

STATE OF MINNESOTA

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REMARKS/MESSAGES

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***A COMMITMENT TO IMPROVED LAND AND WATER RESOURCE  
MANAGEMENT IN THE PHALEN CHAIN OF LAKES WATERSHED:  
A SEVEN-POINT ACTION PLAN***

*Adopted April 7, 1994*

**Whereas**, during the past 150 years, the landscape of the Phalen Chain of Lakes Watershed has been transformed by cultivation and urbanization, causing degradation of water quality and habitat; and,

**Whereas**, The Phalen Watershed Project was initiated by local and state organizations and funded by the McKnight Foundation to develop a comprehensive, long-range plan for improved management of land and water resources in the watershed; and

**Whereas**, the Phalen Watershed Project Steering Committee places a high value on the protection and enhancement of natural resources for the benefit of residents and communities in the watershed, and has created a blue-print for future management of land and water resources, entitled "A Seven Point Action Plan to Manage the Phalen Chain of Lakes Watershed" (herein referred to as the Plan); and

**Whereas**, the Plan sets forth specific watershed goals, and outlines implementation strategies to achieve these goals during the next 50 years through a partnership among citizens, local governments, businesses, organizations and local, state and federal agencies; and through the establishment and support of a Watershed Natural Resources Board to promote and coordinate implementation of the plan:

**Now Therefore Be It Resolved** that the Phalen Chain of Lakes Watershed Project Steering Committee affirm their commitment to improved land and water resources in the Phalen Chain of Lakes Watershed through the pursuit of the goals and types of strategies contained in this plan.

## ACKNOWLEDGEMENTS

This plan was completed by a Steering Committee including representatives of local governments, businesses, organizations, and citizens in the Phalen Chain of Lakes Watershed.

Assistance to the Steering Committee was provided by an Interagency Technical Team, including representatives of local governments and state and federal natural resources management agencies working in the watershed.

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Hal Norgard	Ramsey County Board of Commissioners (alt.)
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Bob Pederson	Little Canada City Council
Richard Kuster	North St. Paul Planning Commission
Glenda Mooney	White Bear Lake Planning Commission
Sue Wolsfeld	White Bear Lake Planning Commission
Dennis Carson	Suburban Chamber of Commerce and Little Canada Planning Commission
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Sherry Buss

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## **PREFACE**

### **PROJECT HISTORY**

The Phalen Chain of Lakes Comprehensive Watershed Project is a partnership among local governments, citizens, businesses, and state and federal natural resource management agencies. The goal of the project is to demonstrate that a variety of interests can work together to manage development in an urban watershed while recognizing and protecting natural resources.

The project was funded by the McKnight Foundation, with contributions from project partners including the Ramsey-Washington Metro Watershed District, Minnesota Department of Natural Resources, University of Minnesota-Department of Landscape Architecture, and local governments.

This plan is the first product of the Watershed Project. The plan sets seven goals for management of natural resources in the watershed, and includes recommendations and actions steps for achieving these goals. A key goal is the establishment of an ongoing Natural Resources Board for the watershed, to advocate and coordinate plan implementation, and to continue to identify, examine and make recommendations to local communities on natural resources issues affecting communities and citizens in the watershed.

The Phalen Chain of Lakes Watershed Project is one of several pilot Comprehensive Watershed Management Projects initiated by the Minnesota DNR with local partners. These projects work on a watershed basis to plan and manage natural resources based on the following principles:

### ***A COMPREHENSIVE ECOSYSTEM BASIS FOR PLANNING***

The project addresses resource issues from an ecosystem perspective. Project analysis and recommendations integrate recommendations for ground and surface waters, fish, wildlife, forest resources, recreation and land use on a comprehensive, watershed basis.

### ***CITIZEN PARTICIPATION***

The success of the planning effort is grounded in participation by local governments and citizens. The plan is based on a long-range vision for natural resources in the watershed developed by local representatives. The goals and recommendations in the plan were developed to achieve this vision.

### ***PARTNERSHIPS***

All state and federal resource agencies with land and water resource management responsibilities, as well as local governments, private organizations and citizens are invited to participate in the planning process and in implementation of the plan.

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## *LONG-RANGE VIEW*

Development in the watershed and changes in natural resources have occurred over 150 years. Resource problems will not be solved overnight. The watershed planning process uses a 50-year horizon for developing a vision for natural resources in the watershed. The plan includes both short-term and long-term recommendations for achieving this vision.

### **THE PHALEN CHAIN OF LAKES WATERSHED PLANNING PROCESS**

The Ramsey-Washington Metro Watershed District received funding from the McKnight Foundation in January, 1993 for the watershed project. Project staff met with City Councils, Planning Commissions, business and environmental organizations and other groups in the watershed in early 1993 to describe the watershed project and request participation and representation on the project steering and technical committees.

The Steering Committee began meeting in May, 1993, and met monthly through April, 1994. Local "experts" spoke at the first four meetings to provide background to the Steering Committee on conditions and issues in natural resources in the watershed. Presentations included: pre-settlement conditions, settlement history, affects of settlement on natural resources, conditions and issues in surface waters, ground water, fish, wildlife and forest resources, and a summary presentation relating land use, human activities and natural resources in the watershed.

With this background, the Steering Committee next developed its vision for natural resource conditions in the watershed in fifty years. This vision statement was used to guide the development of goals, recommendations and action steps during the last five steering committee meetings. The plan was approved at the Steering Committee's April, 1994 meeting.

The Interagency Technical Committee also met approximately monthly during the planning process. The committee helped to develop information for the Steering Committee, and provided comments, suggestions, and other technical assistance to the Steering Committee and project staff in developing the plan and implementation projects.

Steering Committee members individually endorsed the plan and will ask local governments, organizations and natural resources management agencies to endorse the plan, and cooperate in its implementation. The Steering Committee, Natural Resources Board, Watershed Project Partners and staff will work together to implement the plan recommendations with all organizations and individuals involved in natural resources management in the watershed.

The plan and its implementation are a significant beginning to manage development, redevelopment and individual decisions about land and water management in the watershed, to accommodate growth while recognizing and protecting sensitive natural resources.

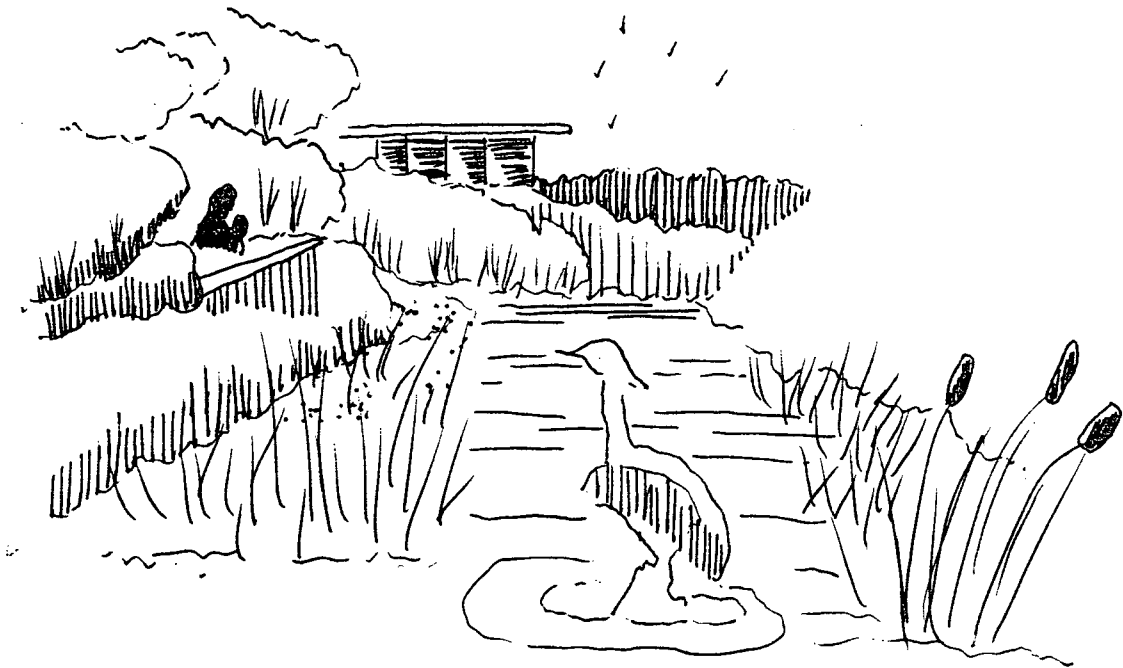
The plan recognizes that natural resources provide a variety of services for watershed residents, such as flood control, stormwater cleaning, drinking water, energy savings, and recreational opportunities. It recognizes that appropriate protection, restoration and management of natural resources can improve these functions, and meet multiple objectives. Finally, the plan recognizes that the natural resources of the watershed are important ecological, economic, aesthetic and recreational assets for local communities and citizens, and are a critical consideration as communities make decisions about land use, development, and land management.

## PLAN CONTENTS

Chapter One of this plan is an executive summary of the goals and action recommendations adopted by the Steering Committee. Chapter Two provides some background information on the Phalen Chain of Lakes Watershed, and discusses the relationship of this plan to other plans and implementation.

Chapter Three includes the long-range vision for natural resources in the watershed developed by the Project Steering Committee and is followed by the complete body of goals and action recommendations developed by the Steering Committee.

The Appendices include a variety of information, data and maps describing natural resource conditions and land use in the watershed.



## ***SEVEN POINT ACTION PLAN SUMMARY***



# A SEVEN-POINT ACTION PLAN TO MANAGE THE NATURAL RESOURCES OF THE PHALEN CHAIN OF LAKES WATERSHED – SUMMARY

## GOAL 1

### IMPROVE, RESTORE AND PROTECT SURFACE WATER QUALITY

**Improve, restore and protect the quality of water in area lakes, wetlands and creeks to ensure compatible uses desired by area residents and maintain a healthy environment.**

- ❑ *Urban Stormwater Detention and Infiltration* — Complete demonstration projects that test methods to hold and infiltrate stormwater on site in urban neighborhoods. Advocate that cities adopt successful methods in developing and redeveloping neighborhoods to reduce stormwater flows to lakes, creeks and wetlands.
- ❑ *Stormwater Cleaning* — Improve existing ponds, marshes and filter systems and add filter basins in developing and redeveloping areas on a regional basis to improve storm water quality before it enters lakes and high-quality wetlands.
- ❑ *Reduce pollutant and sediment loads* — Change yard and street management practices and reduce impervious surfaces to reduce sediments and associated pollutants in surface runoff.
- ❑ *Land Use Management* — Identify, evaluate and recommend appropriate land use controls to protect water and natural resource quality.
- ❑ *Control trash and debris* — Encourage residents to control trash, waste and pollutants entering surface waters through public education and by encouraging voluntary clean up events that benefit local lakes, creeks and wetlands.
- ❑ *Water Quality Monitoring* — Establish a long-term water quality monitoring program for water bodies that includes chemical, biological and user-perception criteria.
- ❑ *Study and Recommend a Mechanism to Fund and Implement Stormwater Programs* — establish a local mechanism, such as a stormwater utility, to finance improvements needed to protect water quality, coordinate public information and education activities, and water quality monitoring.

## GOAL 2

### RESTORE, ENHANCE AND PROTECT WETLANDS AND COUNTRY DITCHES (CREEKS)

**Improve, restore and protect wetlands and creeks on a watershed basis to maintain water quality, provide fish and wildlife habitat, and maintain the health and diversity of natural resources in the watershed.**

- ❑ *Watershed Wetlands Plan* — Complete a watershed-wide wetlands plan that assesses the functions and values of wetlands and develops a plan for protection, management, restoration, and mitigation based on these values.
- ❑ *Wetlands Protection* — Protect high value wetlands and associated unique resources through purchase of wetlands and easements.
- ❑ *Phalen Wetland Park* — Support the re-creation of wetlands on the former Ames Lake/Phalen Shopping Center site and connection of the wetlands to Phalen Regional Park and Lake.
- ❑ *Wetland Buffers* — Establish and maintain vegetated buffers around wetlands based on their functions and values.
- ❑ *Creek Enhancement* — Name or rename the creeks (“county ditches”) in the watershed. Enhance and restore creeks and riparian areas to improve water quality, habitat, and recreation.

## GOAL 3

### PROTECT THE GROUND WATER RESOURCES OF THE WATERSHED

**Manage land use in the watershed to protect ground water resources and local drinking water supplies.**

- ❑ *County Ground Water Plan* — Encourage local governments to support, adopt and enforce the county ground water plan (draft available March, 1994) and participate in inter-community and inter-county efforts to protect critical ground water areas.
- ❑ *Inventory Potential Sources of Ground Water Contamination* — Conduct a comprehensive inventory of land use activities that may represent a potential harm to ground water resources and drinking water supplies. Adopt appropriate local regulatory and non-regulatory actions to ensure existing and future sources do not contaminate ground water resources.
- ❑ *Well Inventories and Sealing* — Complete inventories of local wells and seal abandoned wells, with a priority in critical ground water areas.
- ❑ *Wellhead Protection* — Develop wellhead protection programs based on state rules and the county ground water plan, including delineation of wellhead protection areas and development of management plans to prevent contamination of wells.

- ❑ *Citizen Awareness and Action* — Increase citizen awareness of abandoned wells and groundwater issues, promote existing well-sealing programs, and develop incentives to seal abandoned wells. Promote ground water education concerning aquifers, water supplies, ground water quality protection, and land use management to schools, citizens, local officials, and operators of potential contamination sources.
- ❑ *Ground Water Quality Monitoring* — Perform annual ground water quality monitoring in key areas and on major wells.

## **GOAL 4**

### **DEVELOP AND SUPPORT A CONNECTED SYSTEM OF "GREEN CORRIDORS"**

**Develop a corridor system that links the wetlands, creeks, lakes, parks and natural areas of the watershed to protect water resources, enhance fish and wildlife habitat, improve the health and diversity of natural resources in the watershed, and provide recreation and natural resources education opportunities, where appropriate, for area residents.**

- ❑ *Develop open space and corridor plans* — inventory and identify key natural resources, open spaces and connecting corridors in the watershed, and develop a plan for a system of "green corridors" that links and supports the health and diversity of natural resources and systems. Complete management plans for open space and corridor units.
- ❑ *Acquire areas needed to complete corridor connections or protect unique resources* — Explore and recommend options among local communities, the county and others for planning, ownership and management of the corridor system, such as joint powers agreements.
- ❑ *Complete management activities to enhance water resources, fish and wildlife habitat and recreational opportunities in the corridor system* — implement reforestation plans, wetland restoration, native plant community restoration, creek restoration, trail development, etc., to enhance the corridor system.
- ❑ *Enhance the fishery and fishing opportunities in the watershed* — implement wetland and creek restoration projects, restore native shoreline vegetation, and at the same time provide additional designated shoreline fishing area improvements that allow access but preserve native shoreline vegetation on area lakes.

## GOAL 5

### RESTORE AND EXPAND FOREST COVER AND DIVERSE NATIVE VEGETATION

**Restore and expand the urban forest and diversify plant communities to protect water quality, enhance fish and wildlife habitat, protect shorelines and wetlands, enhance energy conservation and recreation opportunities, and increase natural biological diversity throughout the watershed.**

- ❑ *Revegetate Shoreline Areas* — Complete revegetation of shoreline areas in selected locations with native, unmown vegetation.
- ❑ *Urban Forest Protection* — Reduce the loss of forest associated with new development and other activities through implementation of local tree conservation ordinances.
- ❑ *Urban Forest Enhancement* — Take full advantage of existing local, state, federal and private resources to enhance the urban forest in the watershed.
- ❑ *Natural Community and Native Plants Restoration and Enhancement* — Restore, enhance and protect native plant communities in upland woods and grassland areas as well as wetlands, and increase natural diversity in plantings and community types on public and private lands in the watershed.

## GOAL 6

### INCREASE PUBLIC INVOLVEMENT

**Increase public awareness and involvement in improving water quality and natural resources in the watershed, and increase citizen understanding of the effects that management of individual yards, public and private lands, streets, and infrastructure have on natural resource quality.**

- ❑ *Watershed Outreach and Education* — Raise the awareness of local officials, citizens, corporations and businesses through environmental education that illustrates the ways their decisions and management practices affect the quality of swimming, fishing, and other land and water resource quality in the watershed.
- ❑ *“Model” Residential Development* — work with builders and developers and their professional associations to develop a “model” residence or subdivision as a showcase that illustrates development and yard management practices that benefit water and natural resources, and helps to educate building professionals and citizens on alternatives to current practices.
- ❑ *Watershed Stewardship Demonstration Projects* — Provide watershed citizens, corporate volunteers and other interested persons with hands-on opportunities to participate in landscape management, restoration and monitoring activities that benefit natural resources in the watershed.

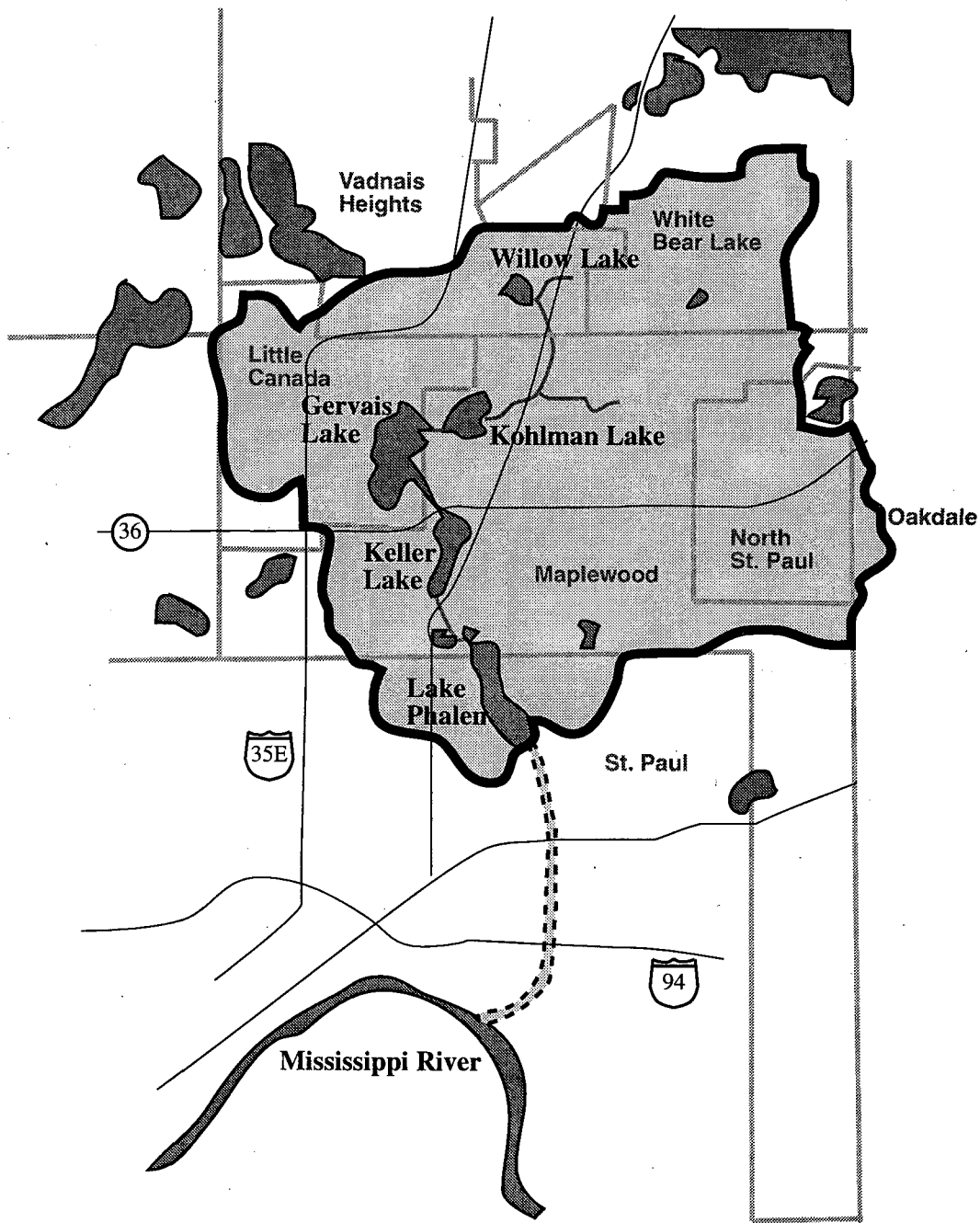
- *Public School Programs* — Work with K-12 environmental education programs, adult education programs and the University of Minnesota to link information about the watershed and its resources to environmental education efforts, and include hands-on participation in watershed resource monitoring, field work, research and restoration activities.

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**GOAL 7****IMPLEMENT THE  
WATERSHED  
NATURAL RESOURCES  
PLAN****Establish a local watershed natural resources advisory board with representatives from the local governments, citizens, businesses and other interests in the watershed to promote, coordinate and monitor implementation of this natural resources plan.**

- *Watershed Natural Resources Board* — the Phalen Watershed Project Steering committee should establish an ongoing local Watershed Natural Resources Board to ensure implementation of the Watershed Plan. The Board should work with local governments, businesses, citizens, and natural resources agencies to identify and consider natural resources issues in the watershed and recommend actions or solutions, initiate and fund demonstration projects, coordinate information and education for citizens and local officials on natural resources in the watershed, and provide other advice and assistance as needed to meet the natural resources goals identified in the Watershed Plan.

The Natural Resources Board should be provided appropriate support staff and resources to carry out its mission.



## INTRODUCTION – THE WATERSHED AREA

## INTRODUCTION – THE WATERSHED AREA

### THE PHALEN CHAIN OF LAKES WATERSHED

The Phalen Chain of Lakes Watershed covers about 23 square miles (14,734 acres). It includes five major lakes—Kohlman, Gervais, Keller, Round and Phalen. The lakes are like a string of beads, following the ancient bed of the pre-glacial St. Croix River. The total water surface area of these lakes is approximately 700 acres.

Beginning in the upper watershed, water flows through a series of county ditches and large wetlands into Kohlman, Gervais, Spoon, Keller, and Round Lakes and ultimately into Lake Phalen, which is the outlet for the watershed. From this outlet, water flows into the Middle Beltline Sewer and finally into the Mississippi River.

The watershed includes approximately 950 acres of wetlands (6.43% of the watershed). Lakes, streams and wetlands cover about 11% of the watershed area.

Most of the watershed is located in Ramsey County, with a small portion in Washington County. It includes all or large portions of the cities of Little Canada, Maplewood, and North St. Paul, and smaller portions of Oakdale, St. Paul, Vadnais Heights and White Bear Lake. The population of the area is approximately 52,500.

The lakes and surrounding park lands are unique and heavily-used recreational resources for local residents and the entire eastern Twin Cities Metro Area. Lake Phalen and Lake Gervais feature heavily used public swimming beaches. These lakes and Keller Lake are also excellent fishing lakes, and average several times the fishing pressure of lakes in the Metro area. The Chain of Lakes and parks provide important areas for walking, biking, skiing, picnicking, and other recreation.

The Phalen Chain of Lakes Watershed lies within a major flyway for migrating waterfowl and songbirds, and provides significant habitat for other birds and wildlife in an urban setting. The large wetland complexes in northern Ramsey County, including the watershed area, are among the major mallard duck reproduction areas in the United States. At least one Minnesota Threatened Species, the Blandings Turtle, has been found within the watershed, as well as a plant species of special concern, False White Indigo (*Baptisia leucophaea*).

Before settlement by Europeans began in the 1840's, the watershed consisted largely of rolling oak savanna and oak groves interspersed by prairie openings. Lakes and wetlands dotted low areas. Fires that occurred naturally or were started by native peoples maintained the open savanna landscape.

Since about 1850, the watershed has undergone substantial urbanization, and will continue to do so. Continuing development presents significant potential for drainage and water quality problems,

as well as continuing fragmentation and loss of bird and wildlife habitat, urban forest resources, open space, and recreation.

By presenting a vision, goals and action recommendations for the Phalen Chain of Lakes Watershed, this plan provides a framework for natural resource protection and urban development. By protecting, restoring and managing natural resources, and by planning and implementing development more carefully, the implementation of this plan can provide a model for better integrating the natural and urban worlds.

**As the plan is implemented, the watershed will be a better place to live, work, visit, recreate and travel through. Wetland protection and enhancement can serve public works functions like flood control and stormwater cleaning. Animals and remnant natural communities can survive and benefit from better habitat and connections. People will enjoy walking, biking, canoeing, swimming and fishing in local parks and along "green corridors" recommended in the plan. Local communities can take pride in high-quality natural resources that provide important public services and link current residents and future generations with each other and the natural world.**

[Additional information about natural resource conditions and settlement of the watershed are included in the Appendices to this plan.]

## **RELATIONSHIP TO OTHER PLANS AND POLICIES**

The Phalen Chain of Lakes Watershed Natural Resources Plan is an advisory document to local governments, state and federal agencies, and local citizens and businesses.

Cities may use the plan and natural resources information to:

1. Administer city programs and services affecting the area.
2. Provide information and education to city residents on wise management of yards and other properties, and the effects of individual land management decisions on watershed resources.
3. Review city regulations or ordinances and develop new regulations on a city or watershed-wide basis.
4. Incorporate portions of the plan in city comprehensive plans or other plan documents, and develop natural resources elements in local comprehensive plans.
5. Coordinate with other governments and groups through the Natural Resources Board created to implement the plan.
6. Develop lobbying priorities for changes in state law or federal programs and in seeking funding for demonstration projects or other activities to implement the plan.
7. Develop specific zoning districts, ordinances or other measures to implement the plan.
8. Include funding for acquisition, restoration, operation and main-



tenance of the “green corridors” system in city Capital Budget programs or annual city budgets.

9. Respond to development proposals within the area.
10. Guide development and maintenance of city-owned parks, infrastructure and other property.

Ramsey County may use the Plan and information to:

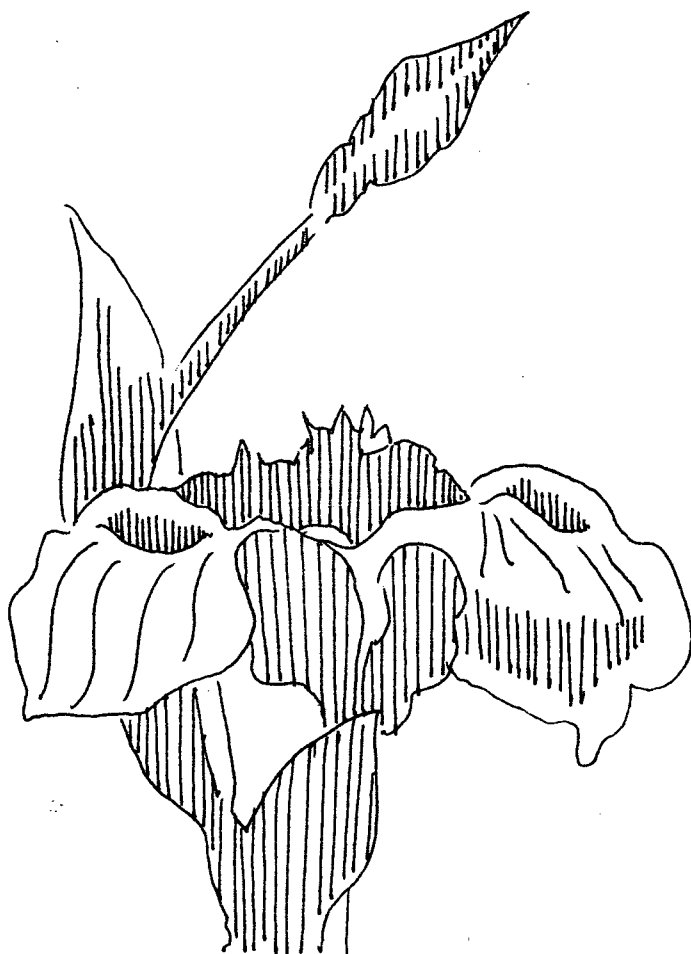
1. Administer County programs and services that impact the watershed.
2. Educate County residents about natural resources issues and land and yard management practices that can benefit natural resources.
3. Review County regulations or ordinances identified in the plan, and develop new regulations if needed.
4. Coordinate with other governments and groups through the Natural Resources Board created to implement the plan.
5. Develop lobbying positions for changes in state and federal law or programs and in seeking funding for plan implementation.
6. Include funding for planning, acquisition, restoration, operation and maintenance of the “green corridors” system in the County’s Capital Budget programs or annual budget.
7. Respond to development proposals within the area.
8. Guide development and maintenance of county-owned parks, infrastructure and other property.

State and federal agencies may use the plan to:

1. Make funding decisions and establish funding priorities.
2. Coordinate with other groups to make decisions about further wetlands, water quality, and natural resources management and research.
3. Coordinate with other governments and groups through the Natural Resources Board created to implement the plan.
4. Guide technical assistance and other activities and projects consistent with and complementary to the mutually developed and agreed upon plan.
5. Guide development of state and federal lands and infrastructure in the watershed.

Watershed residents, businesses, and others may use the plan to:

1. Increase understanding of natural resources issues in the watershed, and understand how management of each property may affect the quality and quantity of watershed resources.
2. Develop and manage yards and other properties to benefit natural resource quality in the watershed.
3. Initiate projects, demonstrations, and activities that affect the natural and developed systems of the watershed.



***VISION FOR NATURAL RESOURCES IN THE WATERSHED***

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## ***STEERING COMMITTEE VISION FOR NATURAL RESOURCES IN THE WATERSHED IN 2043 A.D.***

[The Phalen Watershed Project Steering Committee developed this vision for the future of the watershed at their October, 1993 meeting.]

In 1994, a dedicated and visionary group of watershed residents completed the Phalen Watershed Natural Resources plan. Since then, the plan has been implemented with the cooperation of city governments, Ramsey County, local businesses, citizens, and state and federal agencies.

### ***LAKES, WETLANDS, AND STREAMS***

The Phalen Chain of Lakes are known throughout the Metropolitan Area for their high quality and clarity. Through the efforts of local citizens and governments, the quality of the lakes has steadily improved since the Phalen Watershed Natural Resources Plan was implemented in 1994. Algal blooms no longer affect the quality of fishing and swimming in the major lakes, and the quality of smaller lakes in the watershed is improving as well.

The condition of wetlands and creeks in the watershed has also improved since the 1990's. Key wetland complexes in the watershed have been protected, expanded and made more biologically diverse. Wetlands and associated storm water ponds help to filter nutrients and sediments before they enter lakes, and provide sufficient water storage to prevent flooding. The creeks in the watershed (once called "county ditches") have been restored and renamed, and help to clean water, as well as provide fish and wildlife habitat and recreation opportunities for watershed residents.

Changes in land use and management have been the largest contributor to improved water quality in the area's lakes, wetlands and streams. For example, residents who live near these resources no longer mow their lawns to the edge, but instead have encouraged or planted native grasses, cattails, and colorful wildflowers as buffers to filter runoff and protect shorelines from erosion. Speed reductions or elimination of motorized boat traffic on some area lakes have also reduced shoreline erosion and threat of invasion from exotic species.

### ***RESIDENTIAL AREAS***

Residents throughout the watershed now view the watershed as a whole working natural system, and understand that the way they manage their own yards affects the natural systems throughout the watershed. Most yards now devote 25 to 50 percent of their area to shrubs, hedges, trees, vegetable and flower gardens, native grasses

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and wildflowers or ponds. With these changes, residents have noted improved water quality as well as a dramatic increase in the numbers and variety of birds, butterflies, and other animals that visit or live in the area.

Fruiting hedges rather than fences define many yards. In some neighborhoods, residents have opened their yards into common areas, and adopted cooperative plans that increase planting diversity and bird and wildlife habitat. Residents have discontinued application of nutrients and harmful pesticides and herbicides to lawns.

The area is particularly noted for its quiet. Ambient noise levels in residential neighborhoods are more like rural than urban areas. The main sounds at night are birds, crickets and the rustle of leaves.

### ***PARKS, TRAILS AND GOLF COURSES***

The watershed is now knit together with a system of green corridors that link the wetlands, creeks, lakes, natural areas, parks and commercial and residential areas. An extensive system of walking and biking trails was built through some corridors. The corridors provide for wildlife movement, human recreation, and commuting opportunities for watershed residents and workers. The trails also help residents to see and understand the movement of water through the watershed and its connections to other natural resources.

Walking and biking are regular activities for most residents, who enjoy viewing the variety of birds, wildlife, and landscapes in the Watershed. Everyone in the watershed lives within a half mile of a recreational trail, which is linked to other trails, providing miles of recreational opportunities and encourage commuting by bicycle. Light-rail transit lines also follow some trails, and many residents prefer using light rail or bikes for travel to work and shopping. Dependence on the automobile for commuting and recreation has dropped among watershed residents.

Parks and golf courses have also adopted changes in landscape management. Riprap and mown edges on lake shoreland are rare—most areas have a thick buffer of wetland plants, grasses and flowers. Native plants and natural materials such as rocks are heavily used in park designs. Many mown areas have been converted to longer grasses and flower meadows in portions of parks that are not regularly used for games or picnics. Mown edges, fences, and a generous use of wildflowers maintain a neat and attractive appearance in these “naturalized” areas.

Golf courses have used similar planting and management strategies in “rough” areas. Golfers appreciate the larger number of courses and interesting challenges offered by the “naturalized” courses in the area. In several parks and golf courses, oak savanna is being restored.

## ***WILDLIFE AND FISH***

The variety of birds and wildlife in the scattered woodlands, wetlands and open spaces in the watershed has been increasing as these areas have become part of a linked system, plantings have been diversified, and natural areas restored. Shorebirds, waterfowl, and songbirds are particularly abundant. Bluebirds have returned to the restored oak savanna areas. Schools have built and monitor bluebird boxes, with the help of parents and children. Peregrine falcons, long absent, have also returned to the watershed.

The changes in shoreland and vegetation management and improvements in water quality have improved fishing opportunities, despite increasing use by St. Paul area residents.

These changes have also reduced problems with exotic species in lakes and wetlands in the watershed, by reducing disturbance and opportunities for exotics to spread.

## ***COMMERCIAL AREAS***

Changes in commercial areas and corporate properties in the watershed have been among the most dramatic. Cities in the area have adopted tighter controls on proportions of impervious surfaces in commercial areas, and include incentives for green spaces and ponds that connect to parks, trails and wetlands in the watershed. The views from some commercial areas across wetlands and parks are spectacular, and developments such as Maplewood Mall are no longer just a "sea of asphalt." Storm waters from these areas are managed through systems of ponds that filter nutrients, sediments and pollutants before entering the major wetlands and lakes of the watershed.

In addition to offering incentives to developers to maintain natural resource quality in residential and commercial areas, cities have adopted other innovative strategies, including more effective street cleaning methods that reduce loads of phosphorus and pollutants entering storm sewers. Leaves and grass clippings are composted and reused by local residents. Commercial and housing developments use dry wells, detention ponds and other strategies to capture stormwater runoff from buildings and hold and infiltrate it on-site.

## ***URBAN FOREST***

City plans and policies protect and enhance the urban forest, and particularly encourage the planting of native trees such as oaks. Cities encourage the planting of shrubs and trees that contribute to wildlife habitat and energy conservation on public and private properties. Through the cooperation of cities and their residents, most residential streets have a leafy canopy, and diverse plantings throughout the watershed guarantee a healthy landscape that can respond to disease and change.

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## ***DEVELOPMENT AND REDEVELOPMENT***

Local governments have established a variety of incentives and adopted ordinances to control development and manage its effects on the natural resources of the watershed. In addition to controlling the amount of impervious surface, developers are encouraged to build more densely, and dedicate more area for open space. Several neighborhoods in the southern portions of the watershed are being redeveloped, with homes more frequently clustered, leaving more parks and garden areas for residents.

The Ames Lake wetland was re-created on the Phalen Shopping Center site by 2010, and the area redeveloped. The wetland and its surrounding area have served as a model for the watershed and the nation in how commercial areas can benefit from ties to natural areas, and how to develop urban areas to maintain resource quality.

## ***EDUCATION***

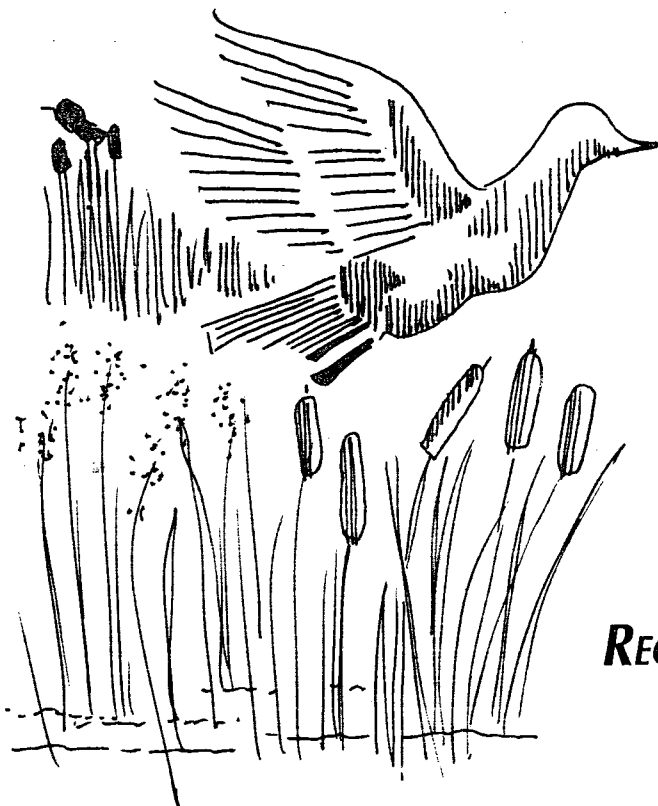
Cities and school districts in the watershed are actively involved in educating adult residents and children about natural resource issues. The landscape of the watershed itself is used to communicate about the value of wetlands, lakes, streams, woodlands, and other resources. Schools use the watershed park and corridor system to teach children to identify flora and fauna, and how natural systems work. Schools also use a variety of innovative methods such as environmental simulations to teach students about the interactions among people and resources in the watershed.

The Northeast Metro Environmental Education Center teaches stewardship, preserves and presents cultural and natural resource history information, and offers demonstration areas for homeowners to learn the latest techniques in landscaping and yard maintenance. It also sponsors an active education program for local government officials and staff on natural resource issues and management.

The local media play an active role in educating and maintaining a high awareness of human activities and resource concerns in the watershed.

## ***AND FINALLY . . .***

Residents of the watershed are extremely proud of the place where they live, and of their own efforts to achieve the vision developed 50 years ago.



## **RECOMMENDED ACTIONS**

## RECOMMENDED ACTIONS

These recommendations detail the Steering Committee's action ideas for meeting the goals identified in this plan for land and water resource management in the watershed. Each recommendation identifies the major organization(s) responsible for implementing the recommendation.

The **Natural Resources Board** identified in Goal 7 will have primary responsibility for advocating and coordinating the implementation of these recommendations

### recommended actions

## Goal 1

### IMPROVE, RESTORE AND PROTECT SURFACE WATER QUALITY

**Improve, restore and protect the quality of water in area lakes, wetlands and creeks to ensure compatible uses desired by area residents and maintain a healthy environment.**

#### *URBAN STORMWATER DETENTION AND INFILTRATION*

- ❑ The City of Maplewood, Ramsey-Washington Metro Watershed District and other partners should complete a stormwater demonstration project with LCMR or other funding in a selected Maplewood neighborhood. The project should test a variety of methods to detain and infiltrate stormwater on-site, monitor results, and assess their applicability to developing and redeveloping neighborhoods in the watershed.
- ❑ Based on successful demonstration project results, the demonstration project partners should encourage cities in the watershed to adopt land use and subdivision regulations that require new developments or redeveloping neighborhoods to hold and infiltrate stormwater generated within the development under normal conditions, and prevent its flow into surface waters in the watershed.
- ❑ The Ramsey-Washington Metro Watershed District, cities and others should research and test methods to hold and infiltrate stormwater close to its source, so that these methods may be adopted to reduce the flow of stormwater and associated sediments and nutrients causing declines in surface water quality in the watershed.

#### *STORMWATER CLEANING*

- ❑ The Ramsey-Washington Metro Watershed District should complete its wetlands plan for the watershed, and identify priorities for wetland protection, modification, and mitigation to improve stormwater quality.



- ❑ Local governments should require site plans for new residential and commercial developments and redevelopment projects that ensure that stormwater from these areas does not cause declines in surface water quality in the watershed.

Site plans should provide for stormwater basins, grassed swales, protection of upland vegetation and other appropriate management practices, ensuring that these developments are consistent with the recommendations of the watershed plan.

### ***REDUCE POLLUTANT AND SEDIMENT LOADS***

- ❑ Cities and the Watershed District should encourage lawn care practices that eliminate the use of unnecessary phosphorus in fertilizers, encourage alternative ground covers that reduce runoff and the need for fertilizers, and promote proper disposal and composting of yard wastes.
- ❑ Cities in the watershed should develop a uniform fertilizer and pesticide ordinance, that considers the actual need for nutrient (phosphorus) application.

The ordinance should consider provisions that discourage phosphorus application in the watershed, such as signage in local retail fertilizer outlets that informs consumers that \$—,— in tax dollars were spent to remove phosphorus from surface waters in the watershed during the past year, and that additional phosphorus is not needed in local yards for healthy plant growth.

- ❑ Cities and the Watershed District should educate citizens, local governments and agencies on the importance of other yard management practices in maintaining surface water quality in the watershed—for example, fertilizer application on streets and driveways, leaves and other organic matter on streets and surfaces, and the influence of individual yards on watershed resources.
- ❑ County and city parks and public works departments and school districts should take the lead in modeling environmentally healthy landscape practices on parks, golf courses, athletic fields and other public open spaces, and increase citizen awareness of these practices.
- ❑ The Watershed Natural Resources Board, Watershed District and Cities should evaluate the benefits and costs of a combination vacuum- and brush-sweeping program for streets in the watershed, and recommend needed changes in sand application, sweeping strategies, or other street maintenance strategies to reduce sediments and pollutants in street runoff.

## *LAND AND WATER USE MANAGEMENT*

- During the next two years, the Watershed Natural Resources Board should work with cities, agencies, developers and citizens to evaluate and recommend land use controls that address the goals of this plan.

These strategies may include:

- reductions in proportions of impervious surface in residential and commercial areas to reduce stormwater runoff,
- use of clustering and Planned Unit Development designs that protect forest and habitat resources,
- establishment of Natural Resources zoning class to protect unique resources,
- density limitations to protect sensitive areas, etc.

Recommendations should be available to cities by December, 1995.

- Ramsey County, local cities and the DNR should convene discussions regarding regulation of boating speeds allowed in watershed lakes and channels where needed to reduce shoreline erosion and maintain native aquatic vegetation that protects shorelines.

## *CONTROL TRASH AND DEBRIS*

- The Watershed District and cities should work with local volunteer groups to stencil all storm drains in the watershed to indicate that they drain to \_\_ (name) \_\_ Lake, Wetland or Creek.
- Ramsey County the Watershed District and cities should educate watershed residents on problems created by disposal of oil and other pollutants through drains in the watershed, provide information to residents on proper disposal of household and business hazardous wastes and automobile wastes, increase opportunities to dispose of hazardous wastes, and support voluntary clean up events that benefit local lakes, wetlands and creeks.

Recycling businesses should be encouraged to leave notices of upcoming opportunities to dispose of hazardous wastes and facility locations in household recycling bins.

## *WATER QUALITY MONITORING*

- The Watershed District and Ramsey County should develop a system for monitoring water quality in lakes and surface waters, and communicate changes in water quality that affect recreational use and the health of biological communities to citizens, local governments and agencies.

- ❑ Area nature centers should work with local schools, Ramsey County, the Watershed District, lake associations and citizens to develop a coordinated water quality monitoring program for creeks, wetlands and lakes in the watershed.

### ***ESTABLISH A MECHANISM TO FUND STORMWATER PROGRAMS***

- ❑ The Watershed District and Cities should examine models for local stormwater utilities and other mechanisms for funding stormwater projects, and determine the need for such a utility or other mechanism(s) to finance stormwater management improvements, public education activities related to water quality, and water quality monitoring activities.

## ***recommended actions*** **Goal 2**

### **ENHANCE, RESTORE AND PROTECT WETLANDS AND COUNTY DITCHES (CREEKS)**

**Improve, restore and protect wetlands and creeks on a watershed basis to maintain water quality, provide fish and wildlife habitat, and maintain the health and diversity of natural resources in the watershed.**

#### ***WATERSHED WETLANDS PLAN***

- ❑ The Ramsey-Washington Metro Watershed District should work with the Minnesota DNR, PCA, U.S. Army Corps of Engineers, Board of Water and Soil Resources and others to complete a watershed wetlands plan. The plan should assess the functions and values of wetlands, evaluate restoration potentials, and develop a plan for wetland protection, restoration, management and mitigation. The natural diversity of wetlands in the watershed should be considered in developing the plan.

The Natural Resources Board and local governments should also be involved in the development of this plan to bring local community and citizen values for wetlands to the plan, and to educate local officials and citizens on the results of the plan and significance of wetlands in the watershed.

- ❑ Ramsey County and cities in the watershed should participate in development of the plan, in adoption of its recommendations, and in activities to implement the plan. Wetland inventories and plan results should be available in digitized and hard copy map formats for local governments to use in plans and development reviews.

#### ***WETLANDS PROTECTION***

- ❑ The Ramsey-Washington Metro Watershed District, Ramsey County, and local governments should adopt methods to permanently protect high-value wetlands in the watershed. These may include wetland purchase, easement purchase, land use regulations, and other methods that provide permanent protection.

- ❑ The Watershed Natural Resources Board and Cities should encourage appropriate management of wetlands and adjacent vegetation to protect wetland quality. The Board and Cities should identify owners of properties adjoining wetlands in the district and encourage appropriate management of wetlands and adjacent vegetation to protect water quality. This can be accomplished through hands-on demonstrations, informational materials, education programs and other support.

Residents should consider establishing neighborhood “Wetland Watch” groups to monitor wetland resources and management practices.

- ❑ Ramsey County and local communities should consider property tax credits or other incentives to encourage owners of properties adjoining wetlands to utilize management practices that protect wetland quality and function.

### ***PHALEN WETLAND PARK***

- ❑ The City of St. Paul should adopt and implement the plan to create the Phalen Wetland Park on the former Ames Lake/Phalen Shopping Center site, and connect the recreated wetlands to Phalen Regional Park and Lake.

The Wetland Park should include a strong education component that describes the roles of wetlands in stormwater cleaning and management and in providing fish and wildlife habitat.

- ❑ The Watershed Natural Resources Board, Watershed District and Natural Resources Agencies should work with the City of St. Paul to provide technical assistance in wetland design and restoration, and in assisting to secure funding for the wetlands restoration.

### ***WETLAND BUFFERS***

- ❑ As a part of the Watershed Wetland Plan, the Watershed District, Natural Resources Board and natural resources agencies should develop recommendations for delineation and maintenance of vegetated buffers based on wetland functions and values. The Watershed District and local governments should adopt and enforce these recommendations.
- ❑ The Watershed Project should provide information to wetland property owners on the significance of wetland buffers and appropriate maintenance strategies.

## *CREEK ENHANCEMENT*

- ❑ With participation by watershed residents, the Watershed District and Ramsey County should name or rename the county ditches in the watershed as creeks.
- ❑ The Watershed Project partners should work Ramsey County, local schools, private corporations and organizations and citizens to restore and enhance creeks and riparian areas to enhance water quality, fish and wildlife habitat and recreation opportunities.

### *recommended actions*

## **Goal 3**

### **PROTECT THE GROUND WATER RESOURCES OF THE WATERSHED**

### **Manage land use in the watershed to protect ground water resources and local drinking water supplies.**

#### *COUNTY GROUND WATER PLAN*

- ❑ Local governments (cities, Watershed District and Ramsey County) should support, adopt and enforce the county ground water plan.
- ❑ Local governments and citizens should encourage and support inter-governmental and inter-county planning efforts to identify and protect critical ground water recharge areas that cross political boundaries.

#### *INVENTORY POTENTIAL SOURCES OF GROUND WATER CONTAMINATION*

- ❑ The Ramsey Soil and Water Conservation District should actively work with cities to conduct a comprehensive inventory of all land use activities that may represent a potential harm to ground water resources and drinking water supplies.

Cities, the Watershed District, and Ramsey County should adopt appropriate local regulatory and non regulatory pollution prevention activities to ensure existing and future pollution sources do not contaminate ground water resources.

#### *WELL INVENTORIES AND SEALING*

- ❑ The Ramsey Soil and Water Conservation District should continue to inventory local wells. All local wells should be inventoried with a priority in critical ground water areas. The Ramsey SWCD should make well inventory maps available to local governments in the watershed.
- ❑ Ramsey County and the Watershed District should identify and evaluate incentives or regulations that could accelerate sealing abandoned wells, and their economic and resource benefits and problems. These might include tax credits or property tax reduc-

tions for sealing abandoned wells; requirements that wells be sealed to obtain building permits, combined with special assessments that spread the cost of well-sealing over several years; or partial grants to homeowners to seal abandoned wells.

- ❑ The Watershed Natural Resources Plan should include maps of critical ground water areas, wellhead protection areas, and existing well inventories. These maps will be provided to city planning and engineering departments and planning commissions, to encourage them to adopt and implement local wellhead protection plans and contaminant source management strategies.

### ***WELLHEAD PROTECTION***

- ❑ The Ramsey SWCD should work with public water suppliers (cities) to develop wellhead protection programs based on state rules and the recommendations outlined in the county ground water plan. The State Department of Health requires public water suppliers to delineate wellhead protection areas and develop management plans to prevent the contamination of well supplies.

### ***CITIZEN AWARENESS AND ACTION***

- ❑ The Watershed Project should work with cities to implement a citizen education project on abandoned wells and the importance of well-sealing in one or more cities in the watershed.
- ❑ Cities and the Ramsey SWCD should target education efforts to citizens in critical ground water protection areas, and use city newsletters, water bill mailings, informational meetings, or other strategies to provide information on ground water and well issues to citizens and promote the Watershed District's well-sealing program.

Promotion of ground water education should include information concerning aquifers, water supplies, ground water quality protection, and land use management to schools, citizens, local officials, and operators of potential contamination sources.

### ***GROUND WATER QUALITY MONITORING***

- ❑ The Ramsey SWCD should perform annual ground water quality studies for select areas and wells within the watershed, based on available funding and resources.

*recommended actions***Goal 4****DEVELOP AND  
SUPPORT A NETWORK  
OF "GREEN  
CORRIDORS"**

**Develop and support a network of "green corridors" that links wetlands, creeks, lakes, parks and natural areas of the watershed to protect water resources, enhance fish and wildlife habitat, improve the health and diversity of natural resources in the watershed, and provide compatible recreation and natural resources education opportunities for area residents.**

***DEVELOP OPEN SPACE AND CORRIDOR PLANS***

- The Ramsey County Parks Department, St. Paul Parks Department, and an interdisciplinary team from the Minnesota DNR Metro Region, should inventory and identify natural resources, remnant and sensitive natural communities, rare species habitats, open spaces and connecting corridors in the watershed. This inventory should be used to develop a plan for a system of "green corridors" in the Watershed and identify funding resources to implement the plan.

This plan should consider existing and potential connections to corridors and open space areas in adjacent communities and the Metropolitan Area.

Following completion of the plan, Ramsey County and St. Paul Parks and DNR staff should develop management plans and funding for park and open space units in this corridors system.

***ACQUIRE AREAS NEEDED TO COMPLETE CORRIDOR CONNECTIONS AND USE LOCAL ZONING DISTRICTS OR OTHER REGULATIONS TO PROTECT UNIQUE RESOURCES, AND PROVIDE CORRIDOR CONNECTIONS CLOSE TO ALL RESIDENTIAL AREAS IN THE WATERSHED.***

- Ramsey County, Minnesota DNR, cities, and private corporations and organizations in the Watershed should cooperate to use available resources to acquire or protect properties needed to complete connections and protect significant resources in the corridors system. This could include working with private landowners along corridors to obtain easements or encourage yard management practices that support corridor development.

***COMPLETE MANAGEMENT ACTIVITIES TO ENHANCE WATER RESOURCES, FISH AND WILDLIFE HABITAT AND RECREATIONAL OPPORTUNITIES IN THE CORRIDOR SYSTEM***

- Ramsey County and St. Paul Parks, Minnesota DNR, cities, and private corporations and organizations should work with local

citizens and other volunteers to implement projects for reforestation, wetland restoration, native plant community restoration, creek restoration, trail development, etc., to enhance the corridor system, and natural resources in the watershed.

### *recommended actions*

## **Goal 5**

### **RESTORE AND EXPAND FOREST COVER AND DIVERSE NATIVE VEGETATION**

**Restore and expand the urban forest and diversify plant communities to protect water quality, enhance fish and wildlife habitat, protect shorelines and wetlands, enhance energy conservation and recreation opportunities, and increase natural biological diversity throughout the watershed.**

#### ***REVEGETATE SHORELINE AREAS***

- ❑ City and county parks departments and other public land owners in the county should be leaders in adopting and implementing environmentally responsible land management practices, and in providing information to park and open spaces users about practices used.
- ❑ The Ramsey County and St. Paul Parks Departments should identify funding resources and implement demonstration projects to restore native shoreline vegetation in selected areas on Phalen and Keller Lakes, and other highly visible shorelines in local parks. These projects may be undertaken in cooperation with local volunteers, citizens, schools, or other groups in the watershed. These projects should include interpretative information for park and trail users that explains these activities.

These demonstrations should become models for restoration of shoreline vegetation on other lakes and wetlands, and promote their restoration, preservation and interpretation in the watershed.

- ❑ During the next decade, lake shorelines in the watershed should be returned as much as possible to native, unmown vegetation, including submergent, emergent and upland vegetation, to benefit fish and wildlife habitat, reduce erosion, manage goose populations, and demonstrate the look and function of natural vegetation to watershed residents.

#### ***URBAN FOREST PROTECTION AND ENHANCEMENT***

- ❑ The Watershed Natural Resources Board should work with cities, developers and builders, and resource agencies to:
  - inventory existing forest and vegetation resources in the watershed, and note diseases or other problems;
  - develop local tree conservation and natural resources ordinances to be adopted and enforced by cities in the watershed;
  - develop protection and planting strategies that protect native trees and communities and wildlife habitat



Inventories and strategies should be presented to city and county public works departments and their engineering and maintenance staffs.

- ❑ The Department of Natural Resources-Forestry Division should work with local governments in the watershed as requested to assist them in taking advantage of local, state, federal and private resources to enhance the urban forest in the watershed.
- ❑ Cities and the Department of Natural Resources-Forestry Division should provide information and assistance to local residents and organizations to enhance the urban forest and natural diversity of plant communities in the watershed.
- ❑ The Natural Resources Board should work with local governments and agencies to develop strategies for wood utilization such as mulch distribution to area residents.

### ***NATURAL COMMUNITY RESTORATION AND ENHANCEMENT***

- ❑ The Department of Natural Resources, Ramsey County and St. Paul Parks Departments, and private corporations and organizations should work together to identify remaining remnant native plant communities in the watershed, and identify areas where such communities can be restored.
- ❑ The DNR, Ramsey County and St. Paul Parks Departments, and private corporations and organizations should identify funding resources and complete projects to restore and protect native plant communities in cooperation with local citizens, schools and voluntary groups in the watershed. These projects should include interpretation and information for park and trail users that explain these activities.

These projects should recognize the value of native upland plant communities such as woodlands and prairies, as well as wetlands, and promote their restoration and interpretation within the watershed.

- ❑ The Watershed District, Watershed Natural Resources Board, landscape and nursery businesses, University of Minnesota Agricultural Extension Service and Master Gardeners should provide information to local residents on how to increase natural diversity in plantings on private properties. Demonstration projects, home tours, awards, nature center programs, etc., should be used to encourage residents to increase diversity in private yards, with an emphasis on native plantings, to benefit water and nongame wildlife habitat in the watershed.

The DNR Forestry Division and its nurseries should increase the availability and diversity of native plant species available to public agencies and individuals, and work with local nursery and landscape businesses to encourage a wider availability of native plant materials.

- The Watershed Natural Resources Board, cities, and landscape businesses should work with local residents to complete demonstration projects using diverse native plantings in yards in at least one new subdivision and one older neighborhood in the watershed.

### ***CONTROL OF DEER AND OTHER PROBLEM WILDLIFE***

- The DNR Division of Wildlife, Ramsey County and cities should work together on a watershed basis to find resources to manage deer, geese and other problem wildlife, and minimize their effects on vegetation and water resources.

## ***recommended actions*** **Goal 6**

### **INCREASE PUBLIC INVOLVEMENT**

**Increase public awareness and involvement in improving water quality and natural resources in the watershed, and increase citizen understanding of the effects that management of individual yards, public and private lands, streets, and infrastructure have on natural resource quality.**

### ***WATERSHED OUTREACH AND EDUCATION***

- The Watershed Natural Resources Board, cities, and natural resources agencies should implement education programs and demonstration projects to raise the awareness of local officials and watershed citizens of all ages through environmental education, illustrating the ways their decisions and management practices affect the quality of swimming, fishing, and other land and water resource quality in the watershed.

Education programs should utilize the local media, city newsletters and utility mailings, neighborhood workshops, nature center programs, K-12 and adult education programs and other available information and education tools.

Cities could develop “welcome” packets for new residents that include information on watershed resources and recommendations for yard and home management based on the watershed plan.

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### ***WATERSHED STEWARDSHIP DEMONSTRATION PROJECTS***

- ❑ The Watershed Natural Resources Board should work with cities, the Minnesota DNR, the Watershed District, local corporations and organizations, and others to provide watershed citizens with hands-on opportunities to participate in landscape management, restoration and monitoring activities that benefit natural resources in the watershed.
- ❑ Demonstration projects should include work with builders and developers and their professional associations to develop a “model home or subdivision” as a showcase that illustrates development and yard management practices that benefit water and natural resources, and helps to educate building professionals and citizens on alternatives to current practices. Such a project should be incorporated into home tour programs, such as the “Parade of Homes”.

### ***PUBLIC SCHOOL PROGRAMS***

- ❑ The Watershed Natural Resources Board should work with cities, the Minnesota DNR, the Watershed District, Ramsey County, local school districts and corporations to link K-12 environmental education programs and community education programs to the watershed and its resources; and involve students in watershed monitoring, field work, research and restoration activities.

### ***NATURAL RESOURCES ELEMENTS IN CITY COMPREHENSIVE PLANS***

- ❑ The Natural Resources Board should work with cities in the watershed, the Watershed District and resource agencies to consider the need for Natural Resources elements in city comprehensive plans, and to assist cities in the development of the elements and integration of natural resources components in comprehensive planning activities.

*recommended actions***Goal 7****IMPLEMENT THE  
WATERSHED****NATURAL RESOURCES  
PLAN**

**Establish a local watershed natural resources advisory board with representatives from the local governments, citizens, businesses and other interests in the watershed to promote, coordinate and monitor implementation of this natural resources plan.**

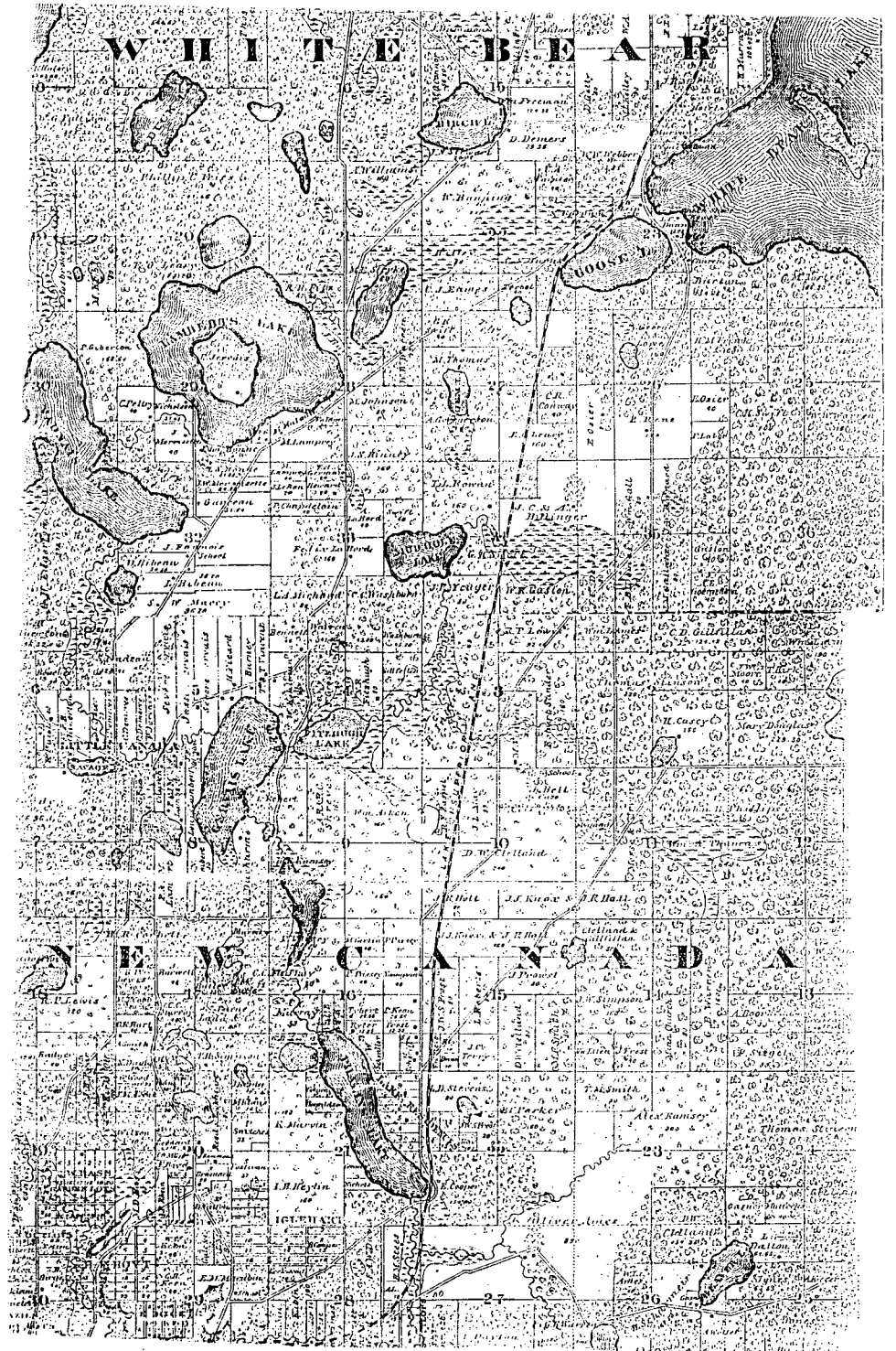
***WATERSHED NATURAL RESOURCES BOARD***

- The Phalen Watershed Project Steering Committee should establish an ongoing Watershed Natural Resources Board to coordinate implementation of the Watershed Plan. The Board should be provided support staff and resources to successfully carry out its mission.

The Board should work with local governments, businesses, private corporations and organizations, citizens, and natural resources agencies to identify and consider natural resources issues in the watershed and recommend actions or solutions. They should initiate and fund demonstration projects, coordinate information and education for citizens and local officials on natural resources in the watershed, and provide other advise and assistance as needed to meet the natural resources goals identified in the Watershed Plan.



**PHALEN CHAIN OF LAKES AREA - 1867**



**APPENDICES - WATERSHED HISTORY AND NATURAL RESOURCE CONDITIONS**

## APPENDICES

# I. HISTORICAL PERSPECTIVE IN THE PHALEN CHAIN OF LAKES WATERSHED AREA – PRESETTLEMENT CHARACTERISTICS, SETTLEMENT OF THE WATERSHED, AND THE EFFECTS OF SETTLEMENT ON NATURAL RESOURCES

## PRESETTLEMENT CONDITIONS IN THE WATERSHED

The Phalen Chain of Lakes Watershed lies within the Anoka Sandplain-St. Croix River Valley Region of Minnesota. During the past 35,000 years the landscape of the watershed has been worked and reworked by glaciers, and covered with a variety of vegetation types, including tundra, pine forest and prairie, as the climate changed over the region.

By the beginning of the 1800's, the vegetation of the watershed was dominated by **oak woodland and oak forest**. Three major factors accounted for the these vegetation types—**climate, soils and fire**.

- **Climate.** The Twin Cities are located at about 45 degrees north latitude. This is a transition area between coniferous and deciduous forests. Deciduous trees (oaks) dominated in the Phalen Watershed area, though just north on the St. Croix River coniferous trees (white pines) were the dominant canopy trees.

The Twin Cities also lie within a transition zone for precipitation—toward the east, forest is favored, while toward the west, declining precipitation favors grasses. The Phalen Watershed, like much of the Twin Cities Area, included mixed forest and prairie communities at the time of settlement.

- **Soils.** The soils in the watershed are mainly the result of glacial activity. The watershed is located in the Eastern St. Croix Moraine area. The last glaciers to cover this area came from the Lake Superior Basin, bringing coarse sand and gravel that were deposited in thick layers (moraines) in the relatively low Twin Cities basin as the glaciers began to melt about 20,000 years ago. These soils have little calcium content, and so are of generally low fertility.

The Chain of Lakes in the watershed (Kohlman, Gervais, Keller, Round and Phalen) lie along an old river valley of the St. Croix River. During the last glaciation, gravels and soils were depos-

ited in the valley, and large chunks of ice were left in low areas, forming the chain of lakes.

The glaciers left a landscape of rolling, well-drained land dotted with lakes and wetlands that remained on poorly-drained soils deposited in low areas. The upland areas consist of reddish sand and gravel soils that are droughty, relatively infertile, and still apparent in the watershed today.

- **Fire.** Fires caused by lightning and by native peoples regularly burned the prairies and oak openings areas in Minnesota, including the Phalen watershed. Native people used fire to create pasture for game animals, and to drive animals during hunts. Upland areas with annual or frequent fires remained as prairies, as fire suppresses most trees and benefits prairie grasses and flowering plants. Areas with fires every 5-15 years usually became oak openings or savanna, as oaks (especially bur oaks) are among the few trees resistant to fire. Many of these trees became shrub-like in response to burns.

Areas close to streams or on the lee sides of lakes that were not burned and had damper soils were covered by elms, basswood and other trees that could not survive prairie fires. Marshes developed in the low areas where glaciers left poorly drained soils, and water remained on the land for at least part of the year.

- At the time of the original land survey (1845-1847) most of the watershed was covered by oak woodland or oak savannah, with scattered groves of northern pin oak, bur oak, white oak, and aspen trees and an underbrush of young oak and aspen sprouts, hazel, and prickly ash. Ground vegetation included short and mid-length prairie grasses and flowering plants.

Isaac Higbee surveyed much of the Phalen Watershed area in 1847. He described the area near Lake Phalen in the following way: "This township is rough and broken, second rate, sandy land. Timber is Burr, Black (northern pin) and White Oak, Maple, Elm and Ash of a poor quality, nothing remarkable about it. The town of St. Paul on section 6 is a beautiful site, and will some day be a place of some importance."

- While the vegetation and original landscape of the watershed have greatly changed since the time of settlement, the history of the area is important to understanding current conditions, issues and problems in the watershed.

Some factors are still similar to those found at settlement, such as soils and geologic features, and are important to management of natural resources such as ground and surface waters and vegetation.



The vegetation communities of the watershed evolved over thousands of years, and worked well together. The structure and species composition of these communities provide clues for restoration and management of watershed vegetation.

A few areas of prairie and original oak woodland remain in the watershed, though in small, degraded fragments. The City of Maplewood owns and manages a high quality native prairie (called Jim's Prairie) just outside the watershed boundary, which offers clues about original vegetation and conditions in the watershed.

Finally, conditions in the watershed at the time of settlement remind us that people have influenced and managed portions of the landscape for a long time, since the earliest fires and landscape uses by native peoples. Natural resources planning for the watershed needs to consider human factors as an essential part of the landscape. Human influences need not be classified as all good or all bad, but do cause changes that affect the quality and character of natural resources.

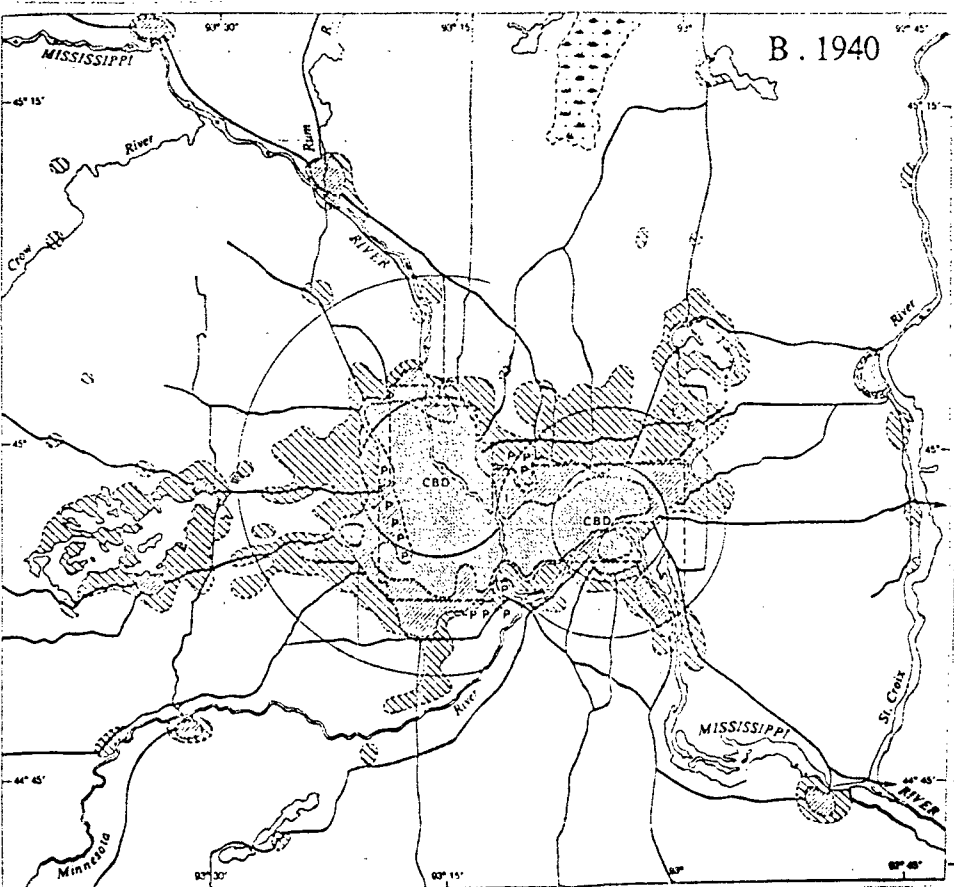
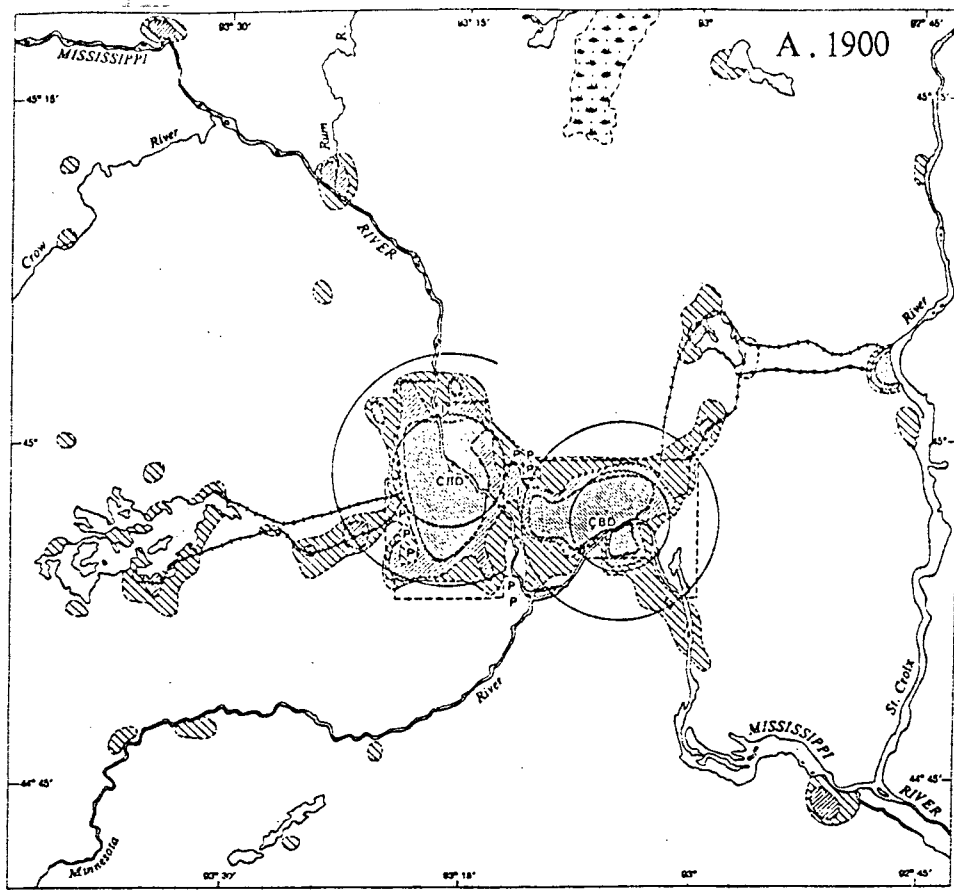
[The information about the presettlement conditions of the watershed provided above was supplied by the Natural Heritage Program staff of the Minnesota Department of Natural Resources.]

### ***SETTLEMENT OF THE EAST METRO AREA AND PHALEN WATERSHED***

Dr. David Lanegran, Professor in the Geography Department at Macalester College, discussed the history of settlement in the East Twin Cities Metro Area, including the Phalen Chain of Lakes Watershed. Highlights of his summary included the following:











- ❑ The eastern side of the Twin Cities Metropolitan Area has grown much more slowly than the western half since settlement began around 1840. This trend has been noted since the late 19th century, when the western half of the region was closer and developed better connections to economic activities in western and northwestern Minnesota.
- ❑ The extensive lake and wetland areas in the northeast Metro Area, including the Phalen watershed, developed particularly slowly because they were harder to develop than areas with well-drained soils.
- ❑ White Bear Lake developed as a resort and high-amenity residential area when it was connected to St. Paul by railway and streetcar. North St. Paul also developed early as a planned manufacturing town on a rail line.
- ❑ Most of the Phalen Watershed was an agricultural area specializing in truck farming (vegetables) and dairy farms well into this century. When the use of horses declined as transportation and

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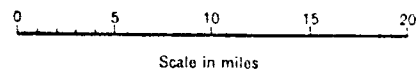
## URBAN SETTLEMENT PATTERNS, MINNEAPOLIS-ST. PAUL, 1900-1980

### LEGEND

-  High-density areas
-  Medium-density areas
-  Low-density areas
-  Suburban railway service
-  Interurban electric line
-  Paved state or federal highway
-  Major highways (4 lanes or more, including freeways)
- Square miles dominated by:
  -  Public parks or grounds
  -  Industrial use or trackage
  -  Central business district

Rings represent limits of urban settlement which would have existed if growth had been in concentric rings from the two cores. Inner ring encloses theoretical high-density area; outer ring encloses theoretical medium- and low-density areas.

- A — Pattern of urban settlement and main suburban transportation routes, 1900.
- B — Pattern of urban settlement and paved state and federal highways, 1940.
- C — Pattern of urban settlement and paved state and federal highways, 1960.
- D — Projected pattern of urban settlement and paved state and federal highways in the low-density areas, 1980.





an abundant source of fertilizer was no longer available for vegetable crops, truck farms were often converted to nursery crops.

Agriculture transformed much of the landscape in the watershed by draining wetlands and wet meadows with ditches to create more arable land.

Settlement also changed other water resources in the watershed. Phalen Creek, which was the outlet from the south end of Lake Phalen to the Mississippi River, was once a steady stream that supplied waterpower for adjacent businesses. With urban development in St. Paul, the stream became intermittent, with frequent flooding problems, and was routed to pipes below ground in the 1960's.

- The development of infrastructure systems was key to settlement of the watershed, including roads, streetcar lines, and agricultural ditches. The optimistic developers and residents of the Twin Cities in the 19th century developed infrastructure at a rapid rate, pushing it out ahead of settlement, and opening new residential and agricultural areas.

The rapid growth of streetcar and road infrastructure in the Twin Cities led to a very low density, suburban scale of development throughout the area. The Twin Cities have the 24th lowest density among the 25 largest U.S. Metropolitan Areas.

- The Phalen Watershed was only lightly settled by 1930, and was primarily occupied by agricultural and open lands. As rapid suburbanization took off in the Twin Cities between 1949 and 1953, some of the southern portions of the watershed near Lake Phalen began to develop, though northern areas remained sparsely developed. The opening of interstate 35E in the 1970's dramatically increased development throughout the watershed.
- The first residential areas developed in scattered pockets on flatter, drier agricultural areas of the watershed. Developers avoided wetlands and difficult topography. Some higher density apartments were developed on higher-value land. Most recently, higher-cost single-family homes have been developed on lakes, steeper slopes and amenity areas in the watershed.

Low density residential land uses currently dominate the land area of the watershed, with commercial areas along transportation corridors and nodes, and parks and higher-value residential areas near amenity features such as lakes. Some large wetland areas remain undeveloped in northern parts of the watershed today.

- The pre-settlement landscape in the Phalen Chain of Lakes Watershed was almost identical to that of the Edina area south and

west of Minneapolis. However, the patterns of development and current landscapes in the two areas are different, largely because of differences in the economies and speed of development in the east and west halves of the Metro Area.

### ***EFFECTS OF SETTLEMENT AND URBANIZATION ON NATURAL RESOURCES IN THE WATERSHED***

[Larry Gates, Watershed Projects Coordinator for the Minnesota DNR, summarized the major changes that settlement and urbanization have caused to natural resources in the watershed.]

- ❑ Settlement has nearly eliminated the native vegetation of the area. While some large oaks remain, the native grasses and shrubs that formed a series of layers in the original vegetation are gone, often replaced by hard surfaces or lawns with one or a few species of grass and few vegetation layers. With these changes, the vegetation and bird and wildlife habitat of the area are much less diverse than they were at settlement over much of the watershed.
- ❑ With agriculture and urbanization, the land and vegetation are much more heavily managed. Less material is left to decay to humus in the soil, and fire is no longer a part of the regime that supported the prairie and oak-dominated landscape.
- ❑ People have brought a variety of foreign plant materials to the landscape (ecologists call these plants “exotics”). Many of these plants are trees, shrubs, grasses and flowers that are grown in farms and yards throughout the region. Some of these plants are highly aggressive, such as milfoil and purple loosestrife, that eliminated native vegetation and important wildlife food and cover.

At the same time, the original oak savanna and forest of the watershed have been eliminated or are growing old, with little effort to replace this resource.

- ❑ The way water moves across the land and through the watershed has changed greatly since settlement. Building and cultivation changed the structure of the soil in the watershed. The soils and wetlands present at settlement easily absorbed much of the water that fell on the land. Little soil was exposed to erosion. In many parts of the watershed the soil structure and complex layers of vegetation meant that little water moved across the land, and this was easily absorbed and held in wetlands, streams, and lakes.

Increasing soil compaction with development, more impervious surface (roofs, driveways, roads), and less complex vegetation with urbanization mean that more water runs off the land with each storm, and that water runs off the land much faster, creating more potential for flooding.

These higher volumes of water also carry pollutants from impervious surfaces (such as oil and lead), as well as nutrients (such as phosphorus and nitrogen) from plants, soil, and surfaces, and sediments from exposed soils. Increasing volumes of water run off over shorter time periods with urbanization, and allow for more transport of nutrients and other pollutants to wetlands, lakes and streams.

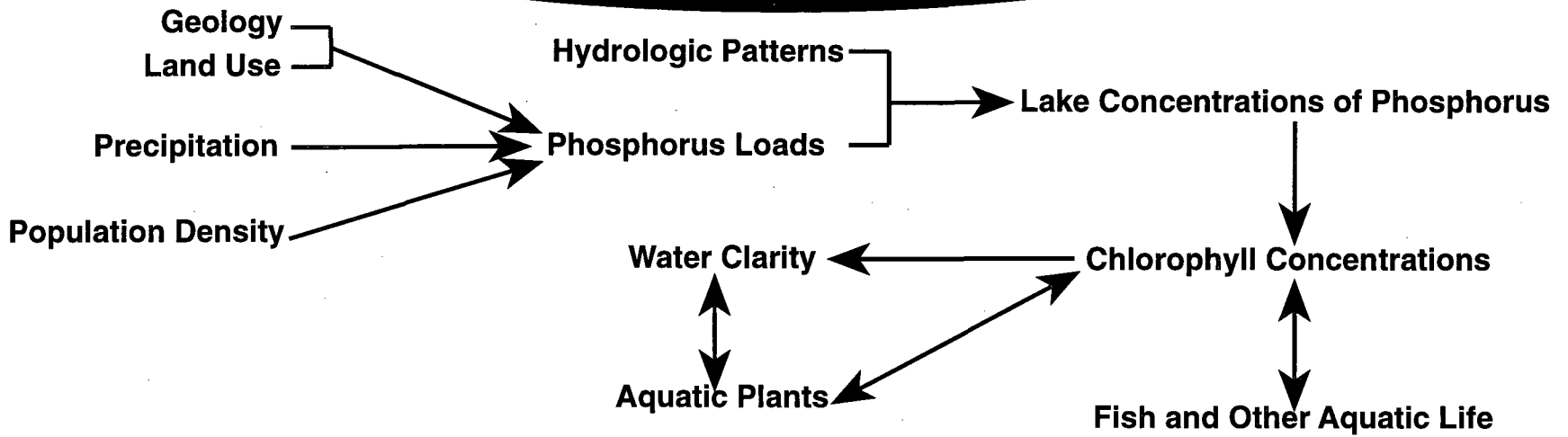
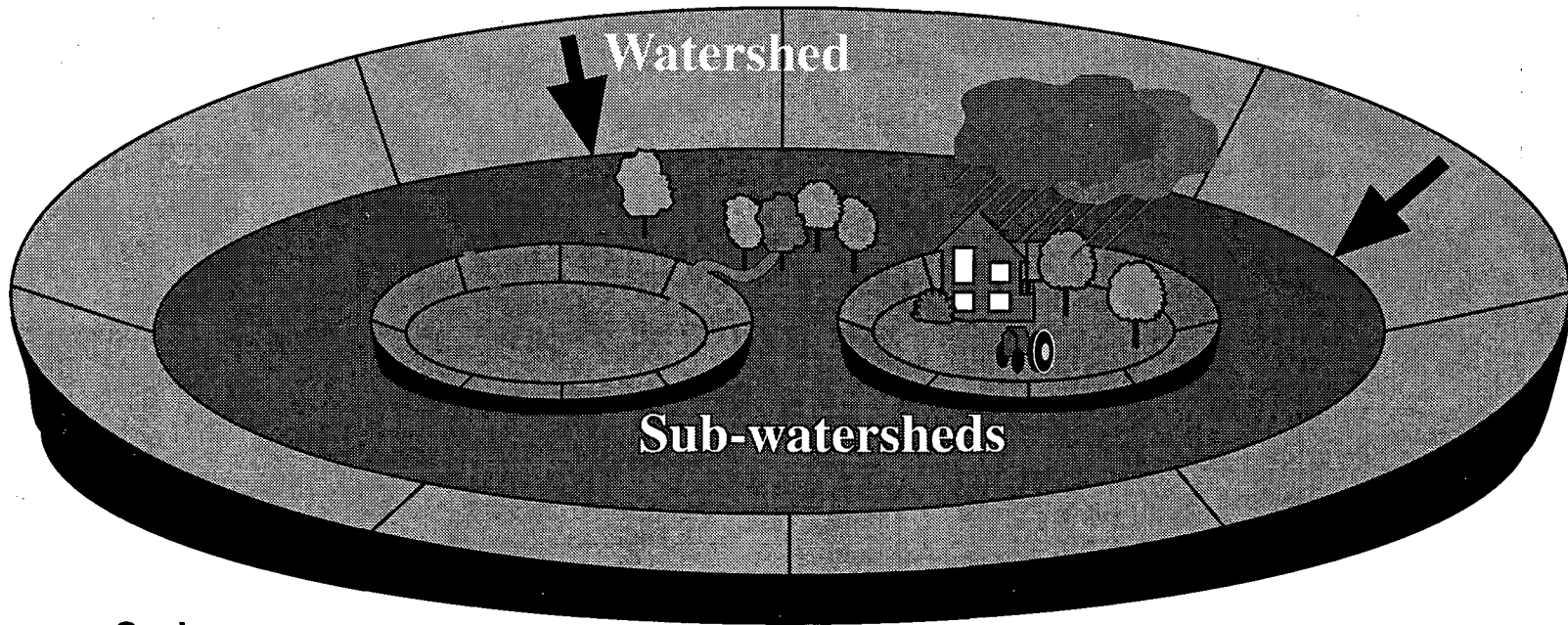
- ❑ Streams in the watershed have been channelized and ditches added to speed the runoff of water from the land and create more tillable or buildable land (the County Ditches are examples of these). When streams are channelized, the speed and volume of water flow is increased from when the stream was allowed to meander. This can cause erosion of banks and more sediment flow into the stream, as well as increased water volumes and flooding downstream.

Streams with natural meanders hold water longer because they move more slowly, can remove nutrients from the water through settling of sediments or attachment to aquatic plants, and meandered streams provide more diverse habitat for fish and other animals than channelized streams. Some “county ditches” in the watershed are still meandering streams that perform these functions well.

- ❑ As lake levels have increased and shorelines have been modified with rip rap or turf grasses, much of the natural vegetation along shorelines and in shallow water areas has been eliminated. Cattails, bulrushes, water lilies and other plants formerly extended from a buffer zone around lakes and wetlands out to 7 or 8 foot water depths. This vegetation helped to filter nutrients and sediments from water entering lakes, and provided habitat for animals and fish. Loss of this vegetation also contributes to erosion of shorelines and allows for easier invasion of exotic species that may not provide the same functions as native plants (such as food for waterfowl and wildlife).
- ❑ The changes in the quality of water flowing into lakes and loss of natural cleaning through aquatic vegetation and wetlands is contributing to a more rapid aging of the lakes in the watershed than was occurring before settlement. Algae blooms on area lakes in the spring and summer are evidence of this aging.
- ❑ Without conscious efforts to manage land and water resources differently, ongoing urban development in the watershed will continue these trends: increasing volumes of run-off, with additional sediments and nutrients transported to wetlands, lakes, and creeks in the watershed; loss of aquatic vegetation and reduced habitat for fish and other aquatic organisms; increasing fragmentation of undeveloped areas and both upland and wetland habi-

tats; loss of trees and mixed vegetation and replacement with pavement and lawns or other simplified vegetation with associated losses of animal species; and reduction in open space remaining in the watershed.

# Land Use Factors and Water Quality





## II. CURRENT NATURAL RESOURCES CONDITIONS IN THE PHALEN CHAIN OF LAKES WATERSHED

The following are abbreviated summaries of natural resources conditions and issues in the watershed presented by "guest experts" to the Project's Steering Committee. The summaries are presented by resource topic, though efforts were made to integrate issues across disciplines in presentations to the Steering Committee and in the summaries that follow as space allows.

### *GROUND WATER RESOURCES AND ISSUES*

A complete picture of the ground water resources of this watershed can be obtained through an analysis of information and maps available from the Minnesota Geological Society in its publication, *The Geologic Atlas of Ramsey County*. The summary of issues that follows was provided by Pat Twiss of the Ramsey Soil and Water Conservation District.

- The *bedrock* underlying the soil surface in the watershed is mainly sedimentary rock deposits. A key feature of the watershed is a deep underground channel that glacial melt waters eroded through these rock deposits. The channel is presently filled with glacial drift materials, such as gravel. It runs under Phalen Lake and toward the northwest.

This eroded channel is in direct contact with ground water aquifers that are utilized (downstream) by the City of St. Paul. Therefore, the quality of water that reaches this channel is of great importance to those using the aquifer.

- The *surface material* in the watershed was originally deposited by two lobes of the last glaciers that moved through the region about 10,000 years ago. A variety of glacial deposit types pepper the watershed. Stream and till deposits cover most of the watershed. These are looser, easily drained sands and gravels. Most soils in the watershed are well-drained, sandy soils.

Lake deposits are finer materials and are concentrated in the area Northwest of Lake Gervais. The soils in this area are characterized by high water tables, slow infiltration rates, and soils that present problems for construction activities.

- Aquifers are subsurface gravel or sand layers that contain enough water between the soil particles to yield water to wells. The most important aquifer in the watershed is the Prairie du Chien-Jordan Aquifer, which is used by municipal wells in the watershed.

### Lake Phalen Watershed Aquifer Use 1991

Use	%
Water Supply	89.3
Air Conditioning	5.5
Irrigation	3.9
Lake Maintenance	1.1
Pollution Control	0.2

### Lake Phalen Watershed Aquifer Withdrawals 1991

Aquifer	%
Water Table	0.4
Platteville	0.2
St. Peter	0.8
Prairie du Chien-Jordan	95.0
Franconia-Ironton-Galesville	0.6
Mt. Simon	3.0

### Lake Phalen Watershed Active Water Wells

Aquifer	Domestic	Municipal	Comm/ Indst	Public Supply
Water Table	41	--	--	1
Buried Glacial	130	--	3	--
Platteville	27	--	1	2
St. Peter	44	--	3	--
Prairie du Chien-Jordan	8	10	4	--
F-I-G/Mt. Simon	--	1	--	--
Multiple	--	--	2	5
Unknown	--	--	3	--

### Lake Phalen Watershed Ground Water Quality

Aquifer	Chloride (ppm)	Nitrate (ppm)	Tritium (TU)
Water Table	36.1 - 43.0	<0.01 - 0.14	28.8
Buried Glacial	9.7 - 32.6	<0.01	16.7 - 26.3
St. Peter	1.3 - 4.1	<0.01 - 0.07	<0.08
Prairie du Chien-Jordan	2.8 - 13.9	0.05 - 0.30	2.3 - 20.0

Ninety percent of the aquifer use in the watershed is for domestic water supplies, and 95% of this comes from the Prairie du Chien-Jordan Aquifer. The portion of this aquifer that lies within the Phalen Chain of Lakes Watershed is recharged fairly quickly from surface water.

- The portion of the watershed around Phalen Lake is particularly sensitive for potential pollution of the Prairie du Chien-Jordan aquifer because surface waters have direct and easy access to the aquifer.
- Local Soil and Water Conservation District personnel are assisting some county governments in the watershed in the development of ground water planning. Such plans would include recommendations to local communities for regulations and land use management to protect ground water. An example of ground water protection planning is the designation of wellhead protection areas in a number of communities around the watershed.
- The Ramsey County Ground Water plan will be completed during the spring of 1994. It will include recommendations for local communities and the county related to land use planning, well protection, and other ground water management recommendations.

[Maps and a variety of data provided by the Ramsey Soil and Water District are included in this appendix.]

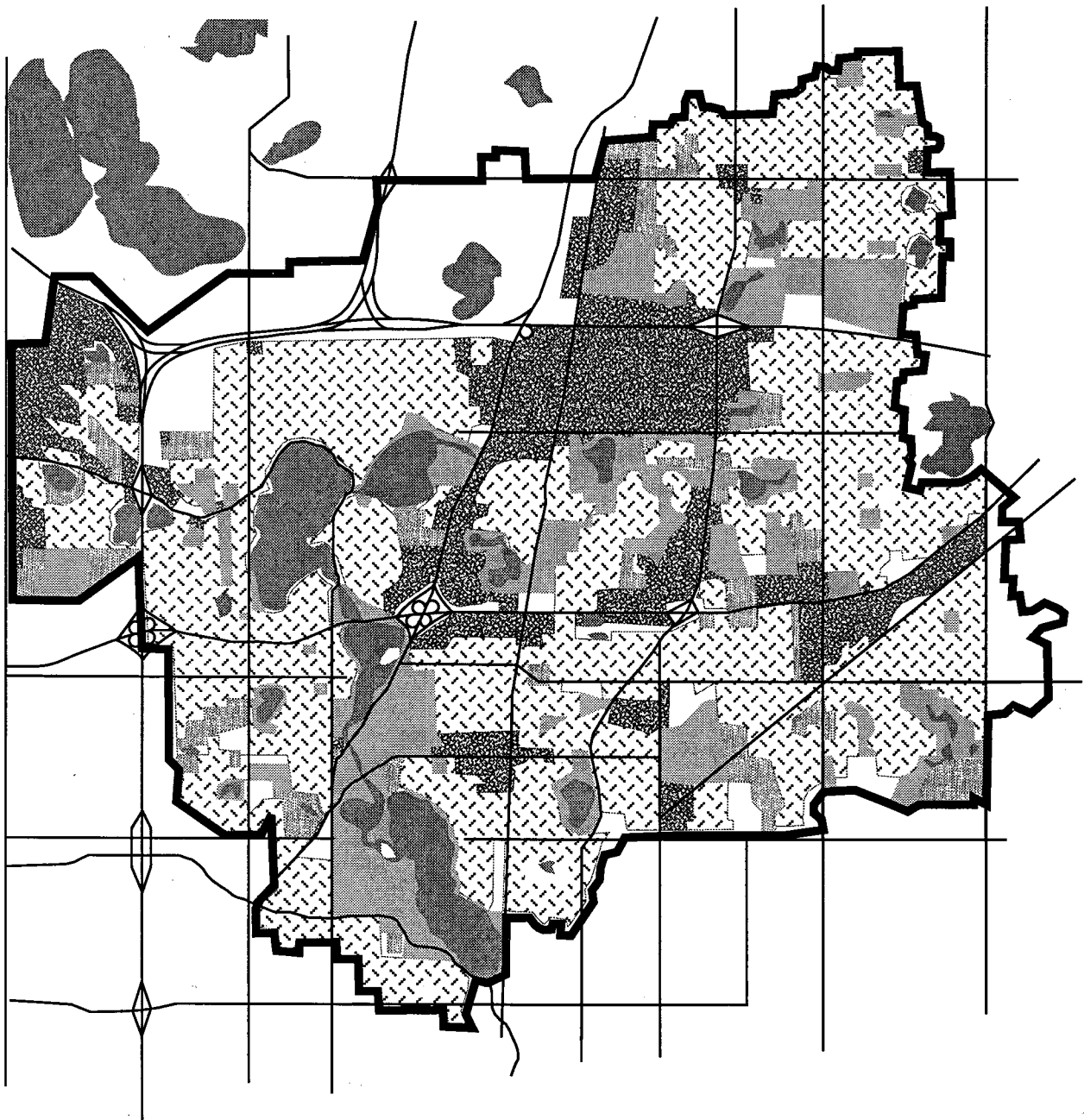
### ***SURFACE WATER RESOURCES AND ISSUES***





[The information that follows was provided by Cliff Aichinger, Administrator, Ramsey-Washington Metro Watershed District, and Terry Noonan, Limnologist, Ramsey County Public Works Department.]

Well into this century most of the land in the Phalen Watershed was developed as an agricultural area specializing in truck and dairy farms and, after replacement of the horse for transportation, nursery crops. Agriculture transformed much of the landscape in the watershed through drainage of wetlands and ditching creeks.

Settlement changed other water resources as well. For example, Phalen Creek, the outlet from the south end of Lake Phalen to the Mississippi River, became intermittent with frequent flooding problems due to urban development. Consequently, during the 1960's it was routed to pipes below ground and is no longer visible on the ground plane. The watershed now outlets to the Mississippi through the Middle Belt-line Storm Sewer from two outlet structures at the south end of Lake Phalen.

As noted previously, much of the watershed is now dominated by low density residential land use commercial areas along transporta-



-  Low Density Residential Areas
-  Business, Commercial
-  High Density Residential - Apts., Mobile Homes
-  Parks & Public Open Space

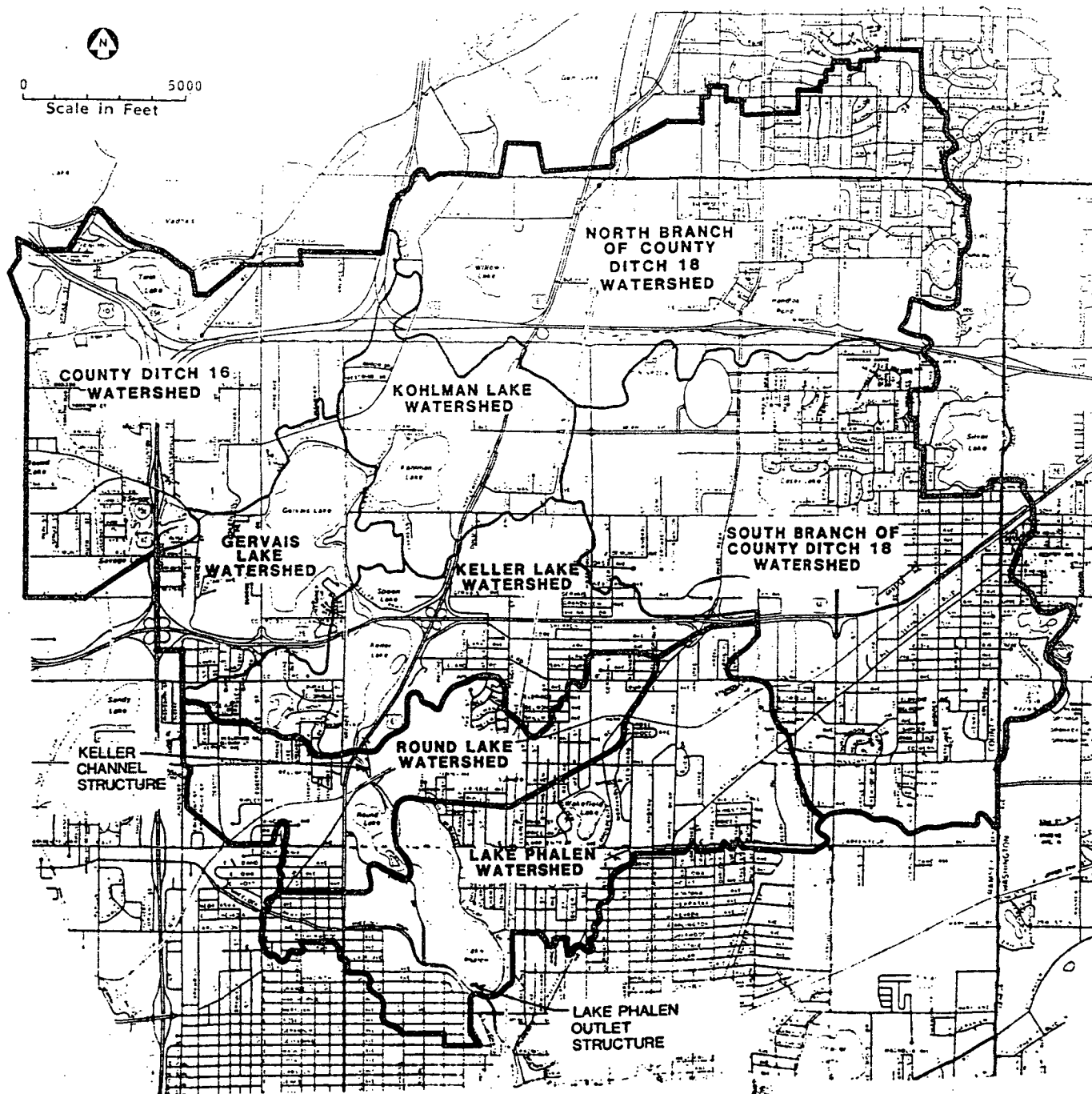
***PHALEN CHAIN OF LAKES WATERSHED COMPOSITE LAND USE MAP***

tion corridors, parks and higher-value residential areas near amenity features such as lakes. Single family homes are now being built on lakes, steeper slopes, and amenity areas in the watershed. Urban development has increased the quantity of water flowing to creeks, wetlands and lakes in the watershed, and reduced the quality of this flow with the addition of sediment, nutrients and associated pollutants.

The Ramsey-Washington Metro Watershed District has completed a variety of projects to successfully manage the **quantity of water** flowing through the watershed, and flooding problems are now minimal. Water levels in the chain of lakes are controlled by a weir in the channel just north of Lake Phalen. The weir was recently widened and a second outlet structure added at the south end of Lake Phalen to accommodate the runoff expected during a 100-year storm event at full development in the watershed. However, **water quality** problems related to increasing urban development and associated sediment and nutrient runoff in the watershed are a continuing concern.

Additional characteristics and issues related to surface waters in the watershed are detailed in the Watershed District's Phalen Chain of Lakes Surface Water Management Plan, published in 1988. Highlights of the plan and issues include the following:

- There are thirteen DNR protected lakes in the Phalen Chain of Lakes Watershed. The five major lakes are Kohlman, Gervais, Keller, Round, and Phalen. The total water surface area of the major lakes is approximately 700 acres and the area tributary to these lakes is approximately 15,000 acres.
- Seven subwatersheds comprise the Phalen Chain of Lakes Watershed, which lies in the northern half of the Ramsey -Washington Metro Watershed District. These subwatersheds are:
  - the *North Branch of County Ditch 18 Subwatershed*, which includes flood improvement projects completed by the City of White Bear Lake;
  - the *South Branch of County Ditch 18 Subwatershed*, which includes large wetland complexes owned by Ramsey County as open space;
  - *Kohlman Lake Subwatershed*, consisting of not only Kohlman Lake, but also ditches and wetlands, and an area where ditch maintenance, new development, and runoff are concerns;
  - the very flat and poorly drained *County Ditch 16 Subwatershed*, where new development and phosphorus levels are concerns;
  - *Gervais Lake Subwatershed*, with associated wetlands, is an area that receives heavy recreational use, making water quality a concern in this subwatershed;
  - a subwatershed with shoreline erosion concerns, the *Keller Lake Subwatershed* has a newer water treatment basin to pre-



MAJOR WATERSHED DIVIDES  
PHALEN CHAIN OF LAKES WATERSHED

- treat storm sewer water from County Ditch 6; and
  - the *Lake Phalen Subwatershed*, the most intensely developed of the subwatersheds.
- The major flooding concerns in the watershed are storage and overflow volumes associated with storm and snowmelt events. The most common critical storms for the subwatersheds in the Phalen Chain of Lakes Watershed are the 1-hour, 12-hour, and 96-hour (four day) storms.

A recent study of the district has identified existing water quantity problems that affect flooding, such as needed improvements to various overflow structures, county ditches that may require widening or deepening, replacement of outflows that may be too small to handle water volumes, and the need to increase upstream storage by modifying existing ponds and wetlands to detain more water. In addition, the 10-day snowmelt event is viewed as critical for the contiguous chain of lakes. This snowmelt event could result in the inundation of several roads and the flooding of several structures, including homes, along the shoreline. In general, flood level elevations, needed storage volumes, and peak discharge amounts are the prevalent water quantity problems for this watershed.

- Water quality issues, especially those related to nonpoint source pollution and erosion are the major surface water issues in the watershed. Private and public lands throughout the watershed contribute to nonpoint source pollution affecting surface waters. Given the eutrophic nature of the lakes in this watershed with the associated higher concentrations of nutrients that produce more algae and other biomass, additional, human-generated, loads of sediment and nutrient-rich runoff present serious water quality concerns.

Nonpoint source pollution in the watershed includes sediments and associated pollutants, such as phosphorus, that originate from streets, hard surfaces, and lawns. Of particular concern in areas of the watershed where building and growth continue, are quantities of sediments from localized areas such as new construction sites where runoff is poorly controlled.

- Managing phosphorus is considered key to water quality management of the lakes in the watershed because the nutrient has such a strong influence on the biology of the lakes. Lakes with higher phosphorus concentrations have higher algae concentrations. Phosphorus added through runoff to these naturally eutrophic lakes acts like a fuel that accelerates the growth of algae on the lakes, affecting water clarity, which in turn affects the growth of underwater vegetation. Algae growth on the lakes affects recreational use and the fishery of the lakes as well.

- ❑ Watershed characteristics such as type of land use and amount of impervious surface, climate, as well as the physical characteristics of the lakes themselves, such as basin size and depth, all influence water quality and lake management. Within the watershed there is a wide variety in lake size and depth among the lakes. For example, Kohlman Lake averages about five feet deep, while the north end of Phalen Lake includes areas over 90 feet deep.
- ❑ Streams and county ditches connect wetland areas and lakes in the watershed. Some of the ditches are major contributors of sediments and nutrients to area lakes because runoff from nonpoint source pollution sources primarily enters nearby ditches and storm sewers, which then empty into area lakes. Maintenance and erosion are problems on some of these water courses as well because they have been channelized to speed the runoff of water from land.
- ❑ Erosion of lake shorelines is also a problem in the watershed and is caused by wave action from wind or boat activity, high water during flooding, and the manipulation of lake levels via dams. Loss of aquatic and native lakeshore vegetation contributes further to shoreline erosion problems in some areas.
- ❑ Managing nonpoint source pollution and water quality requires a comprehensive watershed approach, since land use is so closely tied to water quality and could include such features as fertilizer ordinances, changes in street maintenance policies, and community education programs to educate citizens about the impact on water quality of their placing leaves and other organic matter in to the street, of their disposal methods for pet feces, and the application of lawn fertilizers.

### ***WETLAND RESOURCES AND ISSUES***

[The discussion and issues included in this section were presented to the Steering Committee by Cliff Aichinger, Administrator of the Ramsey-Washington Metro Watershed District. Further detail on wetlands in the watershed, including a complete inventory by type and acreage, is included in the District's Model Wetland Management and Mitigation Plan.]

Wetlands in the watershed are valuable and complex ecosystems that serve a variety of functions, including improving water quality, providing wildlife habitat, temporary storage of storm water and snowmelt, and offering visual aesthetics through the maintenance of natural open space. Not every wetland fulfills each of these functions, and it may be necessary to prioritize wetland functioning given the competitive management uses designated for water bodies and water courses in the watershed.



Many of the problems facing surface waters in this watershed are also concerns for wetlands:

- The wetland areas of the watershed were developed slowly because of the associated difficulties with development in areas with standing water and poorly drained soils. Agriculture transformed much of the landscape in the watershed by draining wetlands and wet meadows with ditches to create more arable land. Approximately 45 percent of the wetlands present in the watershed in 1945 have since been lost, particularly seasonal and shrub/scrub wetlands.

Wetland losses have been the greatest in the most highly urbanized, southern subwatersheds within the Phalen Watershed.

- Like other surface waters, wetlands are also affected by sediment and nutrient loads that come from construction sites, lawns, and hard surfaces and are present in storm water runoff. Water clarity and quality are reduced in wetlands due to nonpoint source pollution. In addition, certain kinds of vegetation exhibit dramatic increases in population density (e.g., cattails), and surface algae growth can increase significantly as nutrient loads increase.

Wetlands have naturally imposed limits on their tolerance for nutrient absorption and cannot be overused as “phosphorus dumps” without severe changes in their structure and function. While they can function as pre-treatment for water that will enter highly valued lakes in the watershed, wetlands are not simply one-dimensional “filters” to maintain lake water quality.

- Vegetated areas adjacent to wetlands and immediately upland of wetland boundaries are important as buffering areas that can filter sediments and nutrients in runoff, and provide habitat for aquatic and wetland-dependent wildlife. One method of reducing the impacts of development on wetlands is to provide a vegetated buffer around the wetland, which some cities in the watershed are currently requiring. For example, Maplewood specifies a buffer of ten feet.
- Use or alteration of wetlands for stormwater management may compromise other functions. Excavation in wetlands to increase their storage capacity, such as widening or deepening them, along with increases in associated runoff may encroach on wetlands and compromise their functions.
- Mitigation for additional wetland losses or changes is becoming prohibitively expensive in the watershed and the Metro Area. Sometimes other resources, such as upland forests, are destroyed for replacement wetlands.
- Although residential and commercial development have en-

croached into wetland ecosystems, some large wetland areas remain undeveloped in the northern parts of the watershed today, and serve a variety of important functions.

Wetland maintenance and enhancement, as well as considerations of the amounts of impervious surfaces, are important considerations for local plans and ordinances.

- Watershed District staff suggest that the next step in wetlands planning in the watershed should evaluate how each wetland in the watershed functions, and then determine functions that are needed in the watershed. This information could then be used to prioritize wetland functions for mitigation. Wetland quality should also be evaluated. Wetland quality, functions and values should be considered to develop a watershed-wide plan for protection, management, and mitigation of wetlands, while maintaining no-net loss of wetland functions.

### ***FORESTRY RESOURCES AND ISSUES***

[The information on forest resources and issues in the watershed was provided by Ken Holman, Urban Forestry Specialist at the Metro Region Department of Natural Resources. Additional detail on forest resources in the Oak Savanna landscape region of the Metro Area is contained in the DNR Division of Forestry's Metro Region Forest Resources Management Plan, 1993]

The character of forest resources in the watershed has changed a great deal over time. The presettlement vegetation of around 1840 was dominated by oak woodlands and oak openings. Despite the presence of oak remnants in this regional landscape today, most of the oaks as well as the associated shrub and grass layers have been replaced by turf, impervious surfaces, and a variety of non-native horticultural plant species. The oaks that remain are aging and are not being replaced.

Key issues in urban forest resources and management in the watershed include the following:

- Settlement has nearly eliminated the native vegetation in the Phalen Watershed. At the same time, people have brought a variety of non-native plant species in to the landscape, including numerous woody species of trees and shrubs. Presently, cities in the watershed have very limited forestry programs, tree planting programs, or tree-vegetation ordinances to guide the public.

Existing community resource management programs, which vary in their levels of development, tend to focus on disease control, reforestation, and tree preservation. Communities need information and assistance to develop ordinances that protect trees and associated vegetation resources in the watershed.

Both publicly and privately owned recreational open space is dominated by turf and is intensively managed for neatness and recreational purposes.

- Urban forests and related understory vegetation play a role in maintaining water quality by trapping nutrient and sediment runoff and by slowing rainfall.

Urban forests and other landscaping can also contribute to energy conservation in the watershed, saving energy dollars and increasing the comfort of homes and open space areas.

- Fragmentation of woodlands and loss of natural vegetation and habitat and associated bird and animal species diversity is a concern.
- Forest resources in some parts of the watershed exhibit poor health aggravated by on-going development pressures and construction practices that harm trees. Oak wilt and Dutch elm disease continue to be a problem. Gypsy moths and Japanese beetles are exotic insects that may affect trees and other plants in the watershed in the future.
- Wetland mitigation sites in the watershed should be chosen so that they do not harm upland forest and vegetation resources.

### ***WILDLIFE RESOURCES AND ISSUES***

[The information included in this section was provided by Joan Galli, Minnesota DNR Non-game Wildlife Section; Lee Pfannmuller, DNR Ecological Services; and Jon Parker, Urban Wildlife Specialist, Metro Region DNR Office.]

While population inventories have not been completed for the Twin Cities area, the wildlife species found in the Phalen watershed are typical of most urban and suburban midwestern communities. Development has caused those species to disappear that were dependent on large, unbroken habitat of oak savanna or prairie, such as bison, bobcats, and bluebirds. The species that thrive are those that adapt well to life with human populations, such as raccoons, deer, robins and sparrows.

However, the watershed provides important habitat for some wildlife that is unique to urbanized settings. For example:

- Surface waters in the watershed provide foraging habitat for shorebirds, such as egrets and herons as well as for predacious birds like eagles and hawks, that nest nearby at Pigs Eye Lake and along the Mississippi River south of downtown St. Paul.

- The watershed is part of a major flyway for migratory waterfowl and songbirds traveling up the Mississippi flyway. While these species do not breed in the area, it provides essential resting and feeding habitat that is important to successful seasonal migration.
- One threatened species in Minnesota, the Blandings turtle, lives and reproduces in the watershed. The turtle is threatened by habitat degradation or destruction in many areas. While it lives in wetlands, this species requires access to adjacent sandy uplands for nesting.
- Habitat degradation, destruction, and fragmentation are critical issues affecting wildlife resources in the watershed and are mostly the result of continuing urban development. Habitat fragmentation is especially noteworthy. It reduces the natural biodiversity, that is species 'richness' of an area and results in the simplification of existing ecosystems by destroying species interconnections.

Loss of biodiversity affects the long-term health and stability of plant and animal communities. It increases the risk of disease for many species. Other impacts include the impoverishment of the gene pool and the diminishing of niche types that would support a more diverse range of animals. Consequently, residents of the watershed have fewer bird and other animal species to enjoy close to home.

Fragmentation affects the reproductive capabilities of many bird species. Some, such as warblers, require large interior forest areas in order to breed successfully. Habitat fragmentation exposes wildlife to an increased risk from predation by exposing them to open spaces and eliminating cover in which birds and animals could hide. Fragmentation and simplification both reduce vegetative sources of food and cover.

- Many of the most familiar birds and animals in the watershed, like robins, bluejays and English sparrows, are "habitat generalists". They can survive in many types of areas, and do very well in fragmented habitats and on the edge areas that humans create by altering the landscape. However, if watershed residents want to maintain a higher, natural diversity of bird species in the area, some larger, unbroken canopy and habitat areas will be needed to sustain species that need such areas.
- Fragmentation and increases in "edge" habitat favors populations of some mammal species like deer, woodchucks, and racoons. People from communities affected by these very successful wildlife species are beginning to recognize the problems associated with their populations.

## *FISHERY RESOURCES AND ISSUES*

[The information that follows was provided by Bruce Gilbertson, East Metro Area Fisheries Supervisor, DNR Metro Region Office.]

The Phalen Chain of Lakes, which includes Kohlman, Gervais, Spoon, Keller, Round and Phalen Lakes are mesotrophic and eutropic lakes located in the eastern Twin Cities Metropolitan Area.

- ❑ Oligotrophic lakes (like those in northern Minnesota) have steep rocky shores, and contain few nutrients to fertilize the water. Oxygen is high at the bottom, where the water is quite cold. Lake trout, whitefish, and walleye live in these cool, oxygenated depths.
- ❑ Eutrophic lakes (such as those in southern Minnesota) are as rich as the farmland around them. These lakes are usually shallow and warm, with little or no oxygen at the bottom, especially in summer or in winter under ice. Dense growths of algae occur in the surface waters. The dominant fish tend to be in the minnow or bass families. Kohlman and Keller lakes are Eutrophic lakes.
- ❑ Mesotrophic lakes (common in central Minnesota) tend to be intermediate between the other types. They lie on sand and gravel and other glacial debris. Lake Phalen is a mesotrophic lake.
- ❑ Aquatic plants are the basis of the food chain of the lake community, because they gather most of the energy and make up the largest proportion of living matter. The clearer the water in a lake, the deeper green plants can grow. Floating and submerged plants provide food for aquatic animals, and provide shelter around and under leaves and stems.
- ❑ Algae are microscopic plants, and are often considered a problem because they produce a scum-like appearance on lakes. In moderate amounts, however, they are important in the food system of the lake.

The Phalen Chain of Lakes are bass-panfish lakes. That is, they contain species of fish adapted to mesotrophic lakes with relatively high water clarity and good rooted aquatic plant communities.

A variety of water quality issues affect fish species in the watershed:

- ❑ High water clarity and adequate rooted aquatic vegetation are needed in bass-panfish lakes to maintain a variety of fish species and adequate numbers of gamefish through natural reproduction. When quality is high, stocking is not necessary.

In the Chain of Lakes, reductions in water clarity and losses of natural spawning areas, such as wetlands that have been drained and filled, have made stocking of walleye and hybrid muskie

necessary to maintain an adequate fishery.

- Fertilizer and nutrients from surfaces in the watershed eventually wash into the water, providing food for algae and other plants. Plant growth increases dramatically, the water becomes cloudy, the temperature warms, and sunlight is blocked from deeper water. Oxygen decreases in deep water areas, and fish that require cool, deep water with plenty of oxygen cannot survive, but less desirable species like carp thrive.
- When shoreline vegetation is removed, erosion often occurs and soil is washed into the water. Shallow water temperatures increase due to the lack of shade, and the cloudy, silt-laden water. Many species of fish use aquatic plants in shallow water as spawning areas, as feeding areas, and as refuge from predator fish. When vegetation is removed by public or private landowners, the fish habitat and production decreases.
- Exotic species such as Eurasian water milfoil, water fleas and exotic fish species are a concern in some lakes in the watershed. Removing vegetation from trailers and boats and following regulations concerning live bait and fish transport can ameliorate these problems.

Sixteen species of larger fish are typically found in the Chain of Lakes. They include:

- Northern pike
- White sucker
- Black bullhead
- Yellow bullhead
- Brown bullhead
- Hybrid sunfish
- Green sunfish
- Pumpkinseed sunfish
- Bluegill
- Largemouth bass
- White crappie
- Black crappie
- Yellow perch
- Various minnow species.

Hybrid muske, carp and walleye are introduced fish species in the Chain of Lakes.

- Fishing pressure in the Phalen Chain of Lakes is generally high in comparison to lakes statewide. Gervais Lake experienced 56 angler hours per acre, Lake Phalen 138 angler hours per acre and Keller Lake 289 angler hours per acre in 1977. The Metro Area median is about 40 angler hours per acre.

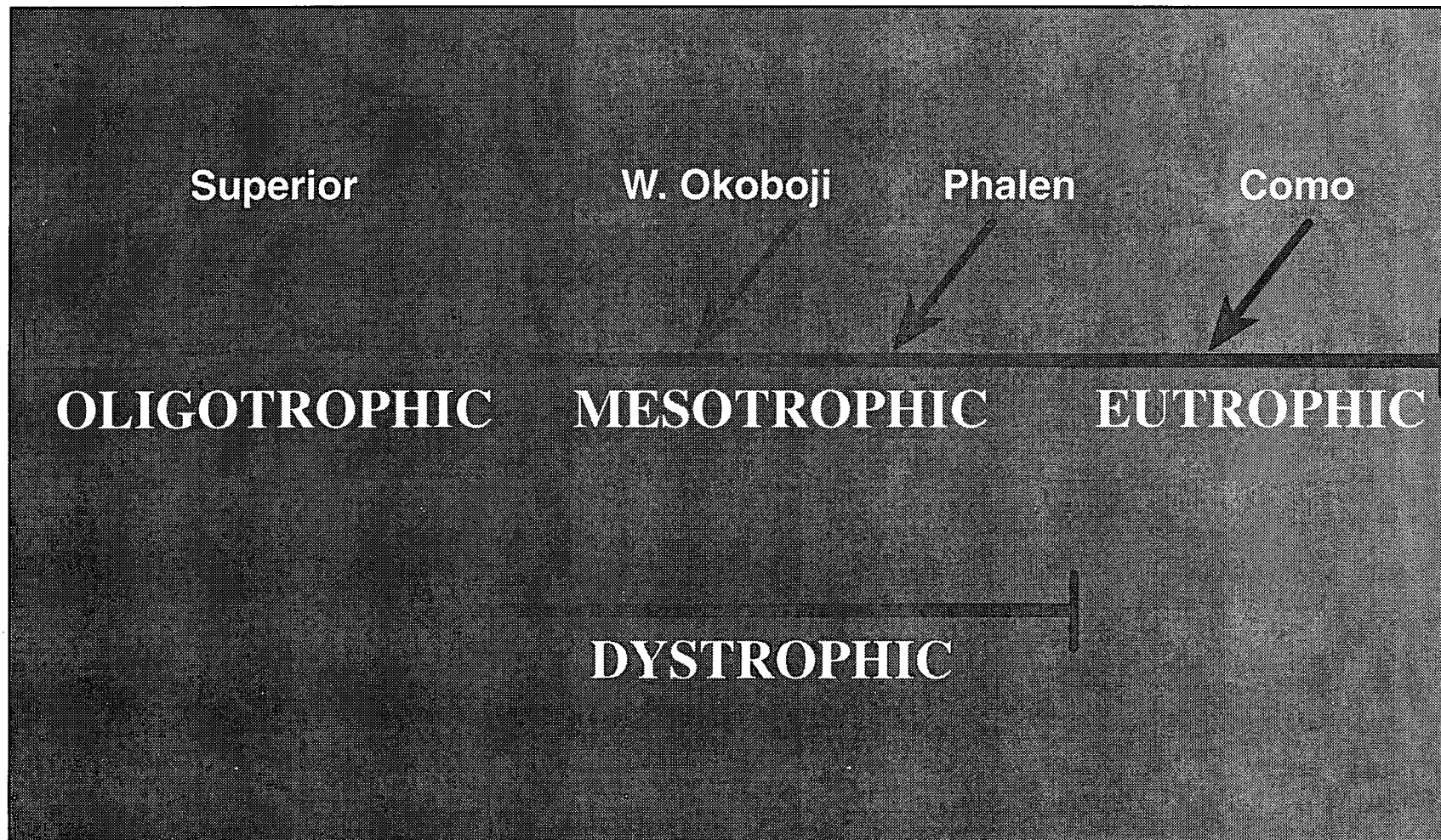
Fishing is normally a higher use than all other lake surface recreational uses combined, excluding swimming.

- Angler use has increased on Lake Phalen due to improvements in water quality and the associated fish population, as well as additional opportunities provided by new fishing piers and a boat launch in recent years.

1974	49 angler hours/acre
1986	82 angler hours/acre
1990	138 angler hours/acre

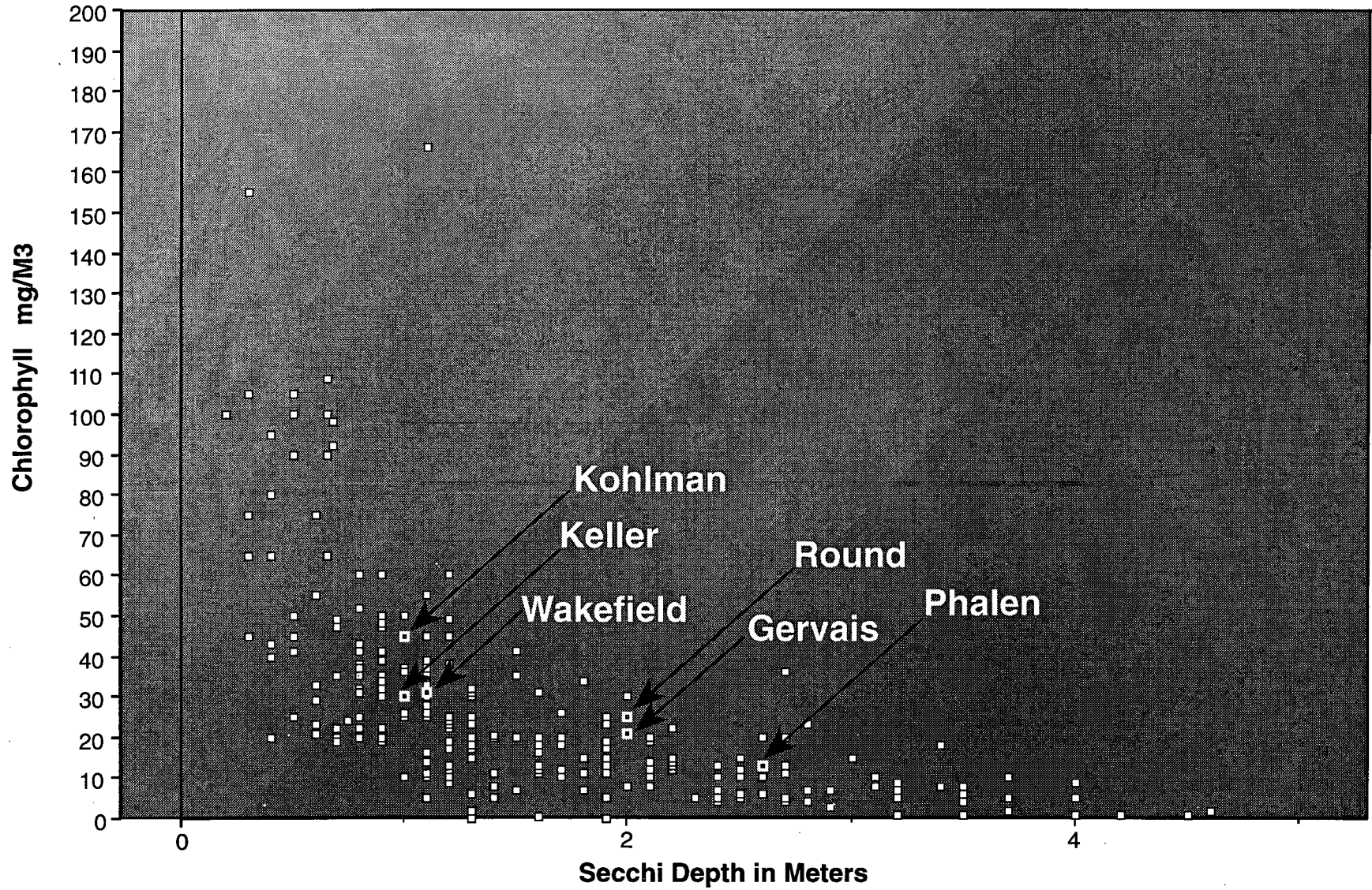
- Involvement and cooperation by various levels of government can increase the effectiveness and reduce the costs of fishing improvement projects. Providing good examples of riparian land management and educating the public about the value of natural resources and good management practices can go a long way toward making improvements in water quality and the fishery of the watershed.

# Lake Conditions

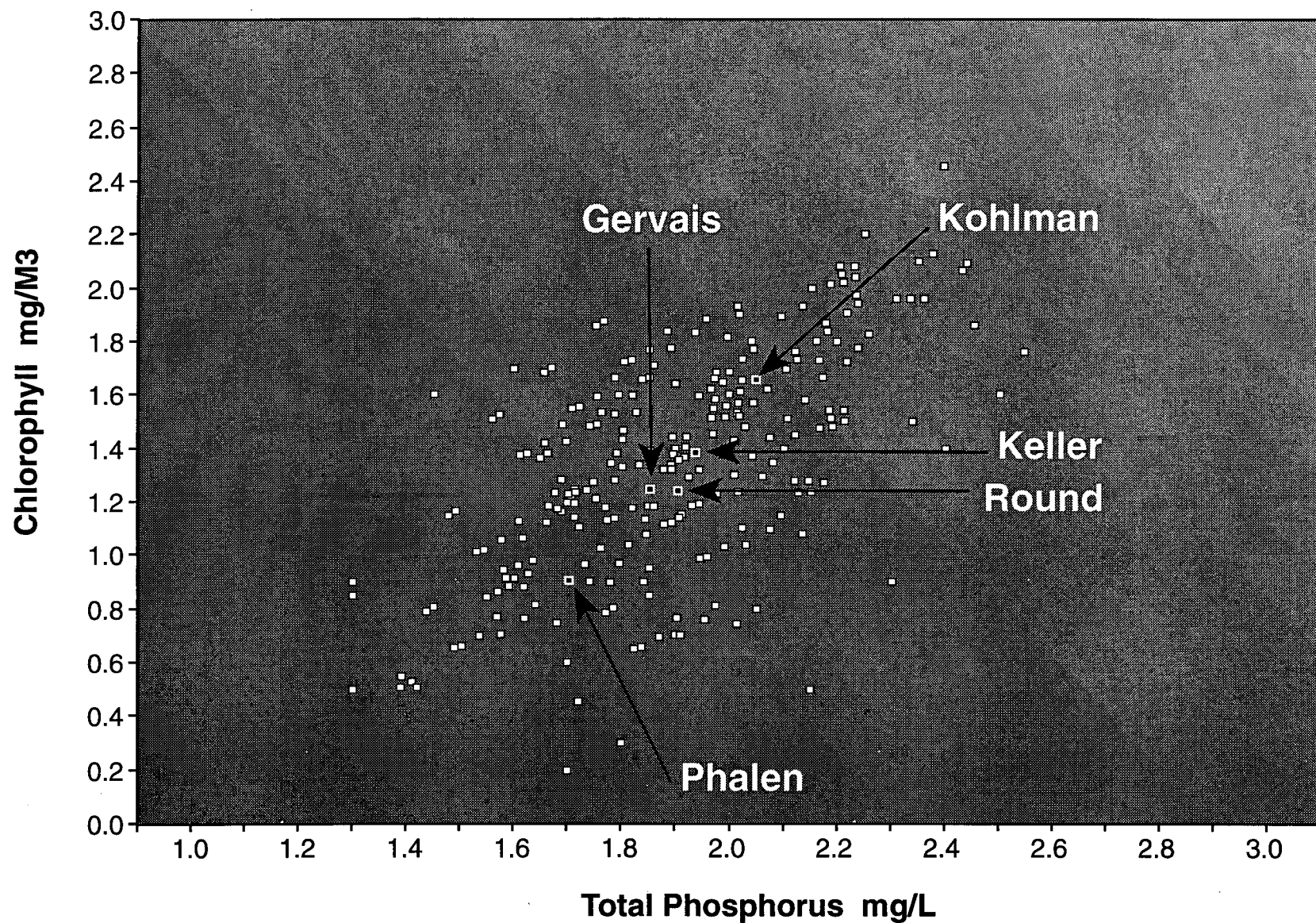




# Average Water Clarity in Ramsey County Lakes (1991)



# Phosphorus Levels in Ramsey County Lakes (1991)



## AVERAGE WATER CLARITY IN RAMSEY COUNTY LAKES – 1991 (RAMSEY COUNTY PUBLIC WORKS)

	<u>YR</u>	<u>LOGTP</u>	<u>LOGCHL</u>	<u>LOGSD</u>	<u>TP</u>	<u>CCHLA</u>	<u>Secchi</u>
Kohlman	1992	ERR	ERR	-0.09691			0.8
	1991	2.143014	1.643452	0	139	44	1.0
	1990	1.968482	1.238046	0.041392	93	17.3	1.1
	1989	1.934498	1.409933	-0.09691	86	25.7	0.8
	1988	2.004321	1.222716	-0.04575	101	16.7	0.9
	1987	2.204119	1.356025	-0.09691	160	22.7	0.8
	1986	2.176091	1.250420	-0.04575	150	17.8	0.9
	1985	2.068185	1.371067	-0.22184	117	23.5	0.6
	1984	2.079181	1.671172	-0.15490	120	46.9	0.7
	1983	2.071882	1.688419	0	118	48.8	1.0
	1982	2.243038	1.359835	-0.39794	175	22.9	0.4
	1981	2.075546	1.478566	-0.09691	119	30.1	0.8
	1980	2.195899	ERR	ERR	157		
	1979	2.100370	ERR	ERR	126		
	1977	2.301029	1.973127	-0.39794	200	94	0.4
	1976	2.217483	1.812913	-0.52287	165	65	0.3
	1961	ERR	ERR	-0.301102			0.5
	1949	2.586587	ERR	ERR	386		
	Gervais	1992	ERR	ERR	0.079181		
1991		1.838849	1.294466	0.278753	69	19.7	1.9
1990		1.812913	1.264817	0.278753	65	18.4	1.9
1989		1.556302	0.875061	0.447158	36	7.5	2.8
1988		1.568201	1.041392	0.397940	37	11.0	2.5
1987		1.623249	1.235528	0.278753	42	17.2	1.9
1986		1.954242	1.093421	0.380211	90	12.4	2.4
1985		1.806179	1.075546	0.255272	64	11.9	1.8
1984		1.812913	1.271841	0.176091	65	18.7	1.5
1983		1.643452	1.184691	0.380211	44	15.3	2.4
1982		1.724275	0.857332	0.301029	53	7.2	2.0
1981		1.633468	1.130333	0.342422	43	13.5	2.2
1978		ERR	ERR	0.176091			1.5
1977		1.633468	1.447158	0.041392	43	28	1.1
1976		1.447158	1.079181	0.204119	28	12	1.6
1975		1.903089	1.662757	-0.04575	80	46	0.9
1953		ERR	ERR	0.041392			1.1
1949	2.315970	ERR	ERR	207			
1948	ERR	ERR	-0.22184			0.6	

YR	-	Year data collected
LOGTP	-	Logrithm for Total Phosphorus mg/L
LOGCHL	-	Logrithm for Chlorophyll mg/M3
LOGSD	-	Logrithm for Secchi Disc value
TP	-	Total Phosphorus mg/L
CCHLA	-	Chlorophyll mg/M3
Secchi	-	Secchi Disc value in meters

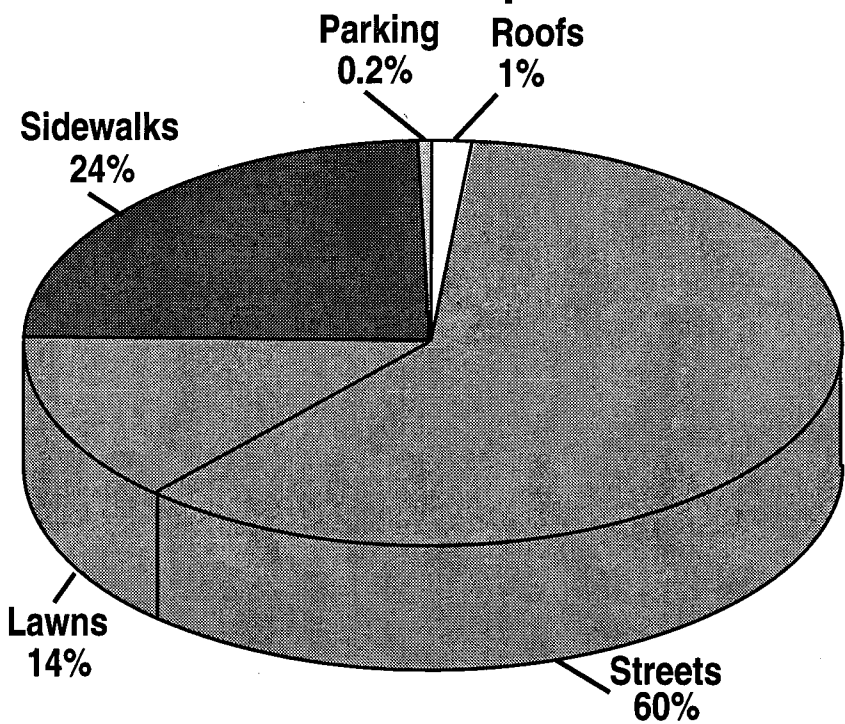
	<u>YR</u>	<u>LOGTP</u>	<u>LOGCHL</u>	<u>LOGSD</u>	<u>TP</u>	<u>CCHLA</u>	<u>Secchi</u>
Keller	1992	ERR	ERR	-0.15490			0.7
	1991	1.934498	1.463892	-0.04575	86	29.1	0.9
	1990	1.732393	1.149219	0.079181	54	14.1	1.2
	1989	1.755874	0.954242	0	57	9.0	1.0
	1988	1.977723	1.627365	-0.30102	95	42.4	0.5
	1987	2.255272	1.290034	-0.15490	180	19.5	0.7
	1986	1.892094	1.531478	-.09691	78	34.0	0.8
	1985	2.041392	1.612783	-0.39794	110	41.0	0.4
	1984	2.113943	1.658011	-0.30102	130	45.5	0.5
	1983	1.949390	1.658011	-0.30102	89	45.5	0.5
	1982	2.217483	1.645403	-0.39794	165	44.3	0.4
	1981	2.017033	1.469822	-0.22184	104	29.5	0.6
	1977	2.146128	1.857332	-0.52287	140	72.0	0.3
	1976	2.089905	1.857332	-0.52287	123	72.0	0.3
	1975	2.130333	1.505149	-0.22184	135	32.0	0.6
1949	1.819543	ERR	ERR	66			
Wakefield	1990	2.075546	1.491361	0.041392	119	31.0	1.1
	1989	1.903089	1.409933	0	80	25.7	1.0
	1988	2.356025	1.527629	-0.04575	227	33.7	0.9
	1987	2.367355	1.363611	0.113943	233	23.1	1.3
	1986	2.146128	1.305351	0.079181	140	20.2	1.2
	1985	2.041392	1.589949	-0.04575	110	38.9	0.9
	1984	2.176091	1.657055	-0.04575	150	45.4	0.9
	1977	2.322219	2.187520	-0.52287	210	154.0	0.3
	1976	2.176091	1.653212	-0.52287	150	45.0	0.3
	1975	2.431363	1.913813	-0.39794	270	82.0	0.4
1974	2.230448	2.021189	-0.52287	170	105.0	0.3	
Round (to Phalen)	1992	ERR	ERR	0.079181			1.2
	1991	1.819543	1.338456	0.301029	66	21.8	2.0
	1990	1.785329	1.155336	0.322219	61	14.3	2.1
	1989	1.653212	0.724275	0.431363	45	5.3	2.7
	1988	1.919078	1.290034	-0.09691	83	19.5	0.8
	1987	2.178976	1.522444	0.041392	151	33.3	1.1
	1986	1.826074	1.528916	-0.04575	67	33.8	0.9
	1985	1.959041	1.547774	0	91	35.3	1.0
	1984	1.963787	1.558708	0	92	36.2	1.0
	1983	1.863322	1.518513	0.041392	73	33.0	1.1
	1982	2.012837	1.397940	-0.22184	103	25.0	0.6
1981	2.000000	1.442479	-0.04575	100	27.7	0.9	

	<u>YR</u>	<u>LOGTP</u>	<u>LOGCHL</u>	<u>LOGSD</u>	<u>TP</u>	<u>CCHLA</u>	<u>Secchi</u>
Phalen	1992	ERR		0.361727			2.3
	1991	1.653212	1.089905	0.414973	45	12.3	2.6
	1990	1.556302	0.939519	0.491361	36	8.7	3.1
	1989	1.380211	0.447158	0.602059	24	2.8	4.0
	1988	1.477121	0.982271	0.431363	30	9.6	2.7
	1987	1.477121	1.012837	0.278753	30	10.3	1.9
	1986	1.568201	0.845098	0.414973	37	7.0	2.6
	1985	1.748188	0.875061	0.397940	56	7.5	2.5
	1984	1.778151	1.056904	0.342422	60	11.4	2.2
	1983	1.556302	0.880813	0.531478	36	7.6	3.4
	1982	1.707570	0.414973	0.505149	51	2.6	3.2
	1981	1.447158	1.029383	0.342422	28	10.7	2.2
	1980	ERR	ERR	0.301029			2.0
	1979	ERR	ERR	0.544068			3.5
	1977	1.477121	1.130333	0.230448	30	13.5	1.7
	1976	1.397940	0.812913	0.146128	25	6.5	1.4
	1975	1.672097	1.477121	0.113943	47	30.0	1.3
	1974	ERR	ERR	0.322219			2.1
	1958	ERR	ERR	0.431363			2.7
	1951	ERR	ERR	0.643452			4.4
Beaver	1990	2.167317	1.613841	-0.04575	147	41.1	0.9
	1989	1.863322	1.354108	0.113943	73	22.6	1.3
	1988	2.322219	1.559906	-0.15490	210	36.3	0.7
	1987	2.164352	1.389166	0.113943	146	24.5	1.3
	1986	2.146128	1.475671	0	140	29.9	1.0
	1985	1.897627	1.434568	0.041392	79	27.2	1.1
	1984	2.041392	1.485721	0	110	30.6	1.0
	1977	2.230448	2.217483	0.079181	170	165.0	1.2
	1976	2.278753	2.004321	-0.69897	190	101.0	0.2
	1975	2.176091	1.778151	-0.09691	150	60.0	0.8
1974	1.724275	1.431363	-0.30102	53	27.0	0.5	

YR - Year data collected  
 LOGTP - Logrithm for Total Phosphorus mg/L  
 LOGCHL - Logrithm for Chlorophyll mg/M3  
 LOGSD - Logrithm for Secchi Disc value  
 TP - Total Phosphorus mg/L  
 CCHLA - Chlorophyll mg/M3  
 Secchi - Secchi Disc value in meters

# Percentage of Pollutant Contributed by Each Source Area in Residential / Institutional Landuse

## Total Phosphorus



## Total Solids

