Minnesota Board of Water and Soil Resources
One West Water Street, Suite #200
St. Paul, Minnesota 55107

In the Matter of Prescribing a Revised Watershed Plan for the Pelican River Watershed District (Minnesota Statutes 1990, Section 103D.405)

ORDER PRESCRIBING WATERSHED PLAN

The board of managers of the Pelican River Watershed District (District) filed a proposed revised watershed management plan with the Minnesota Board of Water and Soil Resources (BWSR) and the BWSR issued a notice of filing a revised watershed plan. The BWSR received no requests for hearing in response to its notice of filing.

Having considered the entire record, the BWSR makes the following Findings of Fact, Conclusions of Law, and Order:

Findings of Fact

1. The District filed a revised watershed management plan (plan) with the BWSR in October, 1990 pursuant to the Minnesota Watershed Act.

2. BWSR staff submitted recommendations on the plan to the District on January 15, 1991.

3. The District transmitted copies of the proposed revised plan to affected counties, cities, and soil and water conservation districts on March 18, 1994, and to the Minnesota Department of Natural Resources (DNR) and the BWSR on March 18, 1994.

4. On March 31, 1994 BWSR staff forwarded recommendations to the District regarding the revised plan.

5. On July 13, 1994 the BWSR received comments on the proposed revised plan from the DNR.

6. On September 14, 1994 BWSR staff recommended submission of the revised plan to the Board.

7. On October 25, 1994 the BWSR issued a notice of filing of revised watershed plan pursuant to Minnesota Statutes, sections 103D.405 and 103D.105, subdivision 2. The notice of filing was published in the Detroit Lakes Tribune (Becker County) on November 2, 1994; and the Becker County Record (Becker County) on November 6, 1994. The notice briefly summarized the content of the proposed revised plan, invited written comments on the plan, and stated that any person could request a public hearing on the plan. No written comments or requests for hearing were received by the BWSR.

Conclusions of Law

1. All relevant, substantive, and procedural requirements of law have been fulfilled. The BWSR has proper jurisdiction in the matter of prescribing a revised watershed management plan for the District.

2. The proposed revised plan states existing water and water-related problems in the District, possible solutions, and the general objectives of the District. The proposed revised plan conforms with the requirements of the Minnesota Watershed District Act, BWSR Guidelines for Watershed District Plan Content, and is consistent with affected county water plans.

Order

1. The BWSR prescribes the attached plan as the revised watershed management plan for the Pelican River Watershed District.

Dated this 7th day of December, 1994.

Minnesota Board of Water and Soil Resources

D. James Nielsen, Chair

PREFACE

In 1965 the Becker County Commissioners petitioned the Minnesota Water Resources Board, asking that a Watershed District be created under the Minnesota Watershed Act. After favorable action by the Board, the Pelican River Watershed District was authorized, and held its first meeting on June 13, 1966.

An "OVERALL PLAN" was approved in 1967 and served to guide the District in its activities for many years.

With the passage of time the original plan no longer served the needs of the District. For this reason, and in order to comply with Chapter 103 of the Minnesota Statutes, a **Watershed Management Plan** was submitted on November 21, 1990 for Board of Water and Soil Resources review (BWSR).

In January 1991 BWSR and others described some deficiencies in the Management Plan, and recommended certain changes be undertaken prior to submitting the document for formal review. **A Revised Management Plan** was submitted on January 22, 1992, and sent to BWSR for further consideration on April 23, 1992. On May 28, 1992, The Department of Natural Resources and other officials commented negatively on the this version too, making numerous suggestions for its additional revision.

Another version was submitted in November of 1992. Owing to personnel changes and the prospect that such changes would signal a change in direction for the District, prior to formal evaluation of this version, in June, 1993, the District asked that the November 1992 version be withdrawn from the review process. At that time no formal comments had been received, though some informal comments were favorable.

This current version bears little resemblance to earlier versions. It reflects some major rethinking of District goals and the status of various programs. It benefits substantially from the completion of a Phase I report for a Clean Lakes Grant which assisted the District in assessing the condition of lakes, identifying certain problems, and the developing of goals, strategies and measures to address the problems.

Much of the general background information on the watershed has been incorporated into a geographic information system (GIS) which facilitates data retrieval, mapping and analysis.

A specific attempt has been made to ensure that this Management Plan is consistent with the Comprehensive Water Plan of Becker County, the county in which nearly all of the District's territory is found. Otherwise, the plan closely follows a draft outline entitled "BWSR Administrative Guidelines for Watershed District Revised Watershed Management Plan Content".

ACKNOWLEDGEMENTS

Numerous persons have assisted in preparing this revised management plan. Earlier efforts featured the work of the District's Attorney, Mr. Charles Ramstad, and former Executive Secretary Peter Waller. Mr. Paul Glander (Department of Natural Resources), Mayor Larry Buboltz (City of Detroit Lakes), and Dale Krystosek (Board of Water and Soil Resources), made very useful comments on the current version as did Mark Geihl, Dennis Kral, David Cox, Ginny Imholte and other managers and members of the Advisory Committee. Oklahoma State University's Dr. Stephen Stadler and Dr. Thomas Wikle and Ms. Susan Shaull provided some technical support. Georgia Hecock rendered invaluable editorial service.

The mistakes and errors of omission are mine.

- Richard D. Hecock
April 18, 1994

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THE DISTRICT AND ITS MISSION

Acting on a nominating petition submitted on September 15, 1965, the Minnesota Water Resources Board (MWRB) established the Pelican River Watershed District (PRWD) on May 27, 1966. In explaining its action, the Board found that the

> "principal bodies of water in the upper reaches of the watercourse of the Pelican River, Detroit Lake, Lake Sallie and Lake Melissa, have become at certain times during the summer recreational months, unhealthy and unsightly due to excessive weed and algae growths. Such undesirable growths in and along the shores of the above lakes have interfered with boating, fishing and swimming; and, have denied lake home owners the enjoyment of water scenery. In addition, weeds and algae growths have affected lake property value." ((MWRB, 1966).

The board also cited navigation, recreation areas, soil erosion, fish and wildlife habitat as matters which required attention from the new watershed district.

While no formal mission statement was adopted at the time of its formation, the perception that the condition of area lakes was rapidly deteriorating was the primary motivation in petitioning for the creation of a watershed district. The same perception guided formulation of the new District's 1967 Overall Plan (p.3). The following objectives were enumerated:

1. To conserve and make provident use of water and other resources;
2. To reduce the pollution of the lakes of the Pelican River chain;
3. To slow down the eutrophication of the lakes.

Though several additional objectives, involving water level regulation, recreational facilities enhancement, the protection of scenery, and the conservation of soil and water, were listed in the plan, subsequent district correspondence and documents, together with District programs make it clear that the Managers *placed the highest priority on correcting problems associated with lakes.*

For example, though the Overall Plan made reference to problems of navigation, water supply, park areas, drainage, and irrigation, much greater emphasis was given to the problems of eutrophication, pollution, and erosion as they relate to area lakes. Similarly, in describing management options and solutions, lakes dominated the discussion.

The District's managers quickly realized that in order to make well-advised decisions concerning District lakes, much would have to be learned about the watershed, its flows, its nutrient sources and their effects. From its inception the Managers sought expert advice from governmental agencies and universities on these and related issues. In 1968 it sponsored the first statewide symposium dealing with lake pollution problems (WRRC, 1969). That effort

served to reinforce the Managers' perceptions that much more needed to be learned. The main District-inspired research efforts have included:

- a study, sponsored by Environmental Protection Agency, described nutrient budgets for Lakes' Sallie and Melissa from 1969 to 1971; Dr. Joe Neel of the University of North Dakota was principal investigator; several masters and doctoral theses resulted from these efforts (Neel, 1973);

- extensive surface hydrologic investigations were conducted in late 1960's and on ground water conditions in the late 1970's (USGS, 1970, 1981, 1982);

- an EPA-sponsored study was carried out by Dr. Neel on the efficacy of weed-harvesting in Lake Sallie in 1973 (Neel, 1973);

- a master's thesis supported by the district investigated septic tank impacts on Lake Sallie in 1974 (Lee, 1972)

- In the late 1970's Dr. Neel monitored the impacts of the improvements to Detroit Lakes wastewater treatment system, particularly as they influenced the nutrient balance of Lake Sallie (Neel, 1978, 1981).

- Mr. Del Hogan of Instrumental Research Associates conducted a 1983 study of several Watershed lakes, and made numerous recommendations concerning strategies for remediation (Instrumental Research, 1984);

The District Managers are proud of the District's contributions to the watershed and its residents, to the region, to the State, and to the community of scholars worldwide who are well-aware of the research which has been conducted here.

Clean Lakes Project

The District received a Clean Lakes Grant from the U.S. Environmental Protection Agency in 1987. Administered through the Minnesota Pollution Control Agency, the program has been directed to the "restoration" of two District lakes, Sallie and Detroit. A thorough inventory of the nature and causes of problems in these two lakes, along with a general plan for accomplishing solutions, was completed in 1993. The District has received some funds to implement this plan.

Other Principal Lake Protection Activities

In addition to its research efforts, the District has undertaken numerous activities in connection with its interest in maintaining the quality of area lakes. Since 1968 mechanical aquatic vegetation harvesting has been conducted on Lakes Sallie and Melissa. Though originally planned as a means of nutrient reduction, harvesting has continued on the strength of its perceived improvement of lake aesthetics and enhancement of boating and swimming activities. In 1991 a similar program was begun in Detroit Lake, in part to undertake control of the exotic, flowering rush. To further assist residents on Melissa, Sallie and Big and Little Detroit Lakes in removing large amounts of vegetation material which is deposited on shore, a weekly roadside weed pickup and disposal service is provided.

Working in a context of multiple administrative jurisdictions, and diverse economic interests, the District has adopted a strategy of cultivating close working relationships with city, township and county governments, as well as many state and federal organizations, sportsman and environmental groups, and local businesses.

In this way, the District has been active in promoting sewers for lake front property. This effort contributed materially to the decisions which led to provision of sewer and water to the north and west shore areas of Detroit Lakes in the early 1970's and to the current expansion of this system to include the south and east shores of those lakes. Due to a shortage of funds, an effort to provide sewer systems for Lake Sallie and Melissa was abandoned in the early 1980's.

The District was instrumental in causing the upgrade of the City of Detroit Lakes Waste Water Treatment System in 1976. This project is associated with substantial reductions in phosphorus loadings to downstream lakes, Sallie and Melissa. The District also has strongly advocated storm runoff control, and in recent years the City of Detroit Lakes has installed a series of dry sedimentation basins, and one wet detention pond as a means of partial control.

Flowering rush (*Butomus umbellatus*) is an exotic plant which was first identified in the mid-1970's in Deadshot Bay, an arm of Big Detroit Lake; the plant subsequently has spread throughout Detroit Lakes, and down the Pelican River to lakes Sallie and Melissa. For more than 10 years the District's Managers has been attempting to bring the plant under control. In 1991 the Department of Natural Resources (DNR) declared the entire shoreline of Detroit Lake and some areas of Lake Sallie as infested with flowering rush and recommended hand removal of plants in shallow water. In 1992 and 1993 the DNR issued permits which allowed mechanical harvesting. Other unsuccessful control measures were tried, including herbicide applications. The Board also has taken the leadership in securing the addition of Flowering Rush to the State's list of Harmful Exotic Species, and recently has joined Bemidji State University in proposing to the Legislative Commission for Minnesota's Resources (LCMR) a comprehensive study of the plant, and its control.

Utilizing its rule-making authority, the Managers require permits for various land alteration activities that take place in or near the waters of the District, and seek to prevent those actions that are judged to be detrimental to water quality (See Appendix A for the Watershed Rules). The District attempts to review proposed construction activities within the District, and monitor those which are approved. The Managers support strict and consistent enforcement of the County and City Shoreland Ordinances, Minnesota's Wetland Conservation Act, and Federal wetland regulations.

Companies servicing septic systems also are monitored under Watershed rules. Septage pumpers are issued permits, and required to maintain and submit collection and disposal logs.

The District has collected substantial amounts of data concerning stream and lake quality.

In recent years the District has come to believe that education is an important function. Believing that accomplishment of the goal of maintaining the water quality of District streams and lakes requires a well-informed citizenry, the District has provided funds, as well as technical support to an innovative Junior High School program which integrates language arts, mathematics, natural and social sciences, in the study of the water quality of area lakes. In addition, the District has begun a series of pamphlets aimed at informing District residents and policy makers about water quality issues and improvement measures.

Other Activities

While the District has clearly emphasized lake water quality issues, some of the other original objectives outlined in the 1967 Overall Plan have been addressed, either directly or indirectly, as a result of District activities. Some of the worst of the water supply problems were solved in conjunction with the District supported sewer projects. A major County park was developed largely as a result of District efforts. As the understanding of the causes of lake nutrification problems grew, the District has become interested in wetland enhancement and erosion control efforts, and has worked with various agencies in those endeavors.

While there was some initial interest in enhancing the navigability through the Pelican River chain, only small progress has been made, including some dredging of channels to facilitate watercraft passage in the 1980's. Recent District thinking on the subject is that further navigation enhancements would speed the spread of Flowering Rush. Though the District occasionally has been tempted to become involved in lake water level management in the main District Lakes, the myriad problems associated with that enterprise, including some jurisdictional matters, have caused the current board to take the position that water level management is not necessary or feasible.

28 Years of Service

The Pelican River Watershed District soon will celebrate its 28th anniversary. Many of the most distinguished leaders of the region have served to guide the District or to assist in its endeavors. These leaders and their fellow residents are proud of the District's accomplishments. Indeed, PRWD has a history of "firsts"! It was the first watershed district in Minnesota whose primary concern was with the water quality of lakes. It was the first to conduct a scientific study on the role of septic tanks on the pollution of lakes, and the first to evaluate the effects of weed cutting on nutrient budgets of a lake. PRWD was the first Minnesota watershed district to levy assessments based on recreational benefits. In 1969, it sponsored the first statewide conference dealing with lake eutrophication.

Has the District fulfilled the original MWRB charge, or accomplished its original objectives? It is reasonable to respond to this important question with some equivocation. Of course, the underlying problem is that lake eutrophication is a continuous, natural process, and no amount of interference by man can alter the fact that lakes are destined to change in ways that are inimical to preserving superior water quality conditions found by the first European settlers in this area. The original managers were well aware of this circumstance, as reflected in their plan objectives and their subsequent actions. The aims were, and are, to "make provident use" of water, to "reduce" pollution, and to "slow down" eutrophication. Any fair evaluation of District accomplishments would conclude that these aims have been fulfilled. But the underlying question is unanswerable because we cannot know what would be the condition of area lakes in the <u>absence</u> of District activities.

Of course, it might be argued that the District could have had greater success or had more impacts. Some would prefer that the Managers should have been more aggressive in pursuit of fulfillment of their purposes and accomplishment of objectives. Most Managers have wished that too, but often have been frustrated by lack of knowledge, inadequate resources, and lack of authority.

A Renewal of Mission

On March 17, 1994, the District Managers formally adopted a new mission statement. Rooted in its original MWRB charge, and sustained by more than 30 Managers and their advisors, the District affirms its central interest in the water quality of the Upper Pelican River chain of Lakes.

> "The mission of the Pelican River Watershed District is to enhance the quality of water in the lakes within its jurisdiction. It is understood that to accomplish this, the District must ensure that wise decisions are made concerning the management of streams, wetlands, lakes, groundwater, and related land resources which affect these lakes."

Armed with this focus, the Managers are dedicated to greeting the 21st Century not only with improved lake water quality, but with established measures that will ensure that improvements will continue.

They are well equipped to do so. As their predecessors did before them, they have become extraordinarily well-informed about lake systems and operations. With an average of over 7 years in office, they have an outstanding record of service to the District. The current Board of Managers is as follows:

	Service from	Term expires	Residence in Subwatershed
Dennis Kral, President	1987	1995	Big Floyd
Dennis Dovre, V. President	1987	1998	Little Floyd
Ginny Imholte, Secretary	1991	1997	Big Detroit
Timothy Bergien, Treasurer	1987	1995	Big Detroit
Orrin Okeson	1987	1998	Campbell
Charles Roper	1982	1995	Sallie
David Cox	1991	1997	Melissa

They are served by an able staff:

Richard D. Hecock, Administrator
Morris Estenson, Aquatic Plant Management Director
Joanne Thompson, Secretary
Charles Ramstad, Attorney
David Grinaker, Engineer.

The administrator, aquatic plant management director, and secretary are part-time employees of the District. The attorney and engineer are retained on a consultancy basis.

The District's **Advisory Committee** is comprised of persons representing special constituencies within the District in accordance with Chapter 103 of the Minnesota Statutes:

Vern Seals	Becker County Commission
William Wickum	Becker County Sportsmen's Club and Long Lake
Mark Geihl	Becker County Coalition of Lake Associations
Russell Okeson	Becker County Soil and Water Conservation district
Doug Friendshuh	Farm Organization

The District's office, located in the Roosevelt Building (803 Roosevelt Avenue, Suite 100) in Detroit Lakes, is provided by the Rural Minnesota CEP, Inc. The District maintains an inventory of equipment, including weed-harvesting equipment, boats, trucks, loaders, computer, and printers.

Monthly meetings are held by the Managers on the 3rd Thursday of each month at 7:30 PM in the City of Detroit Lakes Council Chambers. Other public meetings are announced in local newspapers.

The conduct of meetings, and other non-statutory activities of the District are governed by by-laws (Appendix B). The Board has recently adopted a civil rights policy.

The current valuation of the District is $362,791,000. The District will levy $72,000 on this value in 1994; an additional $74,000 will be assessed for two special projects. Some of these funds will be used to match federal funds in connection with Environmental Protection Agency's Clean Lakes program. The District also has received funds from other granting organizations.

The current managers look forward to the next ten years with greater knowledge, and possibly a somewhat more realistic view of what should be, and what can be, accomplished.

THE DISTRICT'S SETTING

The Pelican River Watershed District is located in West Central Minnesota, about 50 miles east of the North Dakota border (figure 1).

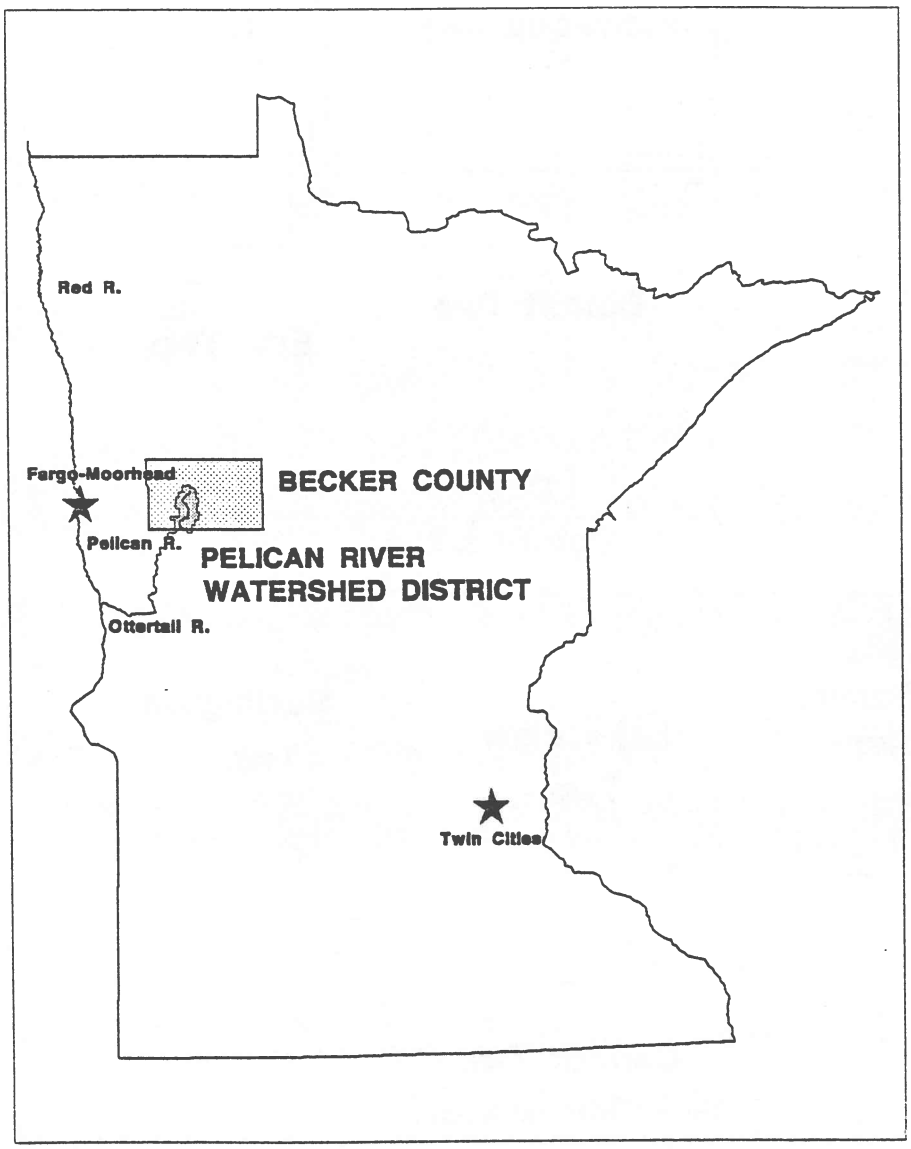


Figure 1. General Location of the Pelican River Watershed District

The District lies almost wholly within Becker County. It includes about 76,000 acres, 120 square miles (32,500 hectares or 315 square kilometers). Of these amounts, approximately 5% is located in Ottertail County. The majority of District lands are contained in Richwood, Detroit and Lake View townships and the City of Detroit Lakes (Figure 2). Other governmental units found wholly or partially within District boundaries include Lake Eunice, Erie, Holmesville Burlington, and Candor townships, and Independent School District #22.

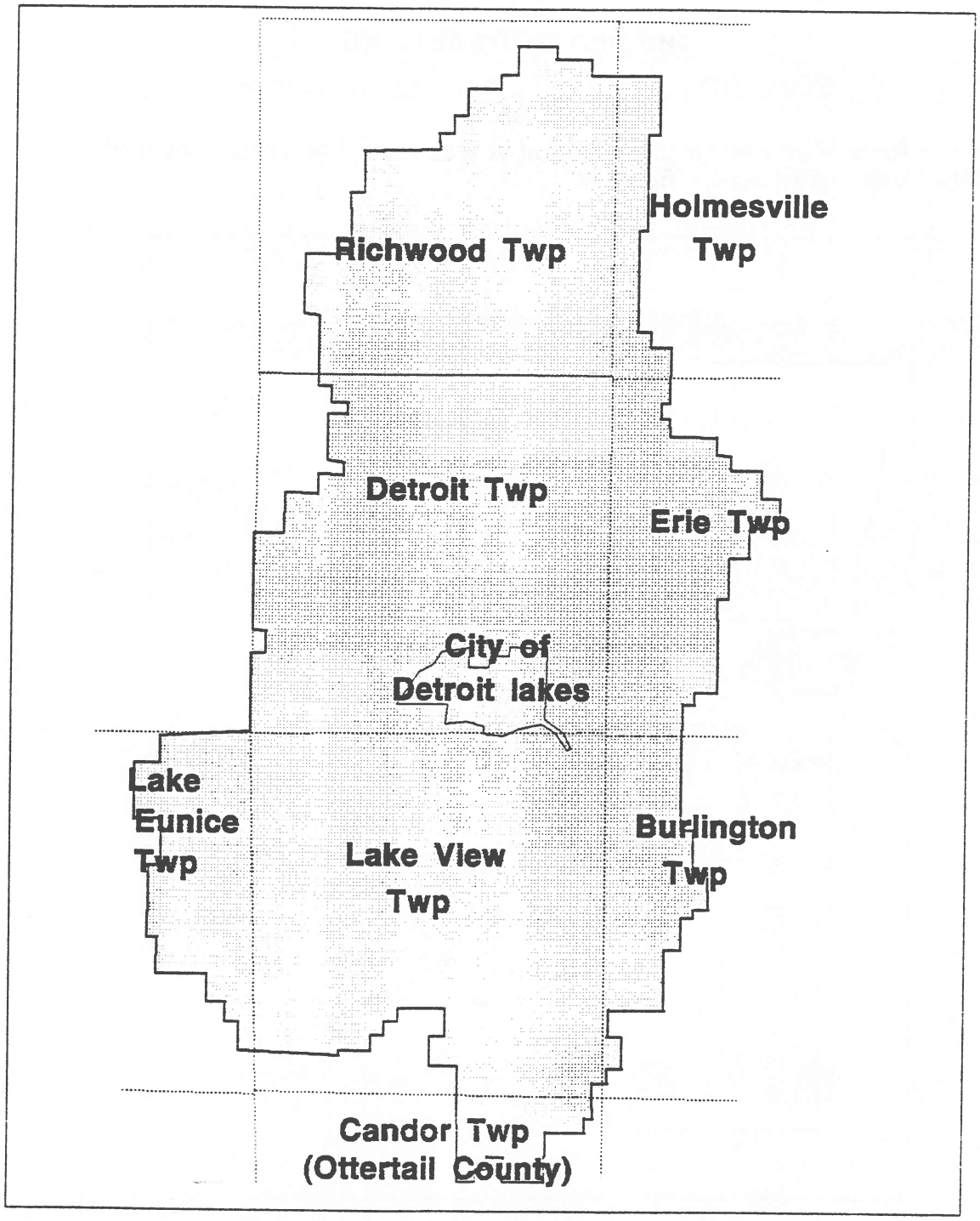


Figure 2. Principal Governmental Units in Relation to District Boundaries

The Pelican River is a tributary to the Otter Tail River, and ultimately to the Red River of the North. Only the upper portion of the Pelican River is included in the Pelican River Watershed District. The topographic limits of the upper portions of the Pelican River's watershed closely correspond to the boundaries of the District (Figure 3).

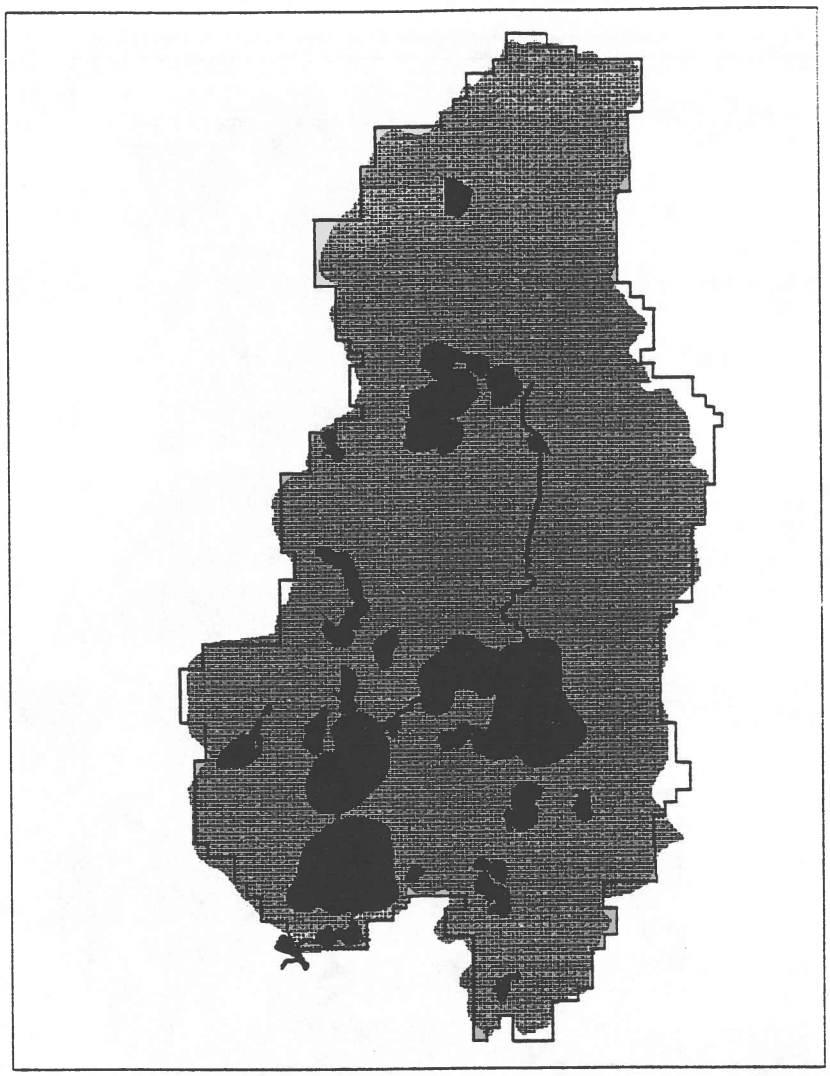


Figure 3. District Boundaries Compared to Physical Limits of Watershed

Terrain

The region owes its physical appearance to a thick blanket of material deposited about 10,000 years ago and consisting of gravel, sand and clay deposits. Surfaces are pitted with numerous "ice-block" lakes and swamps. Overall the relief of the area is about 300 feet, but local relief rarely exceeds 50 feet; stream gradients in the District are mostly low, and the drainage is naturally poor.

The whole of the area is covered by glacial material which generally exceeds 400 feet in the vicinity of the District. This morainic drift is undifferentiated and unsorted material deposited by glaciers, especially when they paused during retreat. The underlying geological structure has no significance to the District's natural or human systems.

Two main types of surface glacial deposits are exposed in the District. In the District's periphery morainic material accounts for higher elevations (Figure 4). Outwash gravels ranging in depth from a few feet to as much as 100 feet are found in the central part of the district. The Pelican River flows across this outwash. Melting of large blocks of glacial ice buried in the outwash created depressions which when subsequently filled with water forming lakes. In this manner most of the large District lakes were formed in the outwash zone, or adjacent to it.

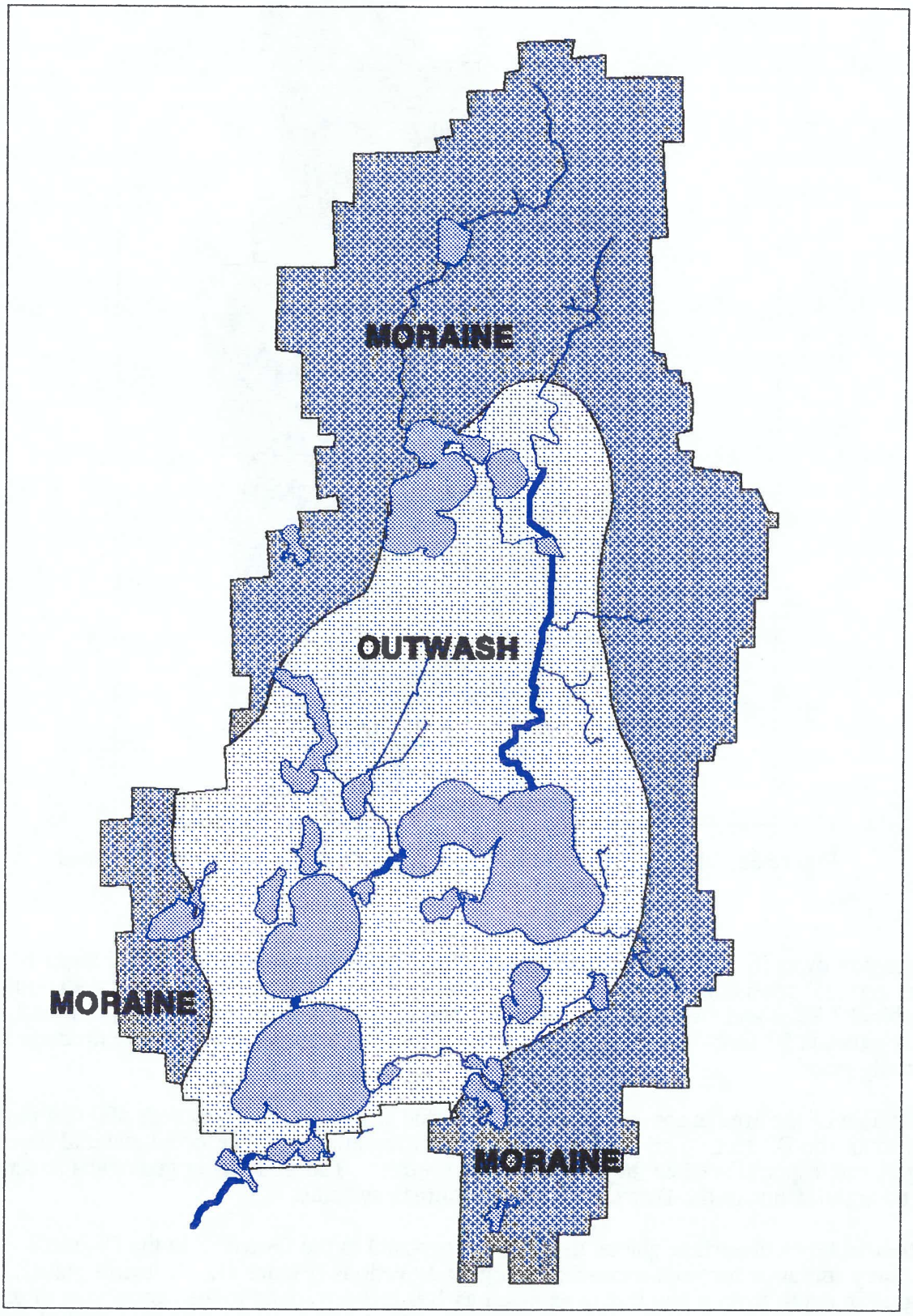


Figure 4 Surficial Glacial Deposits in the Pelican River Watershed District

Soils

The District's upland soils range from medium textured, sandy-loams to sandy soils developed on the deposits of glacial moraine and outwash. The soils of the morainic areas are medium textured, sandy loams. The soils formed in the outwash area are darker, and medium to coarse in texture. Poorly drained organic soils occupy low-lying areas throughout the District. Some problems of soil erosion are associated with soils on slopes. Droughtiness is a common limitation to agriculture. Ponding and waterlogging are associated with low areas.

The full Becker County Soil Survey, completed in 1992, is not yet in a form that permits incorporation into the District's geographic information system (GIS). However, a summary of the District's soil associations and their attributes are summarized in Figure 5a; a generalized soil map is portrayed in Figure 5b.

Association #1 (Verndale-Dorset-Corliss)

Well-drained, sandy loam, soils formed on nearly level to steep slopes in outwash; subject to droughtiness, wind and water erosion.

Association #2 (Waukon-Forman-Cathro)

Well drained to very poorly drained loam or muck soils formed on till or organic deposits on lateral moraines; slopes range from level to moderately steep; used for cropland and woodland and wetlands (Cathro); subject to water erosion and wetness, ponding (Cathro).

Association #3 (Cormorant-Audubon-Foxlake)

Moderately to poorly drained silty-clay-loam soils formed on level steep slopes on glacial till. Major use is cropland; clay content and wetness are management problems.

Association #4 (Nebish-Seelyeville)

Range from well-drained to very poorly drained with loam to muck textures on flat to moderately surfaces. Used for cropland and woodland and wetlands (Seelyeville).

Association #5 (Snellman-Rifle-Sugarbush)

Well drained to very poorly drained soils found in glacial till, outwash and moraines. Found on slopes from level to steep. Rifle variant is very poorly drained, and associated with wetlands. Woodland and cropped areas. Subject to water erosion, droughtiness, and ponding (Rifle).

Source: Becker Soil and Water Conservation District

Figure 5a. Attributes of Soil Associations found in District

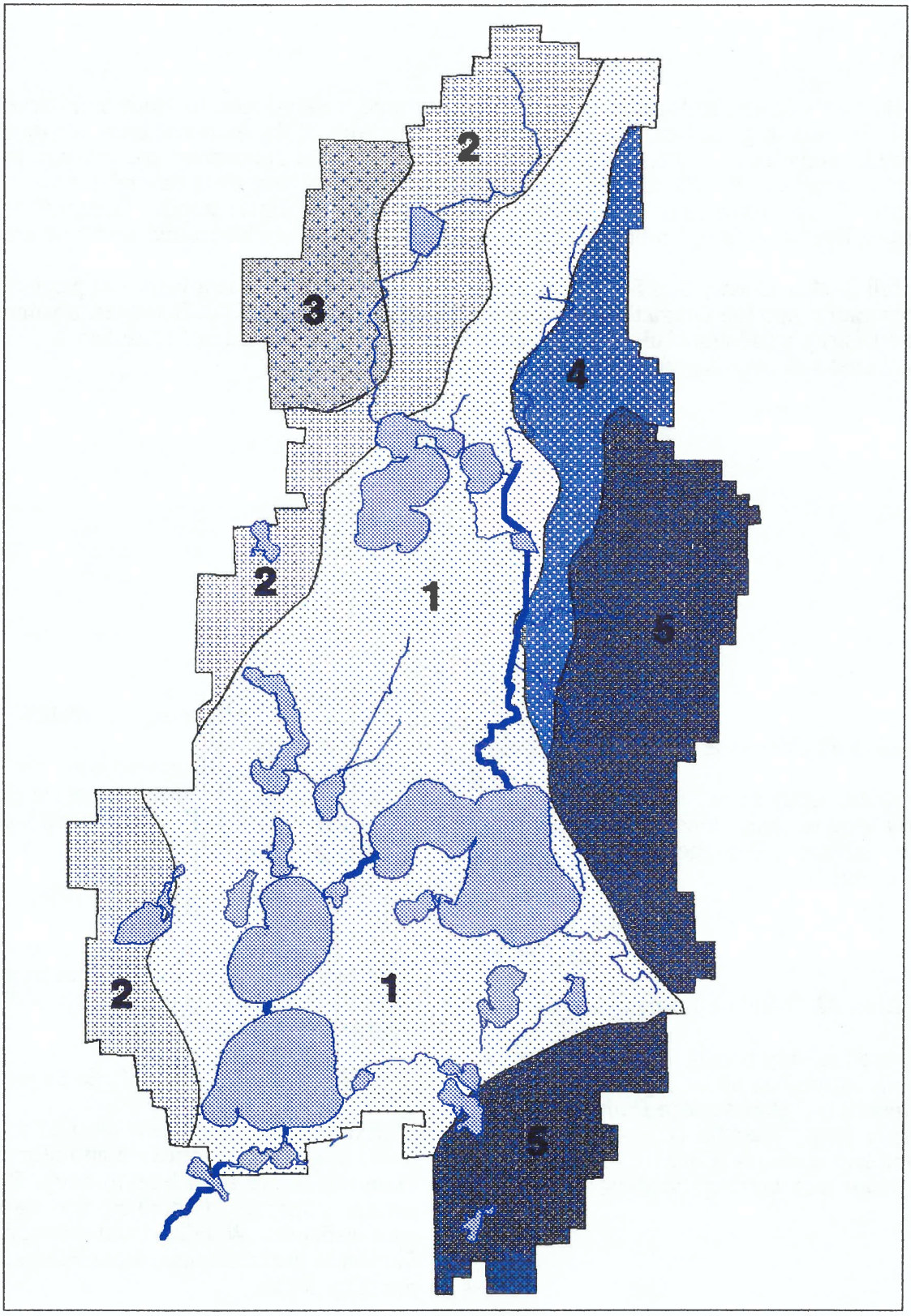
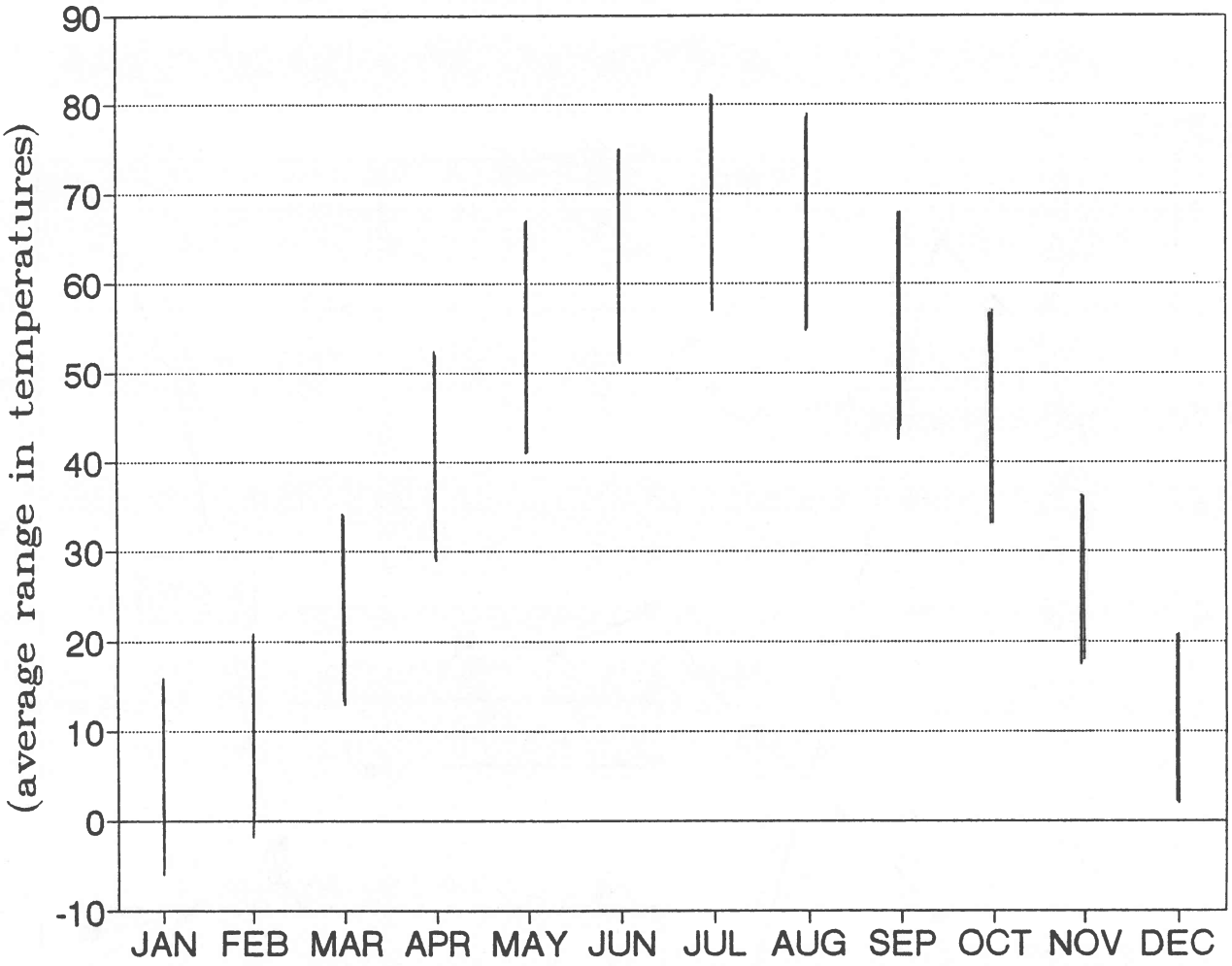


Figure 5b. The District's Major Soil Associations

Climate

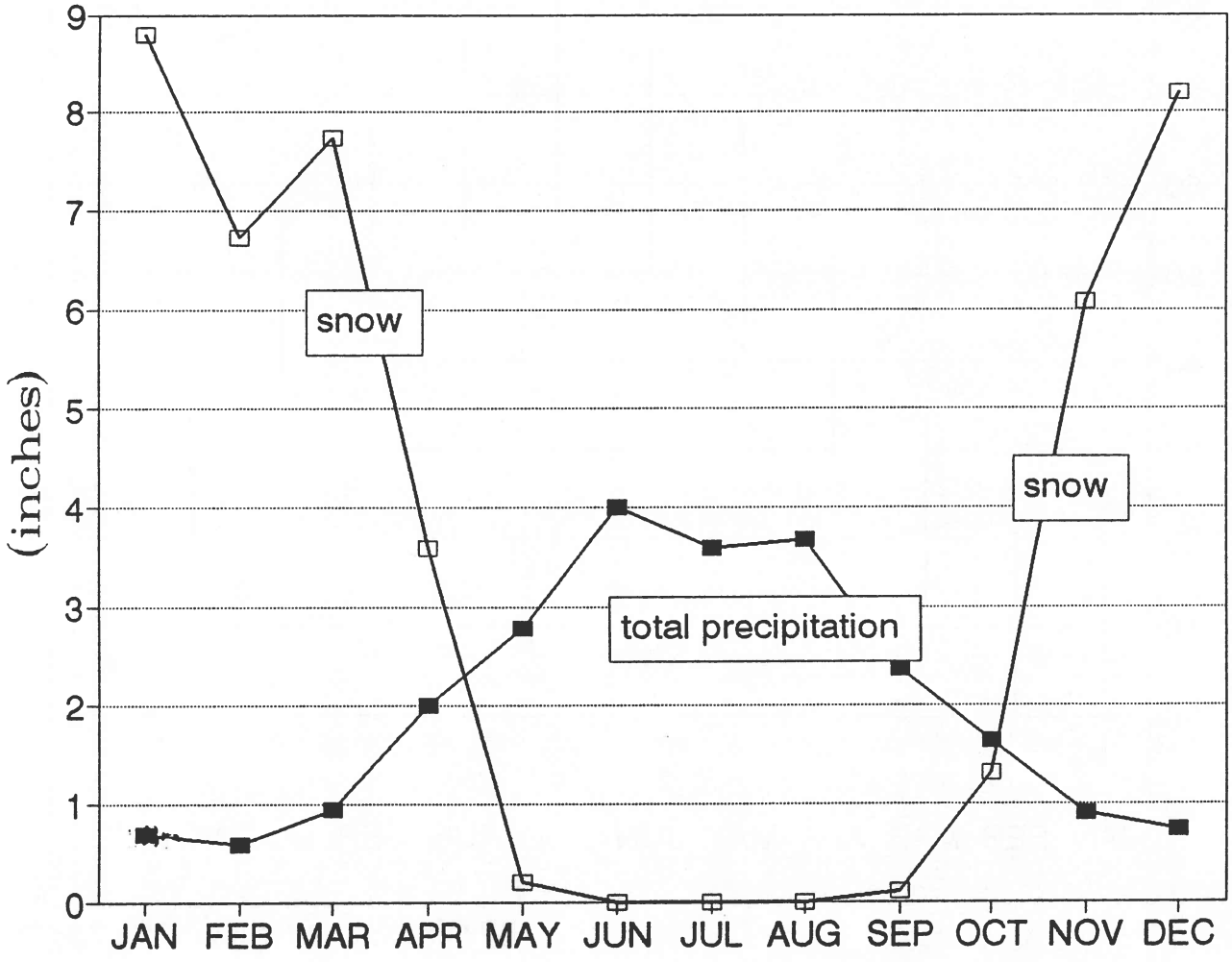
The area's climate has short summers with long cold winters; it is transitional between the humid moisture regime to the east and south, and semi-arid conditions to the west. During the 70 years of record, the area has received an annual average of about 24 inches of precipitation, but large variations are typical. Monthly mean precipitation amounts as well as average monthly high and low temperatures are depicted in Figures 6 and 7. Monthly amounts also are highly variable over time.



Source: U.S. Weather Bureau

Figure 6. Temperature Patterns at Detroit Lakes

Note that approximately 70% of that precipitation falls during the May to September period. Average snowfall is 42 inches. Estimated average annual evaporation from area lakes is slightly more than total precipitation.



Source: U.S. Weather Bureau

Figure 7. Precipitation Patterns at Detroit Lakes

The frost-free season averages 125 days, with last killing frost about May 20 and the first frost about September 22. As indicated by seventy year records available for Detroit Lakes, the ice-on season averages 212 days, with freeze-up occurring on November 22 and open water returning on April 20 (Figure 8). These dates also are highly variable from year to year.

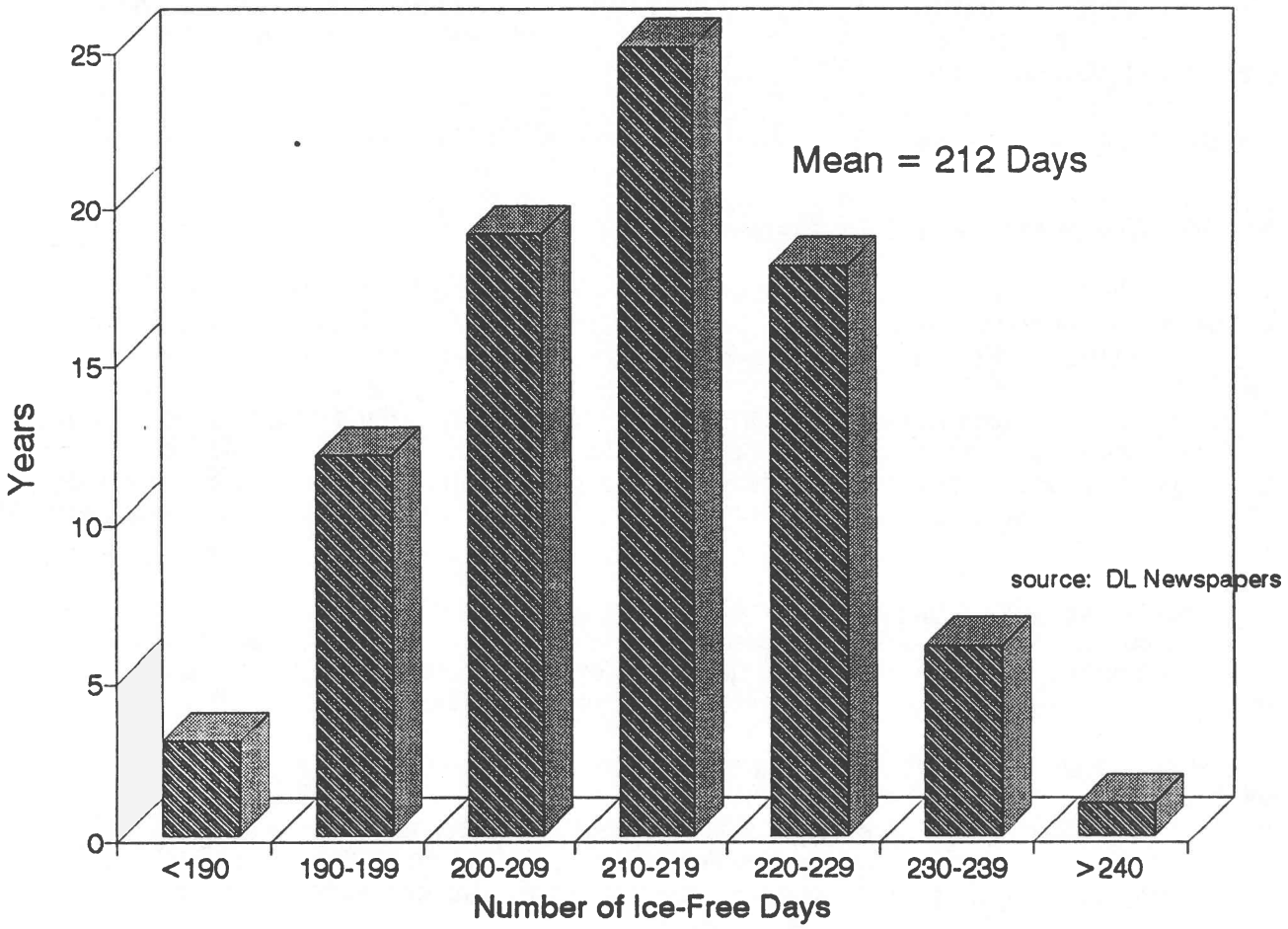


Figure 8. Ice-Free Days for District Lakes (as indicated by Detroit Lakes)

Natural Vegetation

The Minnesota Pollution Control Agency (MPCA) utilizes an eco-region concept based on general vegetation patterns when describing or classifying lakes. Though lakes in Becker

County are found in two of these eco-regions, the Pelican River Watershed District is wholly within the North Central Hardwood Forest region. More precisely, the District lies astride an ecotone which marks the transition between the northern pine forests to the east, the hardwoods to the southeast and the prairies associated with the Red River Valley to the west.

At the time of European settlement nearly all of the District was covered by dense forests. Upland varieties were mainly hardwood climax varieties, especially oak and maple. Basswood, birch and white and yellow poplar were also found. There may have been some white pine in the northeastern part of the District. In wetland areas there were a variety of grass and shrubs and some hemlock and spruce bogs.

Most of the District's original forests were cleared for agriculture and pasturage. Little remains of the old-growth forest. Where forests remain, second and third growth stands contain relatively greater numbers of pre-climax species, especially poplar. Much of the swamp spruce and hemlock stands were also removed, and some of the marginal wetland areas drained and planted.

The present pattern of woodlands is described in the land cover section.

Modification of the Natural Environment

The Watershed's natural environment has been considerably modified. While numerous Native American groups were found in the area prior to European settlement, their landscape impacts were negligible. Early contact with Europeans came with travelers on the Red River Ox Trail which passed near Detroit and Monson Lakes. A trading post was built in 1854 near the mouth of the Pelican River on Big Detroit Lake. The Northern Pacific Railroad arrived in 1871, and with it permanent settlement, at Tylerville, within the present site of the Detroit Lakes Industrial Park. Much of the Watershed was subsequently cleared of native hardwood and coniferous forest cover, and a great amount was brought into agricultural production prior to 1900.

As a result of drainage projects intended to enhance agriculture and urbanization, some "meandered" lakes, and many natural wetlands, were drained, mostly before 1920 (although some drain and fill activities continue to this day). In certain parts of the District, structures and other impervious surfaces have redirected drainage into surface waters.

Alteration of habitat, and other human activities have resulted in the endangerment of a number of in the District. While a full biological survey of the District will not be completed by DNR until 1997 or 1998, the list in table 1 offers a reasonable indication of the status of some species in the District's dominant ecological zone, the hardwood forests. There have been reports that wolves, recently re-introduced into nearby Tamarac National Wildlife Refuge, have been sighted within District boundaries.

The exotic species, Purple loosestrife and Flowering Rush are found in the District.

Table 1. At Risk Species in Minnesota's Hardwood Forest, Peatland, and Aquatic Habitats

Endangered

Five-lined skink	Bog bluegrass
Dwarf trout lily	Glade mallow
Golden-seal	lichen (Pseudocyphellaria crocata)
Bog adder's mouth	Fat pocketbook (mollusk)*
Higgin's eye (mollusk)*	American shore-plantain
Awlwort	prairie bush clover*
Clustered bur reed	western prairie fringed orchid*
Olivaceous spike-rush	Small white water-lily
One-sided pondweed	Perigrine falcon*
Dwarf trout lilly*	Piping plover*
Gray wolf*	

Threatened

Bald eagle	Blanding's turtle
Davis sedge	Wood turtle
Jointed sedge	Twinleaf
Wild onion	

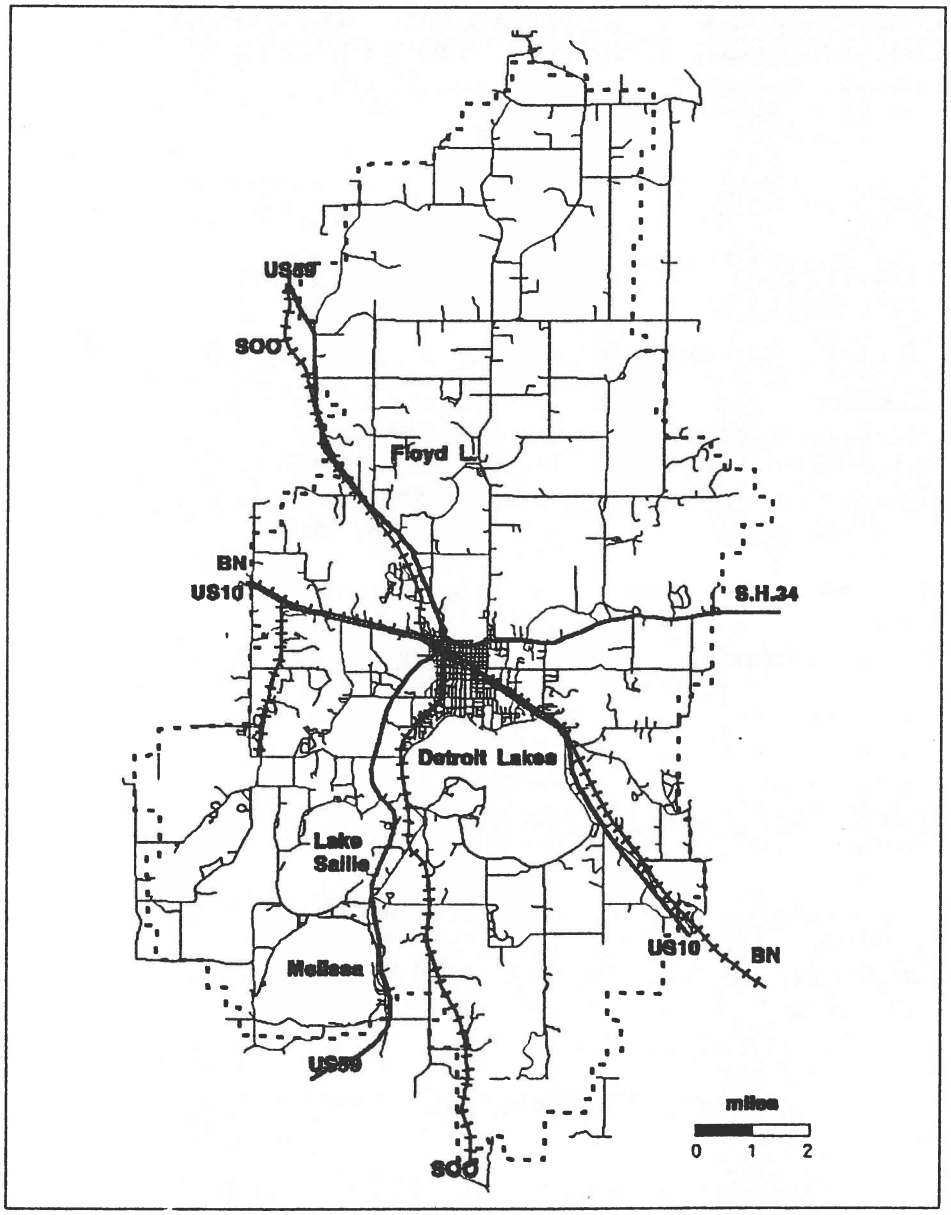
Special Concern

Louisiana waterthrush	Eastern pipistrelle
Red-shouldered hawk	Eastern spotted skunk
Mule deer	Northern myotis
Woodland vole	Eastern hognose snake
Fox snake	Massasauga
Milk snake	Northern cricket frog
Racer	Rat snake
Timber rattlesnake	American bittern
American white pelican	Common moorhen
Forster's tern	horned grebe
King rail	Osprey
Sandhill crane	Bullfrog
Pickerel frog	Snapping turtle
American brook lamprey	Black redhorse
Blue sucker	Bluntnose darter
Crystal darter	Lake Sturgeon
Paddlefish	Pallid shiner
Yellow bass	Ebony shell (mollusk)
Topeka shiner	Elephant ear (mollusk)

Source: Pfannmuller and Coffin

Accessibility

The District's location in West Central Minnesota is not only important from an environmental standpoint, but it also is significant in terms of its human resources. The district is well served by land transportation routes. Major state and federal trunk highways intersect within District boundaries, as does the transcontinental Burlington Northern and the north-south Soo railroads. A superior road network within the District also is noteworthy, as very few parts of the District lie more than one mile from a road (Figure 9).



Source: U.S. Census Bureau Tiger File

Figure 9. District Roads and Railroads

The District is accessible to all the major population centers of the state by rail, road, and air. The four-hour drive to the Twin Cities puts the District within reach of weekend visitors.

However, the District's relative location is especially enhanced by the lack of comparable physical resources to the west. The lakes in the Pelican chain represent closest lake-based recreational opportunities to the Fargo-Moorhead and Grand Forks metropolitan areas as well as to the entire population of Western Minnesota and North Dakota. In recent years, the amenities of the area have even attracted full-time residents who commute to the Fargo-Moorhead area for employment.

Economic Base

The region's economic base is diverse. Even before major logging operations ended in the area, and modern agriculture took hold, several of the area's lakes became popular destinations for cottage and resort development. The Pelican River was altered to permit navigation in 1889. By 1901 steamships carried 4000 tourists per year along the Pelican River between Detroit Lakes and Sallie. In 1904 a boat-train service connected Fargo with Lake Sallie via Detroit Lakes, and by 1909 there were 3 passenger boats each way from the north shore of Detroit Lakes to Shoreham. Indeed, by 1915 there were reported to be 250 cottages near Shoreham, between lakes Melissa and Sallie. Today, the region's economy is mixed, with agriculture, trade, manufacturing, tourism, and services all playing prominent roles (table 2).

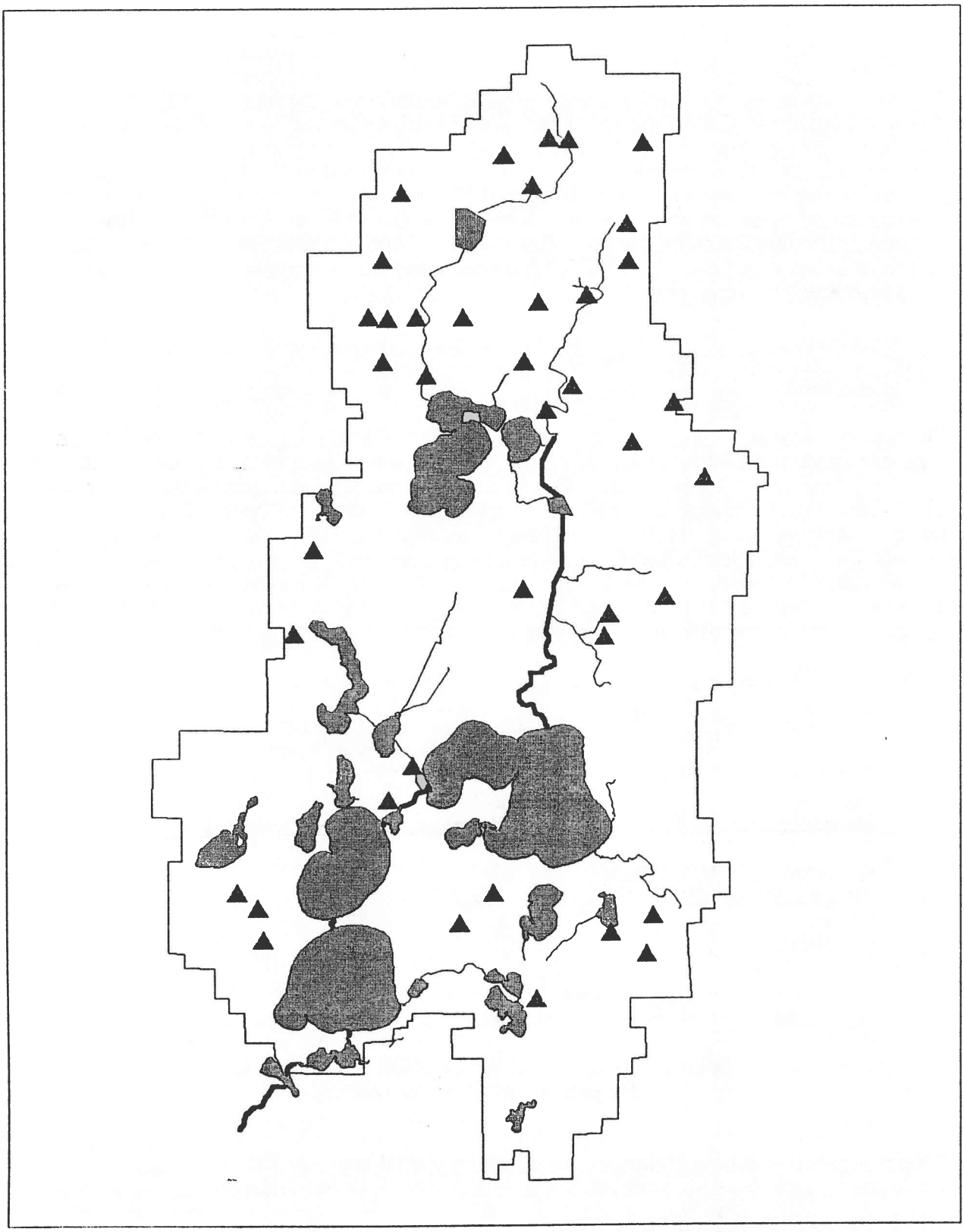
Table 2. 1992 Becker County Sectoral Employment and Wages

	Employment % of Total	Payroll % of Total
Forestry, Fishing, Mining	3.4	2.2
Construction	2.2	2.3
Manufacturing	14.0	16.1
Transportation	6.0	6.9
Wholesale and Retail Trade	23.3	15.5
Finance, Insurance, Real Estate	3.5	3.9
Service	25.3	22.5
Government	21.9	30.2

Data for 8624 employees during 1st quarter of 1992; does not include approximately 1400 self-employed workers, most of whom are farmers.

Source: Research and Statistics Office, Minnesota Department of Jobs and Training

Several regional economic trends are worth taking special note. In Becker County farm employment, farm-based population, and cropped acreage all have dropped significantly in recent years, as have the number of full-time farmers. Major blows to the local farm economy have been struck by the deterioration in the fur business which has resulted in the failure of several mink farms in the District, and the recent decision by Swift and Company, to cease turkey processing and hatchery operations in Detroit Lakes. On the other hand, agriculture is still of economic importance within the District which remains home to important several score of farm units, including about 40 designated livestock operations, especially dairy, beef and turkey (Figure 10).



Source: Becker SWCD

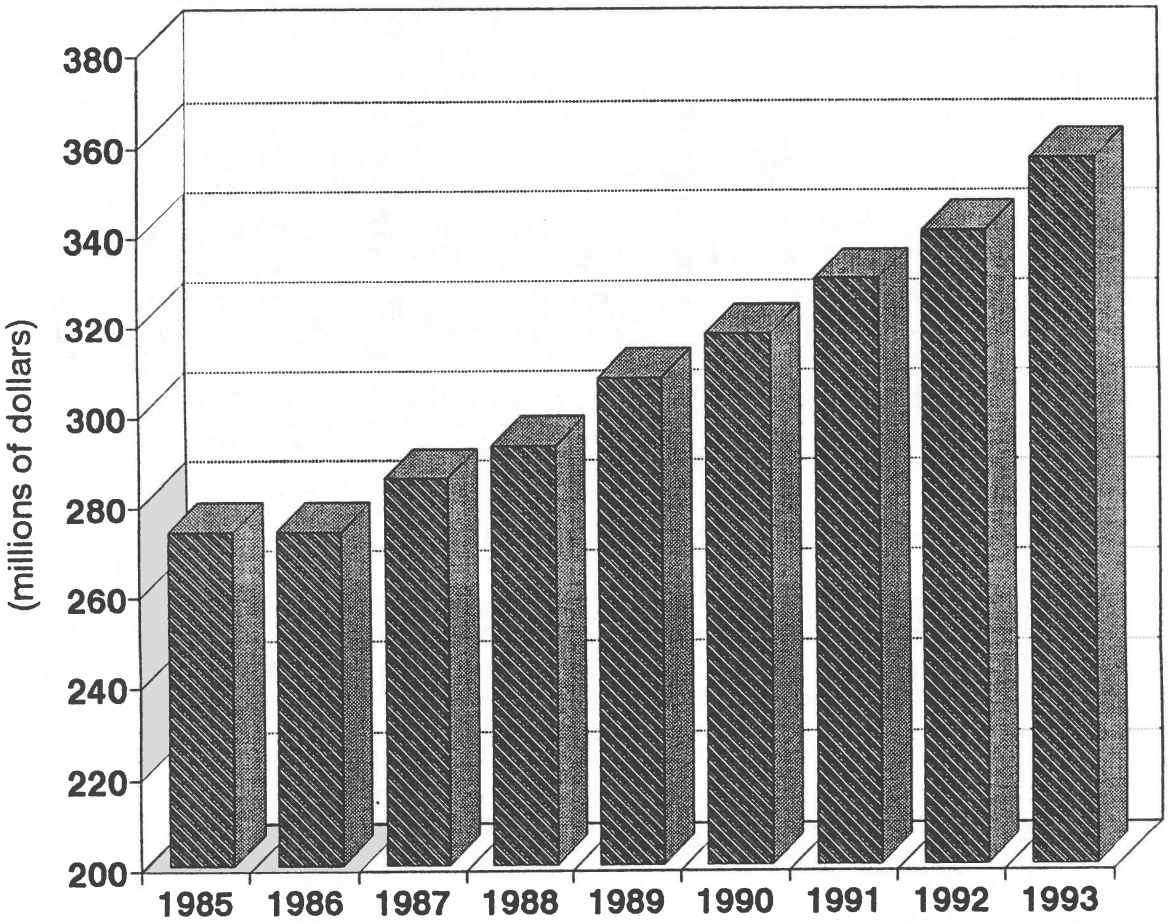
Figure 10. District Livestock Operations

Non-farm employment and earnings have grown in the County, and much of this is centered in Detroit Lakes and adjacent areas within the District. Based upon Minnesota Bureau of Economic Analysis data from 1969 to 1988, manufacturing, services, and wholesale and retail sales employment have seen major increases. Manufacturing is the leading earnings sector, but regional earnings have seen rapid expansions in services, and government sectors. Commuter income now contributes as much earnings as retail trade to Becker County.

Tourism, as indicated by the strength of services and retail trade sectors, remains a strong component in the regional economy. U.S. Travel Data Center figures indicate 1990 travel expenditures of over $63 million dollars in Becker County, up sharply from $56 million in 1986 (Minnesota Extension Service).

Still, the overall economy of the region, as indicated by per capita and household incomes, and the proportion of households living below the "poverty level", lags behind that of the the State of Minnesota and adjacent counties. Moreover, the gap seems to be widening (Minnesota Extension Service).

Some indication of the general condition of the economy of the district also can be discerned from the change in District's market valuations since 1985 (Figure 11).



Source: Becker County Auditor

Figure 11. Change in District's Assessed Valuations, 1984-1993

Population

While census data are not separately available for the Watershed District, its population history can be represented by changes which have taken place in the three townships and the city which comprise most of the District's territory (Figure 2). After growing steadily since the arrival of the railroad, there was a decline in the 1980's (Figure 12). Based upon examination of more detailed Bureau of Census files, actual 1990 resident population within the Watershed District is estimated to be 12,120. There is no evidence to suggest that the overall population base of the District is changing much at the present time.

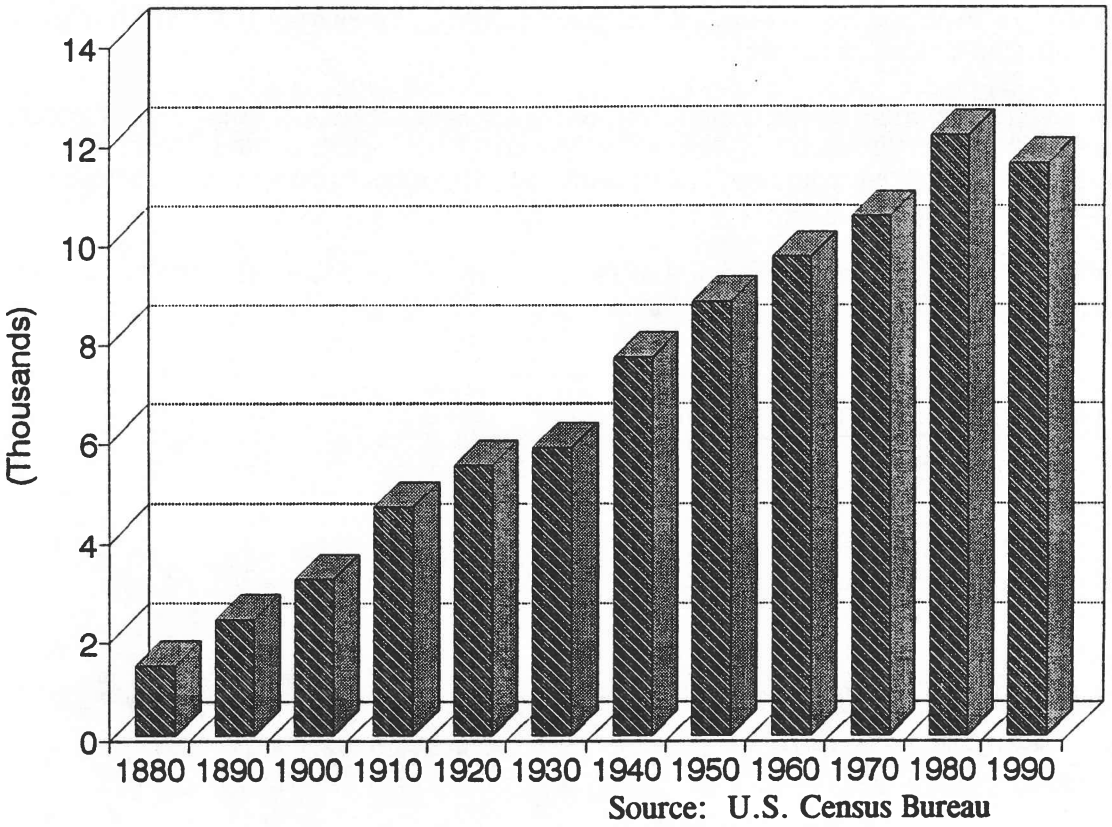


Figure 12 Population Change, 1890 - 1990

However several other aspects of the population situation are important to understanding the District's recent development. First, the region has a pronounced seasonal shift in population. By inference from data on vacant housing, the occasional resident population adds at least 30%, and perhaps as much as 60%, to populations reported by the Bureau of Census, depending upon what assumption is used concerning housing unit occupancy levels (Table 3). Transient visitors add even more people on a temporary basis.

Table 3. Estimated 1990 Housing and Population Data for PRWD

Total Population	12,120
Occupied Housing Units	4,786
Vacant housing Units	1,625
Housing Units Built since 1980	1,110

Source: U.S. Census Bureau (Data based upon Census Tracts 9504, 9505, 9506, 9507)

Second, the data on housing units themselves are important (Table 3). Indeed, it can be argued that housing units that are a better indicator of pressure on District resources than population. In terms of environmental impacts, each housing unit consumes space and other resources that are relevant to District planning. The vast majority of vacant housing is located near District Lakes.

Thirdly, unlike population, the number of housing units in the District appears to be increasing. A significant part of the total housing stock (almost 10%) has been built since 1980. It also can be shown that the reported number of housing units has increased in each of the last three censuses (U.S. Bureau of Census, Census of Population and Housing, 1970, 1980, 1990).

Finally, there appears to be a persistent tendency of regional populations to move toward the periphery. Rural non-farm populations grew from 60 to 68% of total Becker County populations in the 1980's, while both urban and rural farm populations declined. The data strongly support that which is visible in the landscape, that the District is becoming "suburbanized" by permanent residents who have chosen to live in the District's woodland and lakeshore zones. In 1993 residential building permits (including mobile homes) in the "non-urban townships" exceeded those in the City of Detroit Lakes by a ratio of 2:1. Also lending support to this notion is the fact that Lakeview township is the only District township which saw population growth (permanent residents) from 1980 to 1990, and Lakeview, Detroit and Richwood townships all surpassed the City of Detroit Lakes in terms of housing unit growth during that period.

Land Cover

The cultural imprint on the land of the District is complex (Table 4 and Figure 13). Most of the land is still devoted to agriculture, which tends to decrease in concentration from northwest to southeast. Residential and other urban developments are heavily concentrated in a few areas - around the area's lakes and in the City of Detroit Lakes. The previously noted tendency towards scattered isolated residential development is confirmed as well. Woodland is scattered throughout the District, but is dominant in the eastern and southern parts.

Table 4: Land Cover in the Pelican River Watershed District

	Acres	% of Total
Urban, Industrial	2,197	3
Rural Residences, 2nd Homes Farmsteads	2,025	3
Cultivated Lands	17,484	23
Grasslands, pasture	30,790	17
Forest	25,406	33
Open Water	12,115	16
Wetland	3,550	5
Other, incl. gravel, landfill	807	1
totals	76,907	100

Source: DPA International (Based upon 1988 SPOTS Digital Satellite I Imagery)

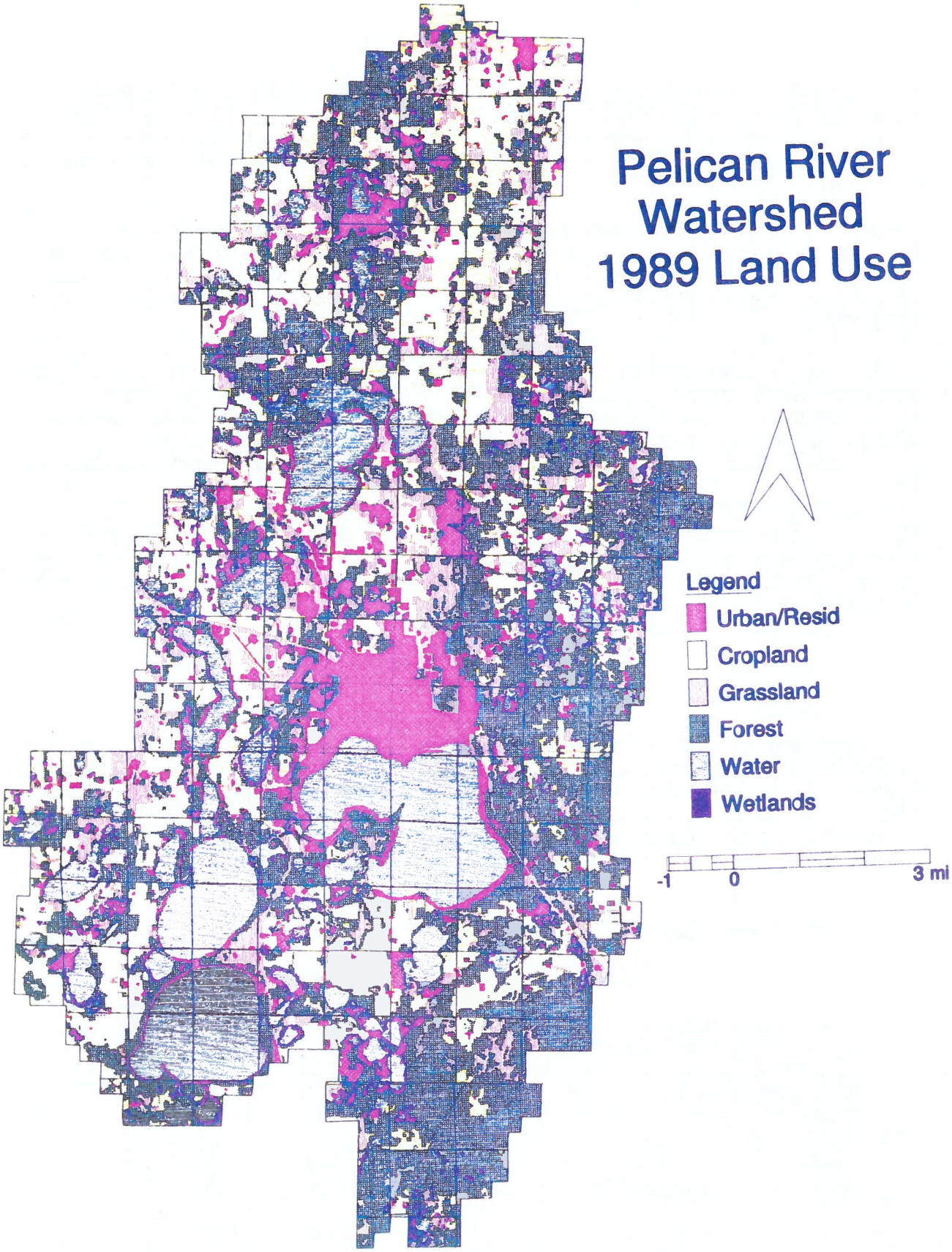


Figure 13. District Land Cover

Land Ownership and Special Management Arrangements

Most of the District's land is held in small private tracts. Only about 20 tracts exceed 200 acres. Aside from meandered lakes which are in the public domain, there are 39 parcels, totaling about 5100 acres (about 7% of District land) which are publicly held (figure 14). The majority of public land is currently managed for wildlife enhancement, though there are park areas within the City of Detroit Lakes and a large park and golf course complex near lakes Sallie and Melissa.

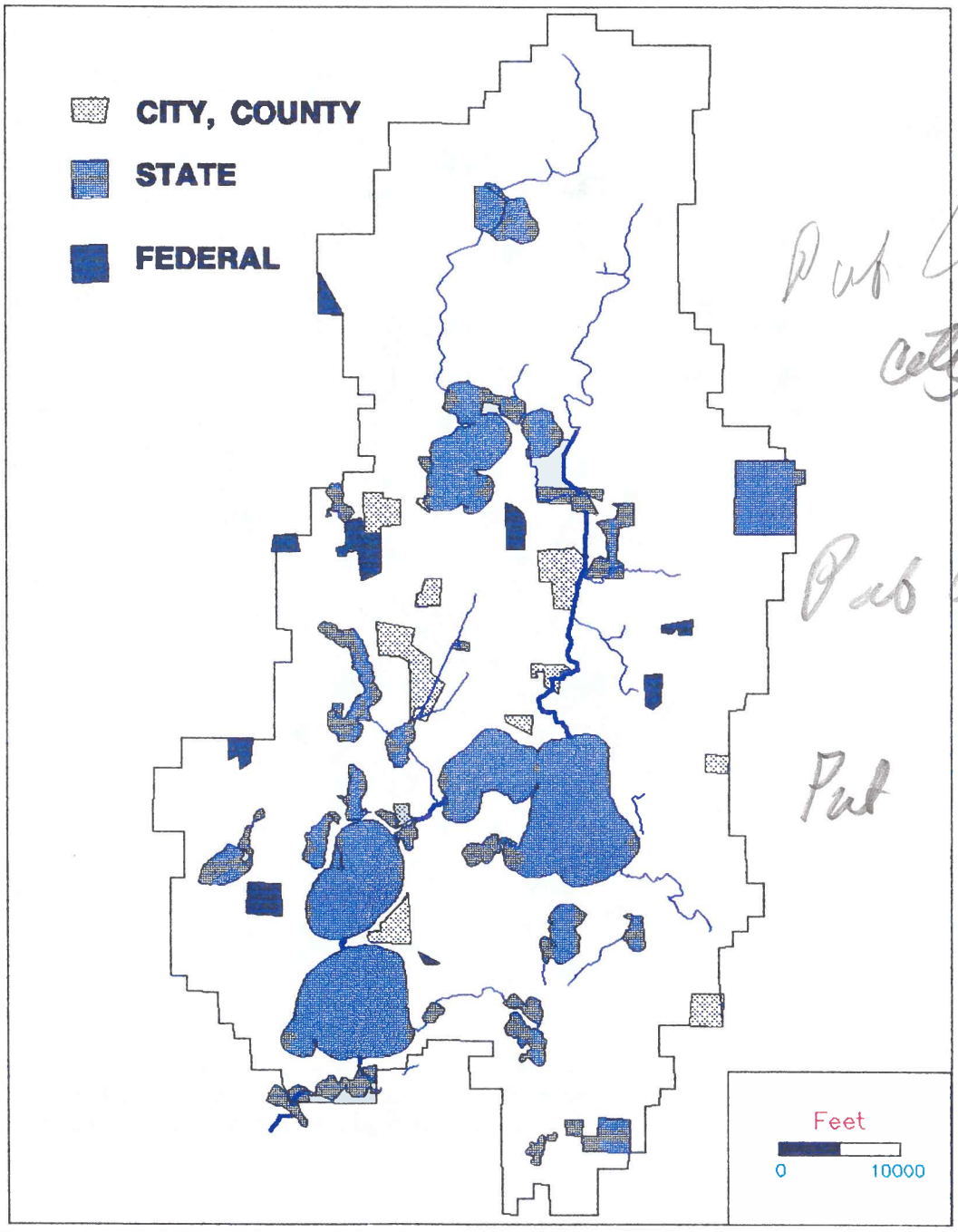
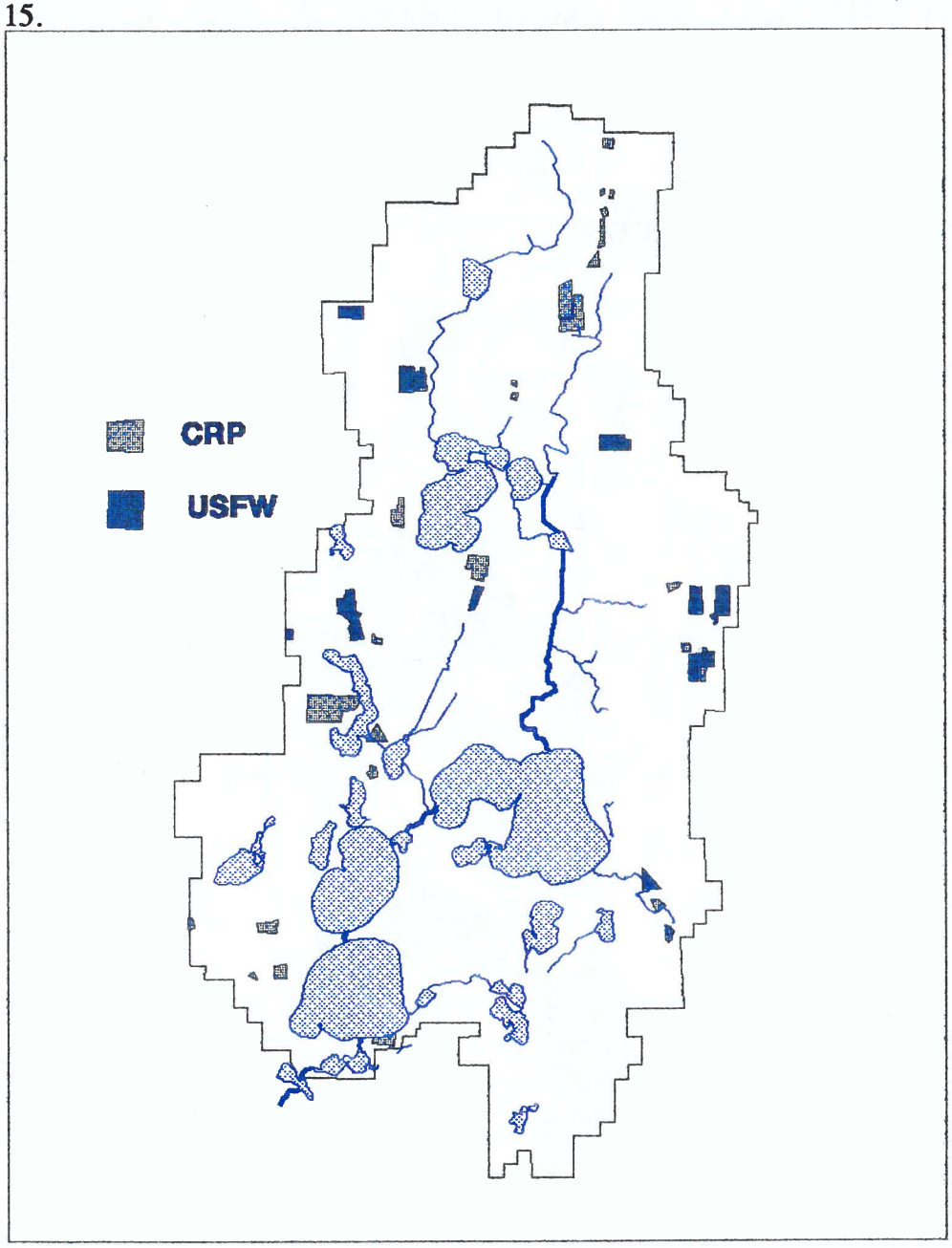


Figure 14. Public Lands in the Pelican River Watershed District

In addition to public ownership, 28 parcels, totalling 938 acres in the District, are enrolled in the Conservation Reserve Program (CRP). Participation in this program requires that the landowner refrain from cultivating the land for a specified period of time. In addition, the U.S. Fish and Wildlife Service has obtained easements on a 10 parcels, a total of 718 acres, within the District. The locations of these restrictions on District land utilization, are depicted in Figure 15.



Source: U.S. Fish and Wildlife Service files
Becker County Soil and Water Conservation District files

Figure 15. CRP and US Fish and Wildlife Service Easements

Historic and Archeological Resources

No full survey of historic resources has been completed in the District. At the present time only these four properties, all within the boundaries of the City of Detroit Lakes, are designated on the National Register of Historic Places:

Detroit Lakes Public Library (Carnegie
Edgewater Inn Cottages
The Northern Pacific Railroad Depot
The Sargent Home (Lake Avenue).

Nevertheless, it is assumed that there are other existing structures or areas of historic consequence within the District, including several structures at Shoreham, the Sportsman's Club on the East Shore of Detroit Lakes, the State Fish Hatchery at Dunton Locks. Also, it is known that there are areas of archeological significance. An important link in the fur trade was the Red River Ox Cart Trail which entered the District from the southeast and followed the East shore of Detroit Lakes and thence westerly along the northern shore of Monson Lake. Pre-European settlement sites also are known to exist.

DISTRICT WATERS

The principle hydrologic feature of the Watershed District is a chain of lakes connected by the Pelican River. The flow is from north to south with generally low gradients in this system, except in the uppermost portions of the watershed. Gradients and normal high water elevations for main district lakes are depicted in Figure 16.

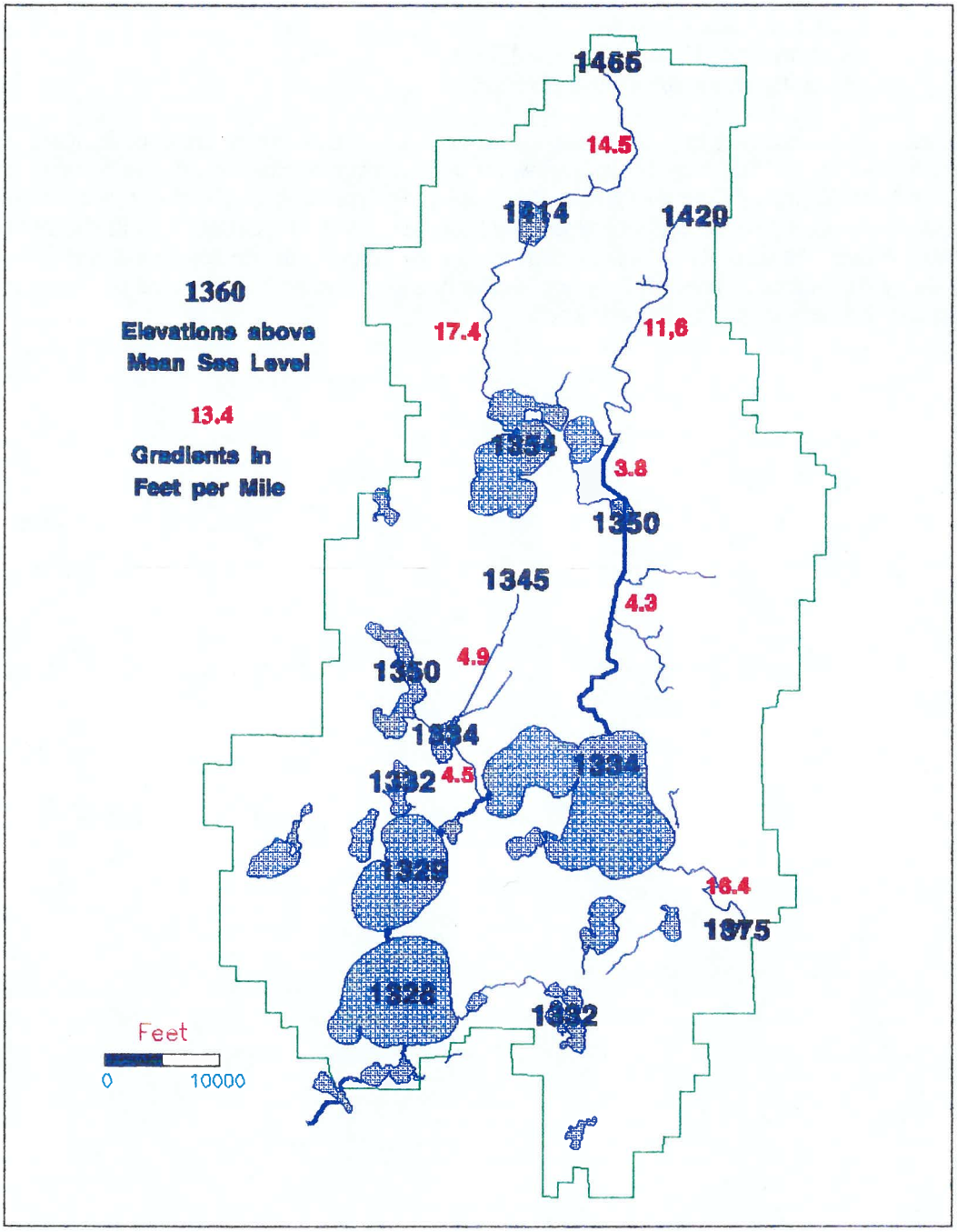


Figure 16 District Lake Elevations and Stream Gradients

Surface Hydrology

There are 51 meandered lakes, and approximately 41 miles of perennial streams. There are numerous wetland areas. The main stem of the Pelican River includes 8.3 miles of river channel plus the lakes. In addition there are approximately 33 miles of perennial tributaries (second and third order) to the main stem.

The District as a whole has average annual runoff of 4.3 inches (USGS, 1969). The typical pattern has low flows during the winter, followed by rapid increases in the spring. Summer flows are quite variable, depending upon rainfall patterns. Flows diminish in the fall.

The Pelican River system is known to have a maximum discharge of 229 cubic feet per second (cfs) and an average discharge of 38.9 cfs at the point where it leaves the District. Flow and runoff are highly variable from year to year (USGS, 1969). A mean annual discharge of 70 cfs may be expected to occur on an average about once in two years. However, flooding is not a serious problem in the Pelican River basin. After a 100 year 10-day rainfall episode in the summer of 1993, the Pelican River and several of its main tributaries (Ditch 11 and Campbell and Sucker Creeks), overflowed their banks in several places, causing some property and tree damage as well as bank erosion.

Ground Water

Underlying nearly all of the watershed is the Pelican River Sand-Plain Aquifer. The saturated portions of this aquifer mostly range from 15 to 60 feet, but saturated layers may reach over 100 feet. In several District shoreland zones, local water tables are within a few feet of the surface. The aquifer receives its water from spring snowmelt and precipitation, as well as from regional aquifers which extend far beyond the boundaries of the District. The Sand-Plain and other regional aquifers are discharged in significant amounts to the Pelican River as well as to local wetlands and lakes (Miller). Some flowing springs are found in depressions and along streams and lakeshores. These discharges play a significant role in hydrology of the District's lakes and streams, providing amounts in the range of 5 to 30 % of annual water budgets for some lakes (Neel, McMann and McBride), and on the order of 10% of the discharge of the Pelican River as it leaves the District.

Main Lakes

There are five main lakes in the Pelican Chain within the District (Floyd, Detroit, Long, Sallie and Melissa). In addition several other sizable lakes are linked to the system by tributaries. The characteristics of the District's main Lakes are summarized in Table 5.

Figure 17 portrays the main tributary and catchment areas (subwatersheds) of the main lakes.

The subwatershed areas of the various lakes differ in terms of landforms, soils and development characteristics (refer to Figures 4, 5b and 13). *Appendix E summarizes watershed land cover by subwatersheds.*

Table 5. Characteristics of the Main Lakes of the Pelican River Chain

	Area (ac.)	Volume (acft)	Max. Depth (ft.)	Approx Inflow (acft)	In-lets	less than 15 feet deep %	Catchment Area 1/ (ac.)
Big Floyd	1,234	12,604	34	800	4	69.9	14,692
Little Floyd	205	3,520	34	800	1	46.6	14,897
Big Detroit	2,160	34,500	82	17,561	3	40.0	37,901
Little Detroit	920	11,000	22	17,500	1	90.0	40,017
Long	424		60		0		1,974
St. Clair	140	598	8	5,000	4	89.9	6,460
Muskrat	67	341	18	22,000	2	95.5	56,945
Monson	132				0		793
Sallie	1,211	20,689	55	22,000	5	42.9	57,378
Melissa	1,831	22,000	43	25,000	2	51.5	70,000+

1/ all contributing subwatersheds

Source: Instrumental Research, Inc., DNR

Hydrologic budgets have not been established for all District Lakes. However Lake Sallie budgets have been calculated on several occasions (Mann and McBride, Neel, 1973, PRWD 1993), and for Detroit in 1988 (PRWD, 1993). These data are assumed to be more or less representative of the main lakes in the District (Table 6), though it is noteworthy that Long Lake and several of the other smaller lakes have no inlets. Available data point to the importance of the Pelican River as the major contributor to surface waters. Groundwater sources are also important. There are pronounced seasonal variations in the relative contributions of the various components. From other Lake Sallie studies, as well as climatological and streamflow patterns, it is certain that there are pronounced year-to-year variations in relative importance of rainfall, groundwater, and surface flows.

Lakes throughout the district reached record high levels during the July and August of 1993, and considerable property damage was reported as well as some severe shore erosion was observed. Lake clarity exhibited adverse effects throughout the remainder of the summer and fall of 1993.

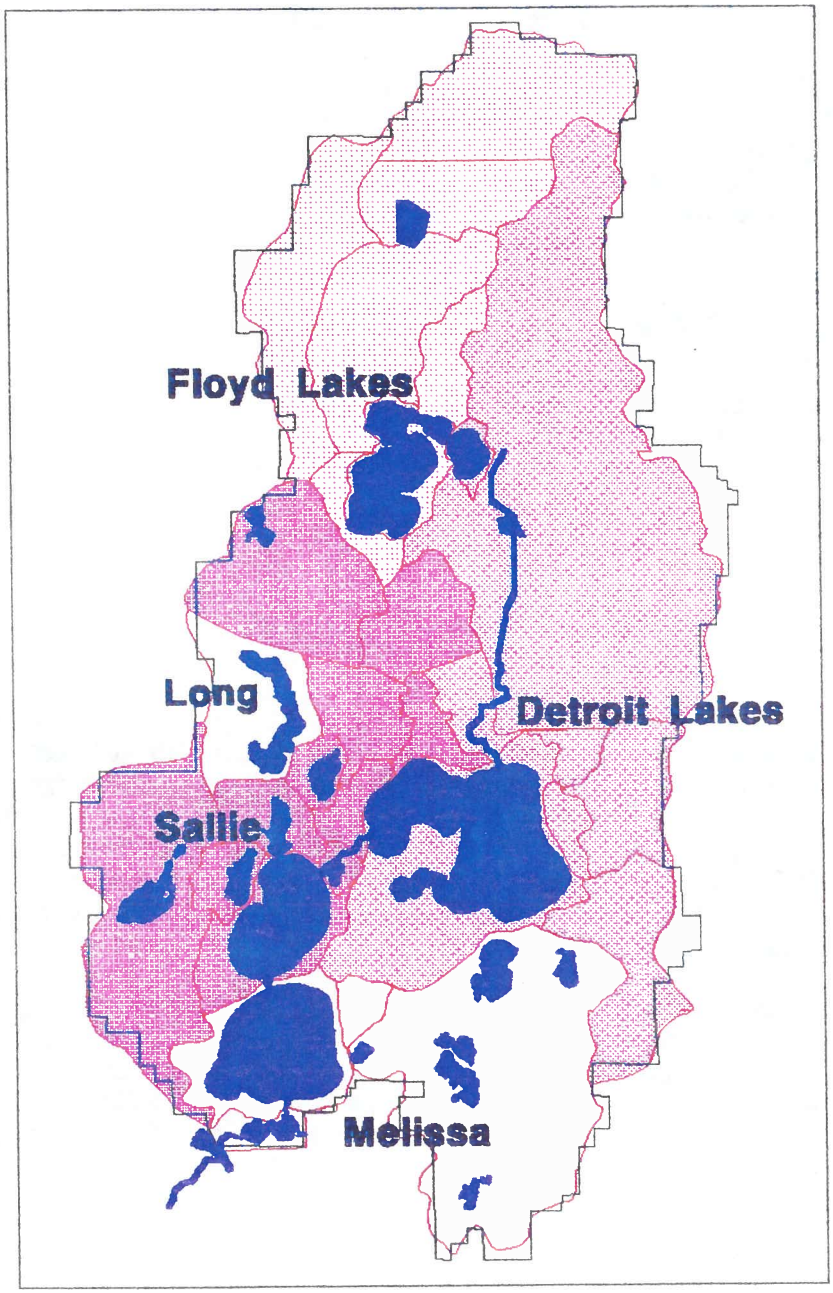


Figure 17. Main District Lakes and their Tributary and Catchment Areas

Table 6. Summary of 1988 Hydrologic Budgets for Sallie and Detroit Lakes

	Detroit Lakes Acre Feet	Sallie Acre Feet
Surface Inflow	5,424	11,279
Pelican River	5,162	10,940
Precipitation	7,069	2,645
Net Ground Water	+7,280	+3,653
Surface Outflow	8,450	13,140
Evaporation	11,507	4,524
% of Surface Inflow in March, April, May	65%	62%
% of Precipitation in July, August, September	59%	58%

Source: PRWD, 1993

Levels of most of the main District lakes are controlled by structures as indicated in Figure 18. It is believed that these structures permitted raising lake levels of Detroit Lakes, Sallie, and Melissa about 2 feet above natural conditions to serve navigation purposes before 1900; thus "ordinary high water levels" are somewhat above natural levels that would have pertained prior to implementation of these controls. As a result of these actions, Muskrat Lake was created from what previously had been a tamarac swamp. At one time, commercial navigation was possible through a series of streams and locks from Little Detroit Lake through lakes Sallie and Melissa as far as Pelican Lake.

Though all control structures, except one between Big and Little Floyd can be operated to some degree to affect lake levels, there is little current interest in doing so. All water control structures are managed by the Department of Natural Resources (DNR) except for the structure between Muskrat and Sallie lakes which is under the jurisdiction of the City of Detroit Lakes. Management plans exist for the DNR structures, but not for the one which is controlled by the City.

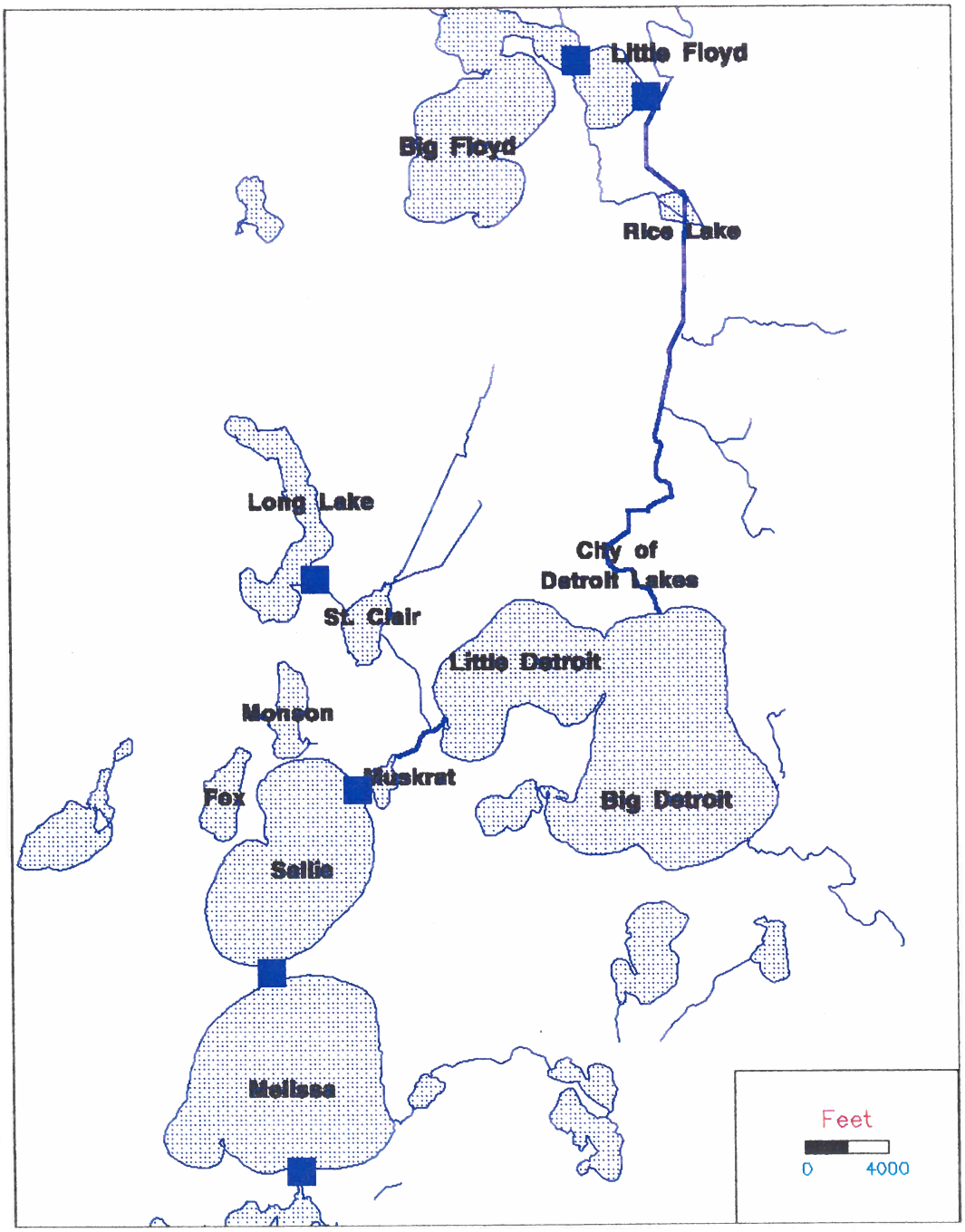
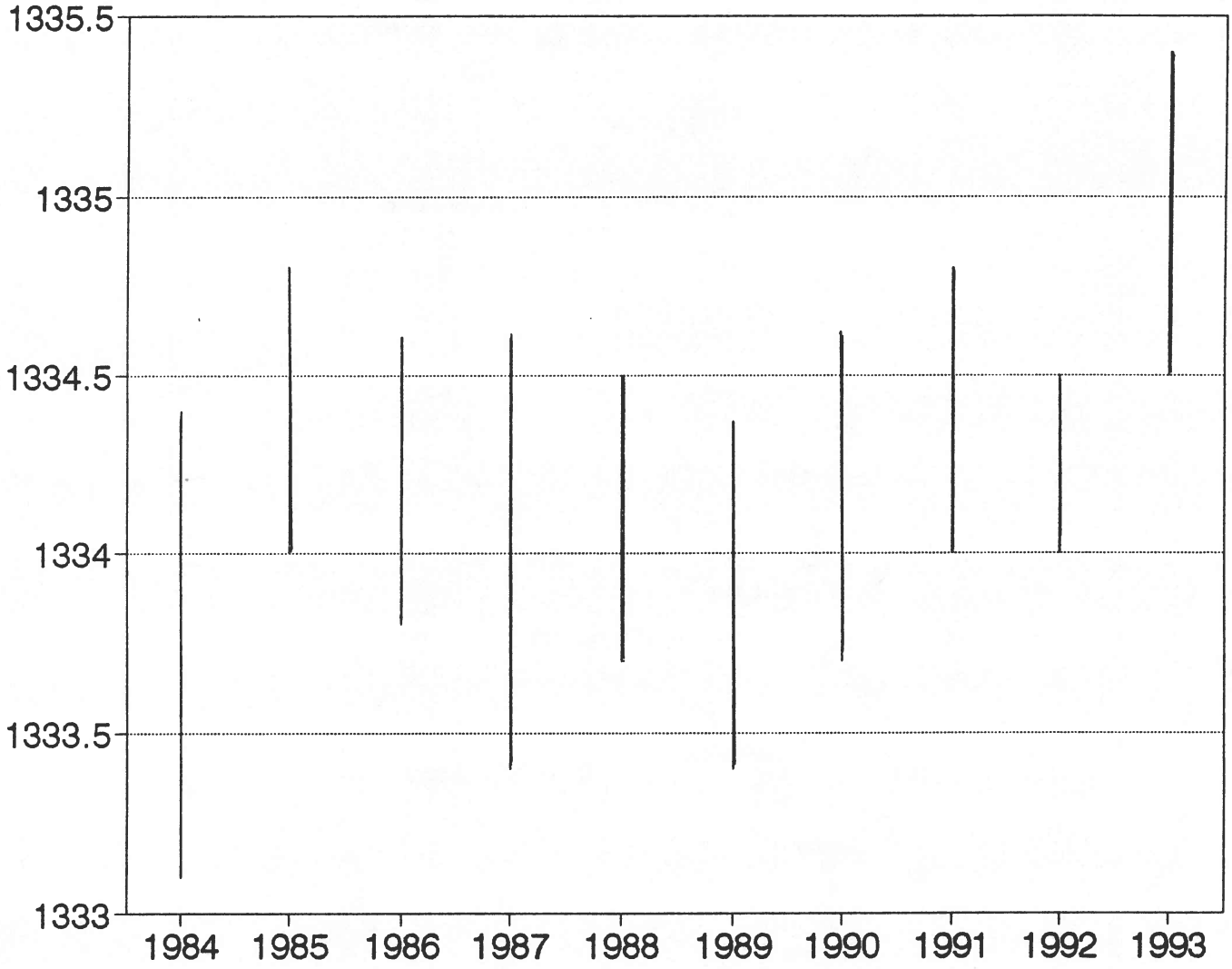


Figure 18. Water Control Structures in the District

Lake levels do vary considerably, both within seasons, and from year to year. The range of within- and between season levels for Detroit Lakes is typical, and includes 1993, during which record high levels were experienced on all District lakes (Figure 19).



Source: DNR

Figure 19. Range of Annual and Year-to-Year Lake Level Variations, as Exemplified by Detroit Lakes

Small Lakes and Wetlands

Besides these main lakes, the District includes 32 other meandered lakes (see Appendix B for names, locations, and meandered acreage), and numerous other small, shallow waterbodies. Many of these water bodies are not directly connected to the Pelican River or its tributaries (Figure 20). Altogether, about 16% of the District's surface is open water, and another 5% is covered by wetland.

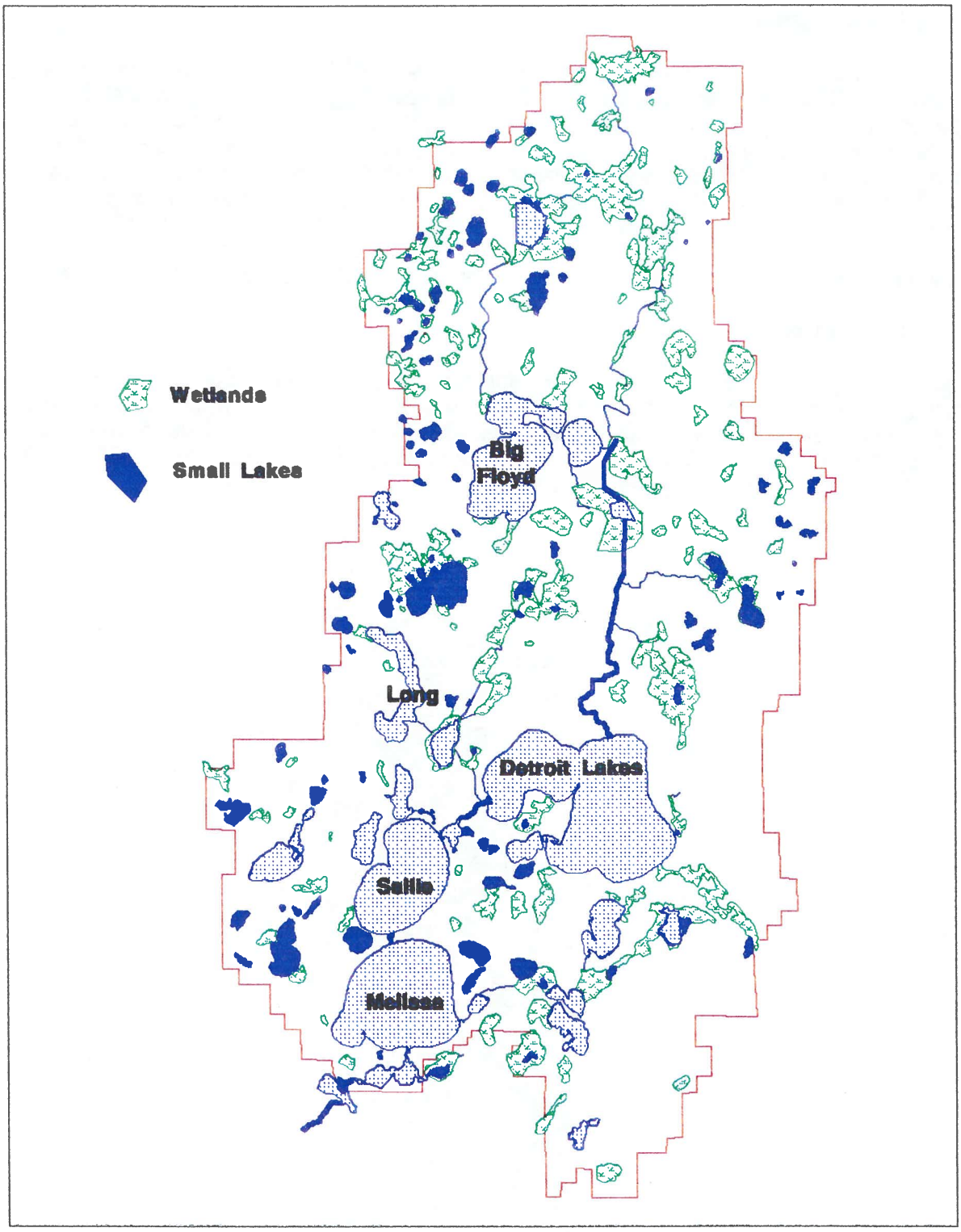


Figure 20. Small Lakes and Main Wetland Areas

The detailed National Wetland Inventory is available on maps at the scale of 1:24,000. As of this time, it has not been incorporated into the District's data base.

Aquatic Vegetation

Rooted plants are prominent in determining the fish and wildlife habitat conditions along streams and lakeshore, and play significant roles in providing water quality, shoreline protection and erosion control benefits. The emergent and submergent species found in some littoral areas of District lakes are of special concern since in some instances they are found in such profusion as to interfere with recreational and aesthetic uses of the lakes. The most common plants are curlyleaf pond weed, muskgrass, northern watermilfoil, coontail and wild celery, but at least 17 different species are common. Some District aquatic plants have already been mentioned in connection with the discussion of "at risk" biological species. As previously mentioned, flowering rush is found in Detroit Lakes, Muskrat, Sallie and Melissa.

Drainage Projects

Once again, parts of the District have been subjected to substantial alterations to the natural drainage system. Figure 21 indicates the location of major lakes which have been drained, as well as major ditches and benefitted areas. Benefits for each of these systems have either recently been re-established, or are in the process of being "re-benefitted" (ditch 14). A full inventory of drained wetlands has not been completed.

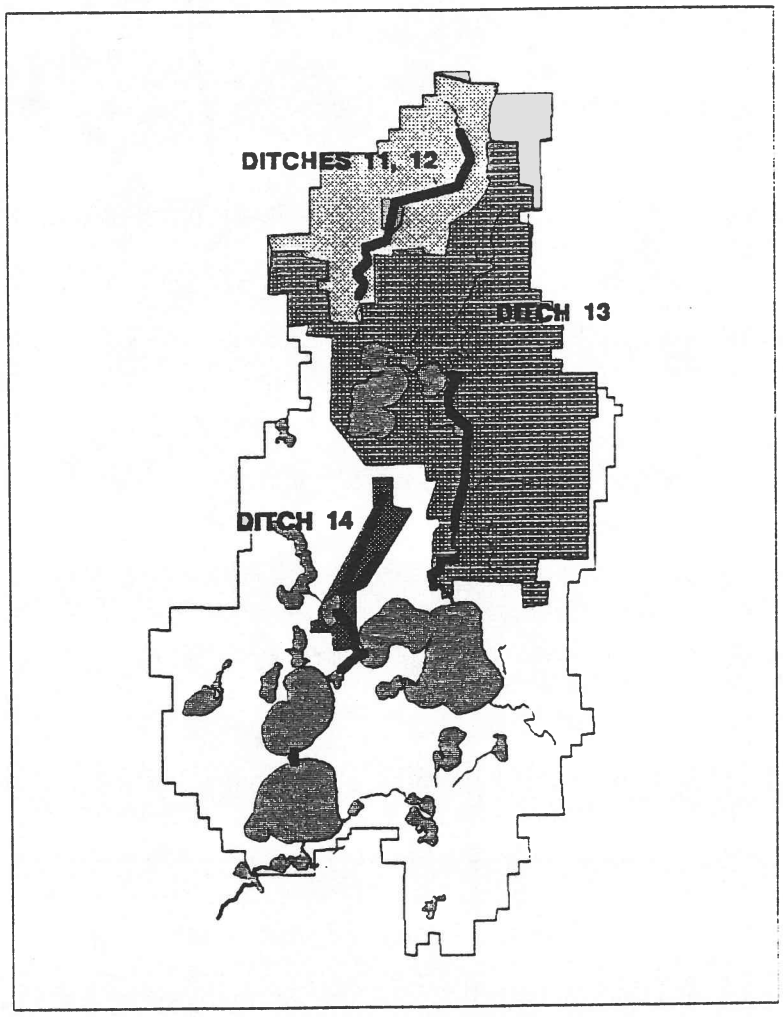


Figure 21. The District's Main Drainage Projects

USE OF DISTRICT WATERS

None of the surface waters of the District serve drinking water supply, electrical generation, or commercial irrigation functions. Indeed, the dominant concerns of the District have to do with their recreational and aesthetic purposes, and most of the history of interest in District lakes have been directly linked to touristic, recreational, scenic and similar attributes. The most revered attributes of District lakes are those that one way or another relate to the provision of high quality boating, fishing and swimming.

Recreational, Aesthetic Uses

District lakes serve the recreational and aesthetic interests of permanent and seasonal residents as well as tourists from near and far. Water-based recreation activities such as swimming and boating are prominent among the preferred activities of residents and guests. The lakes have earned reputations as important game-fishing lakes. Walleyes and Northern Pike are particularly prized, and the City of Detroit Lakes sometimes identifies itself as the "The Sunfish Capital of the World". The aesthetic conditions of the District's landscapes are also valued. Residents pay a very heavy premium for lake shore frontage, in part to secure enhanced access to the lake as a recreational opportunity. However, many shoreline residents and customers do not participate in lake-based recreational activities - for these it can be inferred that the way the lake landscape looks is of critical importance.

A complete survey of recreational utilization, and visitors' perception of the amenity values of area lakes and other water resources is not currently available. Nevertheless, much can be inferred from existing patterns of land and economic development in the area.

Sallie, Detroit, Floyd, and Melissa are classified as "General Development" lakes by the Becker County Zoning Ordinance; Muskrat, Monson, Fox and Long are identified as "Recreational Development" lakes. The general requirements for subdivision of shoreland zone property are summarized in Table 7.

Table 7. General requirements for Shoreland Development

	Area (sq. feet)	Lot Width (feet)	Shoreline Setback (feet)	Septic Setback (feet)
General Development				
Sewered			75	
Riparian	15,000	75		
Non-Riparian	10,000	75		
Non-Sewered			75	50
Riparian	20,000	100		
Non-Riparian	40,000	150		
Recreational Development				
Non-Sewered			100	75
Riparian	40,000	150		
Non-Riparian	40,000	150		

Source: Becker County Zoning Ordinance

The District estimates that there now are approximately 1800 lake frontage residences, and 40 businesses on District lakes. Aside from some public access areas and parks, nearly all

undeveloped land is being held for residential development, and given present zoning requirements (Table 7), it is estimated that about 400 additional residences could be added to the District's inventory of lakefront structures.

In addition to frontage immediately on lakes, many District lakes have witnessed backshore or "second tier" development which occurs landward behind residences which have immediate water access. A District estimate places this figure at about 700 units at the present time; its growth seems assured by those accepting the trade-off between lessened lake accessibility and lower property values and tax costs.

The impact of lakes on nearby areas is represented by the land use situation depicted in the map of the Lake Sallie area (Figure 22).

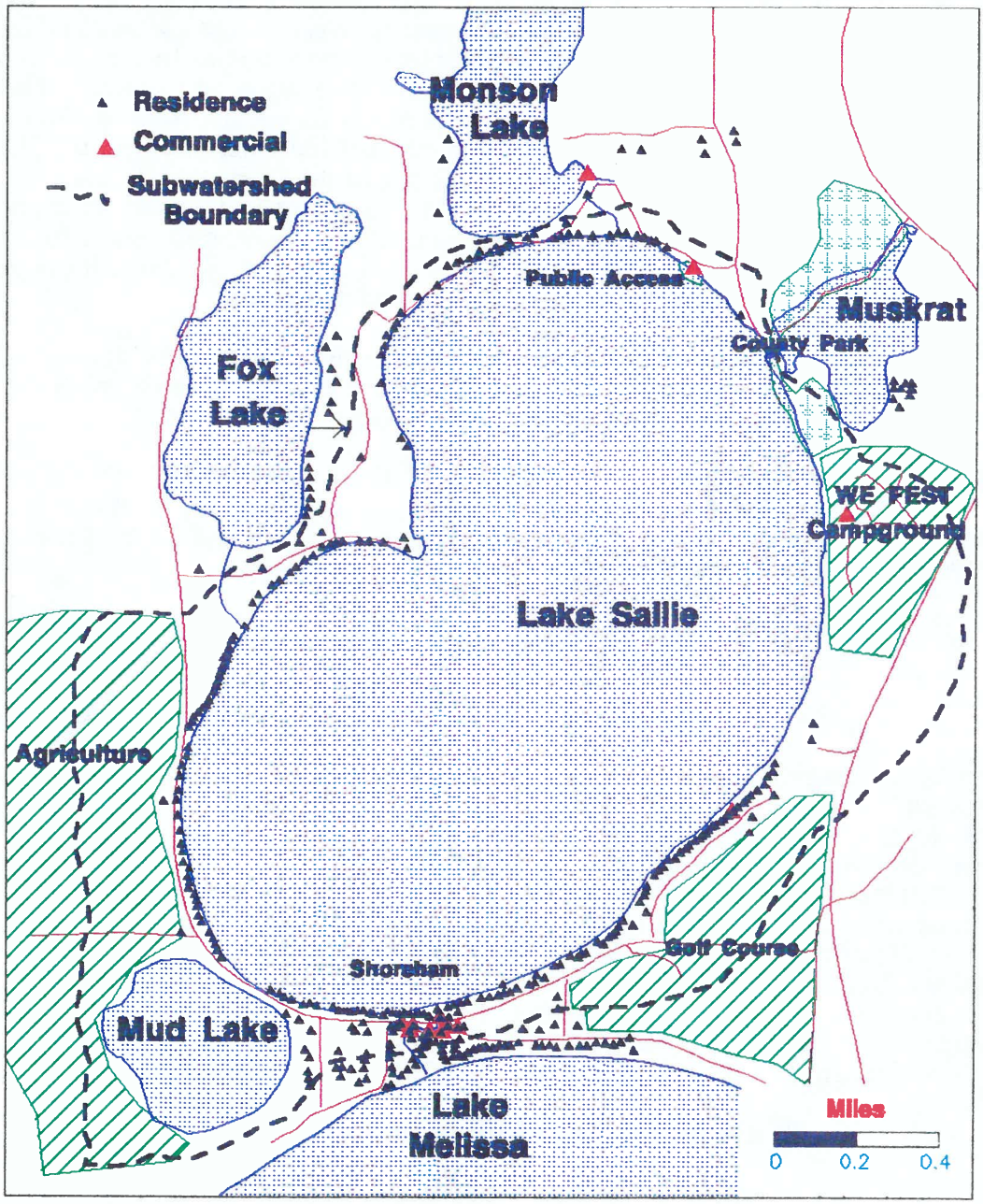


Figure 22. Lake Sallie Area Development

It is important to recall that more than one-quarter of the District's housing units are classified as "vacant" by the Census Bureau. Nearly all of these are used as second homes, and nearly all of the second homes are found on lakes. Many of these facilities have been upgraded for occasional use throughout the year. Some have been converted to year-round residency. These behaviors have important implications for the District, particularly in connection with septic tank, and market valuations.

At the same time, the District is mindful that its lakes do not exist solely for the pleasure of riparian landowners. An unknown, but quite large, number of more transient visitors are guests of resorts, hotels, and other facilities in the District. Such visitors include vacationers, conventioneers, and those passing through. Presumably they are attracted to the area by lakes and the lake-area landscape in various ways, joining residents in such activities as swimming, boating, fishing, hunting, looking, and many other activities. Mention also has previously been made of the economic contributions of such tourists to the area.

Moreover, long-term permanent residents often cite the "lakes" lifestyle in connection with their decision to live in the region. From this it can be inferred that whether or not residents live on the lake, they are economically dependent upon the lakes, and enjoy the recreational and aesthetic opportunities which they offer. This is part of the explanation that can be offered in connection with the previous observation that some of the more rapidly growing residential areas are not located directly on lakeshore.

In sum, it is difficult to underestimate the amenity value of waters of this district.

Fisheries

Closely linked to recreational interest in District lakes is their use as game fisheries. Fishing is extraordinarily popular among residents of the District, and also draws significant numbers of visitors. All of the main lakes in the chain are stocked with walleye on an annual or biannual basis. Additionally, the Detroit Lakes are being stocked with Muskie fingerlings on an annual basis. The Minnesota Department of Natural Resources employs various habitat protection and manipulation techniques, as well as regulation of fishing and commercial harvesting (bullheads), in order to maintain these lakes as important game-fishing areas. An important state fish hatchery is maintained by the Department of Natural Resources near lakes Muskrat and Sallie.

Wildlife and other Uses

Residents and others are well aware of the value of surface waters for wildlife. District lakes and wetlands provide habitat to large waterfowl populations. Large mammals, including beaver, otter, and muskrat are found in District waters. Many other avian and terrestrial species are dependent upon lakes for food or habitat.

Certain of the District's "at risk" species are closely linked to the health of area lakes and other water resources; it is understood that poor water quality, among other factors are detrimental to the health of these and other wildlife that are associated with the lakes.

Water Supply

The City of Detroit Lakes municipal water supply obtains ample water from three wells operating in an artesian system at depths which exceed 230 feet. Operating rate for each is 500 gallons per minute (gpm), with a maximum yield of 1300 gpm. Aside from agriculture, most commercial water supplies are provided by this system as is just over half of the district's resident population, and perhaps one-quarter of the residences. Several thousand residences, and numerous agricultural operations depend upon water from wells ranging from 20 to 100 feet in depth.

Waste Water Treatment

Water resources figure prominently in the treatment of sanitary and storm water wastes in the District. Storm waters are ordinarily diverted, usually without treatment, to the surface waters. Similarly, the City of Detroit Lakes has discharged effluent from sanitary waste treatment facilities to wetlands and ditches which drain to Lake St. Clair since the early 1900's. In recent decades the level of treatment, featuring land application, rapid infiltration, and alum treatment (winter), is such that effluent is not thought to present significant health or environmental or health risks. The closing of the Swift Turkey processing plant in 1992 has resulted in substantial reductions of effluent discharges and phosphorus (Figure 23).

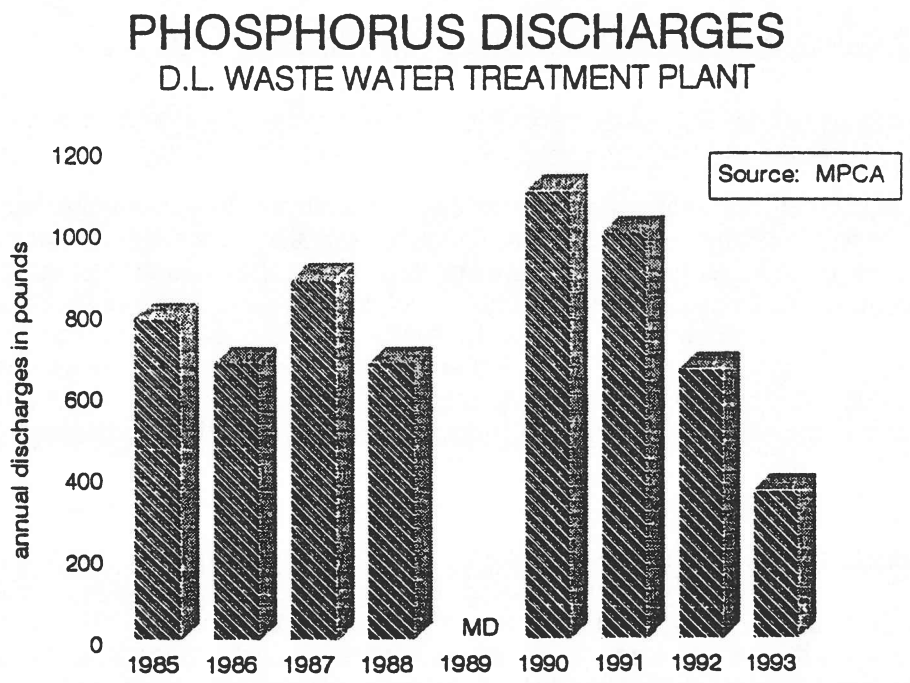


Figure 23. Phosphorus Discharges from the Detroit Lakes Sewage Treatment Plant

All agricultural operations, and approximately two-thirds of all residences maintain on-site sewage disposal systems. It is widely believed, that many of these systems have deleterious ground water impacts; few data are available to substantiate this suspicion.

District septic systems are monitored to the degree that septage system pumpers and haulers have been required to report collections and disposal since 1992. Approximately 2 million

gallons were pumped from lakeshore residences (about 90% of all that was pumped), and land applied on eight sites within the District. Figure 24a indicates the origins of septage by lake, Figure 24b the main disposal sites.

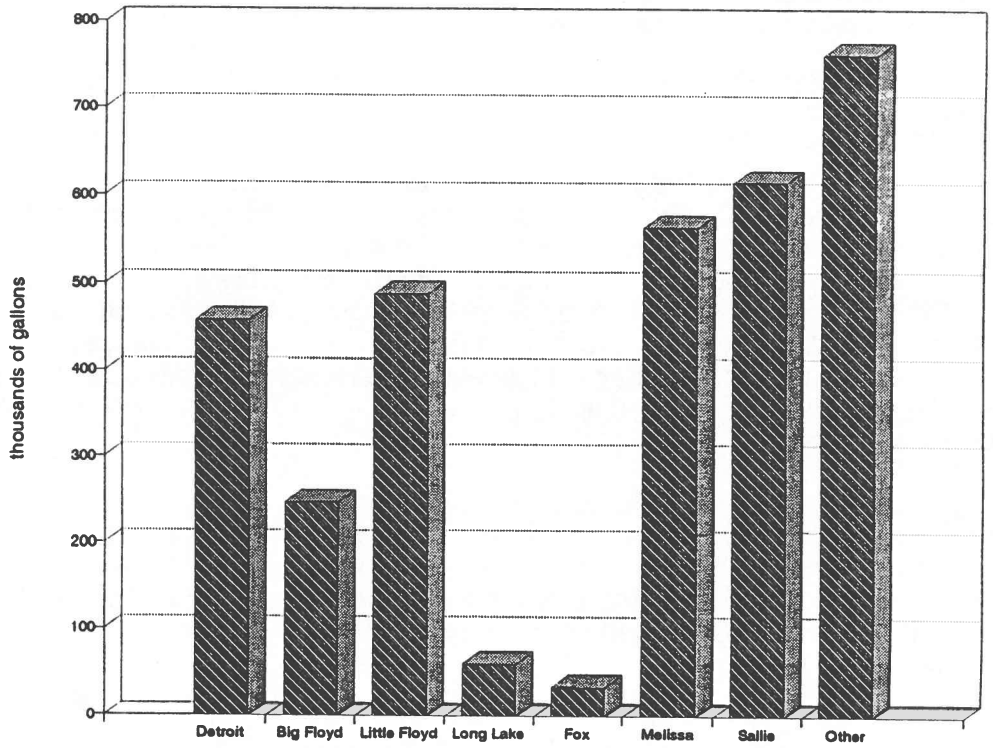


Figure 24a. Septage Removal from Main District Lakes

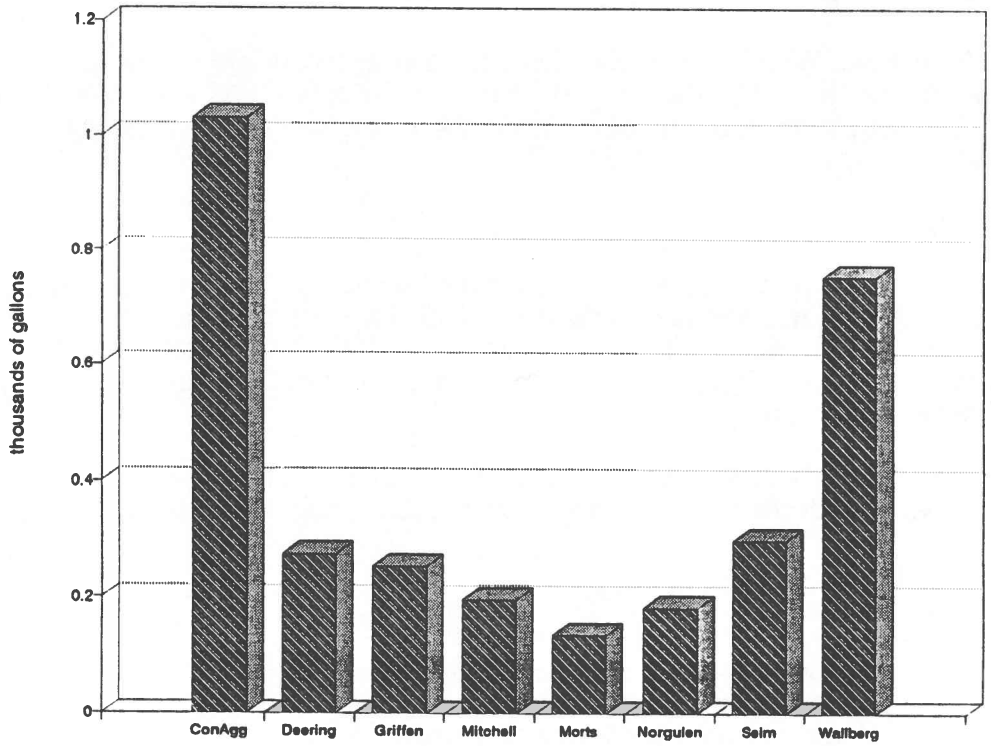


Figure 24b. 1993 Land Application of Septage to District Sites

By the end of this year (1994), several hundred lakeshore and backshore residents on the east and south shores of Detroit Lakes will be connected to the Detroit Lakes Municipal sewage treatment system. There appears to be growing interest by residents of Floyd Lake in considering a centralized sewage disposal system.

Other Waste Disposal

Though there is no direct evidence linking solid waste disposal and the District's waters, there can be no doubt that the potential effects could be severe. The good news is that at the present time most solid waste is removed from Becker County. The County operates a centralized landfill and transfer station; local landfill deposits are limited to construction waste and compost. Other wastes are trucked to incinerators or waste disposal sites in other counties or states. In order to reduce waste handling costs, the County has pursued an aggressive program to encourage recycling. Results are encouraging as the county's solid waste stream has been reduced by more than 40 percent in the last five years (Becker County Environmental Affairs Office).

On the other hand, informal and illegal dumpsites, buried landfills, abandoned storage tanks, and other waste disposal problems are known to offer potential problems, especially in connection with ground water. The practice of discarding waste materials in wetlands is commonplace. Similarly, there some problems remain concerning snow collection and disposal practices by governments, as well as commercial and residential landowners.

At the present time there is not a complete inventory of past and present waste disposal sites in the District.

Interaction with other Water Management Plans and Programs Related to Lakes

Besides the Pelican River Watershed District, several other agencies manage water and related resources within the District. The specific jurisdictions and responsibilities are complex and overlapping. Following is an overview of the main public agencies and their programs that relate specifically to lakes.

<u>Becker County</u>

A zoning ordinance applies to all non-municipal land within the District. Building permits are required, and are issued to those petitioners in conformance with this ordinance. Of special interest is the section, added in 1992, which deals with the shoreland zones (1000 feet from meandered lakes, and 300 feet from streams) and which imposes special restrictions on these zones.

In 1991 Becker County's Comprehensive Local Water Plan was approved. The latter includes several goals dealing with surface water which directly relate the District's mission.

Goal 1. Protect the Quality and Use of Surface Water
Goal 2. Investigate, devise, and implement strategies to reduce degradation of water quality in lakes in Becker County, particularly in the Pelican River Watershed, and the Cormorant Lake Chain.
Goal 3. Improve and Maintain the Quality of Lake St. Clair

In addition, the plan contains numerous goals dealing with groundwater and land resource matters with complement those of the District.

The County also has a solid waste disposal ordinance, and sponsors a recycling program. Becker County Soil and Water Conservation District (BCSWCD) serves as the "Local Government Unit" for purposes of implementing and enforcing provisions of the 1991 Minnesota Wetland Conservation Act. BCSWCD also has completed a study on cropland practices in zones of high erodibility along the main streams in the County, and currently is completing an inventory of the County's waste systems associated with feedlots. The organization administers the Conservation Reserve Program. It provides technical assistance in a wide range of matters, including assessment of "best management plans", and soil limitations. The BCSWCD recently provided some funds towards the District's construction of a wet basin storm water treatment facility.

The City of Detroit Lakes

Likewise the City of Detroit Lakes engages in several activities which relate directly to the District. Of special interest are the shoreland regulations which are similar to those of the county. The City's Comprehensive Plan is currently being revised. The City has assumed responsibility as the Local Government Unit responsible for implementing and enforcing provisions of the Minnesota 1991 Wetland Conservation Act within city jurisdiction. In 1992 the City enacted a fertilizer control ordinance which restricts use of phosphorus fertilizers. The City's Flood Plain Ordinance was enacted in 1993. The City's 1994 Strategic Planning Document cites ties to the Pelican River Watershed District, assigns a high priority to storm water treatment in certain trouble spots, and specifies improvements in the wastewater treatment plant.

Other local Governments

The District interacts with townships and school districts. For example, Lakeview Township has also enacted an ordinance which bans the use of fertilizers containing phosphorus; the District is attempting to sensitize the public to the need for compliance. The curriculum in the Junior High School of Independent School District 22 has a water quality component.

The Minnesota Board of Water and Soil Resources (BWSR)

The Board has statutory responsibility for overseeing the operation of Minnesota watershed districts. BWSR's responsibility for administering the State's Wetland Conservation Act brings the Board into direct contact with the District on a regular basis. Through its regional office in Bemidji, BWSR has provided technical assistance in planning or evaluating District programs.

The Minnesota Department of Natural Resources (DNR)

This state agency has primary supervisory and regulatory responsibility for Protected waters. From the perspective of the District, DNR activities are mostly directed to the areas which lie below the Ordinary Highwater Levels. Hence attention is given to

filling, dredging of lake shore areas, and structures along shorelines. The DNR also has oversight responsibility with respect to enforcement of the municipal and county shoreland ordinances. The District must secure a DNR permit to harvest aquatic plants. The District has been involved in the development of the DNR's Flowering Rush Management Plan, and has been assigned some responsibility in its implementation (DNR, 1993).

The Minnesota Pollution Control Agency (MPCA)

In recent years the District has worked closely with this agency in connection with its Clean Lakes program. (Money for this project originates with the U.S. Environmental Protection Agency, but is administered by the MPCA.) The District also cooperates with the Agency's Citizen Lake Monitoring Program and the Lake Assessment Program. The District currently is working with the Agency's regional office in the development of a protocol to address specific land use problems that impact lakes through a process featuring the coordinated efforts of several agencies. It is believed that the Agency will expand existing feedlot supervision efforts with the intention of exercising more control of these operations.

The U.S. Fish and Wildlife Service (USFWS)

This federal agency has provided technical assistance in evaluating proposed District projects. At the present time, the District has joined USFWS (and other local government organizations) in the preparation of a proposal on wetland restoration to be submitted for funding through the North American Waterfowl Conservation Act. USFWS administers over 2000 acres of waterfowl production areas and easements within the District.

Other Organizations with Water-Related Responsibilities

Numerous other state and federal agencies have water-related responsibilities which directly impact the District. The District interacts with the U.S. Army Corps of Engineers, and the U.S. Geological Survey as well as with the U.S. Department of Agriculture (Soil Conservation Service) and the Minnesota Extension Service. The District has memberships in International Coalition (Red River Basin), and Minnesota Lake Association, the National Lake Management Association, and participates in quarterly meetings of a state watershed administrators organization. The District works closely with the Becker County Coalition of Lake Associations. It has provided technical assistance to Independent School District #22 in connection with its Junior High School water quality, and elementary school conservation curricula.