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Planning for Water Use in Minnesota

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Introduction

Crop losses, as experienced in dry years such as 1976, draw renewed attention to problems of water management in Minnesota. In a year of heavy farm losses, attention focuses on irrigation and agricultural uses of water. Use of water for agriculture, however, is just a portion of the total water management picture.

Water, as any resource in limited supply, has a number of alternative and competing uses. Society must make decisions regarding the use and management of the limited resource. There must be planning and management on a statewide basis toward rational decisions regarding use of limited water supplies.

A substantial portion of the planning effort for water problems falls within the public sector, outside the traditional price and market system because consequences of decisions affecting water use extend far beyond the individual, the firm, or even the municipality or the state.

This article is concerned with some of the planning effort relating to water resources and current issues relating to water management and use in Minnesota.

Planning at the National Level

Many agencies at the federal level have programs and responsibilities relating to water resources. Since its creation by the Water Resources Planning Act of 1965, the Water Resources Council (WRC) has taken major responsibility.

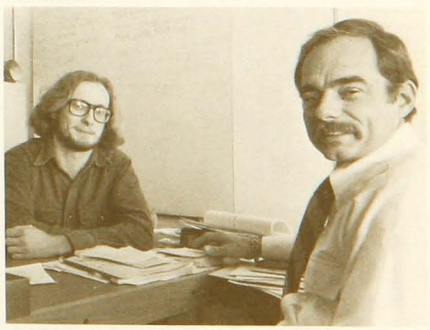
The Council is an independent executive agency, its members the Secretaries of the Interior; Agriculture; the Army; Transportation; Health, Education and Welfare; and the Chairman of the Federal Power Commission. Associate members include an Environmental Protection Agency (EPA) representative, the Secretary of Commerce, and the Secretary of Housing and Urban Development. The Attorney General, Office of Management and Budget (OMB), Environmental Quality Council (EQC), and the eight River Basin Commissions may have a representative observer.

Such broad representation is intended to ensure that the WRC will function properly as an umbrella organization in coordinating comprehensive planning. The WRC is also responsible for preparing a "national assessment," recommending water policies, establishing planning standards, and recommending river basin commissions and reviewing their plans.

The main tool the WRC provides resource planners is a set of "Principles and Standards for Planning Water and Related Land Resources." These apply to all levels of planning and are used by a broad range of agencies. The Principles and Standards specify the objectives and components of a plan so that a comparison will reveal information about the tradeoffs between the alternative policies.

The tradeoff comes in the degree of emphasis that a plan puts on each of the two main objectives: national economic development and environmental quality. Each alternative plan must state its positive and negative contributions to each objective. A complication is that the national economic development effects can be described in monetary terms, while environmental effects cannot easily be converted to this denominator.

There are three levels of planning to which the WRC processes can be applied. Level A plans (framework studies or assessments) are the broadest type. A general analysis of the needs and desires of the people for the conservation, development, and use of their water and land resources is included. Regions requiring a more detailed investigation because of complex problems will be identified. Implementation programs may be recommended for areas not needing further study. In framework studies, problems are dealt with at a conceptual level and major alternative policies are considered.



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Level B plans are regional or river basins plans designed to resolve the complex problems identified in the framework plans and implementation studies. As with the framework study, all levels of government will be considered. Rather than conducting more research to generate new data, the emphasis is on joining federal, state, and local efforts to define the critical issues and work with minimum interference towards a common solution. A Level B study is now being completed for the seven-county Twin Cities metropolitan area.

Finally, Level C (implementation studies) are the most detailed level of planning. These are program or project feasibility studies generally begun by a federal, state or local entity to authorize or develop plan implementation. The WRC intends that these be completed within 2 years, which should lead to some sort of action program on the broad spectrum between preservation and full development.

The WRC is charged with making periodic national water assessments: the first was completed in 1968. The 1975 Water Resources Assessment is a 3-year effort which will continue the assessment process as outlined in 1968. It will identify and describe the nation's severe water and related land resource problems in greater geographic detail and with increased regional and public participation. The analysis will cover two time periods, 1975-1985 and 1985-2000. This assessment was begun in 1974 and should be completed in late 1977.

Planning at the Regional Level

Since the WRC was directed by Congress to set up river basin commissions, there is a direct connection between national and regional planning. The Upper Mississippi River Basin Commission (UMRBC) was created in 1972 as a planning partnership between the states and federal agencies. Illinois, Iowa, Minnesota, Missouri, North Dakota, and Wisconsin were the participating states, though Missouri has since dropped out of active status.

The water resources planning activities of the Upper Mississippi River Basin Commission is a continuous process. The ultimate objective is the production of a Comprehensive, Coordinated Joint Plan (CCJP), the first scheduled for completion in fiscal year 1979. It is a constantly changing set of documents which identifies all water and related projects, programs, and other measures which affect the environmental, economic, and social conditions of the basin. The CCJP includes all the current data on the area necessary to make planning decisions plus previous rankings of water resource problems.

The CCJP will be periodically updated. It is intended to help develop a sense of timing and coordination of planning activities at all levels. As a method of public participation, it can help express a regional viewpoint and create a basin-wide consciousness.

The UMRBC also has a role in the 1975 National Water Assessment. The Commission is participating in the specific problem analysis portion of the assessment which involves identifying and ranking geographic problem areas.

The process began by identifying thirty-six rather distinct problem areas in the Upper Mississippi River Basin, and twenty-nine in the Souris-Red-Rainy region. A WRC Problem Identification Worksheet was then completed for each problem area showing both principal and related problems. Tables 1 and 2 show condensed versions of this matrix. By assigning numerical values to principal and related problems, each problem area could have a matrix score computed for it, and the problem areas could be ranked. This ranking was then averaged with a population ranking.

When areas which already had study funds were eliminated from the ranking, it was possible to recommend some problem areas for Level B river basin studies. The recommended areas for fiscal year 1978 are the Illinois and Sangamon River Basins, the Skunk River Basin in Iowa, the Fargo-Moorhead SMSA and Red River Main Stem, and the Upper and Lower Rock River Basins.

Tables 1 and 2 describe the distribution of the principal problems found in the Problem Identification Worksheets. Water quality is clearly perceived as the most important problem issue in both regions, with flooding also significant. Since recreation, and environmental enhancement and preservation are two functional uses which are very sensitive to water quality deterioration, their predominance as functional use problems is natural. These tables are subject to any biases inherent in the matrix or the researchers.

State Level

Since 1967, Minnesota has made some progress toward preparation of a statewide framework water and related land resources plan. In addition, the state has participated in federal-state planning programs in connection with grants authorized by the Federal Water Resources Planning Act of 1965.

In 1968-1972 several background volumes were published containing information on economy and population; water availability, demands, problems; and possible solutions. In 1972 the more important policy questions were summarized in a publication entitled, "Alternate Programs and Projects for Managing Minnesota's Water and Related Land Resources Through the Year 2020."

While the state has made some progress in preparing a statewide water plan, this achievement is not yet accomplished. This stems in part from lack of clear statewide policy directions. Now, for example, many traditional assumptions regarding population, economic growth, and technical change are being questioned. Public opinion regarding the balance between economic growth and environmental quality is in flux.

It is somewhat difficult to complete a water plan in the absence of clearly stated policy directions. Yet, it can be argued that policies cannot or should not be adopted before impacts of a plan are known and public opinion concerning such issues as economic growth and environmental quality are crystalized.

The way to resolve the dilemma will very likely involve:

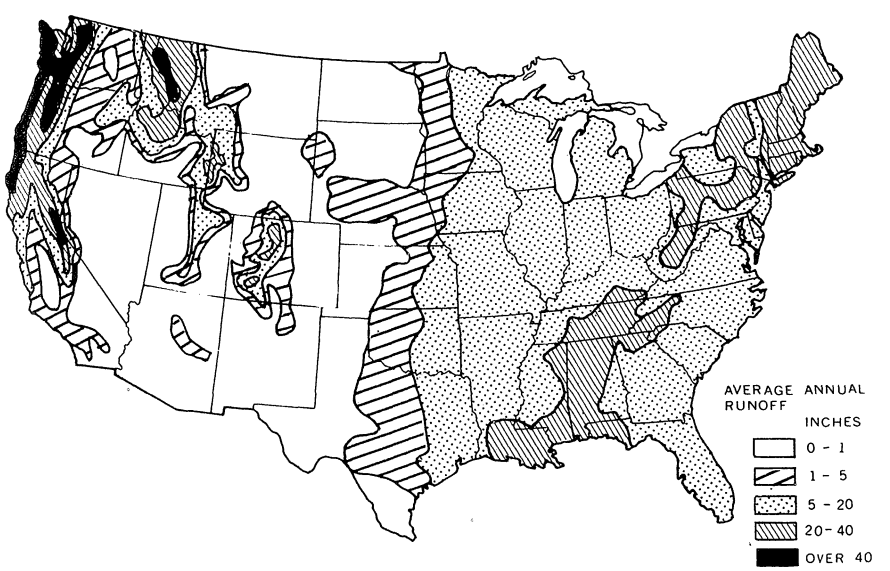
- preparing alternative plans based on several sets of planning policies (alternative futures)
- identifying in broad terms economic and environmental impacts associated with alternative plans

Table 1. Principal problems of the upper Mississippi river basin

Problem issues	Functional uses: Domestic uses	Food and fiber	Mining and energy	Manufacturing	Transportation	Recreation	Environ enhance and preservation	Total	%
Instream flows					1	52	33	86	4
Water supply	65	36	22	68				191	9
Water quality	196	117	14	147		313	189	976	44
Flooding	93	59	4	78		180	158	572	26
Drainage						6	18	24	1
Erosion	7	18	2			9	37	73	3
Sedimentation	21	18	2	16	6	63	54	180	8
Dredging and filling					4	5	12	21	1
Land use conflicts	4	23			1	14	47	89	4
Total	386	271	44	309	12	642	548	2212	
Percentage	17	12	2	14	1	29	25		

Table 2. Principal problems of the Souris-Red-Rainy river basins

Problem issues	Functional uses: Domestic uses	Food and fiber	Mining and energy	Manufacturing	Transportation	Recreation	Environ enhance and preservation	Total	%
Instream flows						203	122	325	18
Water supply	46	25	12	8				91	5
Water quality	120	36	8	11		339	195	709	40
Flooding	135	62		6		161	120	484	27
Drainage								0	
Erosion	9	28				26	49	112	7
Sedimentation	2						1	3	—
Dredging and filling							1	1	—
Land use conflicts		4				19	29	52	3
Total	312	155	20	25	0	748	517	1777	
Percentage	18	9	1	1		42	29		



Average annual runoff (regional data unavailable for Alaska, Hawaii, and Puerto Rico)
Map credit: The Nation's Water Resources, published by United States Water Resources Council, Washington, D.C. 1968.

— identifying a set of policies, and associate plans consistent with these policies.

The Minnesota Water Resources Council has recently received additional funding from the Legislative Commission on Minnesota Resources for an intensified, accelerated program for water and related land use planning.

Water Supplies

The nation's renewable water resources are derived from an average annual precipitation of 30 inches, equivalent to 4,200 billion gallons per day. About 70 percent of this is consumed through evaporation and transpiration. A portion of evapotranspiration provides 80 percent of our food and fiber and nearly 100 percent of our forest products.

The remaining 30 percent of the precipitation constitutes the nation's average annual runoff of about 9 inches, or 1,200 billion gallons per day.

The amount of runoff varies greatly in various parts of the nation.

The availability of both surface and ground water varies annually, seasonally, and over shorter periods of time. In the extreme, flood and drought of varying severity and duration are experienced occasionally across the nation. Flood damage is heavy in areas where intensive development is occurring on the floodplains, although the national total reflects less intensive damage at a vast number of localities.

The amount of runoff that is available for development depends on the variability of the annual runoff, groundwater recharge possibilities, storage capacity of reservoirs, and the evapotranspiration potential, all of which vary from basin to basin.

Groundwater mining in some areas of the nation has augmented water supplies. However, it can only be a temporary solution to meet local requirements and must cease as uneconomic pumplifts are reached or groundwater basins are exhausted.

Desalination may become a significant means of economically augmenting local water supplies in coastal areas. However, currently this process is limited. Other pos-

sibilities include watershed management, snowpack management, evaporation suppression, reduced transpiration through vegetation manipulation, and weather modification.

Although Minnesota is considered to be a water-rich state, and, properly managed, is anticipated to have adequate water supplies for future needs, there are conflicting demands for water use, and many areas needing policy attention.

Factors Affecting Demand

It is helpful to think of water use in terms of demand and supply. Demand for water can be thought of in terms of quantities of water used in conjunction with various prices. As the price of water is increased, ordinarily less water will be used. As with any scarce resource, when demand increases relative to supply, there is upward pressure on price which indicates increasing discretion needed for using these resources.

Water uses can be considered in two broad categories: 1) Withdrawal uses, and 2) instream uses. Withdrawal uses include domestic and municipal uses, industrial (including steam electric power), and agricultural uses. Instream uses include hydroelectric power, navigation, recreation, and fish and wildlife.

Various factors may cause an increase in demand for water. That is, greater quantities may be used at any given price. (Technically, these factors are known as "demand shifters.") Factors which may increase the demand for water include the following: increasing population, increases in per capita income, increases in prices of factors of production which might substitute for water, decreases in prices of factors which might be complementary to water (e.g. fertilizer in irrigated agriculture), increases in demand for the product for which water is used as a factor of production, and changes in technology which may use more water.

Nationally, these factors have acted to increase the demand for water. With respect to consumptive or withdrawal uses, increasing population has been a factor. Probably more important, however, has been the increasing per capita income. This has resulted in increased direct domestic consumption of water, e.g., lawns, swimming pools, etc. It has also increased consumption through greater output of products such as aluminum, steel, and especially electric power, all heavy water-using items. The increased demand for farm products has increased the water demand for irrigation. Increased price of labor has added to pressures for automation, which may use more water. An example would be automatic pipeline cleaning systems for dairy barns. Many similar examples could be cited in industry.

The geographic distribution of the population may also affect demand for water. Increased habitation of arid areas increases the tendency for water development and transport projects.

The demand for instream uses has increased. Greater mobility of the nation's population has increased pressure or water use for fishing and recreational uses. These uses are often competitive with projects intended for irrigation, flood control or electric power.

Price as a Factor in Demand

The previous discussion focused on factors affecting demand, or "demand shifters." A major factor, often overlooked in the use of water, is *price.* As with any product or factor of production which is rationed through price, quantity used may be expected to respond to price. Here is a real pitfall for the estimation of future water requirements.

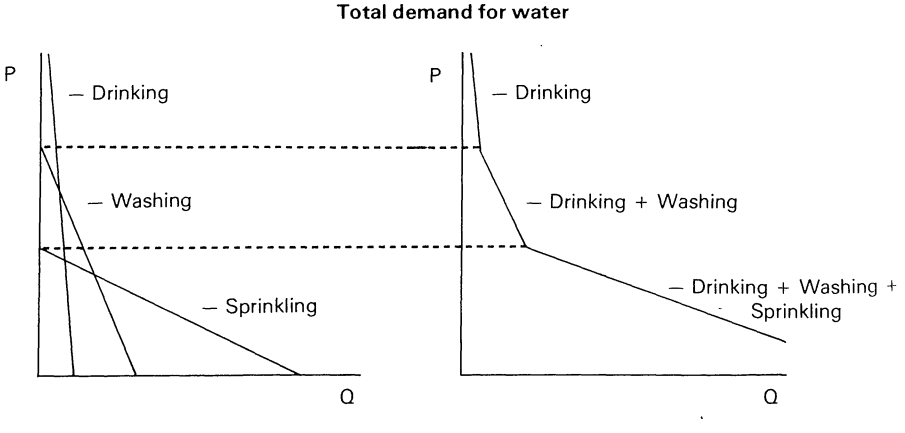
Many water resources planners have made the mistake of equating water needs or requirements with demand. But the need for water is not the same as demand because some needs are more responsive to price than others. As water price rises, lawn sprinkling, rather than cleaning or drinking uses, declines. The following chart could be viewed as a summation of all the demand curves for different uses by different individuals.

In forecasting water demand, it becomes important to know how demand will vary with price, or the price elasticity of demand. Water price elasticity studies are few because the problems of data collection are enormous. The concensus seems to be that residential price elasticity for water lies in the range of -.3 and -.7 and is moderately inelastic. This means that a 1 percent increase in price would cause a .3 to .7 percent decrease in water demand. Residential water elasticity would be expected to vary across the nation with climate and taste preferences.[1]

Earlier research has found domestic in-house use to have an elasticity of -.231. Domestic sprinkling, however, varied from -.703 in the arid west to -1.57 in the east.

Important policy implications follow from the assumption that the quantity of water demanded varies with price. As high quality water becomes more scarce, rising costs must be expected. Projections of "water needs" which assume independence from price will tend to exaggerate future water requirements. Water planners will then design systems to meet these overstated demands, and overinvestment

[1]Such a study is now underway at the University of Minnesota.



in municipal water systems will result. The "requirements" philosophy seems to cause a misallocation of public funds.

Changing rate structures may have even more effect than price level on water demand. Water system expansions are often made mainly to meet increases in peak demands. Using a price differential to make these peak demand users pay the higher marginal costs should induce conservation during the peak periods. With the proper meters this method could be applied to peak hours or peak days. However, at present, differential pricing could only be applied seasonally or monthly. Costly expansions of water supply systems could be delayed or avoided with a changed rate structure.

Similarly, a move away from declining block structures can reduce demand and increase consumer equity. These "promotional rates," in which price falls with quantity purchased, were originally installed to induce use of under-utilized capacity. With these same systems now at capacity, the time for "promotional rates" is outdated. A constant price or marginal cost pricing would allocate this scarce resource in a more efficient and more equitable manner.

As distasteful as this may be to water users, a more stringent rate structure is one means of more efficient use of limited water supplies. To put it simply, higher water rates would force the consumer to decide whether a green lawn during a dry August would be "worth the price."

Recent Events Affecting Demand

Since the early 1970's a number of events have occurred which may have the effect of changing water demands for Minnesota and the Upper Midwest. To some extent, these occurrences may be self-cancelling, regarding the ultimate impact on water demand.

In the First Assessment by the WRC, a population growth rate of 1.6 percent per year was used. This rate of increase, which approximates the population growth rate for the 1950-1965 period, would result in a U.S. population of 468 million by 2020 A.D. However, birth rates since that time have declined considerably and normally will be reflected in reduced future water demands.

In recent decades, there has been a considerable migration from rural to urban areas: about 75 percent of U.S. population now concentrated in urban areas. The continued transition from rural to urban areas will be accompanied by localized water and land use problems.

In addition to these national trends, there have been some regional shifts in economic activity to the south and west.

The WRC procedure for projections of agricultural products was to determine the national demand for agricultural products, estimate the share of national demand to be satisfied from each basin, determine the production capacity of the basin, and point out adjustments needed.

These earlier projections were based on Series B population projections; most observers now believe that Series E is more realistic.[2] Lower population growth implies a lower demand for water for direct consumption and for use in food production. However, there are some offsetting factors.

With lower population growth, there is also a higher per capita income. This results from a lower proportion of dependents and also from a higher proportion of women in the work force. A higher per capita income implies a higher demand for water directly, and indirectly through increased demand for meat and high resource-using products.

Another factor which changed significantly in 1970 is the increased foreign demand for U.S. farm products. This has resulted from a number of factors, including periodic crop failures in areas of Europe and the USSR, several dollar devaluations, and increased prosperity in many nations.

Finally, there has been the energy shortage and its repercussions, which could have effects on supply of farm products. Especially with high energy prices, there could be a shift in competitive advantage back to the midwest as compared to irrigated lands in the west.

The net result of higher energy costs, higher fertilizer prices, and environmental concerns coupled with increasing foreign demand for feed grains is likely to be continued high feed grain and livestock prices, though not necessarily at current levels. The likely result is a change in production patterns as a greater proportion of grain is exported rather than fed domestically to livestock. This is likely to contribute to increased demand for irrigation water in the midwest.

Existing and Emerging Problem Areas

Irrigation

The use of water for irrigation in Minnesota has grown dramatically over the past decade. There was little irrigation in Minnesota through the 1950's. In 1964 an estimated 17,000 acres were irrigated. The 1975 estimate is 140,000 acres, an increase of 30,000 acres over 1974. In 1976 one reliable estimate is that from 60,000-100,000 newly irrigated acres have been added.

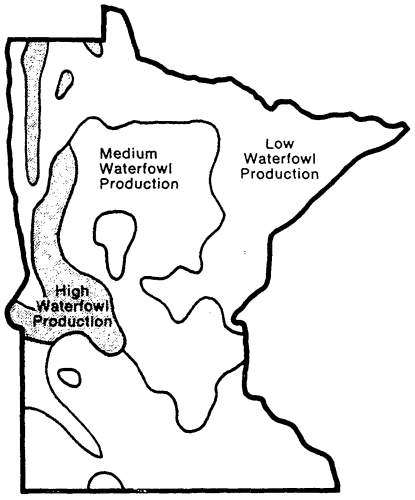
As drought years such as 1976 cause considerable crop losses, there will be increased pressure to use supplemental irrigation in Minnesota. These pressures will be further increased by high farm prices, and high prices of farm inputs such as seed, fertilizer, labor, and fuel. Producers will view supplemental irrigation as a means of "insuring" these inputs, once these expenditures have been made.

Since most of the water used for irrigation is from groundwater supplies, there is concern over the adequacy of this supply. Even though irrigation is currently only a minor use of water, there is concern that drops in the water table may interfere locally with wells for domestic and livestock use. There is also some concern that irrigation withdrawals may be competitive with maintenance of surface water levels for recreation and fish and wildlife purposes.

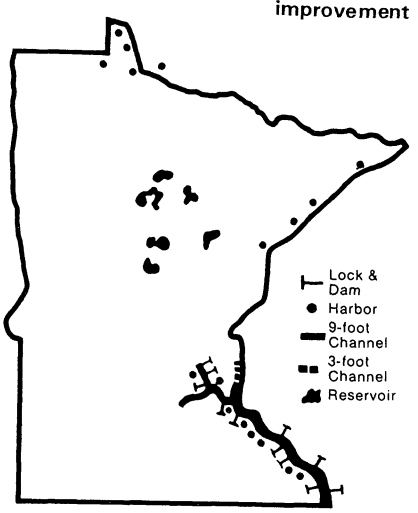
On the basis of these questions and concerns, it appears that extensive monitoring of groundwater levels and detailed studies of Minnesota's groundwater supplies is warranted.

[2] Series B assumes that in the future, women will be giving birth at an "ultimate" rate of 3.1 children per woman during a lifetime. Series E assumes an ultimate childbearing rate averaging 2.1 children per woman in a lifetime. This is the rate at which the parental generation would exactly replace itself.

Waterfowl production areas



Existing navigation works of improvement



Drainage

A continuing source of controversy concerns the drainage of wetlands to increase agricultural production. Unfortunately this is sometimes competitive with use of land for wildlife, particularly waterfowl.

Although some drainage had occurred as early as the 1860's, it was greatly accelerated in the 1940's and through the 1950's. Since then citizens and agencies have been attempting to restrict drainage in an effort to preserve existing wetlands.

In the process, however, controversy arises over permitted or restricted drainage procedures. Agricultural production is a *private* activity, while benefits of wetland preservation are *public*. In resolving the controversy, policymakers must balance public good and private property rights.

While the controversy is still not resolved, 1976 legislation provides an accelerated program of inventorying, classification, and designation of state waters, and establishes a state water bank program for reimbursing land owners for wetland conservation practices.

However, a single Legislative Act does not resolve controversy such as this which will continue to receive attention.

Navigation

The Mississippi and lower Minnesota rivers constitute a major transportation artery. Dredging associated with channel improvement is the source of much controversy involving shippers, barging interests, environmentalists, and competing transportation modes such as railroads.

Existing navigation facilities on the Mississippi river, with favorable channel conditions and proper distribution of up-and-down bound traffic, can economically handle from 25-40 million tons of traffic annually.

Upward bound river traffic has accounted for about 70 percent of the total in recent years with transportation of coal, petroleum products, and grain accounting for most of the traffic. River terminals in Minnesota are located on the lower Minnesota river and at Minneapolis, St. Paul, Red Wing, and Winona on the Mississippi river.

The 50 year life of existing navigation structures on the Upper Mississippi river will be reached around 1990. Lock and dam No. 1 at Minneapolis may need to be replaced. Industrial expansion in the lower Minnesota river area may increase pressure to provide navigation development upriver, perhaps to Mankato within the next 50 years. Other possibilities include extension of the navigation season.

The replacement of lock and dam No. 26 at Alton, Illinois, has already generated considerable controversy as has the placement of dredge spoil farther upstream. These will be subjects of continuing policy debate.

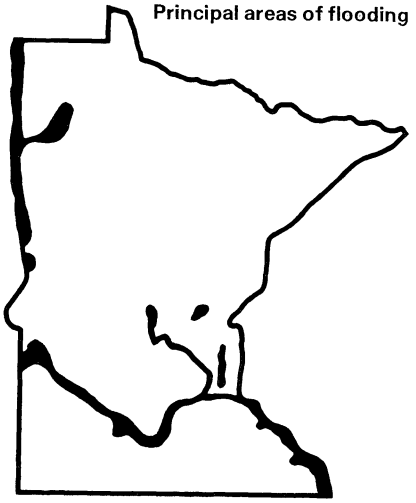
Soil Erosion

The U.S. Soil Conservation Service (SCS) has indicated that some 70 percent of land inventoried has erosion problems. The most serious soil erosion problems are in southeastern Minnesota. The SCS has identified over 8 million Minnesota acres that would benefit from watershed project action.

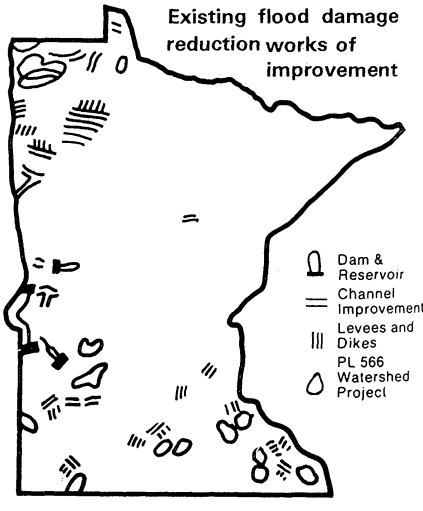
Only about 25 percent of all farmers have been assisted in completing a plan for soil and water conservation for their farms.

The relatively high farm prices of the past several years and the tendency of many farmers to specialize in grain farming has given incentive to remove fences. In addition, more marginal land has been brought into production. These factors have increased the amount of land susceptible to erosion and have increased the possible severity of erosion problems.

Principal areas of flooding



Existing flood damage reduction works of improvement



Floods

Major floods have occurred numerous times during the past 100 years in the Minnesota, the Upper Mississippi, the Cannon, Zumbro, Root, and the Red River Valleys.

In spite of various construction measures, the frequency of major property damage from floods has increased with increased development and use of floodplains.

Without floodplain management or new flood control and protection works, total average annual flood damage potential for Minnesota is expected to continue to increase.

Methods of reducing flood damages include structural measures such as dams, levees, dikes, and floodproofing of structures; and nonstructural measures such as floodplain zoning, flood warnings, and pre-flood evacuation.

In the past, the nation has relied mainly on structural measures for reducing flood damages. However, as these measures (in absence of measures to keep people and structures out of flood prime areas) have failed to reduce damages, there has been greater emphasis on nonstructural measures. Minnesota enacted the Floodplain Management Act in 1972 in an effort to reduce flood damages.

The most economic mix of various flood damage prevention methods will be a continuing problem in need of study.

Surface Water Quality

Although Minnesota recently has made much progress in construction of waste treatment plants, many water pollution problems remain. The sources of harmful substances which enter lakes and streams are many and varied. The most common is the discharge of wastes from homes and from industrial plants. Food processing industries such as canneries, sugar refineries, packing plants, and creameries have large volumes of organic wastes. Pulp and paper mills have both chemical and fiber wastes. Steam electric generating plants raise the temperatures of streams. Disposal of taconite tailings in Lake Superior remains a major problem. Solid waste disposal and septic tank effluent, too, are sources of pollution.

Groundwater Quality

Over 90 percent of the communities in Minnesota and two-thirds of the state's population are dependent on groundwater for municipal use. Groundwater generally provides a high quality water requiring little or no treatment. However, a number of examples of contamination of groundwater have been documented by the State Health Department and the Pollution Control Agency. Groundwater pollution may occur through improper location of dump sites, through abandoned water wells, and through leaching of nitrates into aquifers.

Non-Point Source Pollution

While water pollution is generally thought of in terms of discharges from various "points" such as sewage outfalls, there is increasing concern over pollution from non-point or disperse sources.

The phrase "208 Planning"[3] is associated with administrative activity attempting to deal with non-point pollution sources. The Minnesota Pollution Control Agency is responsible for development of a Statewide Water Quality Plan which would address non-point source pollution. The Metropolitan Council would have major responsibility for the Twin Cities area. Agencies yet to be designated, possible Regional Development Commissions, would have responsibility outside the Metro Area.

While the task of controlling non-point source pollution is difficult, plans are underway to address this important problem.

Power

Water availability is a basic criterion in determining the location of thermal power generating plants. Fuel and the finished product — electricity — can be transported relatively easily. However, water for cooling purposes cannot economically be moved any great distance.

Essentially all of the electric power which is produced by thermal energy requires cooling water. The principal demand imposed on water supply by thermal electric generating plants is that of cooling water.

The major problem with use of water for cooling purposes is that it increases water temperature, although, there is some consumptive use which varies with the technology used.

The thermal effect of the water used for cooling can be reduced through use of cooling ponds and cooling towers. However, these technologies increase the consumptive use of water.

Increased future energy demands will cause continuing problems in use of water for power production.

Recreation, Fish, and Wildlife

The lake and river systems of Minnesota are important recreation resources. There are over 12,000 lakes with recreation potential and about 25,000 miles of flowing water. Recreation activity has been increasing at a much faster rate than population. About one fourth of all outdoor recreation in Minnesota has been and will continue dependent on water.

Nearly all accessible water areas, especially near metropolitan centers, have increasing recreational use. There is great pressure of seasonal home development and use upon available lake surface areas. In some areas, such as Brainerd, density of lake homes equals that of Twin Cities suburbs, but without adequate sewer provisions.

A most disturbing threat to recreation opportunity is possible deterioration of water quality. To meet fishing and hunting demands, increasingly intensive fish and wildlife management and production is required. Protection and management of wilderness and free-flowing wild rivers are logical policy considerations.

The Need for Statewide Water Planning

As stated earlier, water is a scarce resource in that unlimited amounts don't exist. Various uses of water are competitive. Ultimately, as these competing uses come into sharp focus, heated controversy often develops and the issues become subjects of lengthy and costly court battles.

Ideally, public planning, through agencies such as the UMRBC and the various state agencies, anticipate problem areas before the lines of conflict become so sharply drawn that compromise and rational analysis are difficult

Unfortunately, noncrisis planning activities are often given low priority. At the state level, legislative mandate has been given to preparation of a state water plan,

[3] From Section 208 of PL 92-500, the 1972 Water Pollution Control Act.

and some initial background work has been done. However, in the authors' view, planning effort needs to be greatly accelerated because of existing and emerging water problems.

Minnesota is generally thought of as a water-rich state. Perhaps because of this, statewide water planning has been given a low priority. Attention centers around the more visible conflicts which receive media attention. By that time, rational solution becomes difficult or impossible.

Recent controversies over water and the past drought year should remind us that there are these existing and emerging problems that require continuing attention on a comprehensive and statewide basis. Although comprehensive statewide planning cannot be expected to totally resolve the problems of a scarce resource such as water, comprehensive planning can be viewed as investing token amounts of public funds in "preventive medicine" to avoid crises and insoluble problems.

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Jerome W. Hammond . . . . . **Editor**

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