TABLE 2-12

PUBLIC BOAT LAUNCHES (CONTINUED)

Lake or River Access Name	Map Location	Hours Open	Permit Required	Ramp Types	Parking Spaces	Fish* Types	Operating Agency	Notes/Directions to Launch Site
White Bear	R-6	24	Fee or permit	Concrete	15	LMP,NP, W,SMB,C,B	White Bear Lake 429-8525	In city park. Water use regulations. One-half mile east of Highway 61 on 5th Street.
Washington County								
Oneka	W-1	24	No	Earth	10	Hunting	DNR 296-3573	One and one-half miles east of Highway 61 via Oneka Lake Boulevard and Green Avenue North.

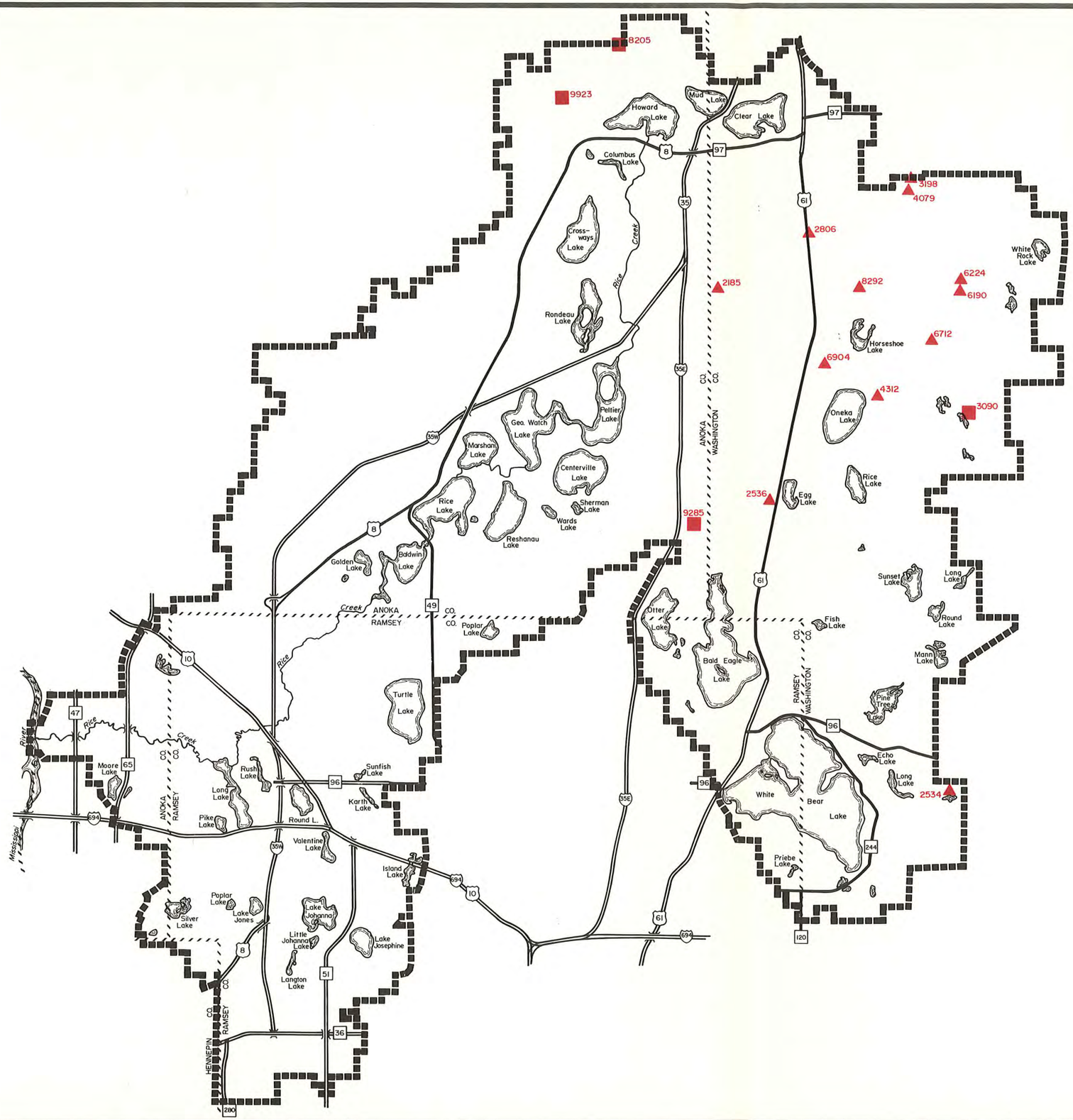
* B - Bluegill
BLH - Bullhead
C - Crappies
LMB - Largemouth Bass
M - Muskie
TM - Tiger muskie
NP - Northern Pike
P - Perch
SMB - Smallmouth Bass
W - Walleyes
(WK) - Winter kill lake
(WK-A) - Winter kill lake with artificial aeration
Hunting - Access site is primarily for hunting

Source: DNR, 1983.

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

PERMITTED ANIMAL FEED LOTS



MAP 9

SOURCE: MPCA, 1984

- ■ Greater Than 25 Animal Units
- ▲ Less Than 25 Animal Units
- 9285 MPCA Animal Feed Lot Permit Number

1 0 2

1/2 1

Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES

WAYZATA, MINNESOTA

Potential Environmental Hazards

In the District, the greatest potential source of surface water contamination is nonpoint source pollution from urban runoff, soil erosion, and animal wastes from feed lots. Potential groundwater contamination comes from existing dumps and industry or petroleum pipelines. Urban runoff and soil erosion sources are discussed in another section of this plan.

Feedlots. There are six permitted animal feed lots in Anoka County and 30 such lots in Washington County. This is a large increase from the 16 permitted feed lots identified in the 1986 water resource management plan. Feed lots, if located close to a waterway and without proper safeguards, can contribute significant amounts of nutrients (including phosphorus) and biological oxygen demand to receiving waters. Of these 36 feed lots, 14 have 25 or more animal units and are considered commercial operations rather than hobby operations. Map 9 shows the location of permitted feed lots, and Table 2-13 gives a brief description of each feed lot operation.

Potential Groundwater Contamination. The MPCA conducted an open dump survey in 1980 and has since continually updated this survey. The MPCA, through the Resource Conservation and Recovery Act (RCRA) permit system, maps locations where hazardous waste is either generated, stored, processed, or disposed. Map 10 shows the location of potential groundwater contamination as identified in these two programs. Table 2-14 gives the name of the potential site of groundwater contamination and a listing of the type of materials disposed at each location. The MPCA, under state and federal Superfund programs, is evaluating several sites to determine potential impacts on groundwater.

Pipelines. Map 11 shows the location of petroleum pipelines throughout the District. There are three oil pipelines within the District: the American Oil Company pipeline, Williams Brothers Company pipeline, and Minnesota Pipeline Company pipeline. In addition, the Northern Natural Gas pipeline traverses the District. These petroleum and gas pipelines cross Rice Creek in several locations; a break in these pipelines would cause harm to surface and ground waters of the District.

TABLE 2-13

PERMITTED ANIMAL FEED LOTS WITHIN RCWD

County	Permit Number	Permit Year	Permitted Use	Waste Management	Location
Anoka	C-2973	Active	Barnyard - 42 horses	Spreading	NE1/4 of Section 35 Village of Lino Lakes Columbus Township
	C-379	Active	Building - 40 feeder pigs	Spreading	Columbus Township
Washington	C-2979	Active	Barnyard - 4 horses	Spreading	NW1/4 as Section 23 Grant Township
	C-634R	Active	Building - 1 dairy cow 4 dairy youngstock 80 sheep 100 chicken layers	Spreading	SE1/4 of Section 15 May Township
	C-3248	Active	Barnyard - 7 horses	Spreading	SW1/4 of Section 16 Forest Lake Township
	I-613(A)R	Active	Stable - 66 horses	Spreading	Eastern section of 5 Grant Township
	I-612(A)R	Active	Stable - 42 horses	Spreading	NE1/4 of Section 4 Grant Township
	C-2452	Active	Building - 10 horses 4 beef feeders 2 breeder swine 12 chicken broilers 2 turkeys	Spreading	NE1/4 of Section 30 May Township

TABLE 2-13

PERMITTED ANIMAL FEED LOTS WITHIN RCWD

(Continued)

County	Permit Number	Permit Year	Permitted Use	Waste Management	Location
	C-1800	Active	Stable - 50 horses	Spreading	Western section of 28 Grant Township
	C-2453	Active	Stable - 80 horses	Spreading	NE1/ of Section 14 Grant Township
	C-2306	Active	Stable - 40 horses	Spreading	NW1/4 of Section 33 Grant Township
	C-2826	Active	Barnyard - 1 beef feeder 3 beef cow with calf 2 dairy youngstock	Spreading	SE1/4 of Section 27 Hugo
	C-1589	Active	Stable - 20 horses	Spreading	SE1/4 ofon 22 Grant Township
	C-2593R2	Active	Stable - 60 horses	Spreading	SW1/4 of Section 15 Grant Township
	C-2501	Active	Stable - 120 horses	Spreading	NE1/4 of Section 21 Grant Township
	C-682	Active	Barnyard - 15 horses	Spreading	SW1/4 of Section 27 Grant Township

Source: MPCA, 1984, 1991.

TABLE 2-13

PERMITTED ANIMAL FEED LOTS WITHIN RCWD

(Continued)

County	Permit Number	Permit Year	Permitted Use	Waste Management	Location
	C-1396	Active	Building - 15 horses	Spreading	Western section of 9 Grant Township
	C-2693R	Active	Stable - 85 horses	Spreading	Western section of 15 Grant Township
Anoka	C-3071	Active	Barnyard - 37 horses	Spreading	SW1/on 36 Columbus Township
Washington	A-1472	Active	600 dairy youngstock	Spreading	NE of Section 12 Hugo
Anoka	C-3980	Active	Barnyard - 25 horses	Spreading	NE f Section 13 Blaine
	SW-9923	1979	House - 6,400 turkeys	Spreading	NW1/4 of Section 15 Columbus Township
	SW-8205	1978	House - 530 hogs	Spreading	
Washington	SW-2185	1974	Barn - 2 horses	Spreading	SW1/4 of Section 31 Forest Lake Township
	SW-2806	1974	Building - 15 beef cattle	Spreading	SW1/4 of Sectino 29 Forest Lake Township

Source: MPCA, 1984, 1991.

TABLE 2-13

PERMITTED ANIMAL FEED LOTS WITHIN RCWD

(Continued)

County	Permit Number	Permit Year	Permitted Use	Waste Management	Location
	SSW-2536	1974	Stable - 18 horses Annual horse show	Spreading	SW1/4 of Section 20 Hugo
	SW-8292	1978	Building - 2 horses	Spreading	SE1/4 of Section 33 Forest Lake Township
	SW-6904	1977	Building - 3 horses	Spreading	NW1/4 of Section 9 Oneka Township
	SW-3198	1974	Building - 2 horses 1 cow	Spreading	SW1/4 of Section 22 Forest Lake Township
	SW-4079	1975	Building - 3 horses	Spreading	SW1/4 of Section 22 Forest Lake Township
	SW-4312	1975	Barn - 2 horses	Spreading	SE1/4 of Section 10 Hugo
	SW-6224	1977	Building - 1 horse	Spreading	SE1/4 of Section 35 Forest Lake Township
	SW-6190	1977	Building - 2 horses	Spreading	SE1/4 of Section 35 Forest Lake Township

Source: MPCA, 1984, 1991.

TABLE 2-13

PERMITTED ANIMAL FEED LOTS WITHIN RCWD

(Continued)

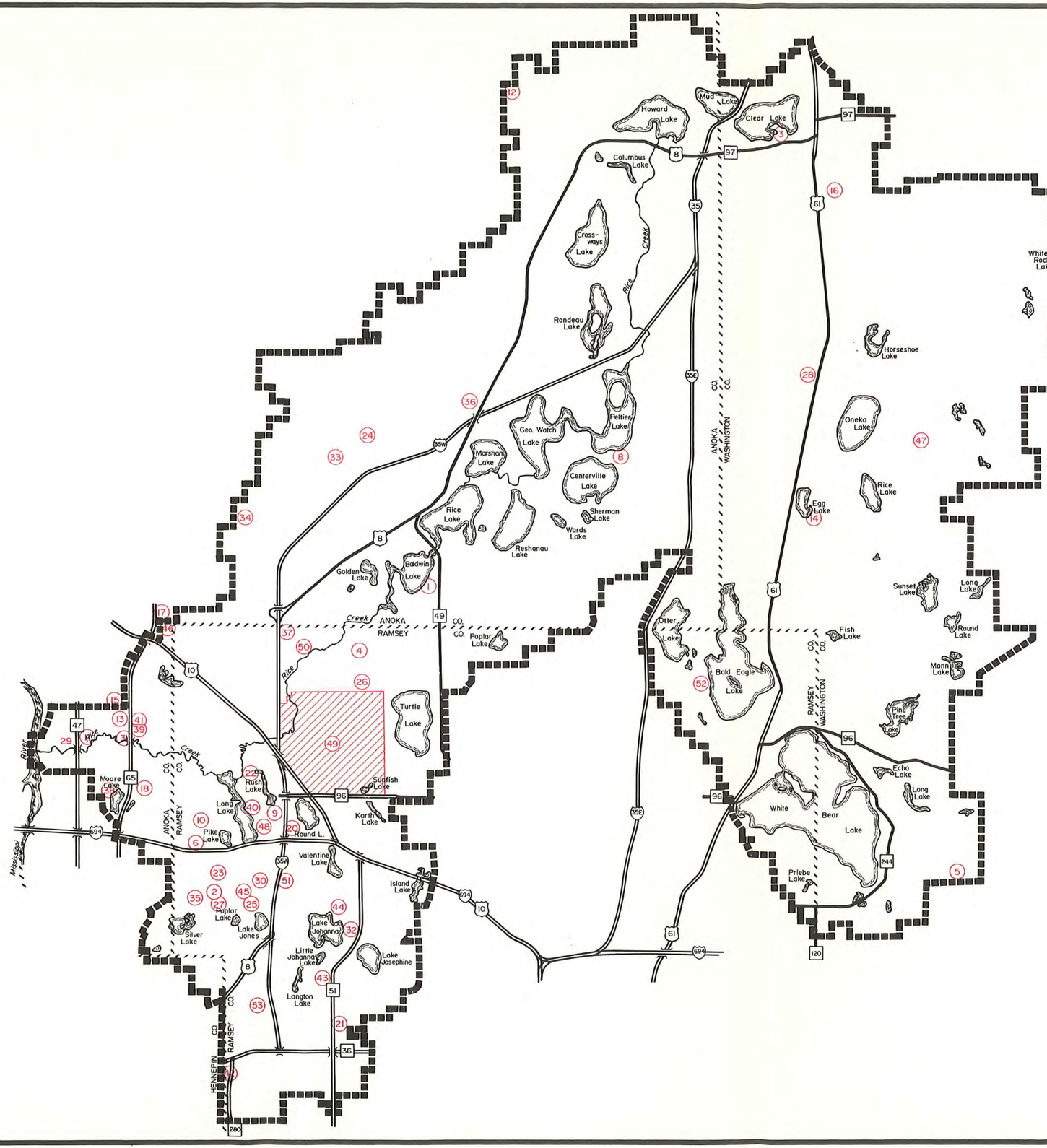
County	Permit Number	Permit Year	Permitted Use	Waste Management	Location
	SW-3090	1974	Building - 25 beef cattle	Spreading	NE1/4 of Section 14 Hugo
	SW-6712	1977	Building - 12 horses	Spreading	SW1/4 of Section 2 Hugo
	SW-2534	1974	Barn - 3 horses	Spreading	NE of Section 21 Grant Township

Source: MPCA, 1984, 1991.

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION



MAP 10
SOURCE: MPCA

1 0 2
1/2 1
Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES
WAYZATA, MINNESOTA

TABLE 2-14

POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION

Map	Site
1	Abandoned Absorption Pit
2	Abandoned Dump
3	Ashback Dump
4	Barn Demo Landfill
5	Bellaire Dump
6	Brighton Village Shopping Center
7	Butcher Spur Site
8	Centerville School Abandoned Absorption Pit
9	City of New Brighton Dump Site
10	Christensen Farm and Dump
11	Columbia Arena Demo Landfill
12	Columbus Township Dump
13	Determan Tank and Welding
14	Egg Lake Dump
15	Electronic Precision
16	Forest Lake Dump
17	Gallagers (aka: Henderscan) Dump
18	Gardena Avenue Landfill
19	General Fabrication
20	Gordon Rendering
21	Handschy Chemical Company
22	Herbst Demo
23	Hillcrest Acres Construction Area
24	Johnson Brothers, Lochness Park
25	Kausel Foundry
26	Ken Flick Open Dump
27	Klugman Farm Dump
28	LaCosse Potato Burial Site
29	Lyndale and 51st Dump
30	MacGillis Gibbs/Bell Pole Lumber
31	Medtronic (formerly National Pole)
32	Midwest Brass and Aluminum
33	Minneapolis Electric Steel Casing Company Dump No. 1
34	Minneapolis Electric Steel Casing company Dump No. 2
35	Minneapolis Reservoir Construction Dump
36	Minnesota Department of Corrections
37	Minnesota Department of Transportation Demo Site
38	Moore Lake Dump
39	National Pole and Wood
40	Northwestern Refining

Source: Hickok, 1977.

TABLE 2-14

POTENTIAL SOURCES OF GROUNDWATER CONTAMINATION
(Continued)

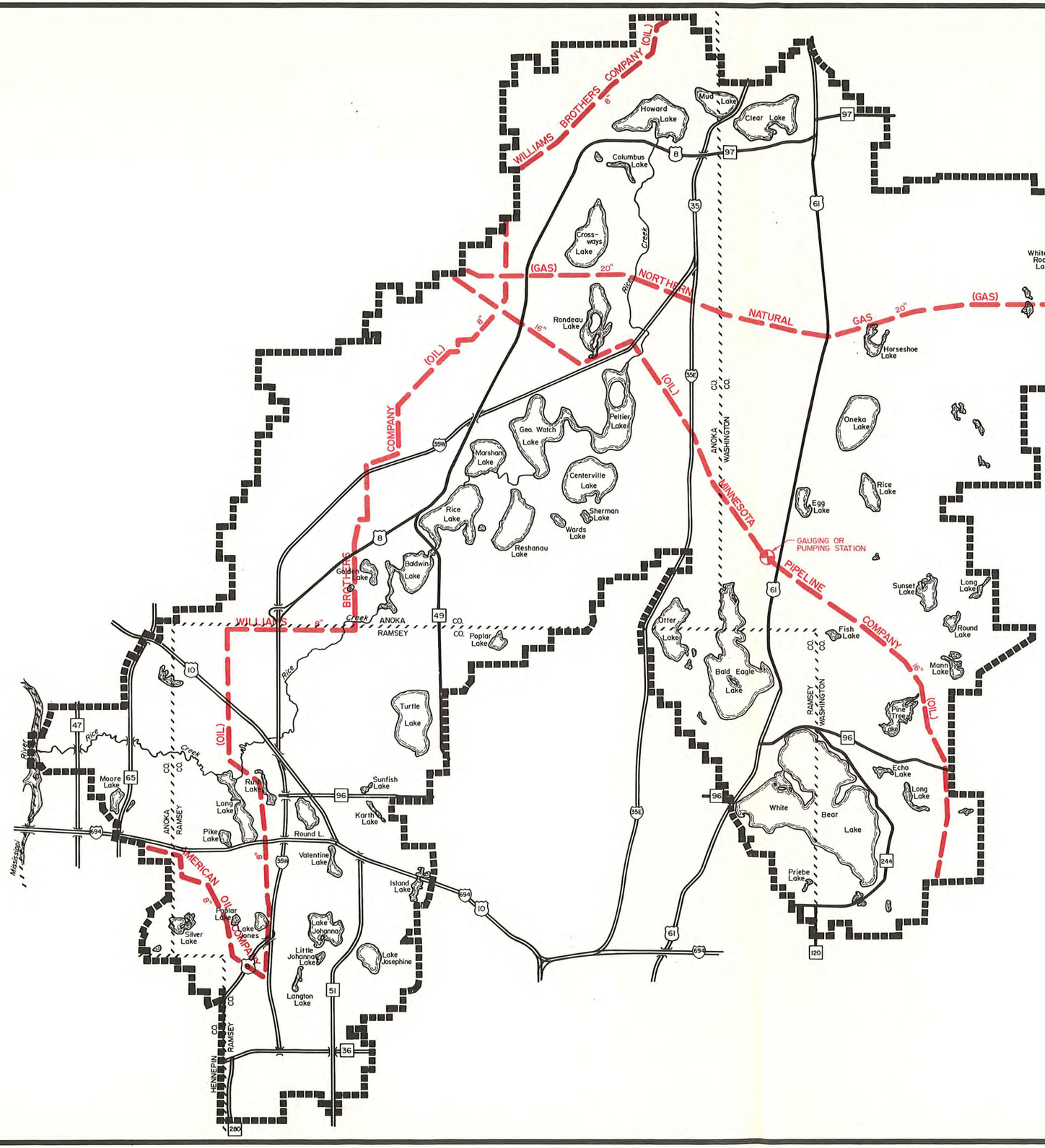
Map	Site
41	Onan (formerly National Pole)
42	Paper Calmenson
43	Paul's Place Demo
44	Polansky's Trucking
45	Rubbish Removal, Inc.
46	Sanders Advance Solvent Recycling
47	Stoltzman Dump
48	Trio Solvents
49	Twin Cities Army Ammunition Plant
50	University of Minnesota Landfill
51	Vandal Dump
52	Weller Demolition (Demo) Site
53	Williams Brothers Pipeline

Source: Hickok, 1977.

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

OIL AND GAS PIPELINES



MAP 11

SOURCE: MINNESOTA DEPARTMENT of TRANSPORTATION

1 0 2
1/2 1
Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES
WAYZATA, MINNESOTA

SECTION 3

HYDROLOGIC SYSTEMS

INTRODUCTION

This section of the Water Resource Management Plan is an inventory of basic hydrological data for the Rice Creek Watershed District. The inventory is divided into five subsections: precipitation, topography and drainage, water quantity studies, water quality studies, subwatershed summary, and groundwater.

Precipitation

Snow and rainfall data for the Watershed District is obtained from the weather station at the University of Minnesota - Falcon Heights Campus. Thirty years of precipitation data has been collected and is summarized in Table 3-1 below.

This station is used by the Watershed District because of its proximity and the low rainfall zone at the region's primary National Weather Service Station at the Minneapolis-St. Paul International Airport. Additional rainfall totals can be obtained through a network of rain gauges overseen by the County Soil and Water Conservation Districts.

Design Storms

Rainfall frequency and duration information for the Metropolitan area is commonly taken from the U.S. Department of Commerce - Weather Bureau Technical Paper No. 40 (TP-40). These statistically derived data are useful for determining critical storms and meeting varying design standards.

TP-40 was produced in 1961 and used data from the Minneapolis-St. Paul International Airport. Because of the "low" rainfall amounts recorded at the airport and the fact that the report is now over 30 years old, several additional references are also available. These include the National Oceanic and Atmospheric Administration's Technical Memorandum NWS Hydro-35: Five to 60-minute Precipitation Frequency for the Eastern and Central United Stated (June 1977), and the Metropolitan Council's Precipitation Frequency Analysis for the Twin Cities Metropolitan Area (January 1989).

TABLE 3-1

ST. PAUL CAMPUS CLIMATOLOGICAL OBSERVATORY
MONTHLY PRECIPITATION, 1961-1991 SUMMARY
(in inches)

	Average	Maximum	Minimum	Standard Deviation
January	0.57	2.10	0.08	0.51
February	0.60	1.98	0.00	0.53
March	1.58	3.97	0.32	0.88
April	2.48	6.20	0.19	1.35
May	3.54	8.12	1.04	1.67
June	4.33	9.26	0.17	2.26
July	4.02	12.03	1.60	2.06
August	3.80	7.65	0.72	1.57
September	3.22	7.17	0.23	1.70
October	2.32	6.92	0.35	1.72
November	1.48	4.59	0.09	1.22
December	0.82	2.78	0.05	0.61
Total	**28.76**	**39.30**	**14.39**	**6.19**

Source: Dave Ruschy, U of MN Soil Science Dept., July 1992

Evaporation

During recent droughts, the issue of lake augmentation has arose as lake levels declined. The annual average evaporation for this area is approximately 30 inches of water per year. When rainfall is below average, lakes with small tributary areas can drop rapidly. In the absence of specific evaporation data, these values can be used to estimate future lake levels and recovery times for lakes when combined with observation well data and hydrology models.

TABLE 3-2

RAINFALL IN MINNEAPOLIS-ST. PAUL METROPOLITAN AREA FOR DURATIONS FROM 30 MINUTES TO 24 HOURS AND RETURN PERIODS FROM 1 TO 100 YEARS

Data taken from U.S. Department of Commerce - Weather Bureau Technical Paper No. 40 - May 1961

Return Frequency	24-Hour	12-Hour	6-Hour	3-Hour	2-Hour	1-Hour	30-Minute	15-Minute
1-Year	2.3	2.0	1.7	1.5	1.4	1.2	0.9	0.6
2-Year	2.8	2.4	2.1	1.7	1.7	1.4	1.1	0.7
5-Year	3.6	3.1	2.7	2.3	2.2	1.8	1.4	1.0
10-Year	4.2	3.7	3.1	2.6	2.5	2.1	1.7	1.3
25-Year	4.6	4.2	3.5	3.0	2.8	2.3	1.9	1.4
50-Year	5.3	4.6	4.0	3.4	3.1	2.7	2.1	1.5
100-Year	5.9	5.9	4.4	3.8	3.5	2.9	2.4	1.7

Maximum probable 6-hour precipitation for 10 square mile area = 24 inches

and recovery times for lakes when combined with observation well data and hydrology models.

TABLE 3-3

**APPROXIMATE MONTHLY EVAPORATION (inches)
FROM SHALLOW LAKES AND RESERVOIRS**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
0.3	0.4	0.9	1.7	2.9	3.0	5.4	5.5	4.3	2.9	1.3	0.4	29.8

Source: Minnesota Hydrology Guide, 1975

TOPOGRAPHY AND DRAINAGE

The hydrologic system will be defined in terms of the District's drainage patterns, which include streams, wetlands, lakes, floodplains, and the various judicial and county ditches.

The drainage patterns of the Rice Creek Watershed District are typical of a glaciated area with outwash plains and terminal moraines. The drainage system is not completely integrated; there are only a few streams and a large number of wetlands and lakes. The drainage system has been supplemented by man-made ditches throughout the north half of the District (Map 12).

The highest ground elevation in the Rice Creek Watershed District is 1,110 feet above mean sea level on the grounds of the Twin Cities Army Ammunition Plant in New Brighton in the southwestern section of the Watershed. The lowest point in the Watershed is at the confluence of Rice Creek and the Mississippi River, which has an elevation of 806 feet above mean sea level.

Rice Creek is the dominant stream in the watershed. From Clear Lake, the headwaters of Rice Creek, near the northern edge of the Watershed, Rice Creek flows for a distance of some 28 miles in a southwesterly direction. Rice Creek flows through an extensive chain of lakes in Anoka County, passes across the northwestern edge of Ramsey County, re-enters Anoka

Clear Lake has a normal surface elevation of 890 feet; or approximately 84 feet above the confluence of Rice Creek and the Mississippi River. However, it is important to note that approximately 64 feet of the natural fall in Rice Creek occurs within the first 8 miles between the Mississippi River and the Arsenal Road. The remaining upper 20 miles of Rice Creek has an average fall of approximately 1 foot per mile resulting in extensive wetlands and shallow water tables.

Rice Creek has two major tributaries: Hardwood Creek and Clearwater Creek. Both creeks intersect with Rice Creek at Peltier Lake. The combined drainage area of Hardwood Creek and Clearwater Creek is 70 miles; or approximately 1/3 the drainage area of the Rice Creek Watershed District.

Hardwood Creek originates in Rice Lake (Washington County) which has a normal lake elevation of 920 feet. Hardwood Creek flows north from Rice Lake for approximately 3.5 miles in Judicial Ditch No. 2, then proceeds westward to join Rice Creek above Peltier Lake at an approximate elevation of 884. Hardwood Creek has a total drainage area of 28 square miles.

Clearwater Creek originates in White Bear Lake, which discharges intermittently into Bald Eagle Lake. Bald Eagle Lake has a normal elevation of approximately 9109 feet. Clearwater Creek has a total watershed of approximately 42 square miles.

A complete tabulation of major structures controlling water flow and levels is included with water quantity modeling results in the Appendix.

The District has been arbitrarily divided into 24 subwatersheds for management purposes. These areas are shown in Map 12. A more numerous breakdown of 83 subwatershed areas is shown intermixed with the TR-20 modeling discussion in the Appendix. The detailed subwatersheds are from the District-wide runoff study recommended in the 1986 management plan.

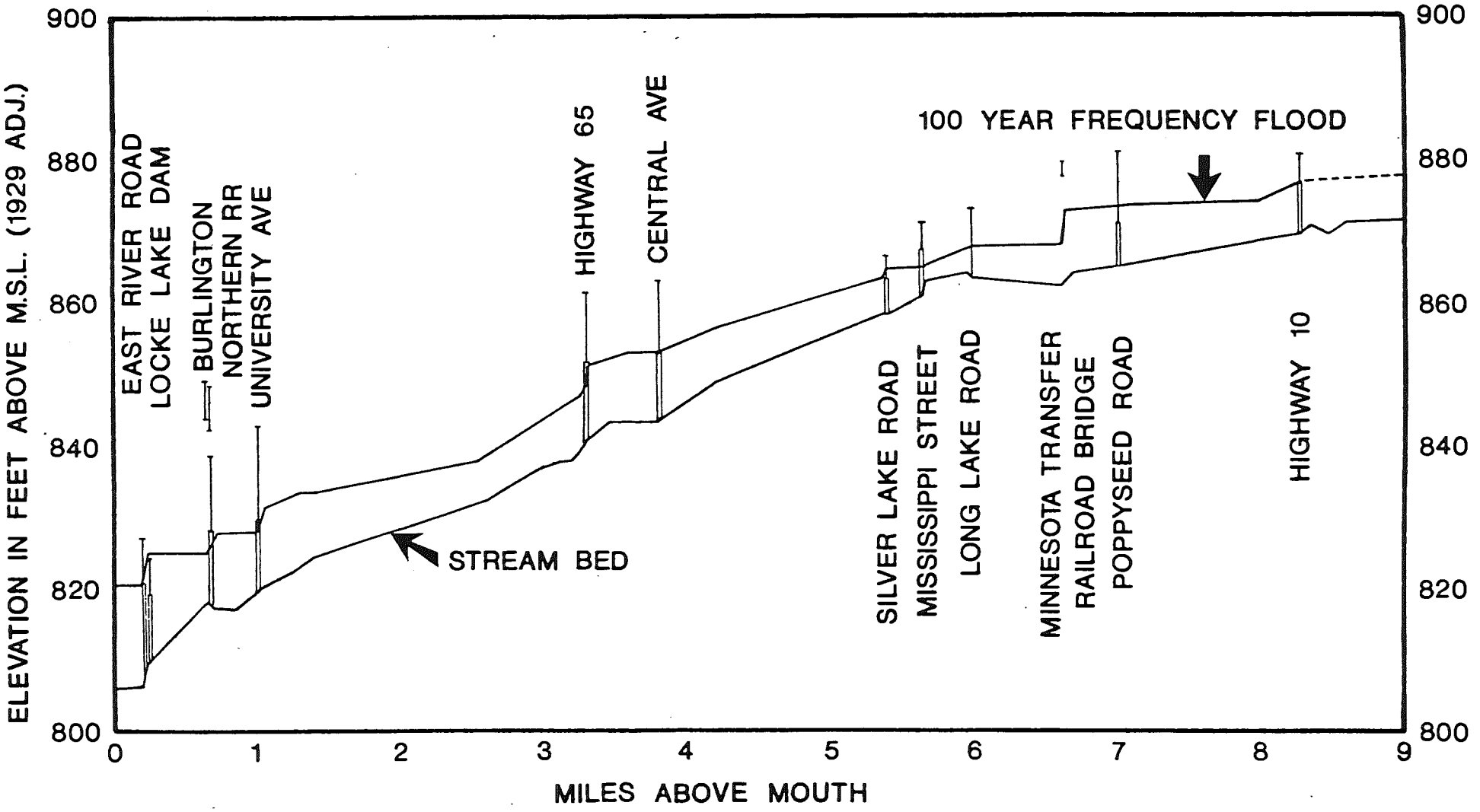


FIGURE 3-1

LOWER RICE CREEK PROFILE

Public Ditches

There are numerous judicial and county ditches within the Watershed District. These ditches were constructed primarily to drain land for agricultural purposes. The approximate location of the judicial and county ditches is shown on Map 12. Map 12 is necessarily crude due to the large map scale. The Watershed District maintains maps of each official system which differentiates public ditch from private laterals/extensions and natural drainageways. The District controls the public ditches and is the ditch authority for the purposes of implementing M.S. 103E (Drainage Law).

Lakes

Approximately 10 percent of the District is lake area. There are 14 lakes in the Watershed with areas in excess of 300 acres. There are 25 lakes with areas greater than 100 acres. These lakes are listed in Table 3-5, and their major physical, chemical, and biological characteristics are noted. The table also includes a "Management Ranking Value" assigned to each lake by the Minnesota Pollution Control Agency (see the MPCA publication entitled "Phase 1 - Lake Classification and Management Ranking Project"). The higher a lake's number, on a scale of 0 to 100, the greater its perceived water quality problem -- and the more likely the public is to benefit from a restoration program.

The TSIP and TSIS values, trophic state index for phosphorus, and Secchi disc depth, respectively, are based on a Carlson Trophic State Index. The greater the TSIP and TSIS values, the greater the total phosphorus concentration and the less the Secchi disc depth, respectively. In general, a TSIP and TSIS value from 0-40 indicates an oligotrophic lake and a value from 50-100 indicates a lake that may exhibit characteristics of eutrophication.

RTSIP and RTSIS is a percentile ranking of the lake, based on lake data the MPCA has on file, for the phosphorus concentration and Secchi disc depth, respectively. A low percentile ranking indicates less desirable TSIP and TSIS values relative to other lakes in the state. A more current discussion of lake quality is included later in this chapter.

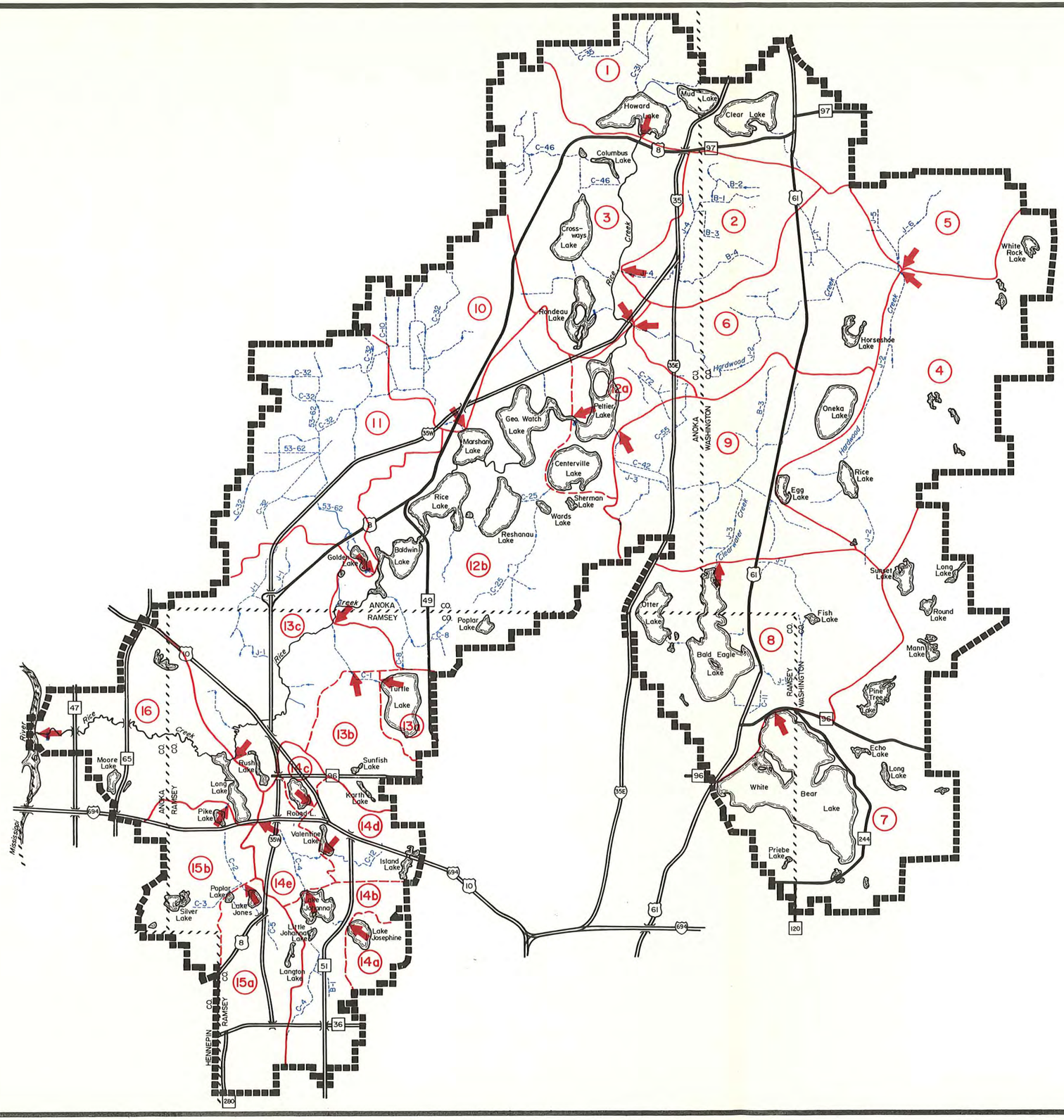
Wetlands

The Wetland Management Program of the District uses the DNR Protected Waters Inventory and the recently drafted National Wetlands Inventory (NWI) as the baseline inventories for

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

DRAINAGE PATTERN



(5) Subwatershed Number

➡ Subwatershed Outlet

J-5 Judicial Ditch

C-25 County Ditch

B-4 Branch Ditch

MAP 12

1 0 2

1/2 1

Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES

WAYZATA, MINNESOTA

TABLE 3-4

EXISTING LEGAL DRAINAGE SYSTEMS IN DISTRICT BY COUNTY

System No.	Year Established	Cost	Benefit	Source Document Aud. File No.	Source Document Reg. of Deeds
Anoka County					
10	1891	$ 1,314.00	$4,930.00		
15	1892	530.89	1,051.00		
22	1984	446.76	1,915.00		
25	1895	759.50	1,989.00		
31	1898	1,310.46	2,113.00		
32	1898	6,439.02	12,788.00		
35	1899	2,400.76	3,122.00		
46	1907	3,781.97	5,459.00		
47	1907	1,156.31	1,652.00		
53	1912	29,116.50	32,031.52		
62	1918	12,136.37	19,264.40		
55	1915	8,836.86	9,818.72		
72	1923	9,566.18	10,870.63		
Ramsey County					
1	1901	880.66		1115	70 of Misc. 98
2	1906	3,897.70		1116	58 of Misc. 119
3	1906	2,836.00	2,488.35	1117	60 of Misc. 2&3
4	1907	3,018.60	3,090.42	1118	59 of Assignm"ts 91
Lat. 1 to 4 cost--					
		39,169.01		2434	313 of Misc. 89
5	1907	6,131.00	2,359.35	1119	59 of Misc. 94 64 of Misc. 521
8	1910	2,208.09	1,869.00	1122	53 of Misc. 545
11	1913	2,733.00	2,752.00	1581	64 of Misc. 567
12	1916	1,281.55	1,400.00	1628	71 of Misc. 338
Washington County					
JD 2	1914			Court File Washington 7263	
JD 5	1921			Court File Washington 9426	
JD 6	1921			Court File Washington 9427	
JD 7	1921			Court File Washington 9428	
Anoka and Ramsey Counties					
JD 1	1911			1114	6327
Anoka and Washington Counties					
JD 3	1914			Court File Washington 8034 Court File Anoka 6916-6922	
JD 4	1915			Court File Washington 8161-8180 Court File Anoka 6977-6985	
Ramsey and Washington Counties					
JD 1	1905			113	147126

TABLE 3-5

LAKE CHARACTERISTICS

RICE CREEK WATERSHED DISTRICT

Lake	DNR Id. No.	Area (acres)	Maximum Depth (ft)	Median Depth (ft)	Management Class	Most Abundant Fish	Winter Kill	Percent Emergent Cover	Waterfowl Habitat	Furbearer Habitat	MRV	TSIP/* RTSIP	TSIS/** RTSIS
Anoka County													
Moore	0075	108	22	5	Largemouth Bass	Bluegill	Aerated	--	--	--	68.	69.4/22	61.4/22
Golden	0045	57.2	24	--	Largemouth Bass	Bluegill	Aerated	1	--	--	62.	72.3/11	63.5/18
Baldwin	0013	255	5	4	Waterfowl	Bullhead	Frequent	25	Good	Good		76.6/7	68.0/11
Rice	0003	442	5.2	4	Waterfowl	Bullhead	Periodic	25	Good	Good		77.2/7	68.9/10
Reshanau	0009	336	15.6	7.9	--	Bullhead	Periodic	10	Poor/Fair	Poor/Fair		70.6/13	68.4/10
Ward	0010	26											
Sherman	0011	33	5	3.2	Waterfowl Furbearer		--	50	Good	Good			
Centerville	0006	455	19	12	Gamefish	Perch	Aerated	1	--	--		75.1/9	55.2/38
Marshan	0007	230	2.5									76.6/7	64.1/17
George Watch	0005	528	6.5	4.9	--	--	Periodic	20	Good	Good		84.1/3	60.01/25
Peltier	0004	465	16	7	Gamefish	Bullhead	Frequent	10	--	--		82.3/4	61.5/21
Rondeau	0015	275	7	3	Waterfowl	Bullhead	Frequent	--	--	--		59.6/31	34.2/97

TABLE 3-5

LAKE CHARACTERISTICS

RICE CREEK WATERSHED DISTRICT
(Continued)

Lake	DNR Id. No.	Area (acres)	Maximum Depth (ft)	Median Depth (ft)	Management Class	Most Abundant Fish	Winter Kill	Percent Emergent Cover	Waterfowl Habitat	Furbearer Habitat	MRV	TSIP/* RTSIP	TSIS/** RTSIS
Crossways	0019	355	9									80.1/6	
Columbus	0018	37											
Howard	0016	488	6.5	3.75	Waterfowl Furbearer	Bullhead	Occasional	<5	Fair/Poor	Good			
Otter	0003	332	21	6	Gamefish	Bluegill	Frequent	10	--	--		58.1/35	55.9/35
Spring	0071	60.2	18			Northern	Frequent	5	--	--			
Ramsey													
Langton	0044	30	5	4	Waterfowl Furbearer	--		25	Good	Good			
Little Johanna	0058	35	40	--	--	Bullhead	Regularly						
Johanna	0078	200	41		Largemouth Bass	Bluegill	None	<1				62.0/25	53.7/43
Josephine	0057	118	44	20	Largemoutn Bass	Crappie	Once	<1			37.7	62.1/25	56.3/33
Jones	0076	13	1.1	.8	Waterfowl Furbearer	--		80	Good	Good			

TABLE 3-5

LAKE CHARACTERISTICS

RICE CREEK WATERSHED DISTRICT
(Continued)

Lake	DNR Id. No.	Area (acres)	Maximum Depth (ft)	Median Depth (ft)	Management Class	Most Abundant Fish	Winter Kill	Percent Emergent Cover	Waterfowl Habitat	Furbearer Habitat	MRV	TSIP/* RTSIP	TSIS/** RTSIS
Silver	0083	69.5	47	–	Largemouth Bass	Crappie	Occasional	1			63.3	71.7/13	65.5/14
Island	0075	56	9	–	Largemouth Bass	Crappie		5				71.1/13	55.7/36
Valentine	0071	56	13.6	4.5	Waterfowl Furbearer			5	Poor/Fair	Poor/Fair	29.7	71.9/11	70.3/7
Pike	0069	35	16	–	Gamefish	Crappie	Occasional	None	–	–	25.7	74..1/10	65.5/14
Long	0067	178	26	–	Gamefish	Bullhead	None	.5	–	–	49.6	68.6/17	64.6/17
Rush	0068/68	36	6.4	4.2	Waterfowl			<10	Good	Good			
Round	0070	122	7	2.6	Minnow	Bullhead							
Karth	0072	15	14.2	9.4	Waterfowl Furbearer	–	Frequent	<2	Poor	Poor			
Sunfish	0065	14	5.2	4.1	Waterfowl Furbearer	–		<5	Good	Fair			
Turtle	0061	502	29	–	Largemouth Bass	Bluegill	None	5	–	–		47.7/74	51.6/50
Poplar	0077	11	5.1	4.4	Waterfowl Burbearer	Carp	Frequent	<2	Poor	Poor			

TABLE 3-5

LAKE CHARACTERISTICS

RICE CREEK WATERSHED DISTRICT
(Continued)

Lake	DNR Id. No.	Area (acres)	Maximum Depth (ft)	Median Depth (ft)	Management Class	Most Abundant Fish	Winter Kill	Percent Emergent Cover	Waterfowl Habitat	Furbearer Habitat	MRV	TSIP/* RTSIP	TSIS/** RTSIS
Bald Eagle	0002	10,120	39	--	Largemouth Bass	Bullhead	None	1			81.7	64.2/21	63.0/20
Priebe	0036	6	5.6	5.3	Waterfowl Furbearer	Bullhead	0	Poor	Poor				
Marsden	0059	260	3.8	3.1	Waterfowl	--		70	Fair	Good			
Washington County													
White Bear	0167	83	8,416	--	Walleye	Bluegill	None	2	--	--	79.0	49.3/67	44.3/74
Long	0130	48	25	--		Bullhead							
Echo	0129	32			Rearing pond								
Pine Tree	0122	174	31	10	--	Bluegill							
Mann	0121	74											
Fish	0137	20.6	33	--	Gamefish	Bullhead	Suggested	1					
Round	0136	26											
Sunset	0153	124	17	--	Gamefish	Bullhead	Frequent	1				67.8/16	62.1/21
Egg	0147	106											

TABLE 3-5

LAKE CHARACTERISTICS

RICE CREEK WATERSHED DISTRICT
(Continued)

Lake	DNR Id. No.	Area (acres)	Maximum Depth (ft)	Median Depth (ft)	Management Class	Most Abundant Fish	Winter Kill	Percent Emergent Cover	Waterfowl Habitat	Furbearer Habitat	MRV	TSIP/* RTSIP	TSIS/** RTSIS
Rice	0146	277	2.5	2.0	--	Bullhead	Yes	--	Fair/Good	Poor			
Oneka	0140	416	7	4	Waterfowl	--			Good			66.1/18	54.2/41
Horseshoe	0138	53	1.3	6.7	--	Bullhead	None	<1	Fair	Poor			
White Rock	0072	65											
Clear	0163	400	28		Walleye	Crappie	None	5				58.6/33	55.8/35
Mud	0168	187	4	3.4	Waterfowl	Bullhead	Occasional	<5	Poor/Fair	Poor/Fair			

* Trophic state index for phosphorus/ranking trophic state index for phosphorus.

** Secchi disk depth/ranking Secchi disk depth.

SOURCE: DNR and MPCA, 1986 RCWD Management Plan.

wetland regulation. DNR protected wetlands are defined in M.S. 105.37 as "all Types 3, 4, and 5 wetlands, as defined in United States Fish and Wildlife Service Circular No. 39 (1971 edition), not included within the definition of public waters, which are 10 or more acres in size in unincorporated areas of 2.5 or more acres in incorporated areas." Permits are required from the DNR for any alteration of protected wetlands or waters below the ordinary high water elevation. Detailed maps of DNR protected waters are included in the Appendix.

The NWI maps were begun in the late 1970s and have recently become available in draft form for the RCWD. The NWI classifies wetland Types 1-8 regardless of size and therefore provides a more complete accounting of wetland areas. Each municipality in the District has been sent copies of the NWI by the District for local use. Additional copies are available through the District or the Board of Water and Soil Resources. Reproduction of the NWI maps within this plan was not possible due to the large area of the District.

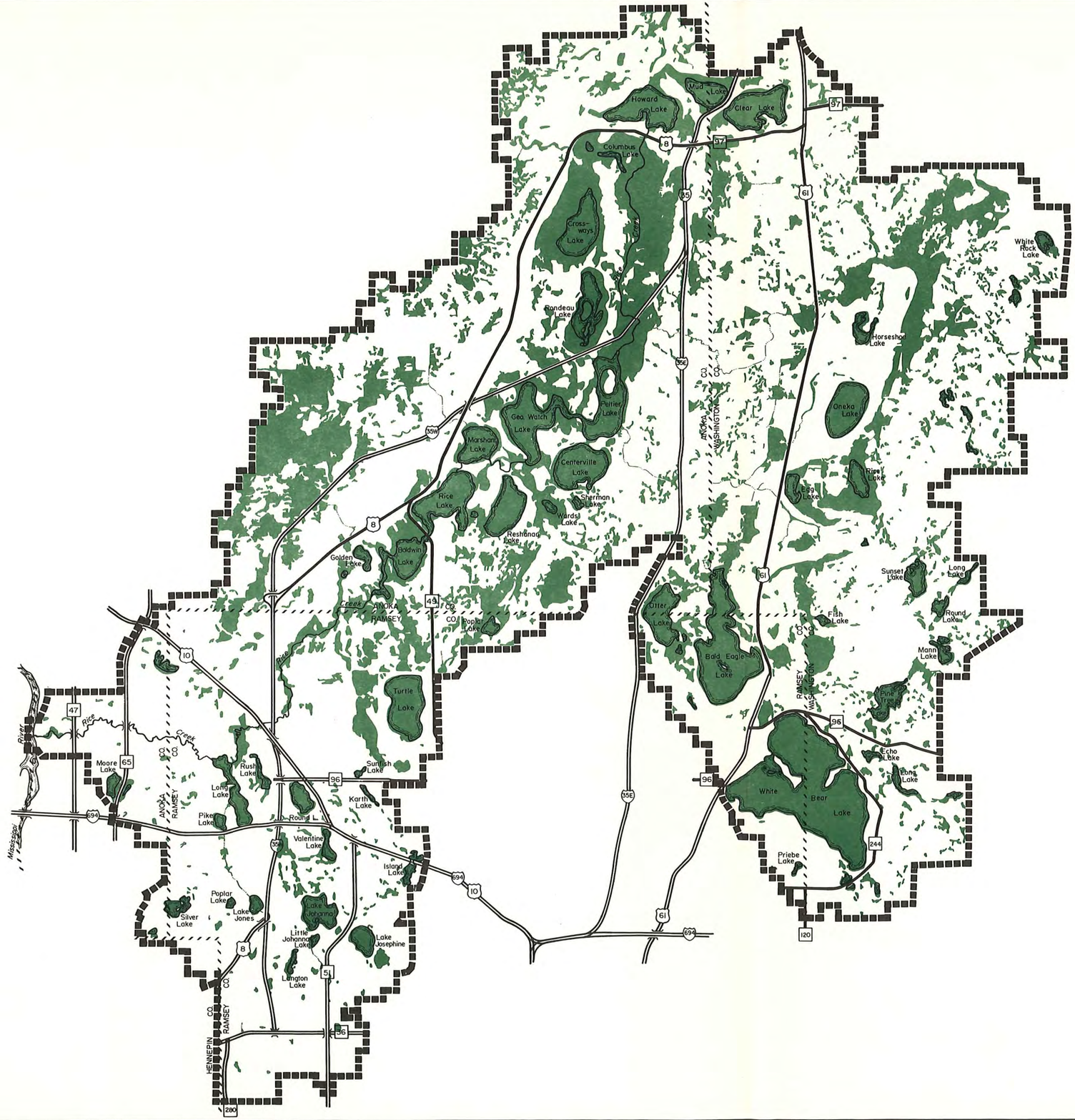
A detailed discussion of wetland complexes and permitting requirements of the DNR and U.S. Army Corps of Engineers is included in the Appendix. Also included is a chart for classifying wetlands under several different classification systems used by the various regulating agencies.

Floodplain

The U.S. Army Corps of Engineers and the Federal Flood Insurance Program have mapped the Watershed District's floodplains. Map 15, which shows the District's 100-year floodplain, is a composite of their surveys. Map 15 delineates the floodplain areas that would be inundated as a result of a 100-year flood. This map does not show all floodplain areas and is in part, based on approximately hydrologic methods and limited topographical data.

St. Paul Water Utility

The St. Paul Water Department plays a significant role in the management of the water resources of the Rice Creek Watershed District. Peltier, Centerville, Bald Eagle, and Otter Lakes are all capable of being directly affected by withdrawals for the purpose of supplying water to the St. Paul system.



WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

WETLAND VEGETATION

MAP 13

SOURCE: U of M, REMOTE SENSING LABORATORY, 1978

1 0 2
1/2 1
Scale in Miles

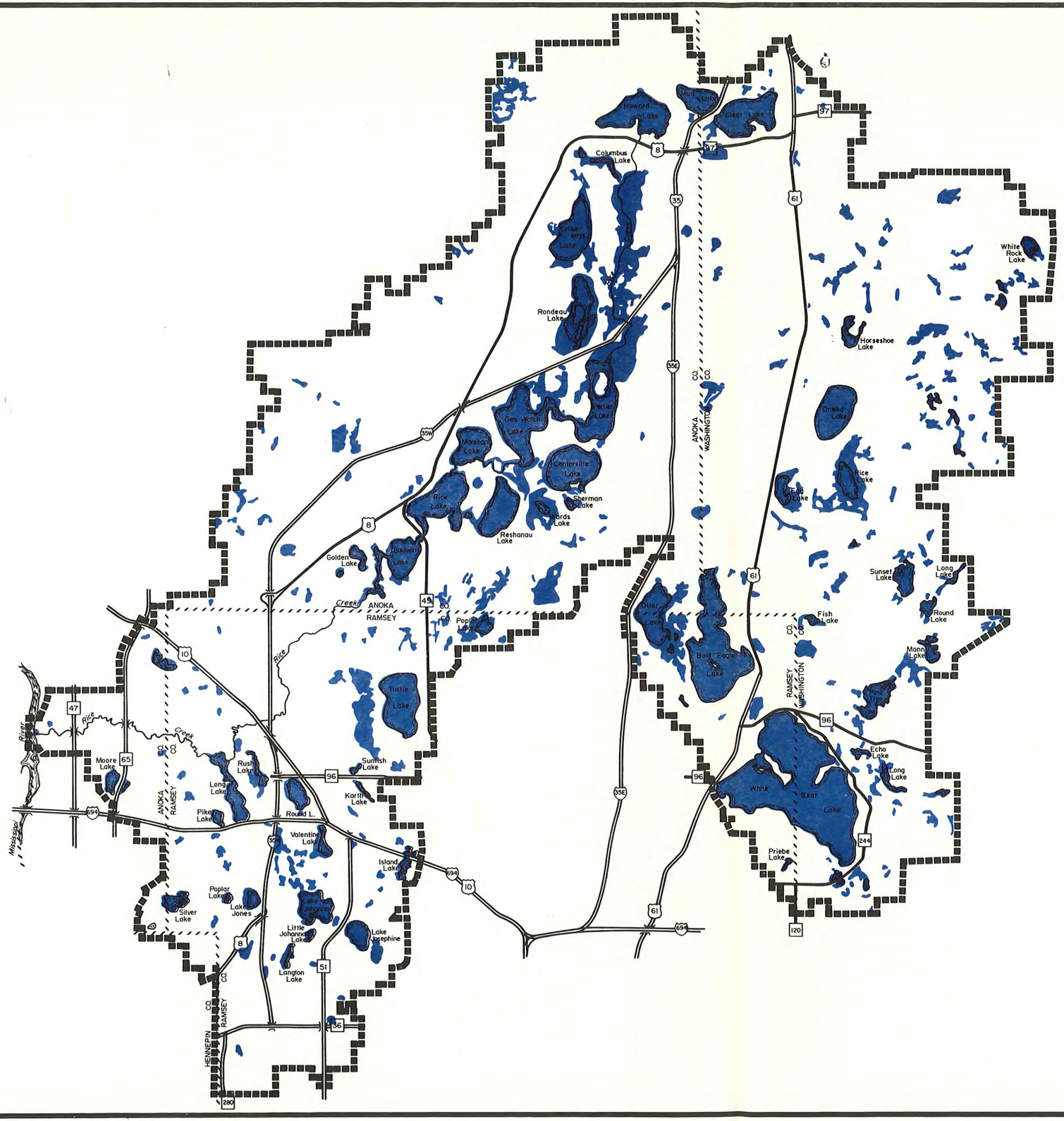
NORTH

E. A. HICKOK AND ASSOCIATES
WAYZATA, MINNESOTA

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

PROTECTED WATERS and WETLANDS



MAP 14

SOURCE: MDNR

1 0 2

1/2 1

Scale in Miles

NORTH

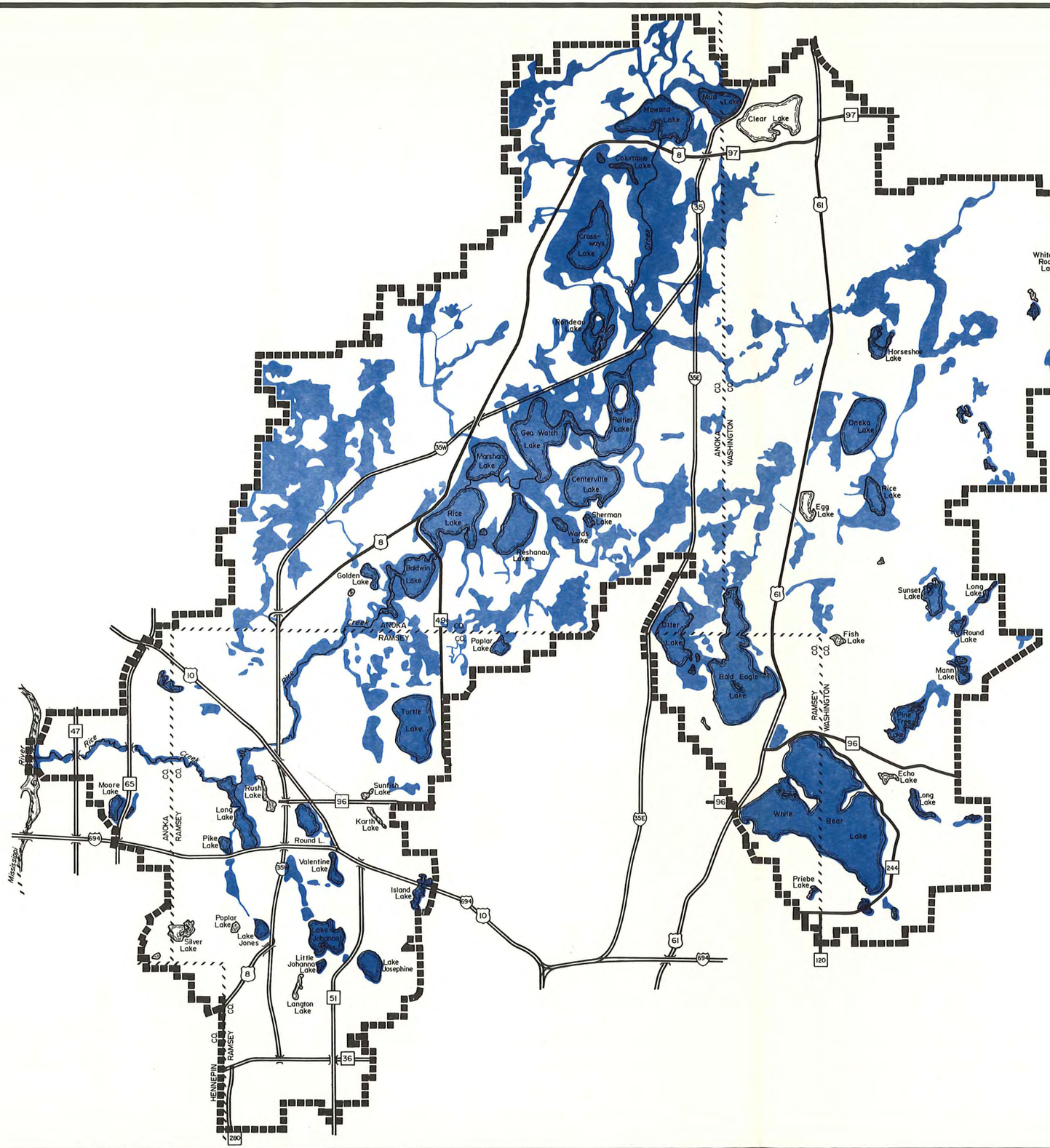
E. A. HICKOK AND ASSOCIATES

WAYZATA, MINNESOTA

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

100 YEAR FLOOD PLAIN



MAP 15

SOURCE: NATIONAL FLOOD INSURANCE PROGRAM, VARIOUS DATES

1 0 2
1/2 1
Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES
WAYZATA, MINNESOTA

Figure 3-2 shows the extent of the supply system. Not all of the surface system is within the District's natural hydrologic boundary. Water taken from the Otter or Centerville Lake pumping stations is essentially a diversion of water from the District.

History. The first water supply system to serve the City of St. Paul was constructed by a private company in 1968-70. The company operated under a State of Minnesota charter dated 1857 and was known as the St. Paul Water Company. In 1884, a 72-inch brick conduit was constructed to deliver water from Vadnais Lake. Shortly thereafter, connection was made to Sucker Lake and Pleasant Lake which are a short distance north of Vadnais Lake. In 1889, the source of supply was extended to Baldwin Lake.

In 1894, extensions were made to Otter Lake. Arrangements were made to receive the overflow from Bald Eagle Lake. In 1914-15, a dam was constructed at the north end of Bald Eagle to impound additional water.

Some water is available from the overflow from Bald Eagle Lake during high water periods. Bald Eagle Lake has a surface area of approximately 1,040 acres. When water in Bald Eagle Lake is higher than the culvert inverts at the north end of the lake, water overflows into Clearwater Creek which drains into the Rice Creek chain. During normal periods of high water levels, water is taken from Otter Lake and by gravity flow is conveyed through a 36-inch concrete conduit to the Centerville conduit and thence to Deep Lake.

A pumping station was constructed in 1896 at Centerville lake to pump water from this source into the chain of lakes system. Over the years a number of deep wells were drilled to meet emergency conditions, but have since been abandoned.

In 1902, a 150-foot wide dam was built across Rice Creek at the outlet of Peltier Lake. A conduit connects Peltier Lake to Centerville Lake creating a total lake storage area of approximately 800 acres, and an available storage of approximately 1.3 billion gallons. The Rice Creek chain of lakes with its upstream tributary lakes of White Bear, Rondeau, Columbus, Housed, Mud, and Clear provides a contributing area of 108 square miles.

Water from the Rice Creek chain is pumped to Deep Lake of the Lower Impounding Reservoir Lake System by use of the Centerville pumping station which is located on the southeast shore of Centerville Lake. This system is equipped with two electrically driven centrifugal pumps with a total capacity of 40 million gallons per day.

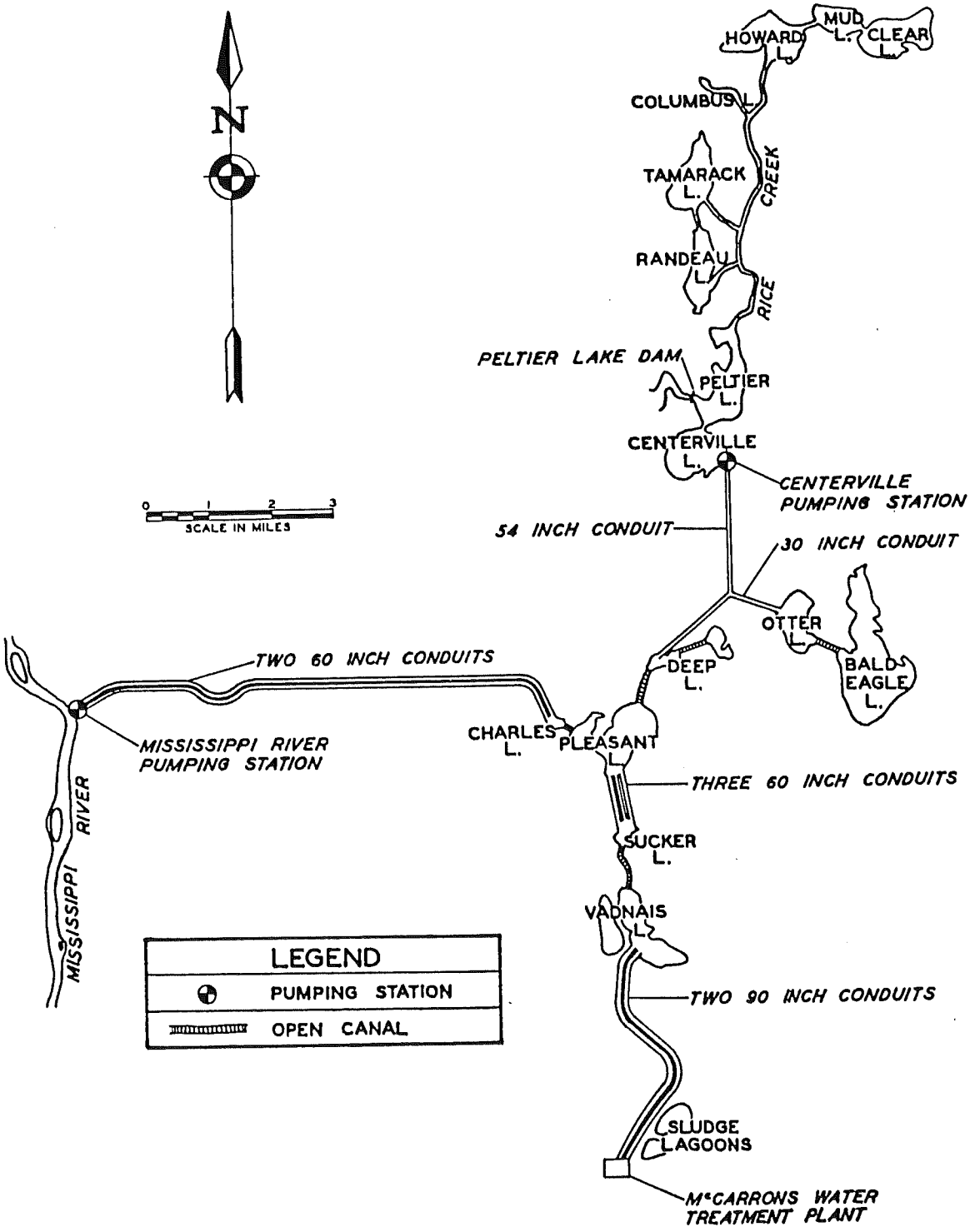


FIGURE 3-2

ST. PAUL WATER UTILITY SUPPLY SYSTEM
Source: SPWU, 1982

Water from the Mississippi River was first taken to augment the supply in 1925 by means of an intake and pumping station on the river in Fridley.

The Water Utility's intake on the Mississippi River is located in the City of Fridley at a point approximately 2 miles downstream of the Coon Rapids Dam and 1 mile upstream of the Rice Creek confluence with the river. The Mississippi River pumping station, located at the intake, is equipped with three electrically driven centrifugal pumps, having a total capacity of 90 million gallons per day. Depending upon climatic conditions, this pipeline source supplies from 65 to 90 percent of the Utility's total required raw water.

The pipeline, which consists of 2 60-inch conduits, generally follows Osborne Road in Fridley and County Road I in Mounds View and Shoreview and eventually discharges into Charles Lake and then to Pleasant Lake, both of which are outside the District.

Withdrawal. Water is taken from the chain of lakes when the quality is such that it is better than the water taken from the Mississippi River. River water quite fluctuates widely in quality relative to the lakes. At times when river flow is too low or of suspect quality, it is advantageous for the utility to utilize "Rice Creek" water to avoid difficult/costly treatment problems.

The recommended improvement actions suggested in the recently completed Centerville/Peltier Clean Water Partnership Diagnostic/Feasibility Study should aid in lowering phosphorus levels in the lakes thereby allowing for additional use of this source. Currently, the lakes are used only in spring during high water, low algae periods. St. Paul is currently reviewing the study results with an eye toward the pumping costs for using Centerville lake, which are a third of those for pumping from the river.

WATER QUANTITY

One prerequisite for an overall watershed management plan is a thorough understanding of the quantity of water passing through the Watershed. The topic of water quality is discussed in terms of lake levels and flow rates.

The drainage system in the Rice Creek Watershed District is quite complex, with a series of streams, judicial and county ditches, lakes and wetlands. In order to analyze the system's flow characteristics, a computer model was used to determine runoff characteristics for the

entire Watershed. In fact, over the years several gradually more extensive models have been developed using new models, data, and approaches.

The most recent (February 1992) effort was completed by the District as outlined in the original M.S. 103B management plan. An excerpted version of this study is included in the Appendix. The study provides data for all major storage reservoirs and crossings near municipal boundaries. A number of original copies of the report have previously been forwarded to cities and the consulting firms serving them.

The hydrographs shown in Figure 3-3 indicate the flow rates for two different 100-year events at key locations in the District. Although the 100-year runoff (snowmelt) event is the critical event for the District, 100-year rainfall event hydrographs are also included for local planning purposes.

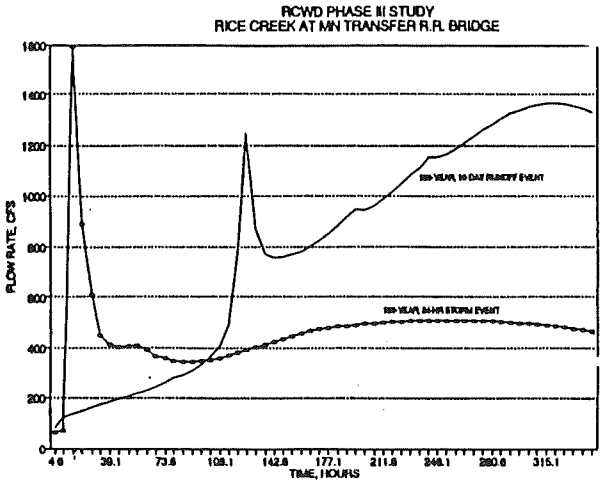
Lake Levels

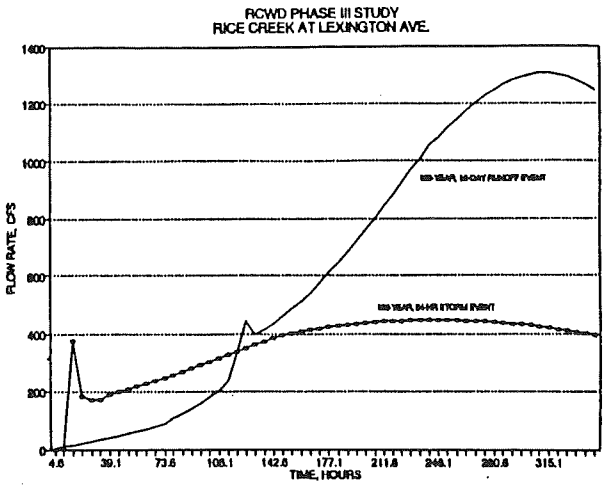
Ramsey County has maintained an extraordinary record of lake levels in the District. In addition, data logged by the Water Utility has provided information on the Rice Creek chain in Lino Lakes. This data was used extensively for calibrating and validating the District's runoff model.

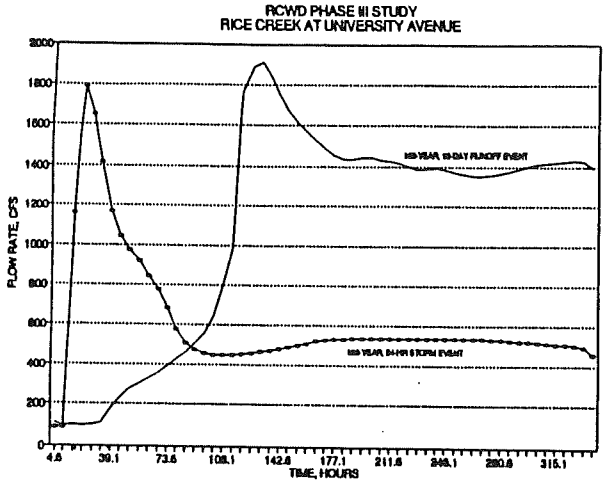
Lake level information has also proved valuable in assessing historic trends. The MDNR's strong position against lake augmentation has led to an increased interest in historic levels and their recovery after drought periods. Unacceptable lake level fluctuations due to floods was chronicled in the Lake Johanna data. In 1979, an outlet modification was performed by the District which has greatly moderated the fluctuations. Lake levels for Long, Silver, White Bear, Turtle, and Johanna Lakes are shown in Figures 3-4 to 3-6.

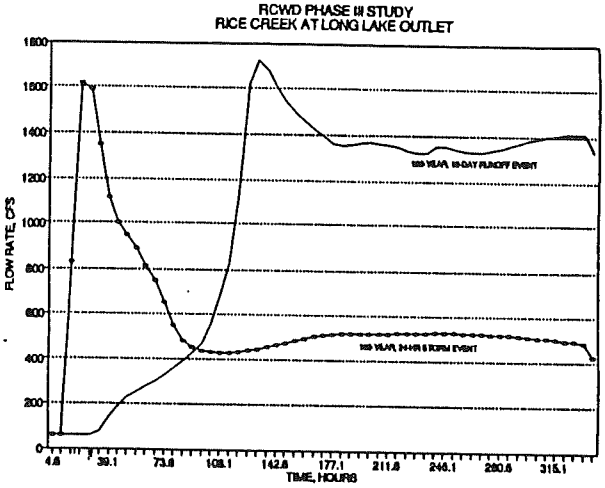
Flow Gauging

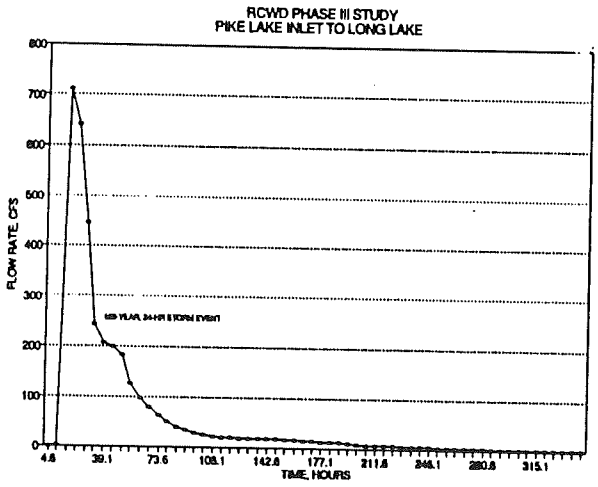
There is almost no continuous flow data for Rice Creek itself. The only gauging station in operation prior to 1975 is near the outlet of Rice Creek at Highway 47. Data for this station goes back only to 1968, with one exception: in June 1965, during a major flood, the discharge at that point was 606 cfs. A flow of 625 cfs was recorded in 1975. In contrast, the predicted 100-year flow is 2,360 cfs. Base flows in the creek have been estimated at 20 cfs in the winter and 60 cfs in the summer. These figures are based on USGS gauge data and RCWD











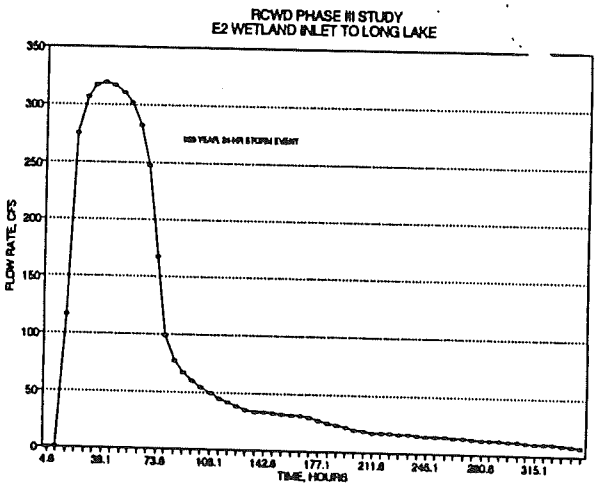
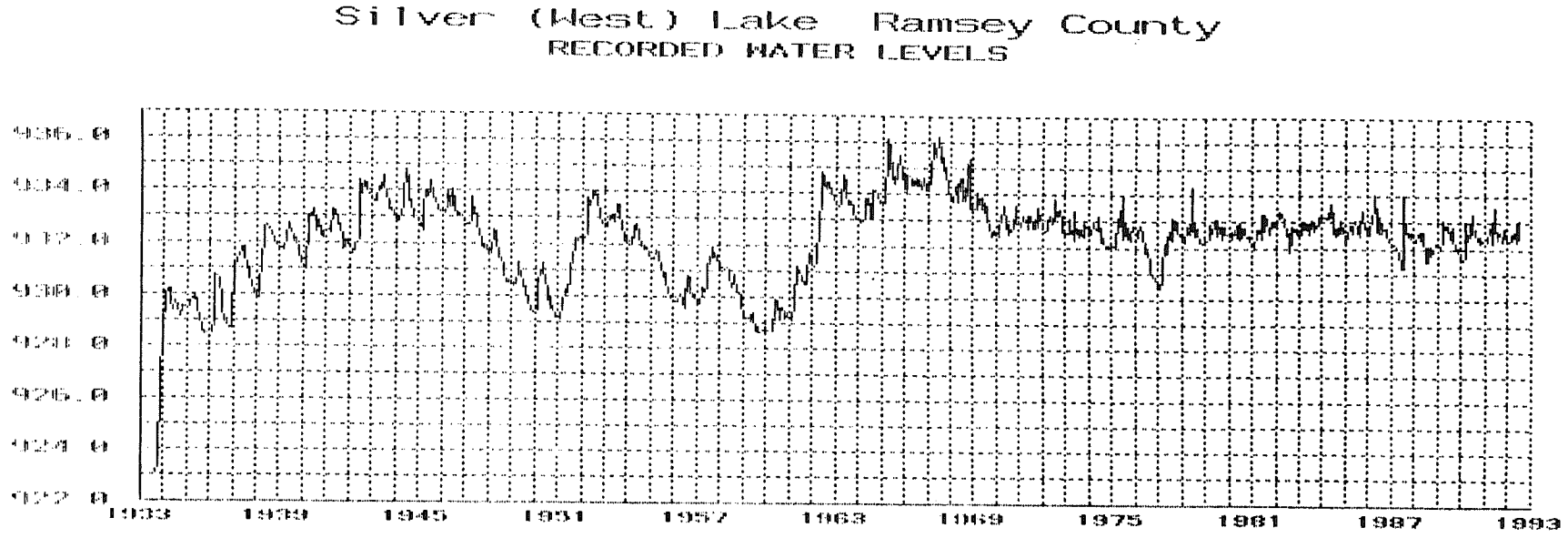


FIGURE 3-3

RUNOFF HYDROGRAPH SUMMARY



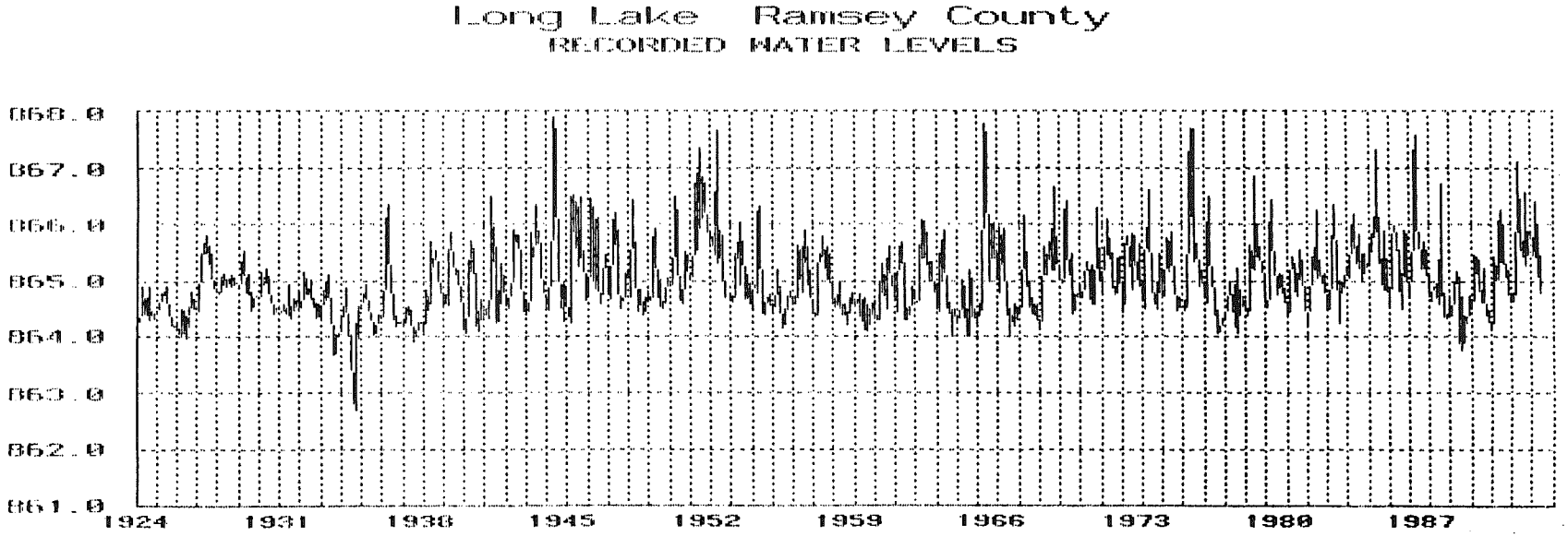
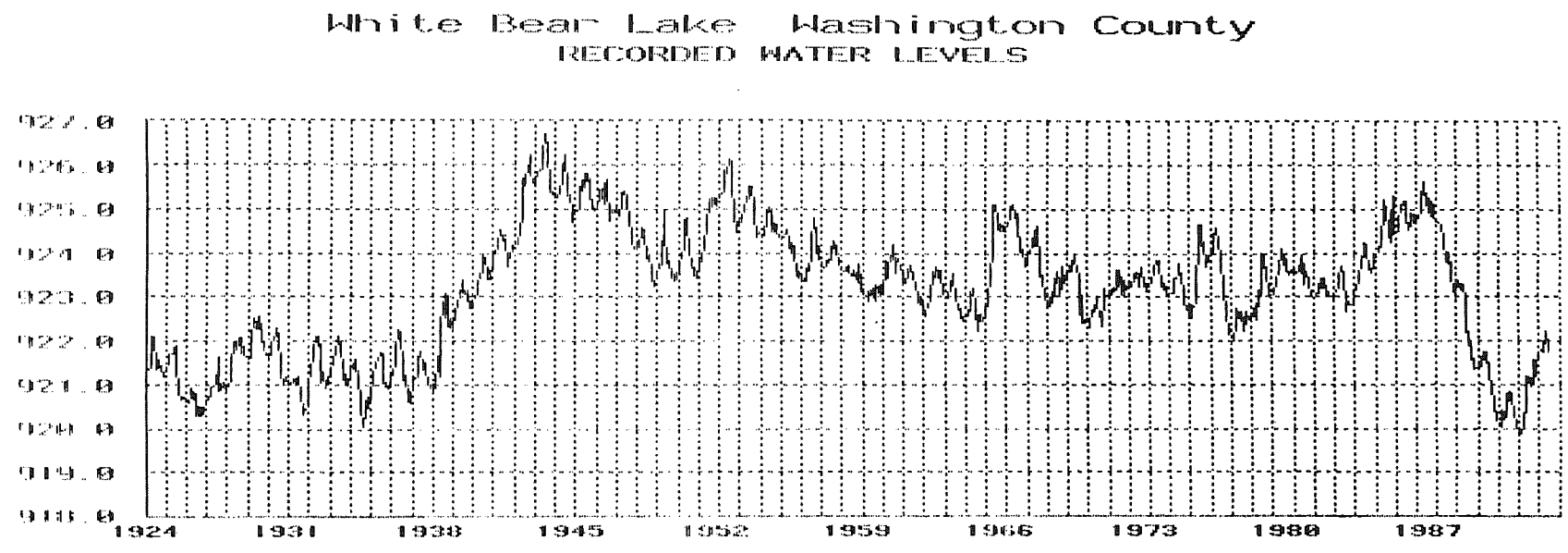


FIGURE 3—4 LONG AND SILVER LAKE LEVELS



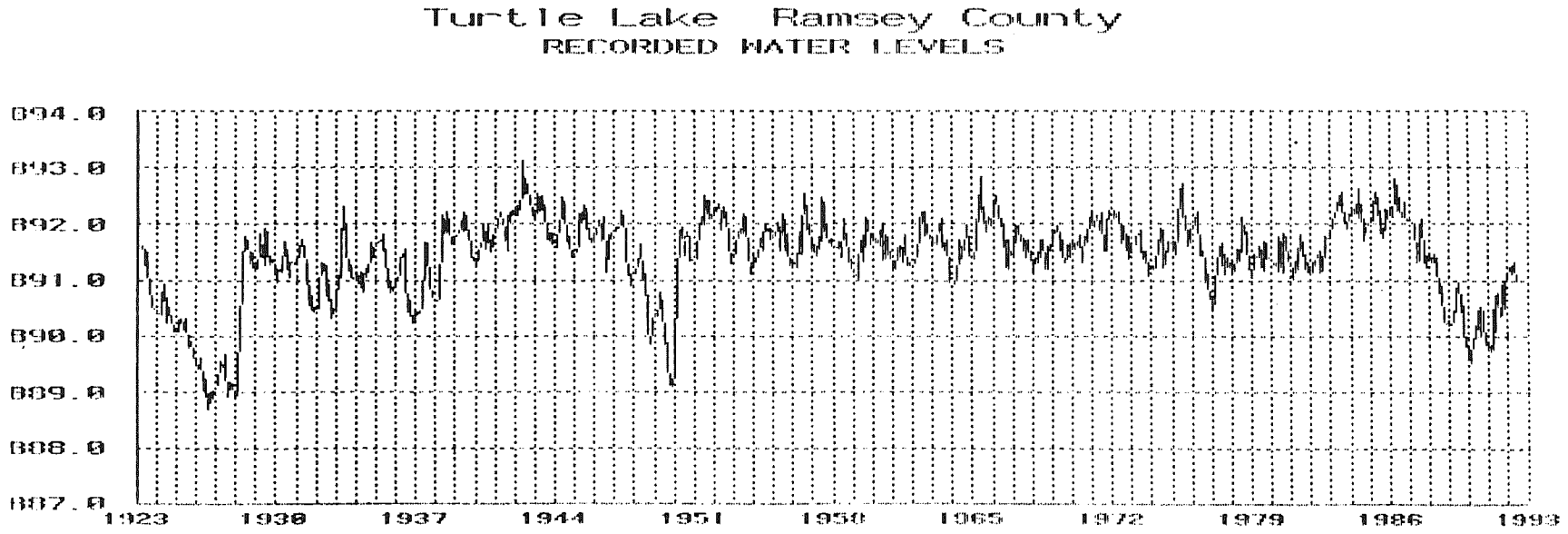


FIGURE 3-5 WHITE BEAR AND TURTLE LAKE LEVELS

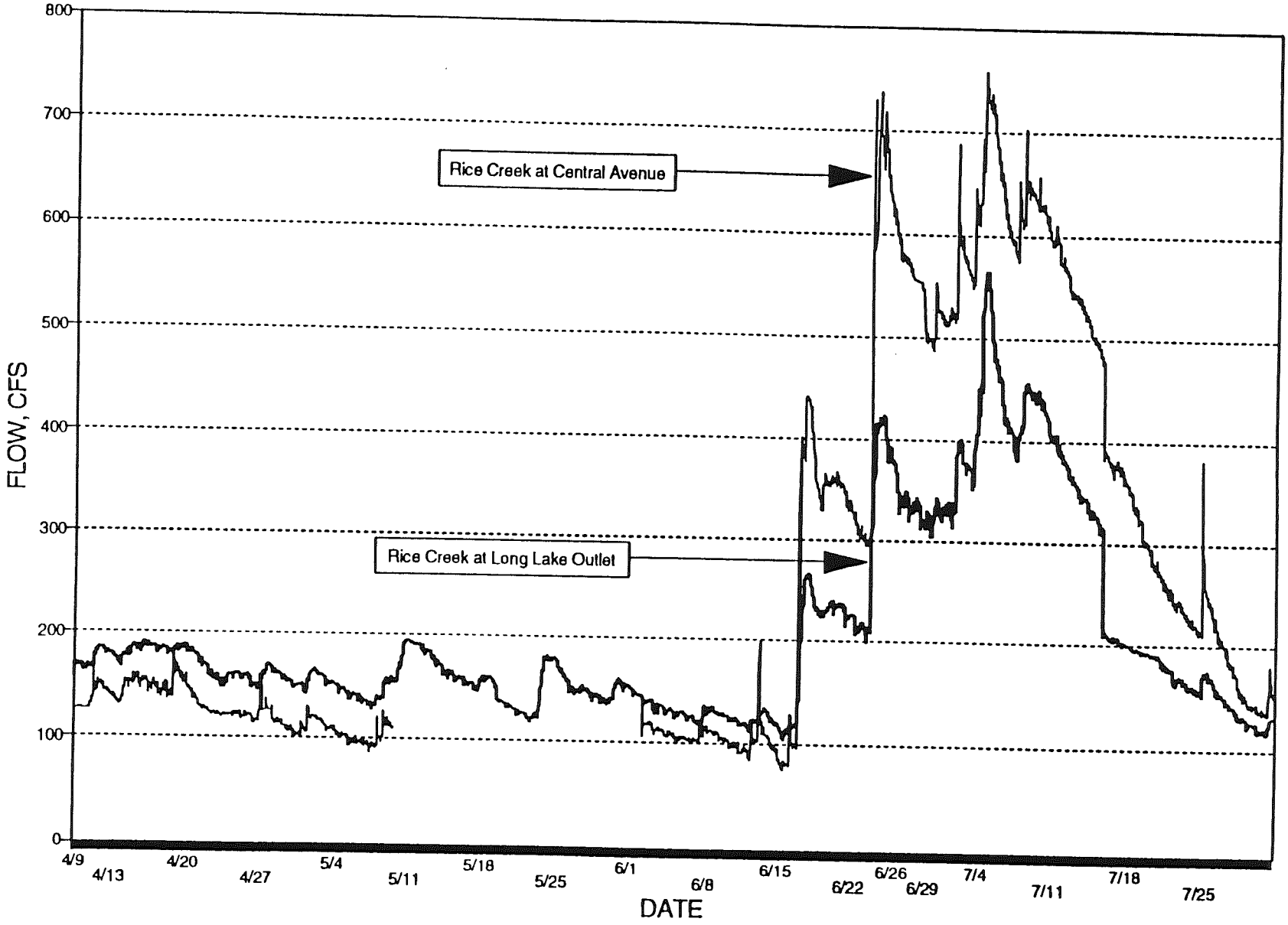


FIGURE 3-7

RICE CREEK FLOWS
APRIL 9-JULY 31, 1993 FLOW RATES

monitoring, respectively. The major annual runoff occurs in the spring, usually from late March to early May, resulting in the peak discharge at that time. Runoff decreases from May through August, but precipitation increases, resulting in another, though lesser, high discharge rate in September. Thus the stream flow of Rice Creek, as would be expected, parallels the precipitation and runoff values on a yearly basis.

The U.S. Geological Survey no longer operates a flow recorder on the creek. The only flow data collected currently is obtained through the District's water quality monitoring program which makes spot readings.

In 1993 the District established several continuous flow recorders to enable the District's hydrology model to be further calibrated. Modeling assumptions of the entire Watershed being affected by the synthetic rainfall event are biased toward conservatism and tend to over-predict peak flow rates. Additional gage data over a period of years will aid in eventually establishing more realistic, accurate flood flow projections.

WATER QUALITY

At the time the District's first management plan was formulated, very little information was available concerning the quality of water in the Watershed's lakes and streams. Information which was available addressed concerned levels of coliform bacteria due to concerns regarding sewage disposal within the Watershed.

To establish a detailed long-term record of water quality data required for effective water management, the Board of Managers established and maintains an on-going program of data collection. Over the last 20 years, the District has accumulated an excellent baseline water quality data base for lakes within the District. Much of this information is tabulated in the following pages.

Past monitoring efforts of the District have sought to obtain data for as many bases as possible. The Board of Managers is refocusing their water quality monitoring efforts to more intensively sample a select number of lakes each year. By establishing a rotating cycle, statistically viable data for trend analysis and problem identification can be obtained.

Future monitoring efforts will also see an emphasis on monitoring numerous inlets to lakes. Additional discussion regarding monitoring programs is included in the management strategies outlined later in this plan.

All data collected by the Watershed District is forwarded to the MPCA for inclusion in the STORET data system. In this manner, the data is available to other agencies and individual interested in the data.

Parameters

The District has generally obtained a core of standard parameters over the years. Some additional parameters may be available in given years due to grant requirements or special direction of the Board. For lakes, the monitoring program collects data on dissolved oxygen and temperature profiles, conductivity, Secchi depth, total phosphorus, and chlorophyll-a.

Stream sampling sites are monitored for total phosphorus, total suspended solids, turbidity, temperature, dissolved oxygen, and stage/discharge.

Comparison of 1991 Data with Historic Data

The RCWD has been monitoring the water quality in its lakes and streams since 1972. The following section examines historic annual values of select water quality parameters and compares them to current water quality conditions. The comparison was completed to identify trends in the water quality of the District's lakes and streams over the past 20 years.

Total Phosphorus. Total phosphorus (TP) concentrations for 31 District lakes were examined to identify long-term trends. The average phosphorus concentration in each lake was calculated using data collected between 1974 and 1990 and tabulated in Table 3-6. The 1973-90 mean was calculated weighting each average appropriately for the number of years it represents. For example, on Bald Eagle Lake from 1974-83, five years worth of data are present, and the average is 80 µg/l. In calculating the average TP concentration for Bald Eagle Lake, the 1974-83 mean is weighted by a factor of 5.

TABLE 3-6

TOTAL PHOSPHORUS CONCENTRATIONS (µg/l) FOR RCWD LAKES, 1974-1991

	1974-1983	Number of Years Sampled 1974-1983	1984-1986	Number of Years Sampled 1984-86	1988	1989	1990	Average 1973-1990	1991	Percent Change Average 1991
Bald Eagle	80	5	50	3	62	54	73	67		
Baldwin	450	9	270	1	370	130	120	380	183	-52
Centerville	140	2	90	2	133	107	93	113	87	-23
Clear	50	1	60	2	43	133	153	83	40	-52
Forsham (Marshan)	270	9	200	1	220	190	260	254		
George Watch	320	9	160	1	370	540	340	330	270	-18
Golden	100	6	50	2	140	120	120	98	133	35
Howard			150	2	360	167	147	195	170	-13
Island	30	1	60	2	163	86		80		
Johanna	60	9	40	3	40	32		52		
Josephine	60	8	30	2	50	39		52		
Karth					60		100	80	60	-25
Long (North Basin)	180	9	140	2	155	103		166		
Long (South Basin)	76	7	40	2	75	43		66		
Moore	100	7	60	3	85			88		
Mud					167	40	110	106	200	89
Oneka	60	9	30	1			60	57	90	57
Otter					80	373	70	174	43	-75
Peltier	290	9	150	2	423	373	244	282	133	-53
Pike	100	7	60	2	120	150	110	100	130	30
Pine Tree					80	50	53	61	53	-13
Reshanau	90	9	120	1	140	90	93	96	107	11
Rice	330	9	330	1	363	113	180	304	207	-32
Rondeau	40	9	40	1	330	67	43	65	50	-23
Round			60	2				60		
Silver (West)	80	9	60	2	81	56		75		
Spring					70	40	290	133	60	-55
Sunset	100	9	90	2			120	100	80	-20
Tamarack (Crossways)	320	9	300	1				318		
Turtle	20	5	20	2	23	22		21		
Valentine	110	7	160	1	270	60	50	119	170	43
White Bear	25	7	10	2	25	19	40	23		

TABLE 3-7

SECCHI TRANSPARENCIES (ft)
FOR RCWD LAKES, 1972-1991

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
Bald Eagle	3.3	5.7	2.5	4.9							
Baldwin			1.6	2.7	0.3	2	3.9	3.5		1.1	1.5
Centerville				2.6	1.2				4.9		
Clear								4.3	2.9	3.5	3.4
Forsham (Marhsan)			1	3.1	2.8	1	3.3	3		3.9	
George Watch			0.9	2.5	0.7	0.9	3.9	3			2.5
Golden					2	2.8	3.8	2.6	2.5	3	
Howard											
Island					3.7					8.2	
Johanna	6	3.6	6	3.5	5.9	7.2	3.9	5.2		4.9	5.6
Josephine	2.9	1.8	3.2	4.1	3.6	3.6	3.1	3.9		4.2	3.9
Karth											
Long (North Basin)				2.6	1.7	2	2.3	3	3.9	1.6	2.6
Long (Souh Basin)				2.5		2.6	4.3	4.6		2.6	3.9
Moore						3	3.8	3	5.6	5.2	1.9
Mud											
Oneka				4.6	4.9	3.3	4.3	5.8		4.3	
Otter		2.7			3.5	1.8	2.2	4.1	3.5	2.9	
Peltier			1.6	2.5	3.6	3.9	2.6	4.2		3.3	2.6
Pike					1.1	2.6	2.5	2.5	3.3	1.6	2.2
Pine Tree			8.5								
Reshanau			1.5	3.9	0.8	0.85	2.3	2.9		1.6	5.7
Rice			1.1	3	1.6	0.8	3.7	2.9		1.7	1.7
Rondeau		4.9	2.8	3.3		1.7	1.8	1.7			
Round											
Silver (West)		2.1	2.9	3.4	3	2.8	2	3.6		4.9	2.3
Spring	3.2	3.1	4.4								
Sunset		2	1.9	1.3	1.6	5.2	4.8			2.3	2.6
Tamarack (Crossways)						1.6	0.7				
Turtle		6						6.8	11.5	5.7	
Valentine		3.6	5.1		2	2.3	2	2	1.2	3.3	
White Bear		8.6	9.2	9.5	7.2	5.2	8.2	8.2			

TABLE 3-7

SECCHI TRANSPARENCIES (ft) FOR RCWD LAKES, 1972-1991 (Continued)

	1983	1984	1985	1986	1987	1988	1989	1990	1991	Average 1973-1991 Averge	Percent Change Average
Bald Eagle						6.8	7.1	5.4		5.1	
Baldwin	2					1.1	3.3	3.2	2.2	2.2	0
Centerville	5					2.6	2.1	3.1	4.0	3.2	27
Clear		2.5			2.7	4	4.8	3.7	3.5	3.5	-1
Forsham (Marshan)	2					0.3	1.6	3.2		2.3	
George Watch	2					0.8	1.6	3.0	2.0	2.0	-1
Golden			3.1	4	2.5	2.3	2.8	3.0	1.9	2.8	-33
Howard						0.66	1.1	0.9	0.7	0.8	-21
Island			2.1		3	3.8	4.7	3.7		4.2	
Johanna	8			7.7		7.4	10.5			6.1	
Josephine	6					3.9	7.4			4.0	
Karth						3.6		2.0	3.0	2.8	4
Long (North)	3					1.6	3.28			2.5	
Long (South)	4.3					2.6	4.9			3.6	
Moore	7	0.7				3.05		1.3		3.5	
Mud						1.8	1.7	2.2	0.7	1.6	-59
Oneka	6							3.5	2.6	4.3	-39
Otter						3.5	11.6	1.1	6.1	3.9	55
Peltier	3				2	3.7	3.1	2.7	2.6	3.0	-12
Pike	3					2.3	2.3	2.0	1.3	2.3	-42
Pine Tree						1.6	5	6.1	4.5	5.1	-13
Reshanau	2				2.6	1.8	2.8	2.2	1.6	2.3	-33
Rice	2					0.9	4.1	3.4	2.7	2.3	19
Rondeau	2			3.4	3.9	0.7	1.1	3.4	2.5	2.5	-3
Round								4.9		4.9	
Silver (West)	2					2.1	4.7			3.0	
Spring						5.9	11.8	7.5	3.6	5.6	-36
Sunset	3					5.5	3	6.5	6.2	3.6	75
Tamarack/Crossways	2									1.4	
Turtle	8	4.8			8.5	6.6	7.1			7.2	
Valentine	3					0.8	1	2.3	1.3	2.3	-42
White Bear	11	8.7	12.5	10.5		11.9	11.2	10.2		9.5	

The 1991 TP concentrations were compared to the long-term average. Thirteen of the 19 lakes monitored had TP concentrations which were less than their respective long-term average. Overall, the 1991 TP concentrations are about 10 percent less than their respective long-term averages.

The water quality in some of the lakes seems to show trends since 1972. Baldwin, Otter, and Rice Lakes seemed to have lower TP concentrations during the last few years than concentrations in the 1970s and early 1980s. Mud and Pike Lakes seem to have decreased in water quality.

Secchi Transparency. In order to identify long-term changes in lake water quality, Secchi disc transparency readings were reviewed. The values shown in Table 3-7 represent Secchi transparencies from RCWD monitoring from 1972-91. Average Secchi transparency is also calculated.

Data collected during the summer of 1991 were compared to the respective long-term averages. Of the monitored lakes, seven showed a decrease in transparency of greater than 30 percent in 1991 compared to the long-term average. Conversely, only two lakes, Otter and Sunset, showed increased water clarity of greater than 30 percent in 1991. However, during 1991 lakes were monitored only one or three times. Given the short-term fluctuations in Secchi transparencies, the 1991 data may not offer a good representation of summer water quality.

Trophic Status. Using RCWD monitoring data, the average trophic state over the past 17 years was determined for 32 lakes within the RCWD. Trophic states were determined using average summer TP concentrations for the respective lakes. Values are shown in Table 3-8.

According to Heiskary (1985), lakes with trophic states of 0-40 are oligotrophic, 41-50 are mesotrophic, 51-70 are eutrophic, while a trophic state of greater than 70 indicates a hypereutrophic lake. Using this definition, an estimate of the Minnesota lake classifications was made. The distribution is compared to the distribution of RCWD lakes in Table 3-9.

TABLE 3-8

TROPHIC STATUS BASED ON MEAN SUMMER TP CONCENTRATION FOR RCWD LAKES 1974-1991

	1974-83	1984-86	1988	1989	1990	1991	Average 1974-1991
Turtle	47	47	49	49			47
White Bear	50	37	51	47	57		48
Rondeau	57	57	88	65	58	61	60
Josephine	63	53	61	67			61
Johanna	63	57	57	54			61
Pine Tree			67	61	61	61	63
Oneka	63	53			63	69	63
Round		63					63
Bald Eagle	67	58	64	62	66		64
Long (South)	66	57	66	58			64
Island	52	63	78	68			65
Clear	61	63	58	75	77	57	65
Karth			63		71	63	66
Silver (West)	67	63	68	62			66
Spring			65	57	86	63	68
Golden	70	61	75	73	73	75	70
Sunset	70	69			73	67	70
Reshanau	69	73	75	69	70	72	70
Pike	70	63	73	76	72	74	70
Otter			67	90	65	58	70
Moore	74	63	68				70
Centerville	75	69	75	72	70	69	72
Mud			78	57	72	81	72
Valentine	72	77	85	63	61	78	72
Long (North)	79	75	77	71			78
Howard		76	89	78	76	78	79
Forsham (Marshan)	85	81	82	80	84		84
Peltier	86	76	91	90	83	75	84
Rice	88	88	89	72	79	81	86
Tamarack/Crossways	87	86					87
George Watch	87	77	89	95	88	85	87
Baldwin	92	85	89	74	73	79	88

TABLE 3-9

COMPARISON BY TROPHIC STATUS OF
RCWD LAKES WITH ALL MINNESOTA LAKES

Trophic State	Minnesota Lakes Number	Minnesota Lakes Percent	RCWD Lakes Number	RCWD Lakes Percent
Oligotrophic	1,203	10%	0	0%
Mesotrophic	3,009	25%	2	6%
Eutrophic	6,017	50%	16	50%
Hypereutrophic	1,805	15%	14	44%

The table shows that RCWD has a greater percentage of hypereutrophic lakes and lower percentage of oligotrophic and mesotrophic lakes than all Minnesota lakes. Most of this can be explained in that local geology and topography makes lakes in the North Central Hardwoods Region naturally more eutrophic than northern Minnesota lakes. In this region, in-lake phosphorus, the parameter on which the value is based, is negatively correlated with mean lake depth (MPCA<1990). Since lakes in the RCWD are generally shallow, they are more susceptible to eutrophication. For example, the Rice Creek chain of lakes in Lino Lakes are not truly lakes, but are more appropriately classified as Type 5 wetlands. Due to their shallow depths, organic bottom material, and emergent vegetation, it is generally not "normal" for these lakes to have low TSI.

TSI can also be used to determine suitability for recreational uses. MPCA (1988) classifies lakes as fully supporting swimming, partially supporting, and non-supporting. Fully supporting swimming corresponds to a TSI $\leq$ 59. A TSI between 60 and 65 indicates the lake is partially supporting swimming. Non-supporting of swimming corresponds to a TSI $<$ 65. Based on this classification, only two lakes, Turtle and White Bear, out of the 33 lakes monitored in the past fully support swimming. An additional 10 lakes partially support swimming.

Macrophytes. In a cooperative effort between RCWD, MDNR, Ramsey County, and local lake associations, the exotic nuisance weed Eurasian water milfoil has been positively identified in four lakes within the Rice Creek Watershed. These lakes are White Bear, Bald

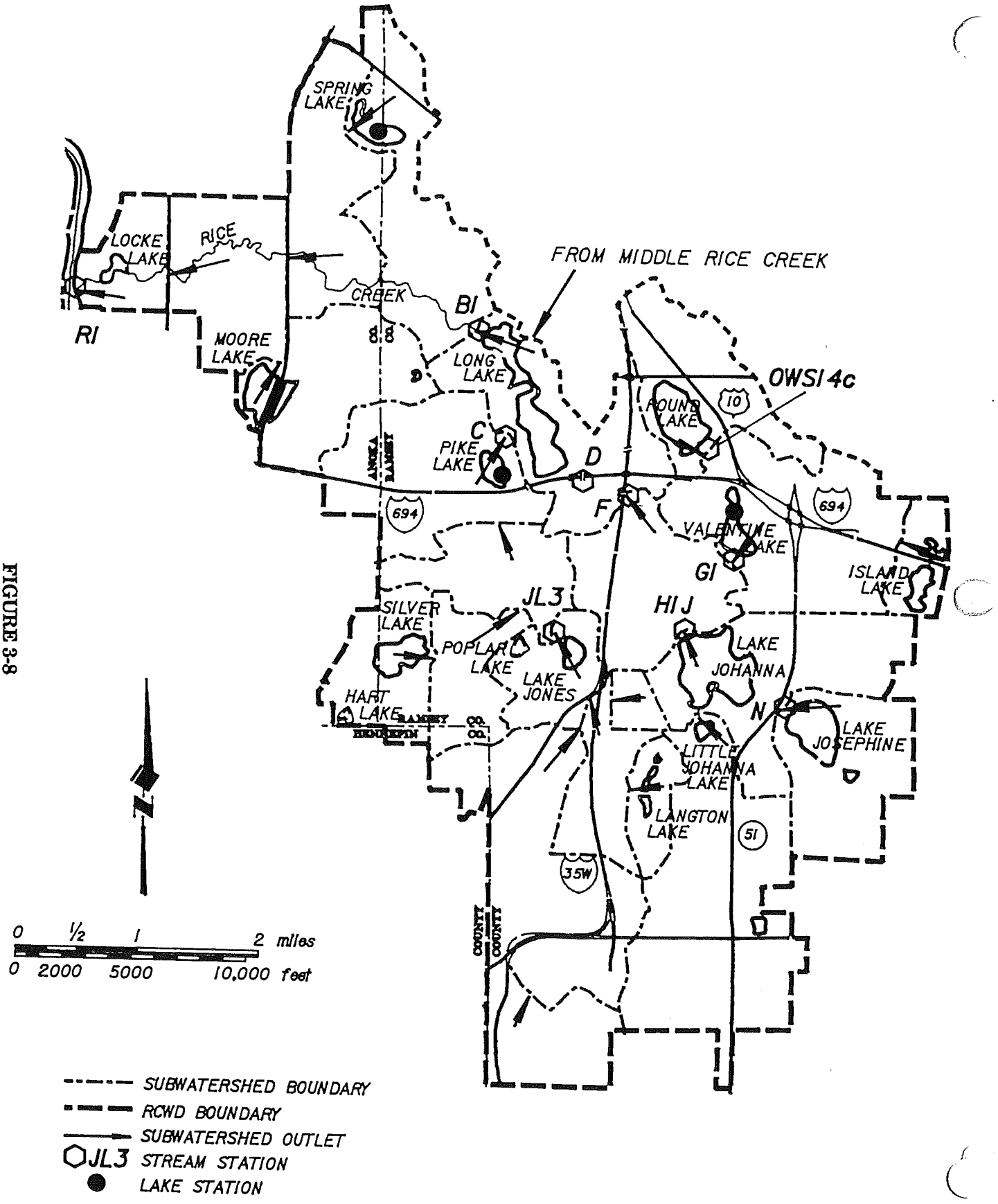


FIGURE 3-8

LOWER RICE CREEK WATER QUALITY MONITORING STATIONS

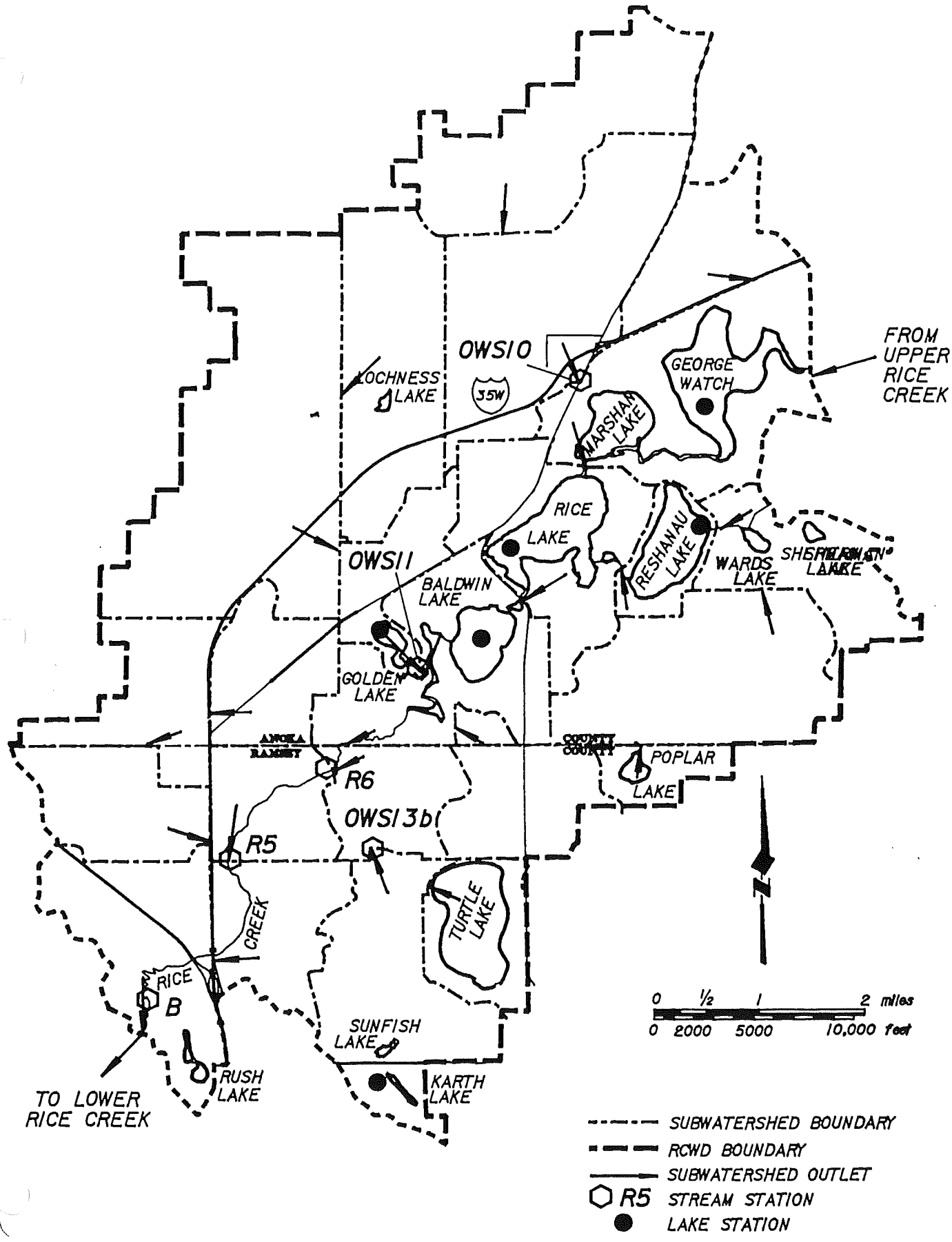


FIGURE 3-9

MIDDLE RICE CREEK WATER QUALITY MONITORING STATIONS

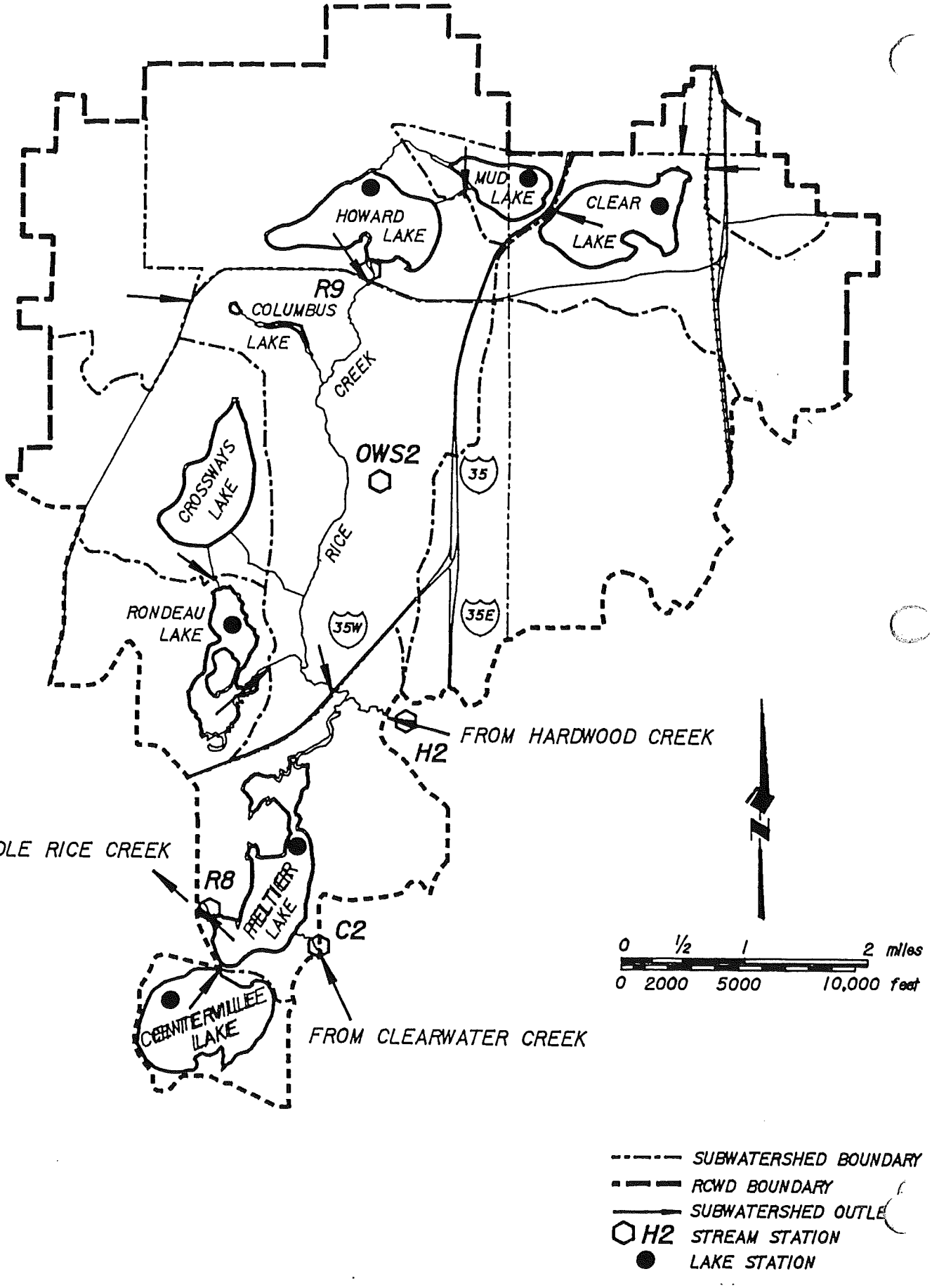


FIGURE 3-10

UPPER RICE CREEK WATER QUALITY MONITORING STATIONS

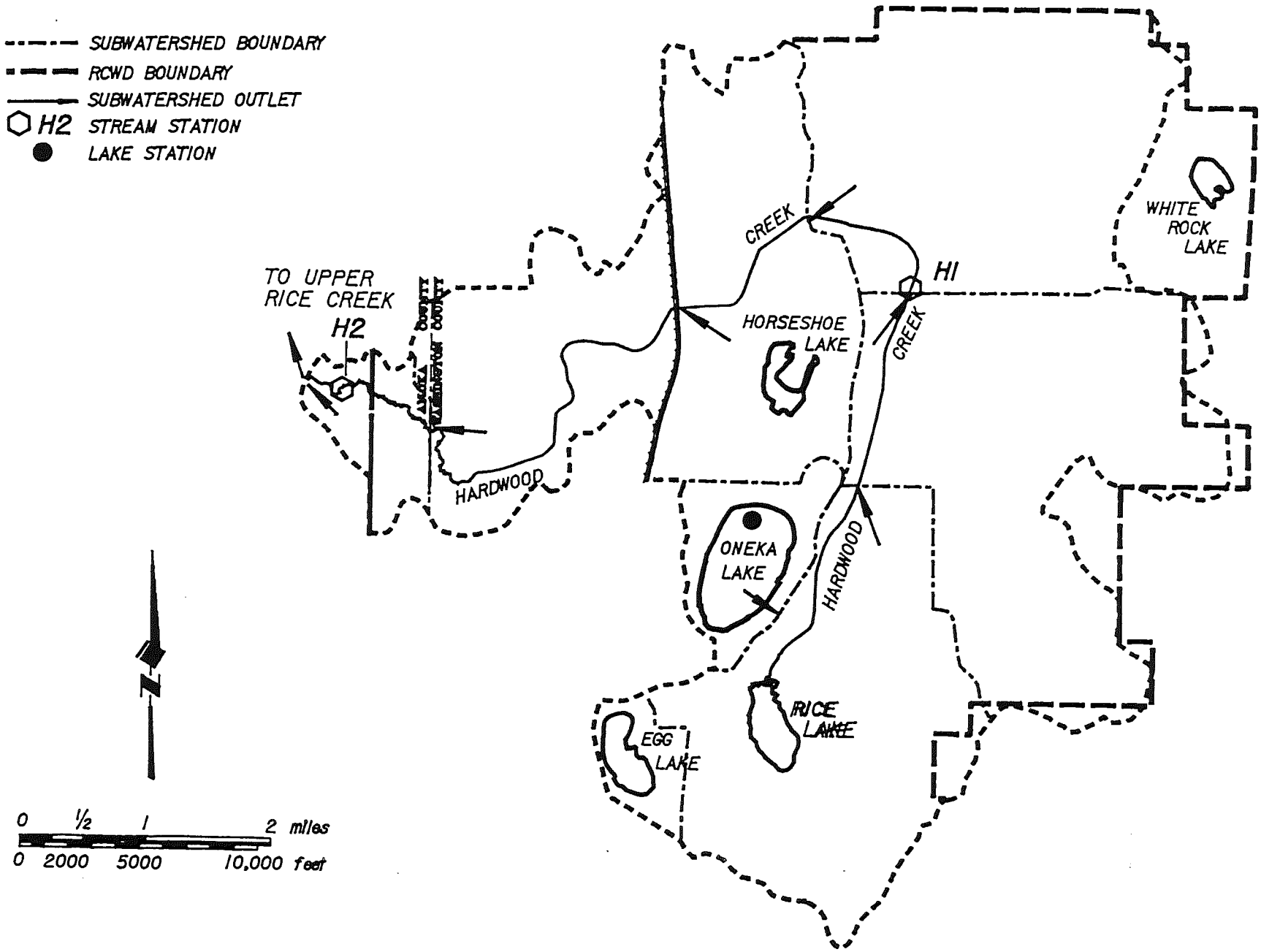


FIGURE 3-11

HARDWOOD CREEK WATER QUALITY MONITORING STATIONS

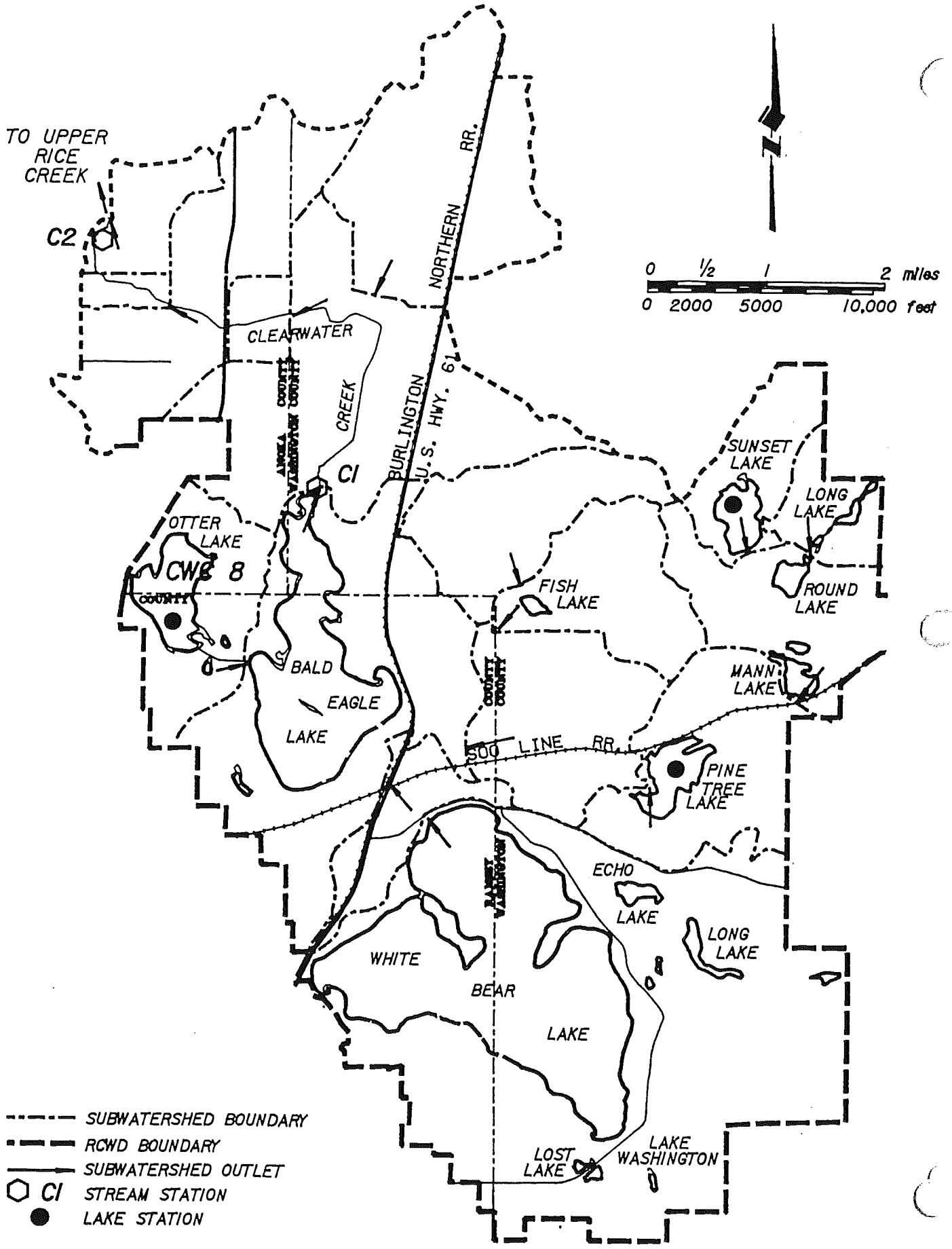


FIGURE 3-12

CLEARWATER CREEK WATER QUALITY MONITORING STATIONS

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

WATER QUALITY MONITORING STATIONS

R1 — Stream Station

• — Lake Station

MAP 16

1 0 2

1/2 1

Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES

WAYZATA, MINNESOTA

TABLE 3-10

AVERAGE TOTAL PHOSPHORUS (µg/l) IN 1991 VS PREVIOUS YEARS' MONITORING RESULTS

Site	1974-84	1984-86	1988	1989	1990	1974-1990 Average	1991	Percent Change 1974-90 Average to 1991
B	190	110	150	130	180	150	160	+7
B1			150	170	140	150	150	0
C	120	120	90	220	160	140	110	-21
C1					200	200	110	-45
C2	110	130	130	220	240	170	180	+6
D	210		140	220	170	190	170	-11
F	160	80	150	170	160	140	160	+14
G1	200	70	90	200	120	140	120	-14
H1	150	100	110	250	270	180	190	+6
H1J	80	150		70	90	100	60	-40
H2	160	190	160	220	370	220	230	+5
JL3	160	130	250	220	240	200	170	-15
N	110	80	100	150	330	150	90	-40
R1	150	100	150	140	150	140	170	+21
R5	200	110	150	140	190	160	160	0
R6	230	110	150	140	190	160	170	+6
R8	210	120	160	190	280	190	160	-16
R9	210	160	130	140	210	170	140	-18
OWS10		170	130	170	150	160	110	-31
OWS11		120	180	250	330	220	170	-23
OWS13b		60	70	150	250	130	80	-59
OWS2		270	190	700	610	440	240	-43
OWS14c							40	

TABLE 3-11

AVERAGE TOTAL SUSPENDED SOLIDS (mg/l) IN 1991 VS PREVIOUS YEARS' MONITORING RESULTS

Site	1974-84	1984-86	1988	1989	1990	1974-1990 Average	1991	Percent Change 1974-90 Average to 1991
B	15.4	7.8	11.8	10.1	11.2	11.3	16.8	+49
B1			11.4	8.5	10.2	10.0	11.3	+13
C	15.9	11.5	9.0	91.6	11.8	28.0	8.1	-71
C1					5.0	5.0	4.2	-16
C2	10.8	18.0	12.2	3.3	19.6	12.8	7.6	-41
D	38.5	11.0	11.7	55.4	8.6	25.0	8.7	-65
F	6.6	4.9	7.5	1.3	5.2	5.1	6.0	+18
G1	13.8	14.0	3.3	4.0	6.7	8.4	8.5	+1
H1	4.7	1.7	5.2	2.4	5.3	3.9	4.6	-18
H1J	7.0	5.0		3.2	7.3	5.6	6.4	+14
H2	9.2	12.0	12.7	2.8	13.3	10.0	6.8	-32
JL3	9.2	9.7	9.8	9.2	9.5	9.5	6.3	-34
N	11.0	7.8	3.6	15.4	19.3	11.4	4.7	-59
R1	12.6	17.0	12.9	11.8	20.4	14.9	31.9	+114
R5	10.5	18.0	12.2	3.9	13.9	11.7	17.6	+5.6
R6	10.4	6.1	21.7	5.1	15.2	11.7	18.0	+54
R8	6.0	11.0	8.5	5.2	11.5	8.4	11.9	+42
R9	21.5	32.0	39.0	14.8	22.6	26.0	22.7	-13
OWS10		17.0	6.9	4.1	5.9	8.5	3.0	-65
OWS11		18.0	8.2	3.7	5.2	8.8	7.1	-19
OWS13b		4.6	9.1	7.8	7.4	7.2	5.2	-28
OWS2		16.0	1.4	1.9	6.2	6.4	1.2	-81
OWS14c							2.2	

Eagle, Otter, and Island. Efforts are underway to develop programs to control the growth of milfoil in these lakes, and to prevent its spread to other waterbodies.

Because of the threat of Eurasian water milfoil, the District has undertaken several macrophyte surveys in recent years. The surveys were performed on Centerville, Peltier, Bald Eagle, White Bear and Clear Lakes. These lakes either had established colonies of the weed, were located downstream of infested lakes, or were considered at risk of becoming infested because of high transient boat traffic. Ramsey County has conducted macrophyte surveys on all the large lakes within their jurisdiction and did not find milfoil communities in any additional lakes.

RCWD field staff routinely makes checks for the weed during all lake sampling events. Any suspect plant is sampled and returned to the laboratory for positive identification. In this manner, nearly all District lakes are monitored for milfoil.

Additional References

Detailed diagnostic/feasibility studies were completed in 1991-92 for Centerville/Peltier and White Bear/Bald Eagle Lakes. As part of these studies, intense monitoring was performed on many of the inlets to the lakes. These reports are on file at the MPCA. Also at the MPCA is a copy of the final report for the Long Lake Chain of Lakes Project. This project targeted water quality within the Long-Johanna-Josephine Lakes Watershed. The majority of the implementation projects were completed in the late 1970s through mid 1980s. The final report discusses some of the specific results of the program and provides additional lake and stream quality data.

Each year the water quality monitoring program for the District is coordinated with the St. Paul Water Utility, Anoka Soil and Water Conservation District, and Ramsey County. Cost sharing parameters and lakes monitored vary from year to year. In addition, the Metropolitan Council has a rotating monitoring schedule which provides data for priority lakes in the Watershed.

The detailed lake studies completed in the last several years have collected large amounts of information which should be assimilated into the watershed management and regulatory programs of the District. The 1992 Water Quality Monitoring Program has established a sub-budget for the District to prioritize water quality management activities. The baseline

TABLE 3-12

MPCA WATER QUALITY STANDARDS

Use	Class A	Class B	Class C	Class D
1. Domestic Consumption	Drinking quality maintained without any treatment	Drinking quality with approved disinfection	Drinking quality after treatment: coagulation, sedimentation, filtration, storage, chlorination	Drinking quality after treatment for Class C pre, post, or intermediate treatment
2. Fisheries and Recreation	Quality permits propagation and maintenance of warm or cold water fish; suitable for all recreation including bathing	Quality permits propagation and maintenance of cool or warm water fish; suitable for all recreation including bathing	Quality permits propagation and maintenance of rough fish species, suitable for bathing	
3. Industrial Consumption	Quality suitable for use without chemical treatment except softening	Quality suitable for use after moderate treatment	Quality suitable for use for cooling and materials transport without high degree of treatment	
4. Agriculture and Wildlife	Quality sufficient for irrigation	Quality sufficient for use by wildlife and livestock		
5. Navigation and Waste Disposal	Quality suitable for aesthetic enjoyment of scenery and to avoid any interface with navigation or property damage.			
6. Other Uses	May be established as determined necessary			

Source: Minnesota Rules, State Revisor of Statutes, 1984.

TABLE 3-13

MINNESOTA POLLUTION CONTROL AGENCY
AMBIENT GROUNDWATER MONITORING STATIONS
RICE CREEK WATERSHED DISTRICT

County	GWQ No.	Ambient Monitoring Station Name
Anoka	0274	Mike Finneman Residence
	0224	City of Fridley, Well No. 5
Ramsey	0068	City of Shoreview (Bucher Park Well)
	0070	White Bear Township, Well No. 1
	0208	City of New Brighton, Well No. 6
	0209	City of New Brighton, Well No. 4
	0210	City of Shoreview, Well No. 3
	0226	Carl Christensen Residence
	0390	City of Shoreview, Well No. 2
Washington	0172	Dellwood Gold Course, Well No. 2

data which the District has accumulated can be utilized to define lake capabilities and expectations in order to develop a more specific water quality management plan.

MPCA Water Quality Standards

The MPCA has established a system of classification of intra-state waters, whereby standards of quality are based on different categories of use. The standards are outlined in the following table. In the Rice Creek watershed, very few waterbodies are assigned specific standards. Rice Creek, Bald eagle, Centerville, and Otter Lakes are all classified as 1C, 2Bd, 3B, 4A, 4B, 5, or 6. All remaining waters are classified under M.R. 7080.0430 as 2B, 3B, 4A, 5, or 6.

GROUNDWATER RESOURCES

The RCWD is located over very substantial groundwater reserves. The major aquifers include: glacial sand and gravel, the Prairie du Chien-Jordan, and the Mr. Simon-Hinckley. The Prairie du Chien-Jordan supplies 75 percent of the groundwater pumped in the Twin City metropolitan area, while the Mt. Simon-Hinckley provides 15 percent. Bedrock groundwater in the northern portion of the Watershed District generally flows toward the west; in the southern portion, the groundwater flows to the southwest.

Groundwater recharge areas are not well known in the RCWD. Glacial sand and gravel aquifers are generally recharged locally. The Mt. Simon-Hinckley aquifer is recharged outside the Watershed. It has generally been documented that the Prairie du Chien aquifer does recharge within the Watershed.

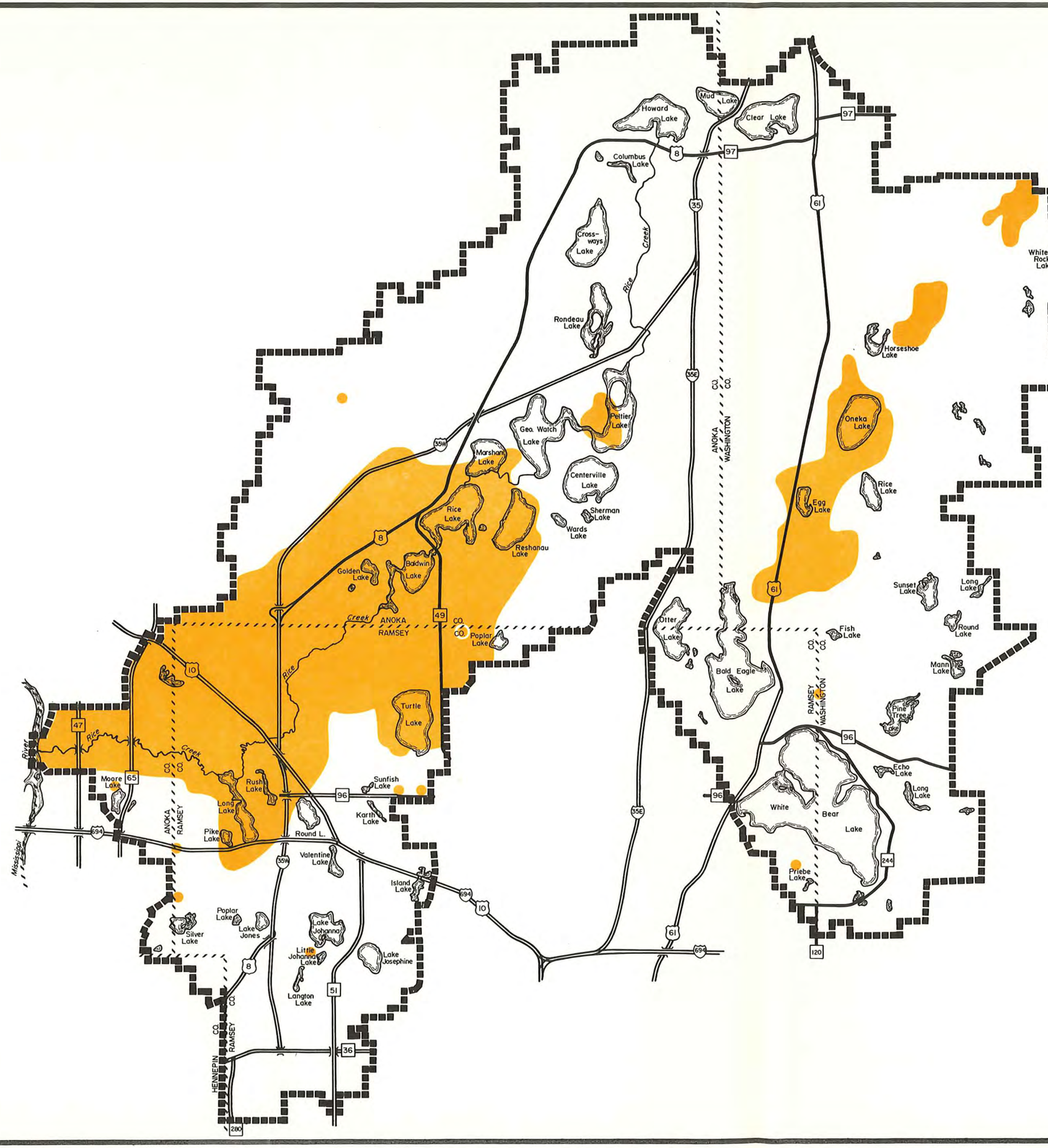
Information from the Minnesota Land Management Information Center was used to develop a recharge map for the Prairie du Chien-Jordan aquifer within the District (Map 17). In preparing the map, areas were plotted with a surface permeability greater than 2.5 inches per hour and a substratum permeability greater than 5-inches per hour over the aquifer subcrop. The map is not intended for specific planning purposes because of the generalized data. However, for regional planning purposes, the map provides a good view of aquifer recharge in the District. One of the recommendations in the Management Strategies section of this plan is to request the Metropolitan Council and the Minnesota or U.S. Geological Survey to prepare a detailed recharge map for the Prairie du Chien-Jordan aquifer.

The MPCA has an active groundwater monitoring system in the Watershed District. The ambient groundwater wells are listed on Table 19 and shown on Map 17. The purpose of the MPCA monitoring program is to characterize the physical, chemical, bacteriological, and organic properties of each water source. Data is available to the District through the STORET system.

WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

GROUNDWATER RECHARGE AREAS



Groundwater Quality Monitoring Stations

MAP 17

1 0 2
1/2 1
Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES
WAYZATA, MINNESOTA

SECTION 4

OBJECTIVES AND POLICIES

INTRODUCTION

The Rice Creek Watershed District's (RCWD) objectives and policies have been structured into a framework for water resource management. This section outlines those objectives and policies, and discusses them on a subwatershed basis. Strategies for management are discussed briefly here and discussed in greater detail in Section 5.

The essential objective of the RCWD is to provide for the wise, long-term management of its water and associate land resources. The term "management" embodies several implicit functions including: planning, organizing, obtaining financial and staff resources, direction or leadership, monitoring or review, control, coordination, reporting, and innovation.

Management is a continuing process which adapts to changing needs and circumstances and which incorporates new knowledge within the expanding context of prior experience. Basic to any effective management process is a consistent, overall policy which enunciates goals, assigns relative priorities, and essentially defines the "mission." The plans, programs, and specific actions which evolve from the basic policy are then continually redefined and refined in response to the future changing environment (social, economic, and governmental).

Overall policy, as stated in the RCWD's Rules and Regulations, provides an impartial, objective basis for developing effective plans and programs for water resources management. Emphasis is placed upon "sound scientific principles" and "provident use of natural resources." Overall RCWD policy is to moderate various competitive interests (e.g., of conservationists; landowners and developers; municipal and county governments) so as to realize the maximum long-term benefit to the RCWD's constituent municipalities, residents, business, and agricultural interests.

Basic principles of RCWD policy should be 1) to evaluate most carefully all proposals which involve irreversible and irretrievable commitments of water and associated land resources, 2) to prevent or reduce adverse impacts upon these resources from proposed developments, 3) to identify and analyze potential alternatives, and 4) to maintain a balanced relationship between the shorter-term uses and the longer-term productivity of the RCWD's resources.

The RCWD will achieve its overall goals predicated upon facts and reason, and by closely coordinating its plans and programs with other concerned governmental agencies at municipal through state levels.

POLICY DEVELOPMENT

Using the general intent of MS 103B as a guideline and assisted by two advisory groups (the Citizens 509 Task Force and Technical Advisory Committee), the RCWD Managers defined their own policies and objectives. An important element in this process proved to be the RCWD's social, physical, and biological diversity, which the final policies needed to reflect. Foremost in this diversity is the presence of both urban and rural land uses. The northern portion of the watershed has a rural character with development occurring sparsely on large lots. The southeastern portion of the watershed is developing in a somewhat more dense manner, while the southwestern portion of the watershed already has an urban character.

OBJECTIVES AND POLICIES

This portion of the Water Resource Management Plan will describe the objectives and policies for water resources management in the RCWD through the year 2000. The first three sections of the Water Resource Management Plan inventoried existing physical and hydrologic conditions and described potential development to the year 2000. This inventory, together with the general purposes of the Metropolitan Surface Water Management Act, were used in determining first the water resource management objectives and second, the water resource management policies for the District. These objectives and policies are shown in Table 4-1.

Objective A: Minimize Public Expenditure to Control Runoff

The first objective is to minimize, to the greatest extent possible, public expenditures used in controlling excessive runoff rates and volumes. This objective will be used to protect downstream areas from hazards related to excessive volumes of runoff while considering costs and benefits.

There are two policies which relate to storage of runoff either on-site or off-site within the RCWD. One states that generally, there is no need for runoff control through the planning period. Another policy indicates that additional storage is needed presently or additional

storage will be required through the planning period. Each of the 84 subwatersheds modeled in the RCWD's stormwater runoff study (outlined in Section 5, Flood Management Profiles) will be subject to one or the other of these two policies. The runoff policies are the only ones which are not tied into the 24 subwatersheds used for the primary planning efforts of this plan.

The policy of the RCWD is to retain the present capacities of the existing drainage system. This is done to reduce costs necessary for possible remedial measures dictated by improper development.

Objective B: Improve Water Quality

The second major objective in the water management plan is to address water quality problems. The purpose of this objective is to improve the water quality of lakes, streams, and wetlands thereby improving habitat for fish and animals and protect water quality for drinking water purposes. In order to more fully describe this objective, five policies were developed.

A policy of the RCWD is to reverse the upward trends observed in pollutants, especially nutrients and sediment loadings, into most of the lakes within the RCWD. This can be done through treatment or control of runoff quality. Minimum requirements have been set which closely follow Metropolitan Council standards.

The RCWD has considerable experience and success with the use of natural wetlands to treat runoff, particularly in the southwestern portion of the watershed. Therefore, a policy to protect wetlands is viewed as an effective way to enhance water quality.

The northern portion of the watershed lies outside of the Metropolitan Urban Service Area (MUSA) line, as delineated by the Metropolitan Council. Outside this line, wastewater treatment is accomplished through individual wastewater treatment systems, primarily septic tanks. The RCWD does not desire to directly regulate individual wastewater treatment systems. However, as a third policy, the RCWD does encourage municipalities to use the Minnesota Pollution Control Agency's Individual Sewage Treatment System Regulations as a model for local control.

After evaluating water quality within the RCWD through the inventory process as described in Section 3 of this plan, it was evident that there are several areas where water quality data is sparse or nonexistent. The policy of the RCWD is to upgrade this water quality monitoring system to identify potential problems and to develop water resource management strategies and quality improvement projects based on this water quality information.

One of the more important policies of the RCWD is to insure good water quality to Minneapolis and St. Paul. The St. Paul water system draws some of its water from the RCWD upstream of Centerville Lake. The Minneapolis water system takes most of its water from the Mississippi River a short distance from the confluence of Rice Creek and the Mississippi River. The watershed should be protected to insure that contamination does not reach the St. Paul or Minneapolis systems.

Objective C: Prevent Flooding and Erosion

The third objective of the RCWD is to prevent flooding and erosion from surface water flows. This two-part objective has five associated policies.

It is the policy of the RCWD that there be no encroachment upon floodways that will reduce capacities to expedite flood flows. It is also the policy of the RCWD to allow only structures in the flood fringe that have been protected from high water either through floodproofing or by other construction techniques.

The 100-year flood levels have not been defined for critical storm events for several portions of Rice Creek. Therefore, it is advisable for the RCWD to work toward defining those flood levels.

One of the goals of M.S. 103B is to move surface water management toward local control. Based on this goal, the RCWD will promote the local adoption of floodplain zoning ordinances conforming to state regulations.

To protect water quality and preserve valuable soil resources, the RCWD has developed a policy to minimize runoff velocities and maximize natural cover in accordance with rural and urban Best Management Practices (BMPs).

To reduce sediment transport and control erosion on construction sites, the RCWD has set a policy which states that a developer must provide all measures necessary to contain sediment and control erosion.

Objective D: Promote Groundwater Recharge

A portion of the RCWD provides groundwater recharge to the Prairie du Chien-Jordan aquifer and surficial aquifers. The Metropolitan Surface Water Management Act encourages the recharge of surface water to groundwater aquifers. The policies of the RCWD encourage this recharge and protect recharge areas from potential sources of contamination.

Groundwater recharge can occur in the area of floodplains. It is the policy of the RCWD to restrict impervious areas within the floodplain in the recharge area of the Prairie du Chien-Jordan aquifer or surficial aquifers.

Portions of the RCWD have experienced groundwater contamination. This groundwater contamination generally resulted from improper disposal of hazardous substances. The policy of the RCWD is to protect recharge areas from future sources of contamination.

Objective E: Protect and Enhance Fish and Wildlife Habitat and Recreation

The water resource management objective for the RCWD is to protect and enhance fish and wildlife habitat and water-oriented recreation. The policies of the RCWD promote and encourage coordination with the Minnesota Department of Natural Resources whose primary responsibility is to protect and enhance fish and wildlife habitats and protect rare and endangered species.

The policy of the RCWD is to preserve wetlands which provide a habitat for game fish spawning and wildlife. There are several areas within the RCWD that provide unique habitats for wildlife management. The most unique of these is the Lamprey Pass Wildlife Management Area in Subwatershed 1.

This planning document has previously identified as an important water management objective the preservation of open space and natural wildlife areas which are an essential part of the ecosystem. The RCWD Managers have no explicit responsibilities for developing parks and open space or managing water-based recreation. However, there is a substantial

commonalty of interest, particularly with regard to the overall approach taken toward "protection" of open space with many other units of government. For this reason, the policy of the RCWD is to coordinate with the state, counties, and municipalities to enhance their ongoing recreational programs which may be affected by water resource management activities.

Objective F: Provide for the Transition of Water Management to Local Units

One of the main purposes of the Metropolitan Surface Water Management Act is to transfer water management responsibilities to local units of government. Surface water management planning and regulations are currently done by watershed districts and state agencies. When local surface water management plans are complete and approved by the RCWD, the local unit of government will implement their own plans. The RCWD will have a continuing responsibility to monitor and ensure implementation of local plans.

These six objectives and associated policies of the RCWD form the framework for water resource management decisions. The following portion of the plan describes the objectives and policies as they relate to specific subwatersheds.

SUBWATERSHED OBJECTIVES AND POLICIES

This portion of the plan will discuss some of the major considerations in the development of the objectives and policies for each of the 24 subwatersheds within the RCWD. In the previous portion of the plan, objectives and policies were discussed in a general nature. This section will present the policies applicable to each subwatershed. Table 4-2 is a summary of the objectives and policies for each subwatershed.

Subwatershed 1: Howard Lake

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, E.1, E.2, E.3, E.4, E.5, and F**

This subwatershed totals approximately 10.75 sq mi. Major waterbodies include Howard, Mud, and Clear Lakes.

During the inventory process for this plan, three major concerns were identified. The first concern was the water quality of the lakes, the second was the effect of water quality on the Lamprey Pass Wildlife Area, and the third was soil erosion primarily in agricultural areas.

Because of the large amounts of lake storage available in this subwatershed, additional storage is not required. There is a need to clearly define drainage routes and attempt to provide water quality ponding for runoff prior to entering the lakes. This will generally be accomplished through use of vegetated swales and sedimentation basins within developments.

The DNR believes rough fish are a major problem with water quality in Howard and Mud Lakes and that wildlife habitat is being harmed by the lack of aquatic plants. The DNR is currently formulating a management plan to control rough fish by manipulating water levels and installing fish barriers.

Recent cooperative groundwater studies performed in the Forest Lake area have sought to better define groundwater influences on Clear Lake. This information, combined with the District's revised monitoring strategies, will help diagnose problem areas within the Clear Lake watershed. Clear Lake was the subject of Clean Water Partnership Grant Applications which were not successful in securing funding.

TABLE 4-1

OBJECTIVES, POLICIES, AND OVERALL MANAGEMENT STRATEGIES

OBJECTIVE A: Minimize, to the greatest possible extent, the public expenditures necessary to control excessive volumes and rates of runoff.

A.1 Policy: Development to the year 2000 does not require the need for measures to control runoff rate unless necessary to prevent localized flooding.

Management Strategy

a. Secure easements or other methods to control wetlands, ditches, drainageways, floodplains, and stormwater retention areas as part of the local water management plans for developing areas and redevelopment area.

b. Restrict modifications where feasible to the outlet of all designated stormwater retention basins that would result in the discharge rate from these areas being increased.

A.2 Policy: Provide for additional storage through the construction of a comprehensive retention area or by on-site ponding in the absence of a comprehensive local/regional stormwater plan.

Management Strategy

a. For each site, control the rate of runoff in conformance with existing RCWD requirements. This will not be necessary if a local water management plan has been approved and satisfactorily implemented for the area.

A.3 Policy: To preserve the retention capacities of the present drainage system.

Management Strategy

a. Maintain county and judicial ditches in accordance with existing state ditch laws (M.S. 103E).

b. Regulate modifications and improvements of existing drainageways that reduce the drainageway retention capacity.

OBJECTIVE B: Improve water quality.

B.1 Policy: Treat and/or control runoff to enhance water quality to reverse the upward trends in pollutants, especially nutrient and sediment loads.

TABLE 4-1

OBJECTIVES, POLICIES, AND OVERALL MANAGEMENT STRATEGIES
(Continued)

Management Strategy

a. In the absence of an approved and satisfactorily implemented Local Water Management Plan, developers will provide the following treatment measures for both new developments and redevelopment of residential areas greater than 5 acres and Industrial/Commercial areas over 2.5 acres.

   1) Sedimentation basin capable of removing coarse suspended sediment from stormwater.

   2) Skimming of oil and floatable materials from the discharged stormwater for the 1-year storm.

   3) Protect all wetlands in accordance with Rice Creek Watershed District wetland policy.

b. Local Water Management Plans must be consistent with, but not necessarily limited to, the three aforementioned items. Any technique may be used if it can be demonstrated that the water quality of public waters will be protected.

B.2 Policy: To preserve wetlands which provide natural treatment for runoff.

Management Strategy

a. Protect all wetlands in accordance with Rice Creek Watershed District wetland policy.

B.3 Policy: To promote the local adoption of Minnesota Pollution Control Agency individual wastewater treatment system regulations.

Management Strategy

a. Require all individual sewage treatment systems to meet requirements outlined in Minnesota Rules 7080

B.4 Policy: To improve the water quality monitoring system for identifying potential problems.

Management Strategy

a. Implement the Annual Rice Creek Watershed District Monitoring Program.

TABLE 4-1

OBJECTIVES, POLICIES, AND OVERALL MANAGEMENT STRATEGIES
(Continued)

b. Provide additional special monitoring in areas identified by the Board of Managers based on specific water quality problem.

c. Coordinate and standardize monitoring with other levels of government.

B.5 Policy: To protect drainage areas that supply the St. Paul and Minneapolis water system from sources of contamination.

Management Strategy

a. Require the District be advised of all site development activities in which the storage and handling of hazardous materials will occur and that storage and handling of such materials comply with all State requirements. The District shall establish a procedure for insuring its awareness of all contamination problems.

OBJECTIVE C: Prevent flooding and erosion from surface flows.

C.1 Policy: To prohibit encroachment that will reduce the capacity of floodways and to allow only structures in the flood fringe that have been floodproofed or that will not receive excessive damage.

Management Strategy

a. Prohibit encroachment in the floodway and allow only protected structures in the flood fringe. Allow fill placement in only RCWD-designated flood fringe areas. The amount of fill allowed must comply with current state regulations.

C.2 Policy: To establish 100-year flood levels based on critical storm events.

Management Strategy

a. Complete floodplain studies for all areas of the RCWD.

C.3 Policy: To promote the local adoption of floodplain zoning ordinances conforming to state regulations, as a minimum, to regulate floodplain development.

Management Strategy

a. Maintain RCWD regulatory control until floodplain regulations are adopted by local governmental units.

TABLE 4-1

OBJECTIVES, POLICIES, AND OVERALL MANAGEMENT STRATEGIES
(Continued)

C.4 Policy: To minimize runoff velocities and maximize natural cover in order that erosion be reduced.

Management Strategy

a. In the absence of an approved and implemented local water management plan, the developer will provide the following on-site treatment measures in both new development and redevelopment:

   1) Minimize slopes.

   2) Provide stabilized channels for stormwater runoff.

   3) Incorporate energy dissipaters into stormwater management features on-site if appropriate.

   4) Encourage use of natural grass waterways to discharge stormwater runoff from sites and to promote natural treatment for stormwater runoff.

b. The local water management plan must be consistent with, but not necessarily limited to, the four aforementioned items.

C.5 Policy: To provide all measures necessary to contain sediment and control erosion within construction sites.

Management Strategy

a. In the absence of an approved and implemented local water management plan, developer will provide the following on-site treatment measures in both new development and redevelopment of residential areas grater than 5.0 acres or industrial/commercial areas over 2.5 acres.

   1) Provide and maintain erosion and sediment control measures on construction sites where sediment could be transported off-site.

   2) Utilize phased construction techniques, if appropriate, to minimize disturbance of vegetation on-site during construction.

   3) Require scheduling and implementation of temporary cover establishment over all construction site areas that are disturbed if the implementation of final cover establishment measures is delayed.

TABLE 4-1

OBJECTIVES, POLICIES, AND OVERALL MANAGEMENT STRATEGIES
(Continued)

b. A local water management plan must be consistent with, but not necessarily limited to, the three aforementioned items. Other techniques may be used if it can be demonstrated that the water quality of public waters will be protected.

OBJECTIVE D: Promote groundwater recharge.

D.1 Policy: To evaluate and control development of groundwater recharge areas.

Management Strategy

a. Prohibit the construction of impervious surfaces over areas designated as floodplain recharge areas except for road construction, trails, and other recreational improvements where no alternatives exist.

D.2 Policy: To protect recharge areas from potential sources of contamination.

Management Strategy

a. Control developments with potential to contaminate groundwater recharge areas.

OBJECTIVE E: Protect and enhance fish and wildlife habitat and water recreation.

E.1 Policy: To promote the adoption of local shoreland ordinances based on Department of Natural Resources regulations.

Management Strategy

a. Maintain RCWD regulatory controls over shoreline management unless municipality adopts and implements local shoreland ordinances.

E.2 Policy: To preserve wetlands that provide habitat for game fish spawning and wildlife.

Management Strategy

a. Follow policies outlined in Sections A and B and maintain communication with the Department of Natural Resources on all land development activities that may compromise fish and wildlife habitat in lakes or wetlands within the RCWD.

TABLE 4-1

OBJECTIVES, POLICIES, AND OVERALL MANAGEMENT STRATEGIES
(Continued)

E.3 Policy: **To coordinate with the Department of Natural Resources to enhance fish and wildlife habitats.**

Management Strategy

a. Consult with the Department of Natural Resources and other appropriate agencies to identify opportunities to enhance fish and wildlife habitat within the RCWD.

b. Incorporate fish and wildlife considerations in the design of water retention and delivery systems and other management policies.

E.4 Policy: **To coordinate with the Department of Natural Resources to protect rate and endangered species.**

Management Strategy

a. Maintain communication with Department of Natural Resources on all land development activities that may impact rare and endangered species.

E.5 Policy: **To coordinate with counties and municipalities to enhance water-based recreation.**

Management Strategy

a. Give priority to watershed projects that complement existing or proposed state, regional, county, or local recreational facilities and programs given all other factors are equal.

OBJECTIVE F: Provide for the orderly transition of appropriate water management responsibilities to local units of government where feasible.

F.1 Policy: **Encourage local units of government to administer water management regulatory functions upon approval of a local water management plan that 1) is in conformance with the objectives, policies, and management strategies outlined herein, 2) outlines functions of both the RCWD and local unit of government during the transition period, and 3) provides for accountable implementation of the water resources management plan.**

F.2 Policy: **The RCWD maintains the right to approve plan amendments and changes in local regulations. The RCWD may withdraw local regulatory authority for just cause.**

TABLE 4-2
SUBWATERSHED OBJECTIVES AND POLICIES
WATER RESOURCE MANAGEMENT PLAN
RICE CREEK WATERSHED DISTRICT

	Subwatersheds																						
	1 - Howard Lake	2 - I-35W	3 - Rondeau Lake	4 - Hardwood Creek East	5 - Hardwood Creek North	6 - Hardwood Creek West	7 - White Bear Lake	8 - Bald Eagle Lake	9 - Clearwater Creek	10 - Lino Lakes	11 - Blaine	12A - Peltier Lake	12B - Baldwin	13A - Marsden Lake	13B - Turtle Lake	13C - Upper Rice Creek	14A - Lake Josephine	14B - Lake Johanna	14C - Round Lake	14D - Valentine Lake	14E - E2 Wetland	15A - Jones Lake	15B - Pike Lake	16 - Lower Rice Creek
A - Minimize Public Expenditure to Control Runoff																							
1 - To Year 2000, Maintain Current Rate of Stormwater Runoff	See Section 5, Runoff Management, for detailed rate control policy for 84 subwatersheds																						
2 - To Provide Additional Storage	See Section 5, Runoff Management, for detailed rate control policy for 84 subwatersheds																						
3 - To Preserve Retention Capacities of Present Drainage Systems	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
B - Improve Water Quality																							
1 - To Treat or Control Runoff to Enhance Water Quality	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2 - To Preserve Wetlands to Provide Treatment for Runoff	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3 - To Promote the Local Adoption of Septic Tank Regulations	X	X	X	X	X	X	X	X	X	X	X	X	X			X							
4 - To Monitor Water Quality	X	X	X						X	X	X	X											
5 - To Protect Water Quality for Minneapolis/St. Paul Water Systems	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
C - Prevent Flooding and Erosion																							
1 - To Prohibit Encroachment in the Floodway and to Allow Only Protected Structure in the Flood Fringe	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2 - To Establish 100-Year Flood Levels	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3 - To Promote the Local Adoption of Floodplain Regulation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4 - To Minimize Runoff Velocities to Maximize Natural Cover to Reduce Erosion	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5 - To Provide Sediment and Erosion Control at Construction Sites	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
D - Promote Recharge to Groundwater																							
1 - To Evaluate and Control Development within Recharge Areas				X	X	X		X	X	X	X	X	X	X	X	X					X		X	X
2 - To Protect Recharge Areas from Potential Contamination	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
E - Protect and Enhance Fish and Wildlife Habitat and Recreation																							
1 - To Promote Adoption of Local Shoreland Ordinance	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2 - To Protect Wetlands for Gamefish Spawning and Wildlife Habitat	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3 - To Coordinate with DNR to Enhance Fish and Wildlife Habitat	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4 - To Coordinate with DNR to Protect Rare and Endangered Species																							
5 - To Coordinate with Local Government to Enhance Recreation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
F - To Provide for the Transition of Water Management to Local	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Subwatershed 2: I-35E

Policies: A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, E.1, E.2, E.3, E.5, and F

This subwatershed does not contain any lakes and is drained by numerous ditch systems in a tributary area of 6.28 sq mi. The subwatershed has not historically been included in the District's monitoring program and has experienced little development activity to date.

Through the inventory process, the primary concerns in water management identified for the subwatershed were the lack of water quality monitoring data and the slow drainage of the ditch system.

Baseline monitoring information was collected for this watershed as part of the Centerville/Peltier diagnostic and feasibility studies. The District's permitting program will continue to protect the large amounts of floodplain and wetland area within this subwatershed. The District will also be inspecting the public ditch systems within this subwatershed as part of the District's annual inspection program.

Subwatershed 3: Rondeau Lake

Policies: A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, E.1, E.2, E.3, E.5, and F

This subwatershed covers approximately 12.76 sq mi. Lakes in this are include Columbus, Crossways (Tamarack), and Rondeau.

Two water management concerns were identified through the inventory process. First, the need to maintain the capacity of the large areas of floodplain and second, the need to address water quality of the lakes in the subwatershed.

Because of the large storage available in this subwatershed and also immediately downstream, runoff rate control is not necessary as the storage will buffer any foreseeable impacts of development.

Agricultural land use is dominant in this subwatershed. As part of the Upper Watershed Improvement Project, cooperative programs with the Anoka SWCD will be explored to lessen potential problems associated with agricultural runoff.

Subwatersheds 4 and 5: Hardwood Creek East and Hardwood Creek North

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.5, and F**

This combined watershed totals 19.52 sq mi and contains Egg, Rice, Oneka, and Horseshoe Lakes. The area is drained by Hardwood Creek (Anoka/Washington Judicial Ditch No. 2) which is very flat and has limited discharge capacity. These subwatersheds have extensive floodplain and wetland areas which are being preserved due to the low density development occurring in this area located outside of the MUSA boundary.

The District has maintained several water quality monitoring stations in these subwatersheds and also conducted intense monitoring during the Centerville/Peltier diagnostic study. Several potential wetland restoration projects are being contemplated in addition to the feedlot control practices to be implemented with the cooperation of the Washington SWCD.

Subwatershed 6: Hardwood Creek West

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.5, and F**

This subwatershed is approximately 8.71 sq mi in area. Horseshoe Lake is located in the subwatershed but provides little active storage due to its landlocked nature. Stormwater modeling indicates there will be a slight increase in flows from present day to year 2000 conditions. More significant increases in flow rates could occur if the capacity of Hardwood Creek channel is increased.

The Upper Watershed Improvement Project will seek to address agricultural land use in the watershed and potential wetland restoration sites. A ferric chloride injection system is contemplated at the mouth of this subwatershed. It is anticipated that low density urbanization of this subwatershed may result in improved water quality relative to its present land use.

Subwatershed 7: White Bear Lake

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, E.1, E.2, E.3, E.4, E.5, and F**

This subwatershed is landlocked and drains approximately 18.04 sq mi. White Bear Lake dominates the hydrology of the area by providing massive storage volume for the entire subwatershed. White Bear Lake was the subject of a diagnostic/feasibility study cofunded between the Clean Water Partnership Program and the Clean Lakes Program. The water quality of White Bear Lake is very good and a protection plan is being devised with little construction work proposed other than retrofitting of existing systems.

White Bear Lake has a small tributary drainage area relative to its surface area which tends to keep the lake clean but subjects it to large variations in water levels during times of drought. The DNR is undertaking a study to define groundwater interactions and a water budget for the basin.

Because there are relatively large amounts of storage in this subwatershed, there is little need for controlling runoff rate associated with development in this subwatershed. The District will concentrate on intercity drainage matters only and continue water quality ponding requirements.

Subwatershed 8: Bald Eagle Lake

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.5, and F**

This subwatershed drains approximately 13.35 sq mi. Bald Eagle Lake has a high capacity outlet structure which drains into Clearwater Creek. During high water conditions, Bald Eagle and Otter Lakes function as a single reservoir which helps moderate flows from this area. Bald Eagle Lake had a diagnostic/feasibility study performed concurrently with White Bear Lake through the Clean Water Partnership and Clean Lakes Programs. Several wetland restoration projects and public information programs were contemplated for improving the quality of Bald Eagle Lake. From the studies, it appears the directly tributary watershed of Bald Eagle is a significant source of phosphorus loading.

Ramsey County maintains a water-based regional park at Bald Eagle Lake. Programs of the District and counties should be coordinated in order to improve recreational opportunities associated with the park.

Subwatershed 9: Clearwater Creek

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.5, and F**

This subwatershed drains approximately 12.35 sq mi and has very little reservoir storage available. In order to reduce potential flooding along the creek, the District emphasis will be upon controlling projected increases in runoff rates from the southwestern portions of the City of Hugo.

Downstream channel improvements contemplated by the City of Centerville will allow for drainage at the lower end of this subwatershed to enter and leave this system prior to the upper reaches of the Clearwater Creek watershed entering the area. This drainage area will be addressed through the District's Upper Watershed Improvement Project which will explore the use of sediment sealing, aeration, and land use improvement to improve the water quality of Centerville and Peltier Lakes

Subwatershed 10: Lino Lakes

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.5, and F**

Little intense development is anticipated within this 6.62 sq mi watershed through the year 2000. The subwatershed has been extensively ditched via public and private system and is covered by large expanses of floodplain and wetland areas protected under the Wetland Conservation Act. Runoff rate is therefore not a major concern, particularly in light of the large amounts of storage available within the chain of lakes located in the city. Drainage issues will therefore be of an intracity nature and best addressed by the city's local water management plan.

Subwatershed 11: Blaine

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.5, and F**

Blaine has currently seen scattered development throughout this 10.82 sq mi subwatershed. Golden Lake is the only lake in this subwatershed and is located at the mouth. Large amounts of storage are present within the flat floodplains and wetlands of this heavily ditched subwatershed. Future runoff rates are not projected to increase significantly due to the relatively low percentage of uplands scattered through the area. Water quality is a concern as Golden Lake was the subject of a Clean Lakes Grant and several water quality improvements have been implemented.

Subwatershed 12a: Peltier Lake

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.5, and F**

The tributary area of this subwatershed is approximately 4.6 sq mi and includes Peltier and Centerville Lakes. The water quality of these lakes is poor but recently completed diagnostic studies for the lakes indicate that Centerville has potential to be greatly improved.

The lakes form the upper end of the large reservoir situated in the middle of the District. The lakes were created from low wetland areas by construction of the Peltier Lake Dam by the St. Paul Water Utility. Large tracts of undeveloped property will remain around the lakes due to the presence of Anoka County Regional Park and land ownership by the St. Paul Water Utility. The improvement of these lakes for enhancement of water-based recreational opportunity is one of the primary goals of the Upper Watershed Improvement Project which the District is pursuing based upon the results of the Clean Water Partnership study.

Subwatershed 12b: Baldwin Lake

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.4, E.5, and F**

This subwatershed totals approximately 19.15 sq mi and includes the entire Lino Lakes Chain of Lakes. These lakes are George Watch, Marshan, Reshanau, Rice, and Baldwin. Several additional DNR-protected waterbodies exist near this chain with the entire chain functioning as one large floodplain during high flow conditions. The large amount of storage provided in the chain will ensure negligible increases in runoff from above this area due to future development.

This area is undergoing rapid development, however, District and city policies for protecting floodplains and wetlands have helped to minimize preservation of natural areas and prevention of flooding.

The Anoka Regional Park extends through this subwatershed and provides canoe and foot trails through the lakes area. Water quality in these shallow lakes is generally poor and it is hoped that implementation of the Upper Watershed Improvement Project will result in higher quality headwaters for the area. The conversion of agricultural land use to residential development may aid in recovery of these basins.

Subwatershed 13a: Turtle Lake

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.4, E.5, and F**

This subwatershed covers an area of approximately 1.3 sq mi. Turtle Lake is generally very high quality and provides adequate storage for the small area tributary to it. Turtle Lake was the subject of a Clean Water Partnership Grant Application to the MPCA which was not approved. In the past several years, Turtle Lake has been subject to an obscure state law which requires the Watershed District to administer a permit program for the nonessential appropriation of water from it. Data from this program is being collected and could be used by Ramsey County and the DNR in future studies which address the effects of the discontinued lake augmentation program from Ramsey County wells.

Subwatershed 13b: Marsden Lake

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.4, E.5, and F**

The Marsden Lake subwatershed covers approximately 2.28 sq mi. Marsden Lake is actually a large DNR protected wetland complex located within the Twin Cities Army Ammunition Plant boundary. Karth and Sunfish Lakes also exist in this subwatershed. Karth Lake is landlocked; Sunfish Lake is used as a walleye rearing pond by the DNR. The low flow rates from this subwatershed are not presently, or projected to be, a District concern. However, uncertainty over the long-range plans for the munitions plant property has led the District to include this subwatershed in the policy area requiring full runoff rate control.

The District has worked with the U.S. Army to help manage excess treated groundwater from on-going remediation efforts at the plant. These water management studies combined with the Comprehensive Stormwater Management Plan for Ramsey County Ditch 1, prepared by the District, provide a large amount of reference material addressing existing drainage conditions.

Subwatershed 13c: Upper Rice Creek

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.5, and F**

This subwatershed covers approximately 11.3 sq mi and consists of numerous discharge points to Rice Creek above Long Lake. This area has undergone intense development during which the District has required full rate control measures to be implemented. The three-phase modeling study performed by the District identified this general subwatershed area to be a major concern for controlling stormwater runoff rates within lower Rice Creek.

The District has constructed an online sedimentation basin at the outlet for this subwatershed which intercepts coarse sediment prior to entering Long Lake. This project was constructed as part of the Clean Lakes Grant for the Long Lake Chain of Lakes and has been maintained every five to seven years.

Subwatershed 14a: Lake Josephine

Policies: A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, E.1, E.2, E.3, E.5, and F

This subwatershed totals approximately 1.31 sq mi. The area tributary to the lake was largely developed prior to formation of the District. Cooperative projects performed with the City of Roseville as part of the Long Lake Chain of Lakes Grant enabled a large storm sewer to be diverted from the lake into a wetland treatment area. This improvement has increased the water quality of Lake Josephine and allowed for increased use of the Ramsey County park facilities at the lake.

Subwatershed 14b: Lake Johanna

Policies: A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, E.1, E.2, E.3, E.5, and F

This subwatershed totals approximately 4.25 sq mi. Numerous projects have been done in the area tributary to Lake Johanna as part of the Long Lake Chain of Lakes Grant. Most notably, Ramsey County Ditch 4 which drains the industrial and retail areas of Roseville has been stabilized to prevent erosion of the channel and deposition of sediment within Johanna. Additionally, the District constructed a new fishing pier/lake outlet which greatly moderates the once widely fluctuating lake levels. Shoreline erosion had been a large problem around the basin.

Water quality of the lake is monitored annually by the Ramsey County Department of Public Works. Little additional development is expected in this subwatershed and District policies will be to promote retrofitting of stormwater quality measures where feasible.

Subwatershed 14c: Round Lake

Policies: A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, E.1, E.2, E.3, E.5, and F

The Round Lake subwatershed extends over 0.83 sq mi. Round Lake is managed by the U.S. Fish and Wildlife Service and has an adjustable outlet capable of providing large amounts of storage. This subwatershed had a large amount of undeveloped land riparian to the lake. Preliminary planning efforts indicate it will be commercial/industrial development area

which will require water quality ponding measures to treat water prior to discharging to the lake.

Subwatershed 14d: Valentine Lake

Policies: A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, E.1, E.2, E.3, E.5, and F

Valentine Lake receives runoff from a 2.4 sq mi area which includes Highways 694, 51, and 10. Runoff rate control will be required due to the high density of development occurring in this subwatershed. The lake receives significant amounts of untreated runoff from the County Ditch 12 system although the ditch itself has been stabilized as part of the Long Lake Chain of Lakes program. Numerous smaller ponds have been established within the Highway 51/694 right-of-way and the Land O'Lakes corporate headquarters. Valentine Lake is monitored by the Ramsey County Department of Public Works and will be the subject of District inflow monitoring to diagnose sources of highest loadings.

Subwatershed 14e: E2 Wetland

Policies: A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.5, and F

This subwatershed was comprised of a large restored wetland complex located southeast of I-35W and I-694. The subwatershed is hydraulically overloaded. An adjustable outlet structure is used to moderate level fluctuations and capture initial spring runoff for treatment in the wetland area. Beaver activity in both subwatersheds 14d and 14e has resulted in unacceptable water level fluctuations in recent years. Detailed hydrologic modeling was performed under the Lake Johanna watershed study and extended over all subwatershed 14 areas.

Subwatershed 15a: Jones Lake

Policies: A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, E.1, E.2, E.3, E.5, and F

This area drains approximately 3.61 sq mi. Drainage through subwatersheds 15a and 15b was documented in the Pike Lake watershed study completed prior to initiation of the Long Lake Chain of Lakes Grant Program. The District performed project work to increase

storage available within Jones Lake to lower peak flood flows downstream in New Brighton. As with most southern portions of the District, little development has occurred within this subwatershed since the District was formed.

Subwatershed 15b: Pike Lake

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.5, and F**

This subwatershed contains Silver and Pike Lakes and drains an area of approximately 4.06 sq mi. This subwatershed was addressed by the Pike Lake hydrology study and had extensive stabilization measures performed along Ramsey County Ditch No. 2 in an effort to alleviate problems with excessive runoff rate associated with development which occurred prior to District formation. Silver Lake is a current concern of the District and is the subject of joint efforts by the Cities of New Brighton, St. Anthony, Columbia Heights, and Ramsey County to improve the watershed draining to the lake. The lake is subject to level fluctuations which provides significant storage within this subwatershed. Preservation of lesser storage areas has been encouraged by the City of New Brighton's Comprehensive Stormwater Plan which has described numerous ponding areas to be preserved in the city.

District modeling efforts for this subwatershed tend to overestimate peak flow as these numerous small retention ponds and their cumulative storage cannot be accommodated in the large-scale modeling efforts undertaken by the District.

Subwatershed 16: Lower Rice Creek

Policies: **A.3, B.1, B.2, B.3, B.4, B.5, C.1, C.2, C.3, C.4, C.5, D.1, D.2, E.1, E.2, E.3, E.4, E.5, and F**

Little additional development is anticipated in this 7.35 sq mi area. The dominant hydrologic feature is Long Lake which accepts flow from the three sectors of the watershed and provides a single outlet for Rice Creek. After the flows converge at Long Lake, Rice Creek provides a single drainage route down the relatively steeply sloped Rice Creek channel to the Mississippi River.

Primary management objectives of the District are to manage channel stability and seek to repair or prevent unacceptable erosion from occurring within the numerous meanders.

From a recreational perspective, large amounts of public lands are located along the creek and at the Long Lake Regional Park. The Anoka County/Rice Creek Regional Trail System continues through this subwatershed and the District will coordinate with the parks departments of Ramsey and Anoka Counties to enhance the recreational opportunities within this subwatershed.

There is a city swimming beach at Moore Lake in Fridley which was improved following a Clean Lakes Grant administered by the city. Additionally, Spring Lake is used by the DNR as a rearing pond but has had occasional winterkill problems.

Long Lake Chain of Lakes projects were conducted in the Long Lake basin to remove sediments and to also treat sediments to reduce internal loading of phosphorus. Other project work has included numerous bank stabilization projects and administration of a bank stabilization grant program described in the District's original 509 capital improvements program. Also in the program is a description of a project for Locke Lake which is located immediately above East River Road. The lake has been subject to sedimentation and has had several attempts at initiation of the projects to remove sediment from the impoundment.

In an effort to better understand flood flows in Rice Creek, the District has installed continuous flow gauges to aid in calibration of District hydrology models. Peak flows observed in the creek have rarely exceeded 700 cfs. Modeling data predicts a 100-year peak flow of over 2,000 cfs. It is hoped that calibration of the hydrology models with the gauged information will lead to more accurate representation of flows. District policies regarding lower Rice Creek flooding is being formed during completion of the three-phase flood profile study.

SECTION 5

MANAGEMENT PLAN

INTRODUCTION

The Rice Creek watershed is a dynamic and complex hydrologic system. Based on current knowledge regarding the watershed's problems, this section evaluates and selects programs and projects to improve existing conditions, prevent further deterioration, and enhance future quality and usefulness of the Rice Creek Watershed District's natural resources. This section is divided into three elements: 1) general water management strategies, 2) water management problem identification, and 3) strategic implementation plan.

General water management strategies parallel the water management objectives discussed in Section 4 of this plan. The water management problem identification section describes a problem identification methodology used to determine the greatest needs for water management within the Watershed District. The surface water management classification system categorizes waters of the District to provide a logical division between planning and management of water resources and the cost of management projects.

The strategic implementation plan identifies 16 areas of concern and sets minimum standards for management during the planning processes. Each area of concern is described in detail with a management strategy and responsible agency identified.

GENERAL WATER MANAGEMENT STRATEGIES

The general water management strategies for the Rice Creek Water Resource Management Plan are discussed in Section 4 and reflect the basic water management objectives which will guide the Board of Managers.

It is understood that occasionally, water management strategies will not be feasible or practical in all instances. In fact, they may be in conflict and require trade-offs with each other. When this occurs, the Board will make a reasonable decision based on the available information and overall circumstances.

WATER MANAGEMENT PROBLEM IDENTIFICATION

Throughout this planning process, the Board of Managers of the Rice Creek Watershed District have involved the public. To accomplish this, the Board of Managers set up two advisory groups: the 509 Technical Advisory Committee and Citizen's 509 Task Force. The Technical Advisory Committee was composed of technical staff of the cities and townships within the Watershed District. The Citizen's Task Force was comprised of one interested citizen and an elected official from each community within the watershed. Individuals comprising the membership of these groups are identified at the beginning of this plan. These bodies were charged with reviewing the plan and for identifying water management problems within the Watershed District. Members of each committee, along with staffs from the various State agencies which control water resources and the county Soil and Water Conservation Districts, were invited to fill out a Water Management Concerns Questionnaire (Table 5-1). These completed questionnaires, along with discussions with other local officials, provided the backbone for problem identification.

TABLE 5-1

WATER MANAGEMENT CONCERNS QUESTIONNAIRE

1. **Runoff - Excessive Rates or Volumes:**

   - Water Body
   - Problem Description

2. **Water Quality - Sedimentation, Nutrients, Sewage, or Hazardous Materials:**

   - Water Body
   - Problem Description

3. **Flooding - Ponding Areas or Floodplains:**

   - Water Body
   - Problem Description

4. **Erosion - New Construction, Long-Term Problems, or Agriculture:**

   - Location
   - Water Body
   - Problem Description

5. **Groundwater - Sources of Contamination:**

   - Location
   - Problem Description

6. **Recreation - Water Volume, Water Quality, or Aesthetics:**

   - Location
   - Water Body
   - Problem Description

7. **Fishery - Spawning Habitats:**

   - Water Body
   - Problem Description

8. **Wildlife Habitat - Nesting, Habitat:**

   - Location
   - Water Body
   - Problem Description

STRATEGIC IMPLEMENTATION PLAN

The areas of concern identified in the water management problem identification process provided the framework for the concerns to be addressed as part of the Strategic Implementation Plan. These concerns are: runoff management (quantity and quality), ditch management, potable water supply, water quality management, individual sewage treatment systems, wetland management, shoreland management, flood plain management, agricultural erosion, construction erosion, groundwater protection, rough fish control, flood management profiles, inspection and maintenance, channel management, and public information/education. The Strategic Implementation Plan was developed to address each of these management concerns.

1. RUNOFF MANAGEMENT (QUALITY AND QUANTITY)

Introduction

Stormwater runoff management in the Rice Creek Watershed District is necessary to prevent development from creating flooding, erosion, and water quality problems in downstream areas. Effective stormwater management will also reduce the public expenditures necessary to construct conveyance systems and downstream facilities capable of accommodating stormwater runoff generated in upstream areas.

The Watershed District has employed numerous runoff management strategies since its inception. The initial policy of the District required 100-year rate control for any development activity within the District. In the 1980s, District policy shifted to require rate control measures for developments in excess of 2.5 acres. The District also began requiring rate control for the more frequent 1-year event in an effort to alleviate flooding associated with storms less extreme than the 100-year event. Water quality considerations were also cited for the increased use of detention ponds.

With the drafting of the Rice Creek 509 Plan in the mid-1980s, the District rate control policy dealt primarily with control of 100-year runoff rates. It was the intent of the Board of Managers to set minimum local plan standards which adequately addressed the District's primary concern of controlling the critical flooding conditions. Municipalities were encouraged to address rate control of more frequent events for their own internal drainage systems. This policy continues, however, the District will require 1- and 100-year rate control for developments in areas where the District retains permitting jurisdiction for runoff management purposes.

Management Strategy

The District will seek to manage maximum flow rates associated with the critical 100-year event on a subwatershed basis. The three-phase flood profile studies (described in subsection 13) have been used to devise a runoff rate control strategy based on the 84 subwatersheds utilized in the study effort. Implementation strategies for each subwatershed will be determined from the flow rates affecting the District on an intercity or intracity basis.

Runoff management strategies will be complemented by the District's implementation strategies for wetlands, floodplain, and channel management. Other policies of the District will support the overall aims for management of the runoff.

Responsible Governmental Unit

The District shall regulate runoff rates from developing areas until local water management plans are adopted by municipalities. To support local plan development, the District has performed a quantitative analysis to establish maximum discharge rates based on 100-year flood profiles (see subsection 13). This work was conducted under the District's authority to manage and control flows, maintain the design flow, and provide for the repair of the bed and banks of the major drainageway system. Under this authority, the District may also propose and construct rate control structures, detention basins, and other improvements to required to achieve control of runoff. The major drainageway system is defined as Rice Creek from Howard Lake to the Mississippi River, and Clearwater Creek from Bald Eagle Lake to Peltier Lake. Once established, the maximum discharge rates shall not be exceeded in the local water management plan regardless of the rates achieved as a result of planning by best management efforts.

Local management plans shall include a quantitative analysis for the undeveloped, existing, and year 2000 runoff conditions. Wherever the existing or year 2000 alternatives exceed the undeveloped analysis, the local plan shall seek reasonable opportunities to meet at least the existing rate of runoff by incorporating regional (or on-site) detention facilities in a best management effort to accomplish the overall goals of the District. Such a best management effort would provide the basis for approval of the local plan. It is anticipated and understood that instances will occur whereby it is not practical or feasible for a local water management plan to meet the undeveloped condition flows.

Once the local plan is adopted, the municipality will administer the program and the District involvement will be limited to audits of municipal records, responding to inquiries, and providing general coordination services with various local units of government.

The District shall exercise its right to resume regulatory authority and administration of the program if it is demonstrated that noncompliance with the approved plan is apparent.

Implementation Strategy

The implementation strategies employed by the District are described below. In general, the District will apply the water quality strategies to all developing and redeveloping areas while additionally seeking to retrofit quality measures where feasible. Water quantity issues will be addressed on a subwatershed basis and in conjunction with local water management plans.

M.S. 103B.3365: Water Retention. During the 1991 legislative session, a law was enacted which requires water retention devices and use of BMPs for all developments which create more than one acre of impervious surface. It required the rate control and treatment of stormwater runoff very similar to what the District had regulated for many years. Thus, passage of the law does not significantly affect the District. Water retention requirements are not applicable to linear projects or to projects and plats approved prior to August 25, 1993.

The District has elected to implement the quantity and quality requirement of this law by policies discussed in this subsection. While it is clear that the water quality requirements of the law are met, water quantity ponding requirements will be met by the District's subwatershed-based rate control policies. The District's use of several computerized models to develop the rate control policy provides a best available technology for addressing rate control on the subwatershed versus an individual site basis.

Water Quantity. Development of a local water management plan for each municipality in the District will be required. The plan must demonstrate that for a 100-year return frequency event, the rate of stormwater runoff leaving the municipality will not exceed the rate the runoff leaves the municipality in its existing condition (at a minimum). Consideration should also be given to reducing runoff rates to below the existing rate and to detain more frequent events.

At a minimum, the plan must include the following information:

- Subwatershed delineations
- Existing and proposed land uses

- Tabulation of normal, 1-year, and 100-year water elevations, and corresponding discharge rates, for all retention areas

- Determination of storage volume and detention boundaries

- Measures to be employed to regulate floodplain, shoreland, and wetland areas

- Support of hydrologic calculations

- Provisions for easement acquisitions stipulated in Objective A, Policy 1A, and outlined in the appendix

Municipalities will be encouraged to use information generated by the District to assist in the preparation of the local water management plans.

The original 509 Plan for the District concluded that subwatersheds 9, 13c, 14b, 15a, and 15b required additional rate control measures to be undertaken. Runoff rates generated during completion of the three-phase District flood profile study were used to expand this original management strategy to the 84 subwatersheds used in the study. Rate control requirements were considered for their impact to the District, to adjoining cities, or to known drainage problems within a city. The District is primarily concerned about flood control on a large scale, however, management of flows across city boundaries requires management as well. Intracity drainage is a minor District concern and generally has not been addressed in these policies except for known flooding problems. Table 5-3 outlines the various subwatersheds and the degree to which the watershed will manage peak flow rates.

TABLE 5-2

SUBWATERSHED RATE CONTROL POLICIES

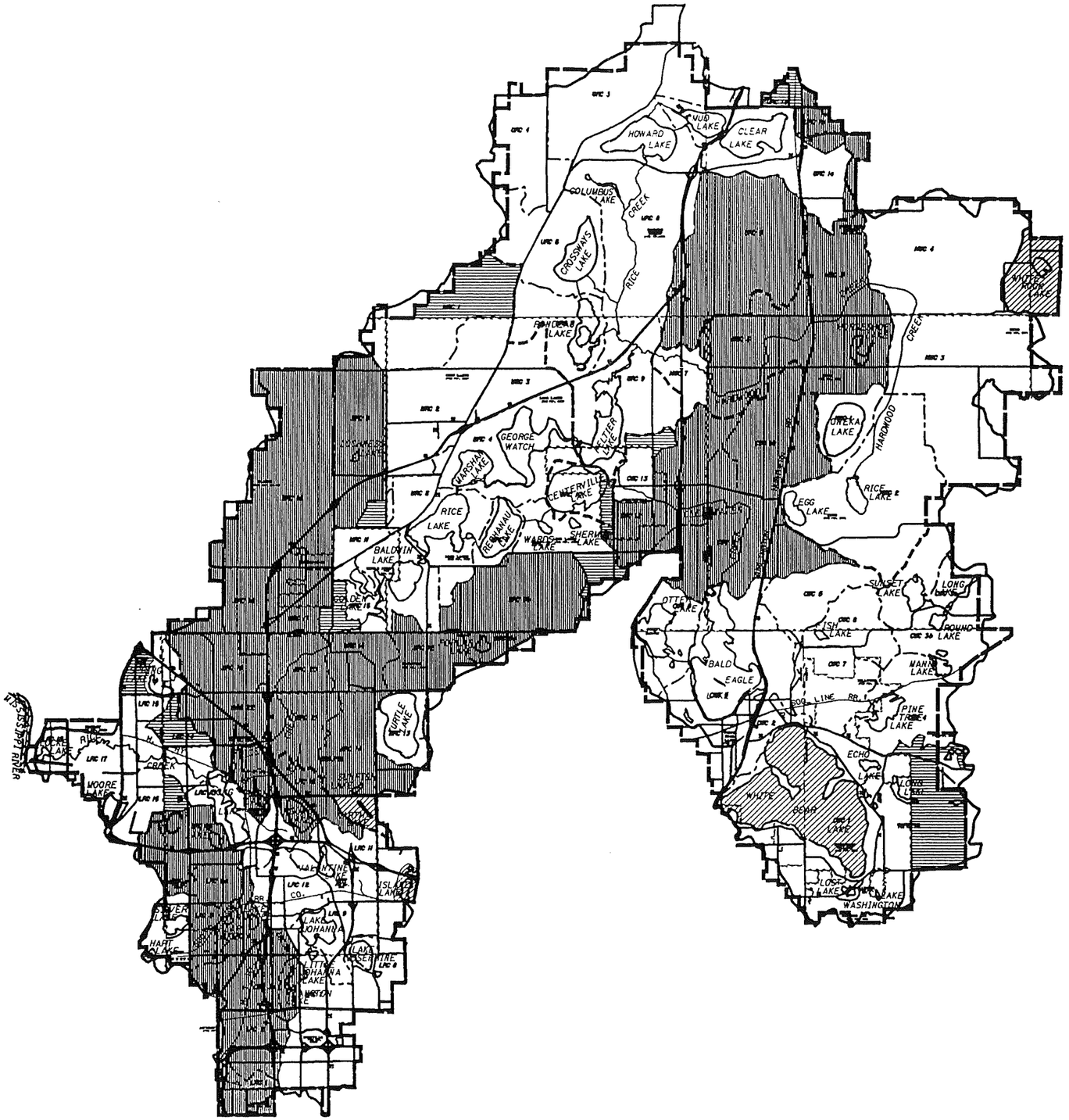
Subwatershed 1-23	Subwatershed 1-80	Management Concern		Peak Flow (cfs)
1	URC 1A	*	(Forest Lake)	25
1	URC 1B	*		85
1	URC 1C			50
1	URC 2			27
1	URC 3			160
3	URC 4			210
2	URC 5	*		240
3	URC 6			35
3	URC 7			50
3	URC 8			50
12a	URC 9			390
12a	URC 10			--
(9)	HWC 1			1,860
4	HWC 2A			6
4	HWC 2B			140
4	HWC 3			1,100
5	HWC 4			800
6	HWC 5	*		840
6	HWC 6	*		990
6	HWC 7			1,120
7	CWC 1	*	(Grant Twp)	25
8	CWC 2			37
(7)	CWC 3A			10
(7)	CWC 3B			7
(7)	CWC 3C			22
(7)	CWC 4			80
8	CWC 5			80
8	CWC 6			110
8	CWC 7			100
8	CWC 8			--
8	CWC 9			160
9	CWC 10	*		190
9	CWC 11	*		580
9	CWC 12A	*		590
9	CWC 12B	*		810
9	CWC 13A			670
9	CWC 13B	*	(Lino Lakes)	690
10	MRC 1	*	(Columbus Twp)	170
10	MRC 2			370
12b	MRC 3			150
12b	MRC 4			1,560
12b	MRC 5A	*		16
12b	MRC 5B	*		520

TABLE 5-2

SUBWATERSHED RATE CONTROL POLICIES
(Continued)

Subwatershed 1-23	Subwatershed 1-80	Management Concern		Peak Flow (cfs)
12b	MRC 6			120
12b	MRC 7			--
12b	MRC 8			1,340
11	MRC 9			70
11	MRC 10			160
11	MRC 11	*	(Blaine)	290
126	MRC12	*		130
13a	MRC13			7
13b	MRC14	*	(excluding Karth Lake)	36
12b	MRC15	*	(Blaine)	1,300
13c	MRC16	*		1,330
13c	MRC17	*		110
13c	MRC18	*		110
13c	MRC19	*		160
13c	MRC20	*		1,390
13c	MRC21	*		1,390
13c	MRC22	*		1,390
15a	LRC 1	*		6.7
15a	LRC2	*		130
15a	LRC3A	*		6
15a	LRC3B	*		26
15a	LRC3C	*		50
15a	LRC4	*		310
15b	LRC5A			23
15b	LRC5B	*	(Excluding Silver Lake)	230
15b	LRC6A	*		510
15b	LRC6B	*		650
14b	LRC7			470
14a	LRC8			60
14b	LRC9			410
14c	LRC10	*		40
14d	LRC11A			0
14d	LRC11B			130
14e	LRC12			340
16	LRC13			1,930
16	LRC14	*		1,990
16	LRC15A			3
16	LRC15B	*		2,050
16	LRC16	*	(New Brighton)	40
16	LRC17			2,300
16	LRC 18			2,360

Note: Watersheds (1-23) noted in parentheses indicate apparent mapping errors.



0 ½ 1 2 miles
0 2000 5000 10,000 feet

LEGEND

- *FULL RATE CONTROL*
- *FRACTION OF SUBWATERSHED NEEDS RATE CONTROL (CITY BORDER)*
- *LANDLOCKED*

MONTGOMERY WATSON
Wayzata, Minnesota

RICE CREEK WATERSHED DISTRICT
FLOOD MANAGEMENT STUDY
1993 PHASE III STUDY

Figure
5-1

Until the local water management plan is approved for a given municipality, a separate permit from the Rice Creek Watershed District will be required for all residential land developments exceeding 5 acres and all industrial, or commercial developments exceeding 2.5 acres. If the local water management plan is not yet prepared or approved, permits will also be required by the Rice Creek Watershed District for all land development activities regardless of size if any of the following conditions exist or are proposed:

- Alteration of any wetlands.

- Development is in or adjacent to a delineated flood plain.

- Development is within 1,000 feet of a public water or protected wetlands and tributary to it.

- Development is within 300 feet of Rice Creek, a major drainage tributary of the District, or an officially established County or Judicial Ditch.

For further information on permitting, refer to the permit information brochure in the appendix.

Water Quality. The Local Management Plan for each municipality shall provide for the treatment of stormwater runoff. This treatment has been broken down into three parts:

1. SEDIMENTATION: the removal of sediment from stormwater runoff shall be accomplished by regional (or on-site) detention facilities with permanent ("dead") storage volumes meeting the following criteria:

    a. The permanent pool volume should be at least equal to the to runoff volume from a 2.5-inch storm over the developed tributary area.

    b. An average depth (volume/area) of at least 4 feet should be targeted with maximum depth less than 10 feet. Minimum-maximum depths as low as 2 feet are permissible where safety concerns are prevalent. The ratio of maximum flow length to maximum pond width should exceed 3 to eliminate short circuiting of flows.

c. Additional design considerations are found in the Appendix. Also, see the design considerations for creating artificial wetlands for wildlife in the Appendix.

2. SKIMMING: the skimming, removal, and suitable disposal of oil and floatable materials from stormwater runoff for all rainfall events up to a 1-year return frequency.

   Skimming shall be considered adequate if a baffle structure extends at least 4 inches below the normal water surface and the velocity of water passing under the baffle does not exceed 0.5 feet per second for the 1-year return frequency design storm.

3. NUTRIENT REMOVAL: the removal of nutrients from stormwater runoff to the maximum practical extent.

   Measures that may be utilized to provide this treatment include, but may not be limited to, the use of constructed wetland treatment systems, the establishment of good housekeeping practices such as street sweeping and leaf removal, the placement of controls on the use of fertilizers, containment of snow storage runoff, and the implementation of sediment and soil erosion control projects. These measures are described in detail in the MPCA publication, *Protecting Water Quality in Urban Areas.*

Sedimentation, skimming, and nutrient removal is to be provided to the maximum practical extent for stormwater runoff prior to discharge to any protected water body or wetland. It is understood that there are occasions when it may be necessary to use a portion of a protected basin to serve as a basin to trap sediment and to provide skimming facilities. Such treatment shall be provided within the appropriate consent procedures of the MDNR.

The District will implement a program addressing bed and bank stabilization. The program will be designed to address erosion problems of District significance that are not attributable to new development or redevelopment. The effort will minimize stream bank erosion and associated sediment loadings. Upon completion of an initial inspection program priorities will be established based on extent and immediacy of the problems and funding availability. Funding of the program is covered in Section 7, Capital Improvements.

Schedule and Estimated Costs

It is anticipated each municipality will have a local Water Management Plan prepared and adopted by January 1, 1995. The estimated costs for runoff management tasks are as follows:

	1991	1992	1993	1994	1995
1. Review of Local Water Management Plans and Amendments	$14,900	$17,500	$20,000	$20,000	$20,000
2. Conduct Annual Audits of Municipality Records and Development to Verify Development in Compliance with the Local Water Management Plan	--	--	--	5,000	15,000
3. Stream Bed and Bank Stabilization Program	30,000	30,000	30,000	30,000	30,000
Total	$44,900	$47,500	$50,000	$55,000	$65,000

2. PUBLIC DITCH MANAGEMENT

Introduction

After the establishment of the Rice Creek Watershed District on January 18, 1972, Anoka, Ramsey, and Washington Counties transferred jurisdiction for all County and Judicial Ditches within the Watershed District's borders. The County and Judicial Ditch network existing within the District is extensive, comprising some 121 miles of drainage ditches. The District is regulated by the provisions of Minnesota Statutes Chapters 103E and 103D for the repair, improvement, and construction of these ditches.

It appears that the original legislative authority to establish ditches was granted for the purposes of flood control and land drainage for agriculture. In the agricultural land use areas of the District, the ditches are relied upon to provide that same function today. However, in the urbanized areas of the District, the ditches are used for the purpose of providing trunk drainage systems for stormwater runoff within the community. Use of the ditches as a trunk drainage system introduces maintenance and administrative issues that are not present for ditches in agricultural areas. In urbanized areas, the ditches no longer provide the original benefits to the assessed property owners. The ditches do, however, provide an important drainage route for use by the individual communities. In some cases, repair or restoration of the ditches is not practical because the ditches have been replaced with conduit systems by the individual communities.

The public ditch system within the Rice Creek Watershed District is an extremely valuable resource and needs to be preserved for the ultimate use as a trunk drainage system among communities.

Management Strategy

The general management strategy of the Rice Creek Watershed District in regard to public ditch management is two-fold. First, the public ditches serving areas that are currently and predominantly used for agricultural purposes, will be maintained and improved in accordance with the provisions of M.S. 103E. Second, in areas that have been, or are in the process of urbanization, the public ditches will be preserved by the District as open channels to serve as the route for the municipalities' trunk drainage system. Preserving the ditches as open channels will avoid high rates of assessment against the original benefited properties

for the installation of conduit systems within the public ditch right-of-way. When conduit systems are needed, equivalent water quality shall be maintained, and these systems shall be constructed and funded under the provisions available to municipalities and, if appropriate, the public ditch shall be abandoned once the corridor is protected under drainage easement.

Responsible Governmental Unit

The responsible governmental unit for the establishment, improvement, and repair of public ditch systems as provided in M.S. 103E, is the Rice Creek Watershed District which has been designated by each county as the "drainage authority."

Implementation Strategy

The Rice Creek Watershed District Water Resources Management Plan hereby incorporates the following principles to assure adequate public ditch management:

1. All currently established public ditches shall be maintained by the District in accordance with the provisions of M.S. 103D and E.

2. The Board of Managers will entertain petitions for the establishment of new ditches and the improvement of existing ditches in accordance with applicable statutes. The Board of Managers encourages cost-sharing agreements with local units of government where District funding may not be available for improvements needed at the local level.

3. The Board of Managers will accept petitions for the abandonment of ditches that no longer serve affected properties or provide a public benefit.

4. Easements will continue to be obtained along the County and Judicial Ditches in conjunction with land development, ditch alteration, and other regulatory activities. Even though a self-monumenting ditch corridor is statutorially provided, explicit easements create greater awareness of the ditch system and define a corridor for future maintenance activities. Easement widths are a minimum of 50 feet from the centerline (total width of 100 ft) of county and judicial ditches and 100 feet from the centerline of Clearwater and Hardwood Creeks.

5. The Board has established a schedule for the regular inspection of all ditches. This schedule is outlined in Table 5-3. Required maintenance work identified in these inspections will generally be conducted the following year. Inspections will seek to determine the as-constructed condition and make repair recommendations. Recommendations will estimate any adverse wetland impacts associated with the repairs contemplated.

6. Construction activity occurring within 300 feet of the centerline of an established public ditch shall not be performed without permit approval from the Board of Managers of the Rice Creek Watershed District. Permit authority will not be relinquished by the District in this management area.

7. Any crossing or conveyance structure placed in a public ditch is the maintenance responsibility of the entity which owns the land or controls the right-of-way on which the crossing lies.

8. The District shall consult with the MN/DNR prior to implementing ditch repair work.

Repairs. The ditches within the District are generally in fair to poor condition due to inadequate maintenance since before control was transferred to the District. Outlet malfunctions, washouts of banks, siltation, growth of trees in the channel and on the banks have occurred in some systems. Debris is found in parts of some channels and unauthorized restrictions or crossings have added to the inadequacies in proper functioning of some drains. The District submitted inspection reports documenting conditions to the BWSR prior to July 1992 as required by state law.

Repairs must not exceed the depth or approximate cross-section of the original ditch. Exceptions to this are instances where it is necessary to reduce side slopes to provide stable banks, and other situations including long-standing changes to the system which will be reviewed individually by the Board.

Since many of the District ditches do not have acceptable record drawings, repair profiles are difficult to document. The District will repair those systems for which a reasonably plausible set of records, survey information, and technical assumptions can be assembled. Such information will be reviewed by the MN/DNR and USACOE.

In instances where the profile is in dispute, additional data from a series of soil borings along relatively undisturbed ditch reaches can provide constructed profile information. Because of costs and the need for multi-agency review of the plan and results, this type of additional work effort will not generally be undertaken without a petition from the benefited property owners.

Funding of Repairs. The present condition of ditches in the District is such that the cost of repair would likely exceed the original cost to construct. In such instances, a redetermination of benefits is required by statute prior to assessing benefited properties. In urbanized (or urbanizing) areas, the cost to complete the administrative activities for such an effort is excessive and not in keeping with the District's interest to minimize expenditures for water resource management.

Funding of ditch repairs will therefore be pursued on an *ad valorem* basis. The Board believes this funding method is justified due to the much lower costs for the project to the District. The *ad valorem* tax will be levied District-wide following a public hearing to order a project.

The general procedure to be followed is to complete ditch inspection, recommend repair areas, obtain permits, hold public hearing on repair, and conduct repairs. It is the intent of the District to pursue the establishment of permanent grass filter strips along the ditch to provide further District-wide benefits. These strips will extend to the crown of the leveled spoil bank or 16.5 feet (whichever is greater) as described in M.S. 103E.

Funding of petitioned repairs will generally be conducted in accordance with the provisions of M.S. 103E.

Costs and Schedule

All maintenance costs required to implement the management plan for the purposes of public ditch management shall be funded as provided in M.S. 103B.241, with the exception of the annual $15,000 District-wide levy for the Water Maintenance and Repair Fund. The money shall be used at the discretion of the Board for the purposes of ditch maintenance or the payment of initial costs of the implementation of the public ditch management portion of the Watershed Management Plan.

Implementation of the management strategies for public ditch management shall be part of an on-going District process.

Maintenance of public ditches is estimated to cost an *average* of $35,000 per mile. It is estimated that ditches will require maintenance repair once every 20 years. Thus, it will be necessary for the District to perform maintenance on 6 miles of ditches annually to maintain this schedule. Repairs are not ordered at this time and will be considered on an individual ditch system basis following inspection.

	1991	1992	1993	1994	1995
Ditch Inspection	$12,000	$ 7,150	$38,000	$ 43,000	$ 36,000
Ditch Maintenance (Repair)	15,000	15,000	15,000	210,000	210,000
Total	$27,000	$22,150	$53,000	$253,000	$246,000

TABLE 5-3

PROPOSED DITCH INSPECTION SCHEDULE

Ditch	Length of Open Ditch (miles)		Estimated Cost
Year 1			
Ramsey County Ditch 11	2.1		$ 3,000
Ramsey-Washington Judicial Ditch 1	2.4		4,000
Anoka-Washington Judicial Ditch 4	4.8	$1322/mi	6,000
Anoka County Ditch 53-62	18.8		14,000
Anoka County Ditch 32-22-10	10.7		12,000
		Subtotal	**$39,000**
Year 2			
Anoka-Ramsey Judicial Ditch 1	7.2		$ 9,000
Anoka County Ditch 25	4.5		7,000
Anoka County Ditch 31	4.2	$1851/mile	7,000
Anoka County Ditch 46	7.6		8,000
Anoka-Washington Judicial Ditch 2	13.0		11,000
		Subtotal	**$42,000**
Year 3			
Anoka-Washington Judicial Ditch 3	11.3		$14,000
Anoka County Ditch 47	1.5		
Ramsey County Ditch 1	1.1	$1519/mi	4,000
Ramsey County Ditches 2, 3, and 5	4.7		8,000
Ramsey County Ditch 4	1.7		4,000
Ramsey County Ditch 8	3.4		6,000
		Subtotal	**$36,000**

Note: The following ditch systems were previously reviewed and found to consist of underground drainage tile and therefore are not included in the above proposed ditch inspection schedule:

Washington Judicial Ditch 5	Anoka County Ditch 55
Washington Judicial Ditch 6	Anoka County Ditch 72
Washington Judicial Ditch 7	Anoka County Ditch 15

3. POTABLE WATER SUPPLY

Introduction

The Twin Cities metropolitan area is extremely fortunate to have available abundant quantities of surface water. However, supplies that meet potable water quality standards are much less abundant. The protection of these waters is a primary concern to the District.

There are two potable surface water supplies for the Twin Cities metropolitan area that have the greatest potential of being affected by activities within the Rice Creek Watershed District. They are the St. Paul Water Utility lake reservoir system located upstream of the Peltier Dam and the Mississippi River water supply which is utilized by both Minneapolis and St. Paul. Water entering the St. Paul Water Utility lake reservoir system upstream of the Peltier Dam originates entirely from surface water runoff generated within the Rice Creek Watershed District. The Rice Creek Watershed District will continue to coordinate with the St. Paul Water Utility to assure that an adequate water supply will be provided. The Mississippi River water supplies drawn by the City of Minneapolis could also be affected by activities within the Rice Creek Watershed District since water from Rice Creek enters the Mississippi River upstream of the Minneapolis water intakes.

Management Strategy

The District intends to be kept advised of all site development activities which could affect, or have already affected, potable surface water supplies. It will defer, however, to the Minnesota Department of Health, the Minnesota Pollution Control Agency, the Department of Natural Resources, or other appropriate agencies, the responsibility to assure that potable water supplies meet all applicable local, State, or Federal Drinking Water Standards.

Responsible Governmental Unit

The Rice Creek Watershed District shall reserve the right to review and comment on all proposed plans for generation, storage, and transportation of hazardous materials, and on any activities within the District that could affect the quality or quantity of potable water supplies. The District shall, however, defer to the Minnesota Pollution Control Agency, Minnesota Department of Health, St. Paul Water Utility, Department of Natural Resources,

or other appropriate agencies the responsibility for reviewing and permitting various activities and uses that could affect the potable surface water supply within the District.

Implementation Strategy

The Rice Creek Watershed District shall be kept advised through the local units of government of the location of all sites generating, storing, and transporting hazardous material. However, permits to handle and store these materials shall be administered by the Minnesota Pollution Control Agency through their Solid and Hazardous Waste Division. The District shall also be kept advised of any water quality problems that at present, or could in the future, affect potable surface water supplies. Direct responsibility to insure that potable surface water supplies meet drinking water standards is the responsibility of the Minnesota Department of Health or other appropriate governmental agencies.

At the present time, the District is notified of any applications for permits from the Minnesota Department of Natural Resources for Water Appropriation and of applications for National Pollutant Discharge Elimination Systems (NPDES) within Anoka, Ramsey, and Washington Counties. NPDES permits are issued by the Minnesota Pollution Control Agency. The District will take the necessary steps to insure the notices of the above permit applications are reviewed.

The District will seek to promote water conservation by urging municipalities to adopt permanent rules similar to those invoked during times of drought. The majority of cities in the District rely upon groundwater for water supply and therefore have a need to conserve water to lessen depletion of the aquifers. Historically, sprinkling bans/limits have been placed to assure adequate (acute) supplies of water when reservoir/water tower storage is low and peaking demands cannot be met.

The District will continue to permit the appropriation of water from public water basins or wetlands of less than 500 acres and protected watercourses with drainage areas of less than 50 square miles located in Hennepin or Ramsey Counties. This permit program is mandated by the State to regulate "nonessential" appropriation of water from lakes for withdrawals below minimum DNR permitting requirements.

Costs and Schedule

	1991	1992	1993	1994	1995
Review NPDES Notices	500	500	500	500	500
Review Appropriations Permits	1,500	1,500	1,500	1,500	1,500
Permit Review for Hazardous Material Facilities	900	400	400	400	400
Water Conservation	--	--	600	600	600
Total	$2,900	$2,400	$3,000	$3,000	$3,000

4. WATER QUALITY MANAGEMENT

Introduction

Lakes and streams within the Rice Creek Watershed District play an important role in providing potable water and water-based recreational opportunities for residents in the Twin Cities metropolitan area. Lakes and streams also provide habitat for fish and wildlife, and provide a low-cost conveyance mechanism for stormwater runoff.

The role of systematic monitoring of surface waters is invaluable to effective water quality management. Monitoring programs, when properly executed, can provide information on water quality trends as well as the sources and characteristics of water quality degradation.

Water quality improvement plans should not be instigated without first developing an appropriate monitoring plan with which to evaluate the effectiveness of the project and recommend alterations as the water quality evolves.

Management Strategy

The District will annually conduct a water quality monitoring program. The program has been broken into three parts: 1) a revolving lake and stream monitoring program that monitors lakes and their major tributaries within the District; 2) a special projects monitoring program to allow a detailed analysis of water quality in areas in which problems are observed or thought to exist.

Responsible Governmental Unit

The Rice Creek Watershed District will have direct responsibility in conducting the monitoring program outlined within this management plan. The District will coordinate this monitoring with other governmental agencies (Ramsey County, Metropolitan Council, St. Paul Water Utility) to assure coordination of effort.

Implementation Strategy

The District's long-term water quality monitoring program includes lakes, streams, and storm sewers. The District also has a program for monitoring in selected areas of the District in which quality problems are suspected and need evaluation. These areas will be identified by the managers on a year-to-year basis.

In addition to the District's monitoring program, the District encourages monitoring by citizens through the Metropolitan Council's Volunteer Monitoring Program. The District also has a dissolved oxygen meter available for use by volunteers.

The District's water quality monitoring strategy has become more focused since 1992. The District has been conducting water quality monitoring since 1974. From 1974 through 1991, monitoring was conducted District-wide with generally one to three samples collected per sampling location per year. Comprehensive diagnostic/feasibility studies have also been completed for the Long Lake Chain of Lakes, Centerville and Peltier Lakes, White Bear Lake, and Bald Eagle Lake. These studies essentially cover the entire District. The combination of the historical routine monitoring and the diagnostic/feasibility studies provides the District with an excellent baseline data set and water quality improvement strategies. The more focused monitoring started in 1992 and provides data for comparison with the information to diagnose and develop water quality goals for District water bodies that have not had detailed diagnostic/feasibility studies. The District is actively pursuing establishment of the Upper Watershed Improvement Project based on the Centerville/Peltier and White Bear/Bold Eagle studies and hopes to secure additional state funding to aid financing.

LAKE MONITORING

Monitoring Program

A total of 20 lakes will be sampled over a five-year rotating cycle with five lakes sampled per year during the first four years. The fifth year of the cycle focuses on monitoring Rice Creek and tributaries to the lakes monitored by Ramsey County. The five lakes sampled per year will be within regions of the District. The schedule for lake sampling is presented in Table 5-4. Ramsey County monitors lakes listed in Table 5-5, while the St. Paul Water Utility monitors Centerville Lake. The District's program does not duplicate these efforts. The

rotating schedule allows eight sampling events to be completed on each lake between May and September.

TABLE 5-4

LAKE MONITORING SCHEDULE

1992	1993	1994	1995
Clear Lake	Peltier	Spring	Pine Tree
Howard	Reshanau	Golden	Sunset
Rondeau	Rice (Anoka County)	Pike	Oneka
Crossways	Baldwin	Jones	Round (Arden Hills)
Mud	Forsham	Karth	Rice (Hugo)

TABLE 5-5

LAKES MONITORED BY RAMSEY COUNTY

White Bear	Otter
Bald Eagle	Josephine
Turtle	Silver
Johanna	Island
Long	

Data Collection:

At each sampling, a 2 meter composite sample will be collected at the deepest region of the lake and one other representative site. The two samples will then be composited. Profiles of dissolved oxygen, conductivity, and temperature with reference to depth will be recorded at the deepest site, as well as Secchi disk transparency at both sites.

Lake samples will be analyzed for total phosphorus and chlorophyll-a. After the first cycle of intensive monitoring, recommendations may be made to alter the monitoring strategies for individual lakes. For example, it may be more appropriate to inventory/map aquatic vegetation in shallow water bodies than analyze chemical parameters.

STREAM MONITORING

Implementation Strategy

Stream sampling will also be conducted on a rotating basis with the fifth year of the cycle focusing entirely on streams and tributaries. Additionally, stream sampling will be conducted with higher frequency than lake monitoring. Stream monitoring data should provide more direct information on the sources of water quality degradation than lake monitoring data. A total of 23 sample sites have been identified corresponding to 23 drainage subbasins. Additional sample sites will be added as necessary to monitor problem sites and inflows to the 15 lakes scheduled for monitoring during that particular year.

A total of 8 to 12 sites will be monitored each year. Each sample site will be sampled 12 times between March and September.

Data Collection

At each collection, a grab sample will be collected at mid-stream and mid-depth. Each sample will be analyzed for total phosphorus, turbidity, and total suspended solids.

On-site measurements for dissolved oxygen, temperature, and stage. Discharge will be measured at sites where existing stage-discharge curves are incomplete.

Costs

Costs of the annual water quality monitoring program are presented below. Individual program elements for which costs are provided include: integrated stream and lake monitoring, support of volunteer monitoring of 5-6 lakes per year through the Metropolitan Council Citizen Monitoring Program, secchi disc monitoring by Anoka SWCD, Silver Lake Improvement Study, and the Upper Watershed Improvement Study.

	1991	1992	1993	1994	1995
District-wide Lake Monitoring	$7,500	--	--	--	--
District-wide Stream Monitoring	30,000	--	--	--	--
Additional Monitoring as Identified by Board	11,100	6,800	--	--	--
Integrated Stream and Lake Monitoring	--	$32,200	$34,300	$37,300	$40,300
Metropolitan Council Citizen Monitoring Program	--	--	5,300	6,000	6,000
Anoka SWCD Secchi Disk Program	2,500	2,500	2,500	2,500	2,500
Silver Lake Improvement Study	2,500	2,500	3,500	--	--
Upper Watershed Improvement Project Elements (sediment sealing, FeCl addition)	--	--		59,500	163,750
Total	$41,100	$41,500	$46,100	$109,300	$215,550

5. INDIVIDUAL SEWAGE TREATMENT SYSTEMS

Introduction

Standards for Individual Sewage Treatment Systems (ISTS) are outlined in Minnesota Rules Chapter 7080. Both sewered and unsewered areas exist in the Rice Creek Watershed District.

Management Strategy

No new ISTS will be allowed in sewered areas including replacement of existing ISTS unless a severe hardship is demonstrated and sewer connections are not practical. In unsewered areas, ISTS will be allowed under Minnesota Rules Chapter 7080.

Responsible Governmental Unit

The Minnesota Pollution Control Agency is responsible for providing minimum standards and criteria for the design, location, installation, use, and maintenance of ISTS. However, the administration and enforcement of these standards is to be conducted by the local units of government, i.e., townships, cities, or counties. Local units of government will be responsible for mapping ISTS locations and assuring that inspections and maintenance of ISTS are carried out.

Implementation Strategy

Each local unit of government within the District shall be responsible for the administration and enforcement of Minnesota Rules Chapter 7080, Individual Sewage Treatment System Standards.

At the request of the local unit of government, the District may provide technical assistance in the implementation of ISTS standards. Through the water quality monitoring program, the District will advise the local units of government on water quality problems that may be associated with the improper design, location, installation, use, and maintenance of ISTS. Enforcement or compliance with the ISTS standards shall be the responsibility of the local unit of government. Local units of government will be responsible for the assurance that inspection and maintenance of ISTS are carried out.

Costs

No capital improvement or maintenance costs by the District are anticipated in the implementation of this management strategy.

Schedule

It is anticipated that the local plans will comply with this requirement and be adopted by January 1, 1993.

6. WETLAND MANAGEMENT

Introduction

Wetlands are an extremely valuable resource in the Rice Creek Watershed District. Wetlands serve as habitat for fish and wildlife, provide for the storage of stormwater runoff, and have the ability to remove nutrients, sediment, and other pollutants from stormwater runoff. In addition, some wetlands function as groundwater recharge areas, and all wetlands contribute to biological diversity by supporting many unique plant and animal species.

Management Strategy

The Rice Creek Watershed District will implement the Wetland Conservation Act of 1991 (WCA), as amended and the accompanying rules of the Minnesota Board of Water and Soil Resources (M 8420) as amended. The purpose of this act is to:

1. Achieve no net loss in the quantity, quality, and biological diversity of Minnesota's existing wetlands;

2. Increase the quantity, quality, and biological diversity of Minnesota's wetlands by restoring or enhancing diminished or drained wetlands;

3. Avoid direct or indirect impacts from activities that destroy or diminish the quantity, quality, and biological diversity of wetlands; and

4. Replace wetland values where avoidance of activity is not feasible and prudent.

In addition to the protection afforded by the WCA, the District will require that wetland alterations in the form of excavation, water level changes or other activity which may change the character of a wetland are in conformance with the general intent of WCA as listed above.

Responsible Governmental Unit

The Rice Creek Watershed District shall serve as the "local governmental unit" for administration of the WCA, and will also require permits for other wetland alterations as described below.

Municipalities that have effectively implemented an approved local water management plan which incorporates the wetland management features of this section may, at their discretion, assume responsibility for administration of WCA and other wetland alteration permitting. This assumption of authority would be conditioned on RCWD continuing to serve on the WCA Technical Evaluation Panel for any municipality assuming these responsibilities.

Implementation Strategy

The Rice Creek Watershed District will administer the WCA in accordance with MN Rule Chapter 8420, as amended, which is hereby incorporated by reference into this Plan.

The Rice Creek Watershed District will require permits for the alteration of any Type 1-8 wetland as defined in the U.S. Department of the Interior Fish and Wildlife Circular No. 39 and inventoried in the National Wetland Inventory (NWI). Areas shown on the NWI map and state protected waters inventory (PWI) map are presumed to indicate the presence of wetland. Wetlands not shown on these maps also exist in the Watershed District, and are hereby protected under all of the terms and provisions of this policy. The NWI and PWI maps show only the general location of wetlands. An on-site determination will usually be necessary to establish the jurisdictional boundary of the wetland.

Wetland Banking. The District will participate in the state wetland bank established by the Board of Soil and Water Resources on a limited basis:

- Use of the bank for replacement of drained or filled wetlands will only be considered when all other alternatives that would avoid/minimize impacts or utilize site-specific replacement have been exhausted. Because of the District's strong emphasis on avoidance, it is anticipated that banking will seldom be used.

- Only restored (not created) wetlands will be accepted for bank credits.

- The District intends to identify high-priority areas for wetland restoration and will limit mitigation banking to those areas.

Alterations Not Addressed in WCA. The District will also administer a permit program encompassing wetland alterations due to excavation, water level changes, or other activities which alter the character of a wetland. In administering this program and evaluating proposed wetland alterations, the District will apply the same general purposes and procedures that apply under WCA. In addition, the following specific criteria will be used to evaluate these types of wetland alterations:

- Creation of open water areas shall be done in conformance with the "General Design Consideration for Wildlife Pond Construction and Wetland Alterations," included in the appendix of the Plan.

- Wetlands may be used for stormwater storage and treatment only if it can be shown that the character of the wetland will not be adversely affected by substantially increased sediment load, tributary area, or water level fluctuations.

Wetland Delineations. Questions concerning the value, location, size, or type of wetland will be submitted to and determined by a technical evaluation panel after an on-site inspection. The requested technical evaluation panel will be composed of staff members from the BWSR, county SWCD, and a representative of the District at a minimum. The "Federal Manual for Identifying and Delineating Jurisdictional Wetlands" (January 1989) shall be used as the primary technical guide. The applicant shall have the burden of establishing exact locations of the boundaries and type of wetland as determined by someone knowledgeable and trained in applying methodologies of the Federal Manual.

All wetland delineations must be supported by the following documentation:

1. Identification of the method used per the 1989 Manual;

2. Identification of presence or absence of normal circumstances or problem conditions;

3. Basin classification using the Cowardian method and Circular 39;

4. Wetland data sheets, or a report, for each sample site, referenced to the location shown on the delineation map. Each data sheet/report will provide the reasoning for satisfying, or not satisfying each of the technical criteria and why the area is or is not a wetland.

5. A delineation map showing the size, locations, configuration and boundaries of wetlands in relation to identifiable physical characteristics, such as roads, fence lines, waterways, or other identifiable features;

6. The location of all sample sites and stakes/flags must be accurately shown on the delineation map. Delineations submitted by applicants will normally be field-verified by District staff. States should be left in the field to aid review of the site.

7. Winter delineations conducted under frozen or snow-covered conditions will generally not be accepted.

Wetland alteration proposals may also be subject to review by the DNR and U.S. Army Corps of Engineers. Review of alterations to DNR protected waters and wetlands may be waived by the District in situations when a separate permit is required by the DNR.

Easements will be required over wetland areas as outlined in the Appendix of this plan. Such easements shall be conveyed to the municipality in which the project is located.

Each local governmental unit shall amend its comprehensive plan and official zoning map to show all DNR-designated protected waters and wetlands. Each local unit shall amend its zoning ordinance to state that any land-disturbing activities, including drainage, affecting a DNR protected water or wetland are subject to DNR regulation and may require the proposer to secure a state DNR permit. In addition, each local water plan shall contain a copy of the U.S>Fish and Wildlife Service NWI map covering the area of the local unit. The plan shall include statements that the local unit will inform persons proposing any filling or development in areas identified as wetlands on the NWI map that a Corps of Engineers permit may also be needed, and will notify the regulatory branch of the Corps of Engineers

St. Paul District of any development proposals affecting these wetland areas. Each local unit of government shall maintain a copy of the NWI map at their official meeting place.

Wetland alterations shall satisfy the additional constraints of the flood plain management policies of the District. Spoils removed from a wetland area shall be placed in an upland diked area above the 100-year flood elevation for dewatering and subsequently graded into the local topography or hauled from the site. Refer to Section 8, Flood Plain Management.

Costs and Schedule

Costs to maintain a permitting program for the wetland alteration is outlined below for 1991 through 1995.

	1991	1992	1993	1994	1995
All Tasks	$10,000	$18,000	$16,000	$25,000	$25,000

7. SHORELAND MANAGEMENT

Introduction

There are numerous lakes within the Rice Creek Watershed District. Fourteen lakes are greater than 300 acres, while 28 lakes are greater than 100 acres. Over 19 square miles, or approximately 10 percent of the Watershed District, is considered lake area. It is imperative that the shoreland of lakes be developed in a manner consistent with MN/DNR protection standards in order to maintain or improve the quality of the lakes within the District.

Shoreland regulations have been established to reduce the effects of overcrowding and poorly planned shoreland development, prevent pollution and contamination of public surface and groundwaters, provide ample space for sanitary facilities, minimize flood damage, maintain property values, maintain natural characteristics of shorelands and adjacent water areas, and guide development compatible with the natural characteristics of shorelands.

Management Strategy

The strategy of the Rice Creek Watershed District is to maintain regulatory controls over shoreland management until municipalities adopt and implement local shoreland ordinances. The Watershed District encourages local municipalities to adopt and implement shoreland protection ordinances.

Responsible Governmental Unit

Arden Hills, Lino Lakes, Shoreview, White Bear Lake, and the townships (unincorporated areas) in Anoka and Washington Counties have state-approved shoreland ordinances. All other communities do not have rules which meet all the state standards. The setback requirements portion of the standards are enforced by the District as outlined in the next section.

Implementation Strategy

1. The Rice Creek Watershed District currently enforces structure and septic field setback requirements for Centerville, Columbia Heights, Fridley, New Brighton, St. Anthony,

and Spring Lake Park. All other communities have setback requirements which meet or exceed DNR standards.

2. The policy of the District is to enforce only those guidelines for the management of shoreland areas that affect water quality. Those guidelines that concern themselves with zoning and aesthetics have not been considered by the District. Accordingly, setbacks and sediment-erosion control only are reviewed. The following setback criteria and definitions are used in consideration of applications for approval of shoreland improvements.

Structure Setback Criteria

The placement of structures on lots is controlled in accordance with the class of public waters as follows:

A. For natural environment waters, at least 200 feet from the OHW for lots not served by public sewer and at least 150 feet from the OHW for lots served by public sewer.

B. For recreational development waters, at least 100 feet from the OHW for lots not served by public sewer and at least 75 feet from the OHW for lots served by public sewer.

C. For general development waters, at least 75 feet from the OHW for lots not served by public sewer and at least 50 feet from the OHW for lots served by public sewer.

Variances to the setback requirements may be granted under the following circumstances:

A. Boathouses may be located landward of the OHW as a conditional use provided they are not used for habitation and they do not contain sanitary facilities.

B. Where development exists on both sides of a proposed building site, structural setbacks may be altered to take setbacks of existing structures into account.

C. Commercial, industrial, or permitted open space uses requiring locations on public waters may be allowed as conditional uses closer to such waters than the setback specified.

D. In areas of unusual topography or substantial elevation above the lake level, setbacks may be varied to allow a riparian owner reasonable use and enjoyment of his property.

Sanitary Facilities Setback Criteria

Septic tank and soil absorption systems shall be set back from the OHW in accordance with the class of public waters as follows:

A. For natural environment waters, at least 150 feet

B. For recreational development waters, at least 75 feet

C. For general development waters, at least 50 feet

Soil absorption systems shall not be allowed in the following areas:

A. Low swampy areas or areas subject to recurrent flooding

B. Where the highest known groundwater table, bedrock, or impervious soil conditions are within four feet of the bottom of the system

C. Where ground slope creates a danger of seepage of the effluent on to the surface of the ground

Definitions

The following definitions were taken from the Minnesota Rules and should be used for clarification of the issues and consistent implementation of setback policy.

Natural environment lake and streams. Managed to preserve and enhance high quality waters by protecting them from pollution, to protect shorelands of waters which are unsuitable for development; to maintain a low density of development; and to maintain high standards of quality for permitted development.

Recreational development lakes. Objectives are to provide management policies reasonably consistent with existing development and use; to provide for the beneficial use of public water by the general public, as well as the riparian owners; to provide a balance between the lake resources and lake use; to provide for a multiplicity of lake uses; and to protect areas unsuitable for residential and commercial uses from development.

General development lakes and streams. Objectives are to provide minimum regulation of areas presently developed as high density, multiple use areas; and to provide guidance for future growth of commercial and industrial establishments which require locations on public waters.

Ordinary High Water Mark (OHW). A mark delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape. The ordinary high water mark is commonly that point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial.

Setback. The minimum horizontal distance between a structure or sanitary facility and the ordinary high water mark or between a structure or sanitary facility and a road, highway, or property line.

Variance. Any modification or variation of official controls where it is determined that, because of hardships, strict enforcement of official controls is impractical. They shall not circumvent the general purposes and intent of the official controls.

Hardship. Hardship means the property in questions cannot be put to a reasonable use under the conditions allowed by the official controls; the plight of the landowner is due to circumstances unique to his property, not created by the landowner; and the variance, if granted, will not alter the essential character of the locality. Economic considerations alone shall not constitute a hardship if a reasonable use for the property exists under the terms of the official controls.

Boathouse. A structure used solely for the storage of a boat or boating equipment.

Conditional Use. A use of shoreland which is permitted within a zoning district only when allowed by a municipality after a public hearing, that certain conditions are met which eliminate or minimize the incompatibility with other permitted uses of the District.

3. The management plan of the Rice Creek Watershed District is to encourage local units of government to adopt and implement ordinances for the protection of shoreland. The Metropolitan Council also requires municipalities to adopt DNR standards as of January 1, 1993. These shoreland ordinances should control development within 1,000 feet of lakes and 300 feet of streams. The ordinances are required by Minnesota Regulations to address the following:

   - Classification of public waters.
   - Provisions for the designation of land use zoning districts compatible with shoreland management classifications.
   - Minimum dimensions for lot size and length of water frontage of lots suitable for building sites.
   - Requirements for the placement of structures in relationship to shorelines.
   - Requirements indicating the amount of impervious surfaces allowed in each lot.
   - Requirements governing the type and placement of individual sewage treatment systems where appropriate.
   - Requirements for the alteration of natural shorelines.
   - Requirements governing placement of roads and parking areas within shorelands.
   - Regulations governing the subdivision of shoreland in municipalities.
   - Provisions for the enforcement administration of municipal shoreland ordinances.
   - Variance procedures.

In conjunction with local units of government and the Department of Natural Resources, the Rice Creek Watershed District will work to assure that proper shoreland management regulations are adopted and implemented in compliance with Minnesota Regulations (MN 6120).

The DNR has received $1.7 million to distribute in order to aid cities and counties in implementing the updated Statewide Standards for Management of Shoreland Areas which went into effect July 3, 1989.

The grant program is designed to aid approximately 200 priority communities (based on natural resource base and need) to adopt the standards and enforce standards upon adoption. The priority cities will receive a notification letter outlining the program in 1990. These letters will include a "2-year automatic approval" of a matching grant not to exceed $5,000 for a city or $8,500 for a county. The notification letter will outline eligible activities for cost sharing such as consultants' fees, public hearing costs, ordinance drafting, and field work.

The following communities have been identified as priority cities and will receive notification in 1990 and 1991:

1990		1991	
Lino Lakes	Birchwood Village	Blaine	Arden Hills
Ham Lake	Dellwood	Centerville	Mounds View
Shoreview	Forest Lake	Circle Pines	New Brighton
White Bear Lake	Hugo	Columbia Heights	Roseville
White Bear Township	Mahtomedi	Fridley	St. Anthony
		Spring Lake Park	Willernie

Costs

The work effort associated with the implementation of this strategy is outlined below:

	1991	1992	1993	1994	1995
Ordinance Review	$1,000	$1,000	$1,000	$1,000	$1,000

Schedule

The Rice Creek Watershed District will encourage municipalities to adopt and implement appropriate shoreland management ordinances by 1995.

8. FLOOD PLAIN MANAGEMENT

Introduction

In May of 1981, the Board of Managers of the Rice Creek Watershed District initiated a flood plain management study intended to culminate in the adoption of a Flood Plain Management Program for the District. The initial phase of this study resulted in the Board's adoption of the flood plain management objectives listed below:

1. Protection of the lives and property values of persons occupying the flood plains.

2. Enhancement of the water resource values of flood plains. Water resource values are defined as those characteristics that promote the natural moderation of floods, maintain the water quality of the stream, and provide groundwater recharge.

3. Promotion of the living resource values existing in flood plain areas which include the protection of fish and wildlife and plant resources.

4. Enhancement of significant cultural resource values of flood plains which include preservation of open space, natural beauty, and areas for scientific study, outdoor education, and recreation.

While the first two objectives listed are most heavily emphasized, all four of these flood plain management objectives mesh exceptionally well with the purpose of the Metropolitan Surface Water Management Act.

Most communities within the District have had Flood Insurance Studies performed under the provisions of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. The boundaries of floods that have a recurrence interval of 100 years (commonly referred to as the 100-year flood) have been defined on maps of these communities. A significant problem exists in the sole usage of this data to determine the 100-year flood plains within the District. The data provided in the Flood Insurance Studies are based upon existing development. Future development can significantly alter the delineation of the 100-year flood plain and the elevation of the 100-year flood profile within these communities. Therefore, sole use of information from Flood Insurance Studies may result in a flood plain management program that will not meet the objectives outlined above.

Management Strategy

The management strategy employed by the District to implement the Surface Water Management Act will consist of establishing requirements for developments in or adjacent to designated 100-year flood plain. Upon inclusion of these requirements in the local water management plan and implementation of such plan, the District will relinquish its permitting authority. The District will also serve as disseminator of updated hydrologic/hydraulic data resulting from District studies and projects (e.g., flood profile studies).

Responsible Governmental Unit

The responsible governmental unit for the regulation and administration of the flood plain management standards of the Rice Creek Watershed District will be the local governmental unit as defined in Minnesota Statutes Section 473.852. In the absence of a local watershed plan, the responsible governmental unit shall be the Rice Creek Watershed District.

Implementation Strategy

To implement the Rice Creek Watershed District Flood Plain Management Program, the District is divided into Sector A and Sector B. These sectors aid in applying management principles which reflect the hydrologic importance of flood plain across the District. The 24 subwatersheds are shown on the Drainage Pattern Map in Section 3. Sector A contains those subwatersheds where the percentage of flood plain to total area is 12 percent or less, and the topography in terms of a generalized slope condition is predominantly greater than 12 percent. Flood Plain Management Sector A includes subwatersheds 4, 5, 7, 8, 13a, 13b, 13c, 14a, 14b, 14c, 14d, 14e, 15a, 15b, and 16.

Permitting Requirements - Flood Plain Management Sector A.

1. Construction of impervious areas within flood plain areas shall not be allowed within the designated groundwater recharge areas for the Prairie du Chien-Jordan formation except for road construction, trails, and other recreational improvements.

2. Encroachment within the 100-year flood plain may occur if all of the following statements can be made and substantiated:

   a. The applicant is faced with severe economic hardship as a result of not being able to encroach upon the flood plain, and

   b. The flood plain storage volume after encroachment is equal to or greater than the flood plain storage volume prior to encroachment (compensatory storage is required), and

   c. Such encroachment does not lie within the floodway and does not result in a violation of Rice Creek Watershed District wetland policy.

   d. Construction or development subject to flood damage will have a minimum floor elevation of 2 feet above the 100-year flood profile, and

   e. Any structures, facilities, or embankments within the flood plain shall be capable of passing the 100-year flood without increasing the elevation of the 100-year flood profile or creating excessive velocities as determined by the District Engineer.

Permitting Requirements - Flood Plain Management Sector B. Sector B contains those subwatersheds where the percentage of flood plain to total area is greater than 12 percent, and the topography is characterized by a general slope condition of predominantly less than 12 percent. Flood Plain Management Sector B includes subwatersheds 1, 2, 3, 6, 9, 10, 11, 12a, and 12b.

1. Construction of impervious areas shall not be allowed within the designated groundwater recharge areas of the Prairie du Chien-Jordan formation except for road construction, trails, and other recreational improvements.

2. Encroachment may occur in the flood plain areas of Flood Plain Management Sector B if all of the following statements can be made and substantiated:

   a. The encroachment lies within the floodway fringe area of the 100-year flood plain in those areas where floodway has been identified, or in the absence of an established floodway, compensatory (live) storage is excavated.

b. The encroachment does not result in increasing the 100-year flood profile within the floodway portion of the flood plain by more than 0.5-foot or create velocities exceeding 2.5 feet/second or as determined by the District Engineer.

c. The encroachment does not violate the principle of "equal encroachment."

d. The encroachment does not result in violation of Rice Creek Watershed District wetland policy.

e. Structures and facilities subject to flood damage built within the 100-year flood plain shall be provided with 2 feet of freeboard between the lowest floor and the 100-year flood profile.

f. Such encroachment may not occur within the flood plain of Rice Creek or any protected water, within 100 feet of the centerline of Hardwood Creek and Clearwater Creek, within 50 feet of the centerline of county and judicial ditches, or within 25 feet of the centerline of any major drainageway of the District. These provisions shall not apply to roadways, bridges, or other linear-type facilities running transversely to the flow line of the floodway.

Other Strategies. The Board of Managers has identified other strategies for implementing the management plan.

1. Drainage easements will be obtained over flood plain areas in accordance with the memorandum included in the appendix of this plan. At a minimum, the easement shall extend 100 feet from the centerline of Rice, Hardwood, and Clearwater Creeks, 50 feet from the centerline of judicial ditches, and 25 feet from the centerline of any major drainageway. The easement shall extend over all areas inundated during the 100-year flood.

2. Flood plain mapping based on detailed hydrologic study is a basic requirement for effective, long-term reduction of flood damages. The District has completed a three-phase flood management profile study using 84 subwatersheds which expands the detailed hydrologic data available for the watershed. Study results have been distributed to the majority of the District communities and/or their consultants.

The District's ability to perform hydrologic studies on a regional basis can provide municipalities with important data. The District will work with communities to amend Flood Insurance rate maps based on the District's hydrology studies. At this time, it appears the primary areas needing updating are Hardwood Creek and Clearwater Creek (upstream of Centerville). Columbus Township also needs detailed study since a large percentage of the township consists of unnumbered flood zones. Lower and Upper Rice Creek now has HEC-2 data available for assigning flood elevations.

3. The Watershed District will require building additions/modifications or reconstruction to conform to the District's freeboard requirements in order to prevent increased flood damages resulting from such work.

4. To protect water quality and the conveyance capacity of the flood plain, the District will not permit site development which would involve the outside storage of soluble, toxic, or buoyant materials. Samples of acceptable flood plain uses include open space, golf courses, and parking surfaces located outside of designated recharge areas with less than 6 inches of flooding occurring over the surface.

5. The Board will not permit flood fringe encroachment within shoreland areas associated with public waters.

6. Variances will be considered by the District where it appears that by reason of exceptional circumstances, the strict enforcement of District rules would cause undue hardship and strict conformity with the standards would be unreasonable, impractical, and not feasible under the circumstances. Variances granted by the District must be consistent with the general purpose of these standards. Variances will not be provided for lesser degrees of flood protection than those stated in the standards.

7. Many hydrologic and flood studies have been performed in the watershed. The Watershed District's intent is to implement their management strategies based upon the most conservative (i.e., highest) flood elevations identified in reputable studies. In some instances, these elevations may be lower than the highest known water level for an area or differ from the official flood elevation with which municipalities must implement their state-approved flood plain ordinances.

8. Accurate as-built elevations of lowest floors of structures adjacent to flood plains are needed in order to efficiently investigate flooding problems through the District. State and federal flood plain management regulations require municipalities to obtain a certified survey of the low floor elevation prior to issuing a Certificate of Occupancy for the structure. The District will rely upon these records when addressing items before the Board.

9. Proposed projects that affect conveyance capacity of channels or crossing are required to document that equivalent hydraulic capacity is provided. When hydraulic equivalents are not desired or feasible for the project proposer, the District will review hydraulic information prepared by the sponsor which details easement acquisition for increased flood levels (upstream or downstream of the project) emergency overflow elevations, excessive flow velocities, and assessment of the adequacy of the outlet as generally described in M.S. 103E.

Definitions

Floodway. The channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment so that the 100-year flood may be carried without increasing the 100-year flood elevation by more than 0.5 feet.

Floodway Fringe. The area between the floodway and the boundary of the 100-year flood.

Major Drainageway. Any drainageway having a tributary area of 200 acres or greater.

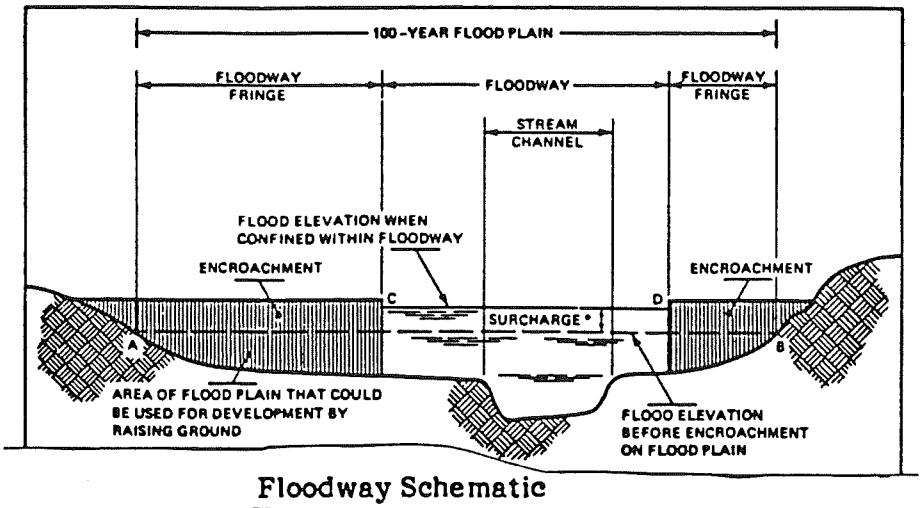
Equal Encroachment. A method of determining the location of encroachment lines so that flood plain lands on both sides of a stream are capable of conveying a proportionate share of flood flows.

Costs and Schedule

To implement the allowable encroachment as outlined in the Management Plan for Flood Plain Sector B, it will be necessary to complete computer modeling of the major drainageways of the Rice Creek Watershed District. Implementation of the Flood Plain Management Plan would be performed by the local governmental unit, or in the absence of a

local water management plan, by the District. Administration costs are estimated at $1,000 annually.

	1991	1992	1993	1994	1995
Administration	$1,000	$1,000	$1,000	$1,000	$1,000
Flood Plain Studies	--	--	--	--	--
Total	$1,000	$1,000	$1,000	$1,000	$1,000



Floodway Schematic

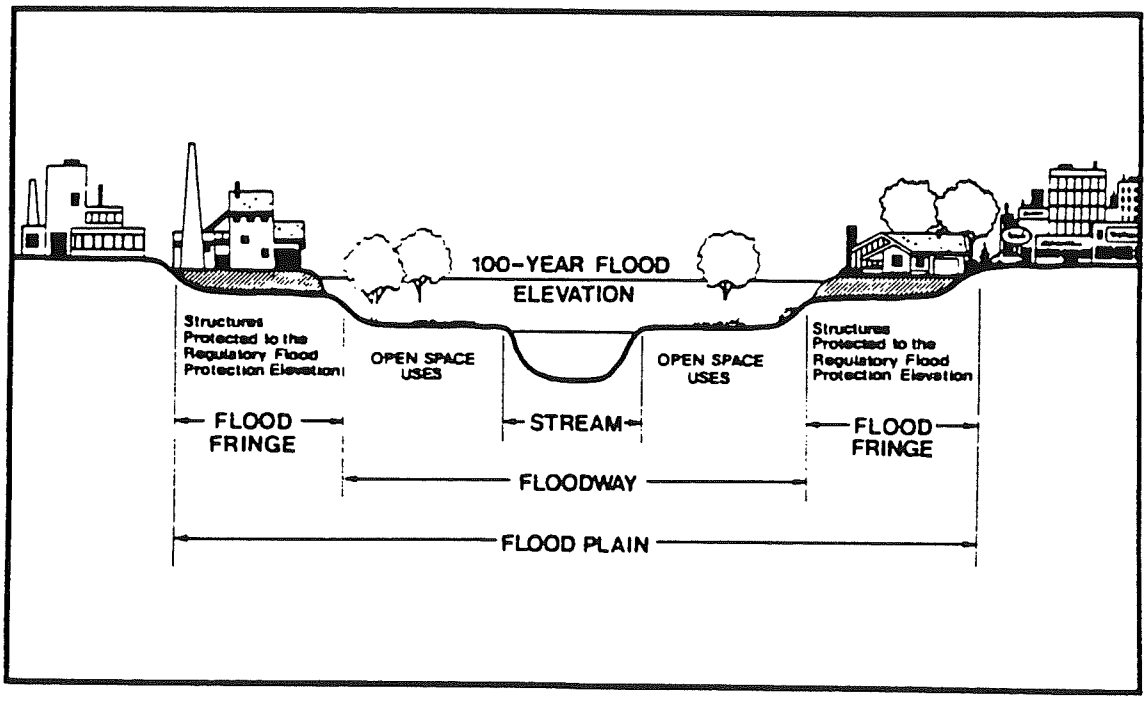
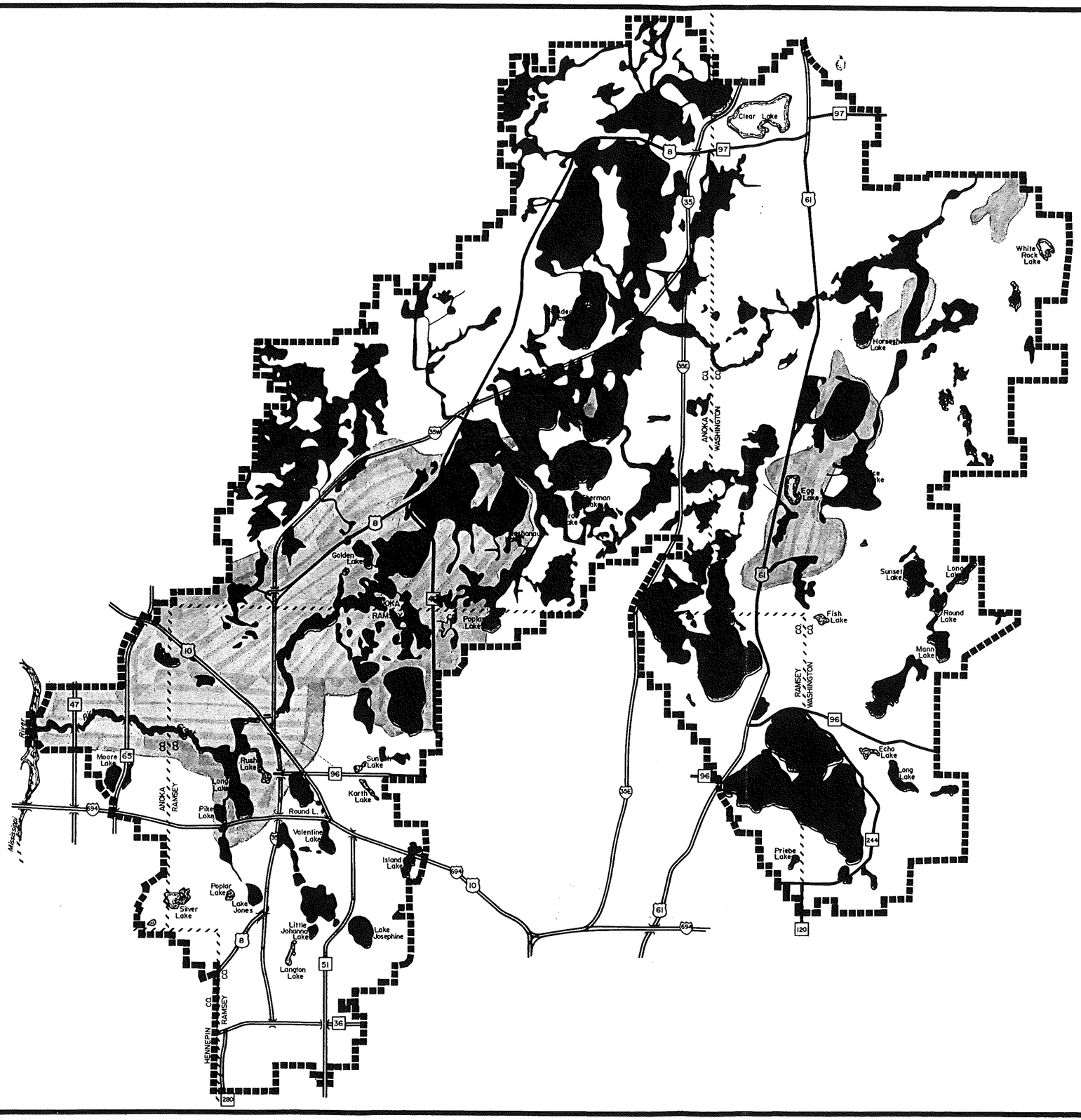


FIGURE 5-1 FLOODWAY SCHEMATIC



WATER RESOURCE MANAGEMENT PLAN

RICE CREEK WATERSHED DISTRICT

100 YEAR FLOOD PLAIN

WITH

GROUNDWATER RECHARGE AREAS

(MAP 17)

OVERLAYED

MAP 15

SOURCE: NATIONAL FLOOD INSURANCE PROGRAM, VARIOUS DATES

1 0 2

1/2 1

Scale in Miles

NORTH

E. A. HICKOK AND ASSOCIATES

WAYZATA, MINNESOTA

V-426

TABLE 5-6

COMMUNITY STATUS IN THE NATIONAL FLOOD INSURANCE PROGRAM

City	Map Date	City	Map Date
Arden Hills	07/02/81	Lauderdale	12/26/78 (rescinded-NSFHA)
Birchwood Village	06/08/84 (rescinded-NSFHA)	Lexington	02/12/19 (rescinded-NSFHA)
Blaine	11/15/79 (rev. 6-/19/81)	Lino Lakes	05/17/82
Centerville	12/04/79	Mahtomedi	06/22/84 (rescinded-NSFHA)
Circle Pines	09/15/78	May Township	2
Columbia Heights	09/29/78	Mounds View	03/02/83
Columbus Township	1	New Brighton	09/01/78
Dellwood	12/26/78 (rescinded-NSFHA)	New Scandia	2
Falcon Heights	NSFHA	Roseville	03/30/81
Forest Lake	3	St. Anthony	NSFHA
Forest Lake Township	2	Shoreview	04/01/81
Fridley	03/02/81	Spring Lake Park	08/24/81 (rescinded-NSFHA)
Grant Township	2	White Bear Lake	09/04/87
Ham Lake	07/16/80	White Bear Township	09/18/85
Hugo	09/29/78 (rev. 12/31/82)	Willernie	05/07/83 (rescinded)

1 Anoka County unincorporated areas 01/16/80
2 Washington County unincorporated areas 05/17/82
3 Not participating in Flood Insurance program but has map (12/16/77)

NSFHA - No special flood hazard area (may or may not have state-approved ordinance)

9. AGRICULTURAL EROSION

Introduction

The dominant land use within the northern portion of the Rice Creek Watershed District is agricultural. The ambient water monitoring programs have identified some sedimentation in the streams that are likely attributable to agricultural erosion. Diagnostic studies for District lakes have also identified agricultural areas as significant sources of non-point source loadings. Over the years, the Watershed District has concerned itself with sedimentation and erosion from urban areas, particularly construction areas. The District intends to address agricultural sedimentation and erosion through a upper watershed improvement project based upon the Centerville/Peltier Water Quality Study results.

Management Strategy

The Rice Creek Watershed District will support the SWCD's efforts to establish best management practices within the agricultural areas of the watershed to reduce non-point source pollution loads to lakes and streams. It is the District's belief that the SWCDs are better equipped to efficiently develop a rapport conducive to achieving goals with landowners.

Responsible Governmental Units

Primary technical support for implementing agricultural BMPs is provided by the Anoka and Washington County Soil and Water Conservation Districts. The District will seek to expand its involvement by implementing watershed-based programs associated with its lake quality projects.

Implementation Strategy

As part of implementing the Centerville/Peltier Lakes Project, the Rice Creek Watershed District will prepare an educational and incentive program aimed at providing an increased understanding within the agricultural community about prevention of erosion and effects of sedimentation on water quality within the District. The programs are described in great detail in the project Diagnostic/Feasibility Report (June 1992).

The Rice Creek Watershed District will also respond to complaints of excessive soil loss and erosion which come to its attention through citizen complaints.

Schedule and Costs

The following table presents the costs and schedule for the development of a soil loss and sedimentation management and implementation plan for the Rice Creek Watershed District.

	1991	1992	1993	1994	1995
Soil Testing	--	--	--	$2,000	$ 2,300
Contact Feedlot Owners	--	--	$ 1,500	--	--
Feedlot Management Projects	--	--	--	5,000	10,000
Fertilizer Seminar w/WSWCD	--	--	2,500	--	--
Education Program/PIC	--	--	15,000	6,200	6,200
Total	--	--	$19,000	$13,200	$18,500

10. CONSTRUCTION EROSION

Introduction

As construction continues in response to the growth needs of each community, it is usually accompanied by a loss of soil through erosion. Many areas of the District also have soil types of granular consistency and are therefore more highly prone to forces causing erosion. Sediment removed from areas stripped of vegetative cover can be carried into downstream drainageways and water bodies. Once present in these downstream areas, the sediment can degrade the water quality, obstruct flow, and reduce the depth of downstream water bodies.

Management Strategy

The Rice Creek Watershed District will implement on a District-wide basis Erosion and Sediment Control Plan Guidelines that will make every effort to eliminate sediment transport from construction sites.

Responsible Governmental Unit

The Rice Creek Watershed District will enforce regulations in each municipality for construction site soil erosion through its existing permit program. The municipality will assume responsibility only after a local Water Management Plan is approved by the Rice Creek Watershed District and implemented. The Watershed District will assist cities to develop and implement their own local sediment erosion control plans and will provide technical assistance. As construction site sediment and erosion control responsibilities are transferred to local governmental units, the District's role will be to oversee implementation of measures and compliance with policy. This will be accomplished through the completion of an annual audit. With the exception of the audit, the Rice Creek Watershed District will respond only to written complaints by either private citizens or local governmental units and will act to resolve such complaints.

Implementation Strategy

The Rice Creek Watershed District requires that the owner of land to be developed prepare a sediment/erosion control plan for construction activities in which existing protective vegetative cover is removed or disturbed. The approval of said plan by the responsible

governmental unit must be obtained prior to any construction. The sediment/erosion control plan must address containment of sediment on the construction site by either structural or non-structural means. Re-establishment of permanent vegetative cover immediately upon completion of the construction activity, where feasible, must also be addressed. Annual grasses are not considered to be adequate ground cover on even a temporary basis as final site grading may not be completed for several years on a typical site.

The sediment/erosion control plan must, at a minimum, include information outlining the direction of all site runoff, and the location of erosion control measures. Installation of measures shall be in accordance with the manufacturer's specifications, accepted Soil Conservation Service engineering practices, and the standard practices expounded in the Minnesota Construction Site Erosion and Sediment Control Planning Handbook, Ramsey County Erosion and Sediment Control Handbook, and MPCA Best Management Practices Handbook (Protecting Water Quality in Urban Areas).

The erosion control plan must address both temporary and permanent cover establishment. Cover establishment practices include, but are not limited to, seeding, mulching, and sodding. All structural and non-structural erosion control measures must remain in-place and be properly maintained until permanent vegetative cover is re-established. When the property owner or designated agent thereof believes that cover has been properly established, a final inspection will be conducted by the responsible governmental unit to confirm compliance. Local units of government shall give consideration to obtaining a cash surety as a safeguard to ensure the plan is fully implemented.

The Ramsey County handbook contains a model ordinance for erosion control. The ordinance provides a good framework for communities to tailor into rules which can be incorporated into local plans.

Local units and the Watershed District will direct all project sponsors disturbing greater than five acres to the MPCA. The MPCA administers a Storm Water Permit Program for such construction activities as required by the Environmental Protection Agency. Projects initiated or continuing after October 1, 1992 are required to have a National Pollutant Discharge Elimination System (NPDES) Permit from the MPCA.

A recurring problem has been encountered with the administration of erosion control during transition of ownership of lands under development. For example, new residential lot owners are unaware of erosion control methods and are not generally the permit holder for the development. Cities are encouraged to address this problem via development agreements and diligent enforcement of municipal erosion control ordinances.

Schedule and Cost

The local units of governmental are required to have an acceptable sediment/erosion control program as part of their local water management plan no later than October 1992.

	1991	1992	1993	1994	1995
Review and Approve Sediment Erosion Control Plan Sections of Local Water Management Plans. Provide Technical Assistance and Annual Audits of Municipal Program Administration. Review Development Plans for Compliance with Watershed Plan Requirements Concerning Sediment/Erosion Control Measures Until Local Plan is Approved	$12,000	$12,000	$12,000	$12,000	$12,000

11. GROUNDWATER PROTECTION

Introduction

The need for protection of groundwater within the Rice Creek Watershed District is increasingly apparent. Documented cases of groundwater contamination, particularly in the New Brighton and St. Anthony areas, underscores this need. Most of the cities in the southern portion of the watershed have community water supply wells. In the northern portion of the watershed, private wells are more common. Several cities in the watershed receive water from either the Minneapolis or St. Paul water systems. Both of these water systems currently use water from the Mississippi River as their primary source. However, groundwater is a secondary source and provides backup supplies.

The management and implementation strategies outlined below apply to protection of surficial aquifers and the Prairie due Chien-Jordan. The importance of these sources of groundwater is more thoroughly discussed in Section III - Groundwater Resources.

Management Strategy

The Rice Creek Watershed District has developed a management strategy for the protection of groundwater resources. This strategy provides for the regulation of developments that may contaminate groundwater recharge areas.

Responsible Governmental Unit

The Rice Creek Watershed District is responsible for groundwater protection and use regulation as provided in Minnesota Statutes. The Minnesota Department of Natural Resources controls use in order to conserve and utilize waters of the state. The Minnesota Health Department is the state's official health agency charged with addressing all environmental health matters, including the protection of groundwater. The Minnesota Pollution Control Agency is required to administer and enforce laws relating to pollution of waters in the state. The Minnesota Geologic Survey is charged with the responsibility to provide a complete account of all the mineral kingdom including groundwater resources. Table 5-8 shows the responsibility of the Minnesota Pollution Control Agency (MPCA), the Minnesota Department of Health (MDH), the Minnesota Department of Natural Resources (MDNR), the counties and local units of government in the protection of groundwater. It

should be noted that some local governments may elect to regulate the installation, operation, and maintenance of individual sewage systems, the operation of feedlots, and the construction, operation, and abandonment of wells. In this management plan, it is assumed that these protection activities may or may not be used by all units of government for groundwater protection, as state agencies have similar protection requirement. Local communities do have the authority to adopt zoning and building ordinances and regulations to protect groundwater. The Rice Creek Watershed District will provide an administrative overview and comment on activities that may affect groundwater quality within the District.

TABLE 5-7

REGULATION OF ACTIVITIES FOR GROUNDWATER PROTECTION

Activity	MPCA	MDH	MDNR	County	Local
A. Disposal of solid wastes	X			X	
B. Installation, operation, and maintenance of individual sewer systems	X				(X)
C. Operation of animal feedlots	X				(X)
D. Disposal of wastes or surplus waters in wells or sumps	X	X			
E. Construction and abandonment of water wells		X			(X)
F. Construction, operation, and abandonment of oil and gas wells			X		
G. Drilling and abandonment of exploratory holes		X			
H. Spreading, disposal, and storage on land of substances that may cause groundwater pollution, including placement in holding structures	X				
I. Discharge of polluting substances into water and air	X				
J. Mining, quarrying, and other excavating activities			X		
K. Handling and storage of liquids, including installation and operation of tanks, pipe lines, and sewers	Authority but no Rule				
L. Irrigation	X		X		
M. Artificial recharge	X				

TABLE 5-7

REGULATION OF ACTIVITIES FOR GROUNDWATER PROTECTION (Continued)

Activity	MPCA	MDH	MDNR	County	Local
N. Management of groundwater levels and pumping rates	X		X		
O. Storage of solids, liquids, and gases underground	X		X		
P. Appropriation of water			X		
Q. Adoption of zoning and building ordinances and regulations					X
R. Reporting and cleanup of accidental spills	X				

( ) Option of local authority.

Implementation Strategy

To implement groundwater protection plan, the Rice Creek Watershed District will support the administration of groundwater resources and advocate better groundwater management procedures.

The Rice Creek Watershed District currently has the role of reviewing and commenting on all MPCA and MDNR permits that may affect groundwater within the watershed. The Watershed District will work with local units of government to aid in the development of zoning and building ordinances to protect groundwater resources.

The Watershed District will discourage the development of commercial and industrial areas that may contaminate groundwater in recharge areas. Where such development occurs the District will review development plans and require proper use of containment dikes, liners, etc. in the design.. As part of the local water management plan, land use controls shall be developed to protect groundwater recharge areas.

At the present time, the Watershed District does not have a policy to control discharges from heat pumps. The District will require local units of government to prepare and maintain an inventory of residential and commercial properties that are appropriating groundwater for heating and cooling purposes as part of the local water management plan. No permit will be required by the District for this activity at this time. Local units of government shall require users of heat pumps to demonstrate that discharges will not create drainage problems.

To do a more effective job in managing groundwater resources, the Rice Creek Watershed District is contributing to a detailed groundwater mapping project in Ramsey County, particularly to map groundwater recharge areas of both surficial and bedrock aquifers. The Rice Creek Watershed District also recommends better coordination among groundwater programs at the state level. This will enable the Watershed District to be more fully apprised of state activities related to groundwater.

The DNR is undertaking a groundwater study of the White Bear Lake area in 1993-94. This study will be funded by the Legislative Commission on Minnesota Resources and closely resembles the study recommended in the District's original Management Plan. The District will cooperate in the study and make the results of the White Bear Lake Diagnostic Study (1992) available to the DNR.

The District will seek to promote water conservation by urging municipalities to adopt permanent rules similar to those invoked during times of drought. The majority of cities in the District rely upon groundwater for water supply and therefore have a need to conserve water to lessen depletion of the aquifers. Historically, sprinkling bans/limits have been placed to assure adequate (acute) supplies of water when reservoir/water tower storage is low and peaking demands cannot be met.

The District encourages the sealing of abandoned wells. The District will cooperate with other governmental units identifying priority wells for sealing.

The District will participate on the Ramsey and Anoka County Advisory Committees in 1993-94 as the Groundwater Quality Protection Plans are assembled.

The District will participate in a groundwater study in the vicinity of Clear Lake. The study effort is being undertaken by the University of Minnesota and the Forest Lake WMO. A cost share of $450 is expected in 1991.

Schedule

The administration of groundwater permits issued within the Watershed District will be part of an ongoing process. The Watershed District does recommend that the detailed mapping of groundwater resources and a more streamlined coordination of groundwater resources at the state level be completed by 1990.

Costs

The cost for the implementation strategy is primarily administrative and will be $1,000 per year through 1995.

12. ROUGH FISH CONTROL

Introduction

Several of the lakes within the Rice Creek Watershed District, especially the Rice Creek Chain of Lakes, have been identified by the Department of Natural Resources as having a rough fish problem.

Rough fish contribute to the eutrophication of lake systems in a number of ways. First, feeding activities of rough fish physically stir bottom sediments, thereby accelerating the sediment nutrient release rate. These feeding activities also decrease the transparency of the water above the sediments. During feeding, rough fish also ingest large quantities of plant and animal matter. The resulting fecal deposits release soluble nutrients, thereby increasing nutrients available to plant life.

One method of removing rough fish is by using the fish toxicant rotenone. This poison is not species-specific and will eliminate all species. The toxicant is applied to all connecting streams, marshes, and lakes above the lake to be reclaimed. Below the lake to be poisoned, a fish barrier is constructed to prevent re-introduction of rough fish. After rotenone is applied, the dead fish are removed from the lake, if necessary. The last must then be restocked with fish species that are appropriate to the ecology of the lake.

The second method involves hiring commercial fishermen to remove rough fish by seining or trap netting. Desirable species are then introduced into the lake.

Management Strategy

The Rice Creek Watershed District has developed a management strategy that involves consulting with the Department of Natural Resources to identify opportunities to enhance fish and wildlife habitat. It appears from preliminary consultations with the DNR that a rough fish problem is present in many of the lakes within the District.

Responsible Governmental Unit

The DNR is the primary governmental unit for the management of fisheries in the State of Minnesota, and thus, is responsible for rough fish control. Water quality benefits warrant the involvement of the Rice Creek Watershed District in a rough fish control program.

Implementation Strategy

The strategy of the Rice Creek Watershed District is to work with the DNR to develop a plan for the control of rough fish, particularly the Lamprey Pass Wildlife Management Area near Howard and Mud Lakes. The goal is to create cost-effective and environmentally sound rough fish control. Water quality will also improve from this strategy.

Schedule and Cost

In 1994, the Watershed District will work with the DNR to develop a plan for the control of rough fish through lake level management. The cost of this plan is estimated to be $1,000.

13. FLOOD MANAGEMENT PROFILES

Introduction

To develop flood management profiles, the District will perform quantitative analyses of existing and year 2000 stormwater runoff flows, identify flooding problems, and establish maximum allowable discharge rates based on 100-year flood profiles. This work will be conducted under the District's authority to manage and control flows, maintain the design flow, and to provide for the repair of the bed and banks of the major drainageway system. Under this authority, the District may also propose, develop, construct, and operate rate control structures, detention basins, and other improvements required to achieve control of flow and runoff. The major drainageway system is defined as Rice Creek from Howard Lake to the Mississippi River and Clearwater Creek from Bald Eagle Lake to Peltier Lake. The flood management profile is defined as the acceptable creek profile resulting from the runoff generated from a 100-year return frequency event.

Management Strategy

The District will determine flood management profiles and will periodically evaluate the hydraulic impacts of future development to ensure that the flood management profile will not be exceeded.

Responsible Governmental Unit

The Rice Creek Watershed District will be the responsible governmental unit.

Implementation Strategy

The District will perform a three-phase quantitative analysis of existing and year 2000 stormwater flows. The detailed analysis will utilize the existing data as possible, but will acquire significant amounts of new data in order to determine 100-year flood profiles.

The purpose of the first phase, the stormwater runoff study, is to perform a hydrologic analysis of the Rice Creek Watershed so that discharge rates can be determined at the municipal boundaries and other appropriate locations. The necessary data will be compiled and the TR-20 model will be run for several 100-year rainstorms to determine the critical

event and the associated peak discharge rate for each subwatershed. The results will be presented in a technical memorandum.

The purpose of the second phase, the flood profile study, is to use the previously determined discharge rates with the HEC-2 computer model to determine the 100-year flood profiles along Rice Creek from Howard Lake to the Mississippi River, and along Clearwater Creek from Bald Eagle Lake to Peltier Lake. A preliminary investigation to determine the status, availability, and condition of the HEC-2 computer data files used in past hydraulic studies will be conducted. New HEC-2 data files will be created form field surveys and computer model runs will be made to provide flood profiles for both future and existing conditions. The results will be presented in a technical memorandum.

The purpose of the final phase, the discharge rate study, is to establish maximum allowable discharge rates at municipal boundaries (and other appropriate locations) and to determine a flood management profile along Rice Creek and Clearwater Creek in consideration of the needs of the local governmental units. Flooding problems will be identified, maximum allowable flow rates will be established to control downstream flows, and related storage requirements will be determined. This work will be coordinated in accordance with the Minnesota DNR Floodplain Management Program so that county and municipal floodplain concerns are considered. Management profiles for the 100-year flood will be determined and drawn for Rice Creek and Clearwater Creek. The results of this study will be presented in a report with finalized runoff management strategies.

Should capital improvements or regulatory controls be required to mitigate potential flood damages, the District shall order the appropriate studies to determine cost, benefit, methods of funding and the appropriate operating agency.

Costs and Schedule

The costs to perform the complete three-phase flood management profile study will be $115,000. The costs for the phases are: Phase 1 - Stormwater Runoff Study, $39,000; Phase 2 - Flood Profile Study, $55,500; and Phase 3 - Discharge Rate Study, $25,100.

	1991	1992	1993	1994	1995
Phase 1	(Completed 1990)		--	--	--
Phase 2	$17,300	$33,600	--	--	--
Phase 3	600	17,500	$ 7,000	--	--
Stream Gauging	--	--	12,250	2,500	2,500
Total	$17,900	$51,100	$19,250	$2,500	$2,500

14. INSPECTION AND MAINTENANCE

Introduction

Regular inspection and maintenance activities are essential to any comprehensive water resource management effort. Regular maintenance can preclude dangerous or undesirable conditions and the costs associated with remedying them. Over the years, the District has worked cooperatively with state and local governmental units to address maintenance problems as they developed. In recent years, rapidly increasing beaver populations and nuisance flooding conditions have highlighted the need for more explicit understanding of responsibilities.

This section of the management plan attempts to document historic understanding of responsibilities by the Board. While the areas noted are not mandated, it is the Board's intent to provide services as outlined. This section also attempts to consolidate the various inspection programs which the District currently undertakes. It is not the Board's intent to pursue additional maintenance responsibilities since the Board does not have laborers or equipment with which to efficiently perform the work. By continuing to use county and city crews for the majority of nonpublic drainageways, the overall public expenditures necessary for maintaining the hydrologic infrastructure is minimized.

Management Strategy

The management strategy of the Board is to clarify maintenance and inspection responsibilities for various hydrologic features, conditions, and governmental units within the District. District inspection and maintenance activities will be primarily restricted to the public ditch systems (mandated), Rice Creek, and emergency situations on major drainageways where acute hydraulic conveyance obstructions are encountered.

Responsible Governmental Unit

The following table highlights the most common maintenance situations encountered in the Rice Creek Watershed District.

TABLE 5-8

MAINTENANCE RESPONSIBILITIES BY HYDROLOGIC FEATURE

Maintenance Area	RCWD	County	City/ Twp	Land-owner	MN/ DOT	MN/ DNR
Rice Creek						
Trees	(X)			X		
Driftwood/Debris	X			(X)		
Beaver	X					
Sedimentation						
Unnatural Sedimentation				X		
Public Ditch						
Overgrowth	X					
Trees	(X)			X		
Driftwood/Debris	X					
Beaver	X					
Sedimentation	X			(X)		
Unnatural Sedimentation				X		
Bridge/Culvert		X	X	X	X	
Private Ditch				X		
Natural Drainageway			(X)	X		
Natural Lake Outlet		(X)	(X)	X		
Lake Outlet Structure		X	X			(X)
Stormwater Pond			X	X		
Storm Sewer System		X	X	X	X	
Bridge/Road Culverts		X	X		X	
Driveway Culvert				X		

(X) Optional

Implementation Strategy

The Rice Creek Watershed District will incorporate the following principles to ensure adequate inspection and maintenance efforts:

1. Public ditch inspection and maintenance will be performed as outlined in the Public Ditch Management section of this plan.

2. The District will conduct an annual inspection of Rice Creek from Baldwin Lake to the Mississippi River. Maintenance will be performed to provide for the regional canoe route and address situations which reduce conveyance or threaten bank stability.

3. As part of its regulatory program, the District will coordinate development of maintenance plans for stormwater facilities with the developer and the appropriate municipality/township.

4. The District Inspector will continue to perform a spring flood inspection program at critical points within the hydrologic system. The following areas have been identified as historic locations where ice dams or debris have formed: Ramsey County Ditch 11; Ramsey/Washington Judicial Ditch 1 at Hugo Road and Portland Avenue; Priebe Lake outlet; Halls Marsh outlet; Bald Eagle Lake outlet; Anoka County Ditch 53-62 at I-35W and Lexington Avenue; Anoka/Ramsey Judicial Ditch 1 at County Road J; Lake Valentine outlet; Rice Creek at the Howard Lake outlet; County Road J; TCAAP gates (County Road I); Long Lake inlet trestle; Long Lake Road; Mississippi Street; Silver Lake Road; Old Central Avenue; Highway 65; and University Avenue.

5. The District will perform inspection maintenance for the projects established through the Long Lake Chain of Lakes Clean Lakes Grant Project. This inspection schedule and methodologies are outlined in the operation and maintenance plan for the grant.

Costs and Schedule

All inspection and maintenance costs required to implement the management plan above shall be funded through the use of M.S. 103B, the Water Maintenance and Repair Fund, and the General Administrative Fund. Necessary maintenance for projects originally funded as Basic Water Management (M.S. 103D) projects will utilize funds assessed for construction and maintenance of those specific projects when available.

	1991	1992	1993	1994	1995
Rice Creek Inspection and Maintenance	$13,000	$10,000	$10,000	$10,000	$10,000
Public Ditches		(Outlined in Ditch Management Plan)			
LLCOL Project Maintenance	1,000	2,000	500	9,500	500
Beaver Dam Removal	200	400	800	800	800
Spring Inspection and Debris Removal Coordination	1,000	2,000	2,000	2,000	2,000
Total	$15,200	$14,400	$13,300	$22,300	$13,300

15. CHANNEL MANAGEMENT

Introduction

Major drainageways often collect runoff from multiple municipalities and convey it via channelized flow. Intercommunity flows are a major concern for the downstream properties and the District is addressing the issue through runoff, maintenance, and channel policies. There are numerous areas where channel flow exists but the principal concern is Rice Creek.

Upon leaving Long Lake in New Brighton, Rice Creek flows through a more defined valley than the wide, expansive flood plain seen north of Ramsey County. There are approximately 56 sites between Locke Lake and Long Lake where the Creek experiences sharp meandering. This number is approximate and reflects only short bends in the Creek and not the numerous minor adjustments in stream alignment.

This meandering is a natural process and barring complete armoring of the channel, inevitable. Turbulent flow within stream channels perpetually tests channel boundaries. As the channel erodes on the outside of the curve, material is deposited on the inside point bar.

The District has conducted several studies that explored channel dynamics. In 1977, an investigation of Locke Lake sediment deposits was conducted which explored sediment sources along Lower Rice Creek. In 1989, an assessment of Lower Rice Creek bank stability was performed which documented the locations of bank failures, crossings, and stabilization measures. This document was used to help direct the preparation of grant applications to the Streambank, Lakeshore, and Roadside (SLR) Program administered by the Anoka SWCD.

An additional work effort of the District was establishing the Streambed and Bank Stabilization (SBBS) Program described in the 1986 Management Plan. This program was initiated in 1991 and has approved one-third cost sharing for over a dozen properties in its first two years of existence. When combined with 50% matching funding available within the city of Fridley, substantial progress is being made towards stabilizing eroding creekbanks. While it is not the desire of the Board to lose the "natural" characteristics of the channel, localized peak flows are experienced in Lower Rice Creek from various portions of the District which developed prior to Watershed District formation. Without limited use of bank

armament, the channel would experience accelerated erosion to the detriment of the regional parks and properties along the Rice Creek valley.

Management Strategy

The Watershed District is uniquely situated to address the multi-jurisdictional issues involved in managing the Rice Creek channel. The District's intent is to address channel maintenance and bank stabilization in reaches of the creek where unacceptable volumes of sediment are being introduced, flow conveyance is substantially impaired, or conditions exist which are conducive to either of these situations developing.

Channel management is also directly affected by the District's other management responsibilities relating to runoff management and the development of flood profiles. These efforts aid in reduction of channel flow velocities which affect bank stabilization.

Responsible Governmental Unit

The Rice Creek Watershed District will retain permitting authority for any development activities occurring within 300 feet of Rice Creek or projects proposing to alter the flood plain along the creek. The District will pursue cooperative projects to address major bank failure along Rice Creek.

Implementation Strategy

The implementation plan for the Watershed District consists of the following elements:

1. The Board of Managers will continue to sponsor the SBBS Program outlined in the Capital Improvements Plan at least through 1995.

2. The District will continue to sponsor grant applications for addressing sites which are introducing large amounts of sediment and debris into the channel and are incapable of stabilizing themselves.

3. The District will function as caretaker for Rice Creek as part of its inspection and maintenance program. Emphasis will be on removal of obstructions which adversely affect conveyance or bank stability.

4. The District will require cities to investigate reduction of sediment delivered to the creek channel and provide stable storm sewer outfalls.

Costs and Schedule

	1991	1992	1993	1994	1995
Sponsor Grant Application	$2,000	--	$ 2,500	$ 2,500	$2,500
Perform Stabilization Project	--	$16,000	21,000	43,000	15,000
Review SBBS Applications	3,000	3,000	3,000	3,000	3,000
Clearwater Creek Channel Improvements	--	8,200	2,000	500	--
County Ditch 12/Bethel College Channel Review	300	800	--	--	--
Total	$5,300	$28,000	$28,500	$49,000	$20,500

It is assumed that grant applications will be submitted annually. Bank stabilization projects were conducted at Sta. 190+00 in 1992 and Sta. 252+50 in 1993. A grant application for Sta. 143+50, 162+50, and 178+00 was submitted in 1993 for 1994 construction. A 1995 construction date is slated for Sta. 322+00 following coordination work with the Ramsey County SWCD in 1994.

16. PUBLIC INFORMATION/EDUCATION

Introduction

Water issues, particularly water quality, depend on actions taken by private landowners. As such, the District's water resources are heavily dependent on the day-to-day land use decisions of the private sector. By improving the District's information dissemination capabilities, the basic cause and effect processes at work with water resource management should become more evident. This approach appears to be a good method for addressing the non-point source pollution concerns in the Watershed District.

Management Strategy

The District's strategy is to expand its current public information/education efforts to reduce long-term costs associated with correcting problems. The Board will seek cooperative funding from state programs to reduce local cost-share to the District.

Responsible Governmental Unit

The District intends to provide technical data and coordination necessary for implementing these efforts. Involvement of municipalities and other governmental units will be required to distribute information to its intended audience.

Implementation Strategy

The District is mandated to disseminate certain information and the Board intends to provide information obtained from past project work. At this time, the following efforts have been identified:

1. District forms and literature have not reflected changing regulations. Some forms being used date back to the District's inception. These materials need updating to reflect current laws and program objectives.

2. The District will sponsor a half-day training session for inspection personnel from the member communities. This training session will address wetland regulations, erosion and sediment control expectations, stormwater facility maintenance indicators, and coordinate inspection programs with the District's efforts.

3. The District publishes an annual newsletter as stipulated in M.S. 103B. This will be continued by the Board and the Citizen Advisory Committee.

4. The District publishes an annual report that meets the requirements of M.S. 103B and 103D. This report documents accomplishments, projects pursued, and financial reports.

5. The District has completed an extensive diagnostic/feasibility report for the Centerville/Peltier and White Bear/Bald Eagle Lake systems. The implementation plan identifies the need for informational materials targeted at these watershed areas and the agricultural community tributary to them. These efforts would be cooperatively pursued with the MPCA and county SWCDs at a minimum.

6. The District's water quality monitoring program was revised to provide more emphasis on tributary streams to a limited number of lakes each year. Using the monitoring results, the District has prepared annual monitoring reports which provide a detailed description of the lake quality and effects of lakes tributary to watershed areas. This information has a limited distribution mailing to properties within the tributary area.

Costs and Schedule

	1991	1992	1993	1994	1995
Nonpoint Source Education	$2,500	$2,500	$9,500	$2,000	$2,000
Annual Newsletter	3,000	--	3,000	3,000	3,000
Annual Report	3,500	3,500	2,500	2,500	2,500,
New District Office/Permit Map	5,000	--	2,000	--	--
Redesign Publications	4,000	3,000	4,000	1,000	1,000
Management Plan Printing	--	500	8,000	500	500
County Geologic Atlases	6,500	5,000	--	--	--
Centerville/Peltier Project	--	600	8,500	1,500	1,500
Total	$24,500	$15,100	$37,500	$10,500	$10,500

COST SUMMARY

This section provides a summary of costs for the 16 areas discussed in this section. These are primarily District-wide costs that relate to the operation and maintenance of flood control components, the implementation of on-going plans and policies related to watershed management, and exploratory planning to improve the system.

Table 5-10 is a summary of the estimated costs associated with the Strategic Implementation Plan. It contains costs for on-going programs that are being currently implemented as part of the District work as well as funding required for new programs. Each year the District shall determine which programs shall be executed in the following year(s) along with the necessary appropriation of funding.

TABLE 5-9

STRATEGIC IMPLEMENTATION PLAN
COST SUMMARY

		1991	1992	1993	1994	1995
1.	Runoff Management, Quality, and Quantity	44,900	47,500	50,000	55,000	65,000
2.	Ditch Management	27,000	22,150	53,000	253,000	246,000
3.	Potable Water Supply	2,900	2,400	3,000	62,100	109,300
4.	Water Quality Management	41,100	41,500	46,100	109,300	215,550
5.	Individual Sewage Treatment System Management	--	--	--	--	--
6.	Wetland Management	10,000	18,000	16,000	25,000	25,000
7.	Shoreland Management	1,000	1,000	1,000	1,000	1,000
8.	Floodplain Management	1,000	1,000	1,000	1,000	1,000
9.	Agricultural Erosion	--	--	19,000	13,200	18,500
10.	Construction Erosion	12,000	12,000	12,000	12,000	12,000
11.	Groundwater Protection	1,000	1,000	1,000	1,000	1,000
12.	Rough Fish Control	--	--	--	1,000	--
13.	Flood Management Profiles	17,900	51,100	19,250	2,500	2,500
14.	Inspection and Maintenance	15,200	14,400	13,300	22,300	13,300
15.	Channel Management	5,300	28,000	28,500	49,000	20,500
16.	Public Information/Education	24,500	15,100	37,500	10,500	10,500
Total		$203,800	$255,150	$302,650	$581,300	$634,850

SECTION 6

LOCAL RESPONSIBILITIES

LOCAL PLANNING

After the District's Watershed Resource Management Plan had been approved and adopted pursuant to M.S. 103B, local units of government having land-use planning and regulatory responsibility are required by statute to prepare a local water management plan, including a capital improvement program and a mechanism to bring the local water management plan into conformance with the Watershed Management Plan. This plan should reflect the basic elements of the Watershed Management Plan and should include, but not be restricted to, planning for the waters of local significance as defined in the previous section. Submission of the local water management plans to the District for approval shall occur within two years of the approval of the Rice Creek Watershed Plan by the Board of Water and Soil Resources.

Local Plan Contents

The Board of Water and Soil Resources has adopted rules (M.R. 8410) regarding local plan content. The RCWD will be revising their plan in 1995-96 to comply with the rules. Local plans will need to comply with M.R. 8410 eventually and are encouraged to do so prior to the District's revisions.

As a minimum, local watershed management plans are required to:

- Describe existing and proposed physical environment and land use.
- Define watershed areas and the volumes, rates, and paths of stormwater runoff.
- Identify areas and elevations of stormwater storage adequate to meet performance standards established in the watershed plan.
- Identify water quality and quantity protection methods adequate to perform standards established in the water management plan.

- Identify regulated areas.

- Set forth an implementation program, including a description of official controls and a capital improvement plan.

Watershed District Review

Each local unit of government shall submit a water management plan to the Watershed District for review before adoption by its governing body. The Watershed District will review and approve or suggest changes to the local water management plan in total or part. The Watershed District shall take no more than 60 days to complete its initial review after written receipt of the plan. If the Watershed District fails to complete its review within 60 days (or within the time period identified in any extensions agreed to by the local unit of government), the local water management plan shall be deemed approved and the local unit of government shall carry on all duties as prescribed in its plan. Table 6-1 shows the current status of planing activities for the member communities.

The preceding chapter of the management plan listed 16 areas of concern which have a wide variety of responsible governmental units for implementing the Board of Managers' management strategies. It is the Board's intent to work toward local regulation of runoff, individual sewage treatment systems, shorelands, flood plain, and construction erosion. The Watershed District will remain the responsible governing body in areas which do not have an approved and implemented local water plan. Table 6-2 outlines the current status of local controls.

The Watershed District and other governmental units will be the responsible governmental unit for the water-quality management plan until the local management plan is adopted and implemented. The Watershed District shall exercise its right under M.S. 103B to resume regulatory authority and administration of programs if it is demonstrated that noncompliance with the approved local water management plan is apparent.

TABLE 6-1

STATUS OF LOCAL PLANNING

	Planning Underway	Plan Received	Plan Approved	No Action
Arden Hills			•	
Birchwood Village			•	
Blaine	•			
Centerville	•			
Circle Pines		• (1993)		
Columbia Heights	•			
Columbus Township				•
Dellwood	•			
Falcon Heights				•
Forest Lake				•
Forest Lake Township				•
Fridley	•			
Grant Township				•
Ham Lake				NA
Hugo	•			
Lauderdale				•
Lexington				•
Lino Lakes	•			
Mahtomedi		•		
May Township				NA
Mounds View			•	
New Brighton	•			
New Scandia Township		•		
Roseville			•	
St. Anthony				•
Shoreview			•	
Spring Lake Park				•
White Bear Lake	•			
White Bear Township				•
Willernie				•

TABLE 6-2

STATUS OF LOCAL CONTROLS

	Runoff Mgmt	Individual Sewage Treatment Systems	Wetland Mgmt	Shoreland Mgmt	Floodplain Mgmt	Construction Mgmt
Arden Hills	No	Yes	No	Yes	No	Yes
Birchwood Village	No	Yes	No	Yes	No	No
Blaine	No	Yes	No	NA	No	No
Centerville	No	Yes	No	No	No	No
Circle Pines	No	Yes	No	Yes	No	No
Columbia Heights	No	Yes	No	No	No	No
Columbus Township	No	Yes	No**	Yes	No	No
Dellwood	No	Yes	No**	Yes	No	No
Falcon Heights	No	Yes	No**	NA	No	No
Forest Lake	No	Yes	No**	NA	No	No
Forest Lake Township	No	Yes	No	Yes	No	No
Fridley	No	Yes	No**	No	No	No
Grant Township	No	Yes	No	Yes	No	No
Ham Lake	No	Yes	No	NA	No	No
Hugo	No	Yes	No	Yes	No	No
Lauderdale	No	Yes	No	NA	No	No
Lexington	No	Yes	No	NA	No	No
Lino Lakes	No	Yes	No	Yes	No	No
Mahtomedi	No	Yes	No**	Yes	No	Yes
May Township	No	Yes	No**	NA	No	No
Mounds View	Yes*	Yes	No	Yes	Yes*	Yes
New Brighton	No	Yes	No	No	No	No
New Scandia Township	No	Yes	No	Yes	No	No
Roseville	Yes*	Yes	No	Yes	Yes*	Yes
St. Anthony	No	Yes	No	No	No	No
Shoreview	Yes*	Yes	No	Yes	Yes*	Yes
Spring Lake Park	No	Yes	No	No	No	No
White Bear Lake	No	Yes	No	Yes	No	No
White Bear Township	No	Yes	No	Yes	No	No
Willernie	No	Yes	No	NA	No	N0

* Needs ordinance.

** Municipalities which act as the WCA LGU for areas outside the District.

COORDINATION

A principal problem in organizing and implementing effective plans for watershed management is the multiplicity of governmental agencies which have varying degrees of authority and responsibility with regard to drainage, flood and soil erosion control, water and land pollution, open space preservation and enhancement, land development and land use controls such as zoning and subdivision, and water resources conservation and development.

The problem confronting the District lies in harmonizing the requirements of state law, the administrative regulations of state agencies, the Metropolitan Council's development guidelines, and the planning objectives of individual county and municipal governments.

Above all, the RCWD should strive for closer coordination and cooperation with all levels of government in the planning and administration of its policies and regulations. The RCWD must abide by certain requirements and constraints in the state law which provide for its establishment and operation. Furthermore, the District Managers must necessarily conform to regional, state, and federal policies and standards. Nevertheless, there is ample room for RCWD to be imaginative and innovative in the resolution of problems and the realization of opportunities specific to this watershed.

The District Managers intend to maintain effective liaison with other governmental units in order to ensure that the watershed's policy, plan, and program are well understood and to propose improvements and other needed changes in associated water resource management programs at state and regional levels. Coordination efforts will be pursued through continued use of public information/education, project reviews, and general regulatory program assistance.

SECTION 7

CAPITAL IMPROVEMENT PROGRAM

INTRODUCTION

The Capital Improvement Program (CIP) identifies structural projects of high priority to the District which are proposed to be completed during the planning period. At a minimum, the CIP is subject to a biennial review at which time each proposed improvement is to be reconsidered and additional improvements added at the direction of the Board of Managers of the RCWD. Inclusion in the CIP means the Board is serious about considering the project. It does not mean it has Board approval and assigned funding. The Board can also implement projects not included in the CIP provided the projects are consistent with the intent of the management plan.

In the following paragraph each improvement is described, the need is established, the cost and proposed methods of financing are discussed, and a completion date is proposed.

LOCKE LAKE RESTORATION AND IMPROVEMENTS

Need

Locke Lake is located in Fridley on Rice Creek immediately east of East River Road. It has an area of approximately 23 acres and is divided into a west basin and an east basin. Reports entitled, "Investigation of Sediment Deposits in Locke Lake" (E.A. Hickok and Associates, January 1977) and "Locke Lake Preliminary Study" (James M. Montgomery, Consulting Engineers, Inc., September 1991) were prepared to gather additional data for quantifying the work effort required. Since 1955 when the Locke Lake dam was constructed, the reservoir has experienced sedimentation to the extent that the east basin of the lake is virtually filled with sediment. As a result, Locke Lake no longer functions as an aesthetically pleasing waterbody, regional canoe route, and in time will not longer function as a sediment reservoir protecting the Mississippi River unless the accumulated materials are removed.

Excavation of the lake and creation of a sedimentation basin s one component of a coordinated plan to replace the existing outlet structure, improve public access, protect the Mississippi River, and provide for a continuous canoe route and trail system from the

Mississippi River up to the several regional park systems along the Rice Creek flowage. This multifaceted program is being coordinated and funded by the RCWD, City of Fridley, Anoka County, Anoka County Parks Department, and Minnesota Department of Natural Resources at a minimum. Additional entities which will be approached for assistance include the Anoka Soil and Water Conservation District and U.S. Army Corps of Engineers.

Scope of Project

At this time, the Board of Managers is considering the project for the purpose of excavating the lake to a depth of 4 feet, developing an in-lake sedimentation basin, and providing overall project management services for the lake improvements.

Alternatives Considered

The 1991 engineering study identified a number of alternative excavation depths, sedimentation basin locations, and maintenance periods. A general excavation depth of 4 feet is currently preferred by the Board of Managers due to its ability to restore full canoe access and discourage emergent vegetation within the basin. The above alternatives were also measured against the potential outlet structures being considered by the City of Fridley.

The majority of sediment which collects in the lake appears to be generated from the floodplain areas of Rice Creek and the channel which meanders through it. The District has initiated a streambed and bank stabilization program for stabilizing private properties on a cost-share basis, and the District has also begun implementing a variety of bank stabilization measures on public lands which introduce the largest volumes of sediment and debris to the creek. Complete armoring of the Rice Creek channel upstream of the basin is neither feasible nor desirable and ultimately would not prevent the reservoir from sedimentation.

Cost

The Board has used costs generated as part of the 1991 study effort and qualitative judgments regarding a reduction in project scale to arrive at a total cost of $700,000 for the District's cost-share of the Locke Lake projects. This figure was based primarily upon an approximate match of the city, county, and Department of Natural Resources contribution for the other lake improvement phases.

Financing

Funding of the District's portion of the project is proposed through a District-wide *ad valorem* tax levy as proved in M.S. 103B.251. A project petition from the City of Fridley has been received by the District for initiating the project.

Based on 1993 tax capacities of the District, a typical $85,000 home would pay a one-time tax of $6.57 to fund an $800,000 project.

The levy would be ordered and certified to the affected counties in 1993. Ramsey County will apportion the costs across the affected counties, as has been the long-standing arrangement.

STREAMBED AND BANK STABILIZATION PROGRAM

Description and Need

Erosion of the bank and beds of Rice Creek and other major streams within the District has caused considerable damage to private and public properties. The intent of this program is to provide matching funds as a means of encouraging stabilization works along the waterways of the District. Applications for matching funding are taken annually from the municipalities and townships within the District. Each project application is prioritized as to needs and benefits. Available funding along with priority establishes which projects are funded in a given year.

The benefits of this program include the protection of private and public property values along the waterways of the District. In addition, the sediment loading on lakes and reservoirs within the District is substantially reduced.

Financial Information

The District is currently levying $30,000 per year to provide matching funds. Funding was authorized following receipt of an enabling petition from Fridley and completion of hearings per M.S. 103D. The $30,000 is provided by a District-wide *ad valorem* tax levy.

Schedule

The program was authorized in 1991 with the initial levy occurring in 1992. Applications for matching funding have been taken since 1991. Applications will be taken during the year prior to the year actual construction will be performed.

RICE CREEK SEDIMENTATION BASIN

Description and Need

A sedimentation basin has been constructed on Rice Creek immediately north of its inlet to Long Lake in the City of New Brighton. The basin went into operation during the spring of 1981. By the summer of 1985, it had collected approximately 16,000 cubic yards of sediment which was removed during the winter of 1985-86. The basin will require periodic maintenance in the form of sediment removal once every four years. Operation of the Rice Creek sedimentation basin has prevented the reformation of a sediment delta at the entrance of Rice Creek into the north basin of Long Lake, thus preserving property values and the ability to navigate in this area of Long Lake.

Financial Information

It is estimated that approximately 16,000 cubic yards of sediment will be required to be removed once every four years. An expenditure of $80,000 was approved in the 1993 District levy. Funding for this project was provided through a District-wide *ad valorem* tax levy under the provisions of M.S. 103B.

Schedule

Maintenance of the basin was originally anticipated in 1989-90. Low creek flows in the late 1980s extended the maintenance interval to 1993. Semi-annual surveys are conducted to measure the volume of captured sediment.

TABLE 7-1

SUMMARY OF FUNDING OF CAPITAL IMPROVEMENT PROGRAM

	1991	1992	1993	1994	1995
Locke Lake Sediment Removal	--	--	--	588,100	--
Streambed and Bank Stabilization Program	30,000	30,000	30,000	30,000	30,000
Rice Creek Sedimentation Basin	--	--	80,000	--	--
TOTAL	30,000	30,000	110,000	618,100	30,000

SECTION 8

AMENDMENTS

AMENDMENT PROCEDURES

The Watershed Management Plan is intended to extend through the year 1995. The Watershed District must conduct a public hearing on all proposed plan amendments. Notice of public hearing on proposed plan amendments and a description of the amendments shall be published by the Watershed District in at least one legal newspaper in each county having territory within the watershed. Publication shall occur at least 10 days before the hearing. Notice of public hearing and a copy of the proposed plan amendments shall also be mailed at least 30 days before the hearing to all counties, SWCDs, towns, statutory and home rule charter cities having territory within the watershed, Metropolitan Council, MDNR, MPCA, MDH, and the Board of Water and Soil Resources (BWSR). At the hearing the Watershed District shall solicit comments on the proposed plan amendments.

Any person may submit a request to the BWSR not later than 10 days following the close of the hearing, asking that the proposed plan amendments be reviewed in accordance with the provisions of M.S. 103B.231, Subd. 7, 8, and 9. It shall be the responsibility of the Watershed District to make an announcement at the hearing that all persons, agencies, and other interested parties may make such request to the BWSR.

The Watershed District shall not adopt plan amendments before the BWSR either 1) approves the amendments or 2) decides that full review in accordance with the provisions of M.S. 103B is not necessary. If the BWSR has not made a decision regarding the proposed plan amendments within 45 days of the close of the hearing, unless the Watershed District agrees to a time extension, full review in accordance with the provisions of M.S. 103B.231, Subdivisions 7, 8, and 9 shall not be required and the proposed plan amendments shall be deemed approved. Before requiring full review, the BWSR shall attempt to resolve any disputed plan amendment issues through communication and negotiation.

FUTURE AMENDMENTS

A number of mandatory amendments are looming for metropolitan area watersheds. The brief description outlined below are provided to aid in the dissemination of these requirements and to stimulate dialogue prior to 1995. This list does not provide a

comprehensive summary of mandated revisions nor amendments being contemplated by the Board of Managers.

TABLE 8-1

FUTURE AMENDMENTS TO THE RCWD MANAGEMENT PLAN

Approximate Year	Sponsoring Agency	Description
1994	BWSR	The Watershed is mandated to identify high priority regions for wetland preservation, enhancement, restoration, and establishment per Article 2 of the Wetland Conservation Act.
1994	RCWD	Addition of Centerville/Peltier construction projects to the Capital Improvements Plan. District is currently awaiting final review of the feasibility study by the MPCA.
1995	Metropolitan Council/BWSR	The Council is preparing a metropolitan area water plan which recommends target pollution loads for watersheds in the metropolitan area. The Council's final report is expected in December 1994. The BWSR will receive the Council's recommendation and determine the actual performance standards for each watershed, presumably in 1995.
1995	BWSR	The Metropolitan Local Water Planning Rules approved by the BWSR become effective January 1, 1995 (MR 8410).
1995	EPA/MPCA	NPDES permitting for stormwater discharges will be affecting several of the larger communities within the District. District assistance for the cities or a District-wide permitting approach will need to be considered by the Managers.

TABLE 8-1

FUTURE AMENDMENTS TO THE
RCWD MANAGEMENT PLAN
(Continued)

Approximate Year	Sponsoring Agency	Description
1996	RCWD	Substantial revisions begun in 1995 will be approved by the District. These revisions will comply with local planning rules of the BWSR. Funding of sedimentation basin maintenance at Long Lake and Locke Lake (proposed) will be determined.