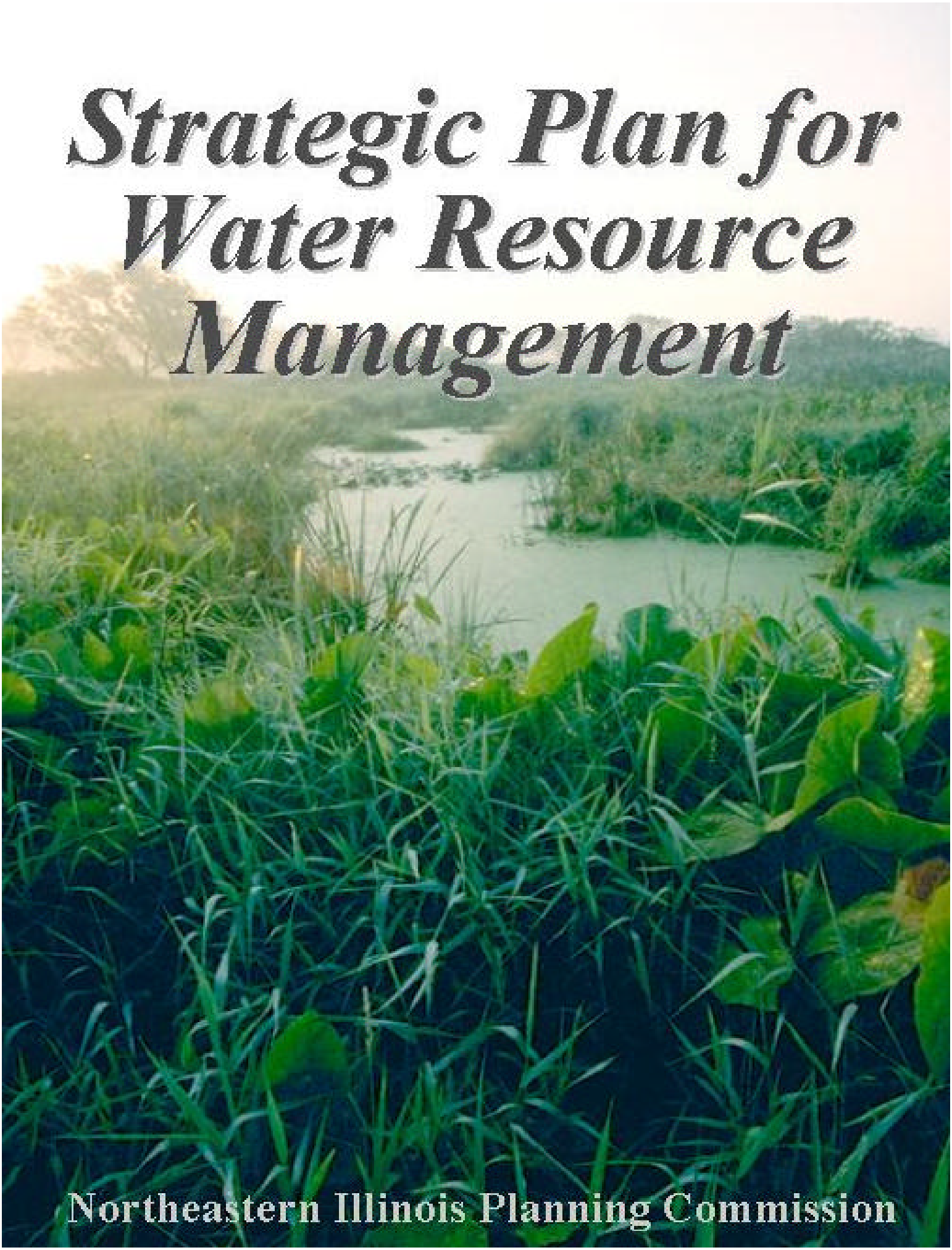
Strategic Plan for Water Resource Management



Northeastern Illinois Planning Commission

[COMMISSIONER LIST-INSIDE FRONT COVER]

Strategic Plan

for

Water Resource Management

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September 2002

To the Public Officials and Citizens of Northeastern Illinois:

On behalf of the Northeastern Illinois Planning Commission, it is my pleasure to submit to you the *Strategic Plan for Water Resource Management*. This plan was developed with the assistance of over 100 regional experts serving on a volunteer advisory committee and three task forces. These experts reflected the perspectives of local governments, state and federal agencies, the development community, and public interest groups. As such, we feel that their direct participation indicates a strong regional consensus in support of the Plan's findings and recommendations. Their work is greatly appreciated by the Commission.

The Commission's authority to prepare and make recommendations to units of local government regarding land use and related issues is found in the Northeastern Illinois Planning Act in Chapter 1705 of the Illinois Compiled Statutes. This plan is part of the Commission's efforts over several decades to develop regional, long-term plans for preserving and enhancing the region's water resources. In particular, this plan calls for a comprehensive, integrated approach to protect our water supplies, reduce stormwater and flooding impacts, and protect the water quality of our rivers, lakes, and wetlands.

This is only the starting point for regional cooperation to implement long-term solutions to our region's water issues. The plan's implementation will require a commitment from representatives of all aspects of water resource planning. It is our hope that the commitment to the planning process will continue during implementation.

Further information on the development of the plan or a specific issue or strategy may be obtained by contacting the Commission or the volunteer contributors to the plan. We look forward to implementing the plan with all of our regional partners.

Sincerely,

Herbert T. Schumann Jr.
President

I hereby certify that the *Strategic Plan for Water Resource Management* was duly adopted by the Northeastern Illinois Planning Commission this 25th day of September 2001.

By: Alexandra A. Radtke
Assistant Secretary

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EXECUTIVE SUMMARY

PLAN BACKGROUND

The Northeastern Illinois Planning Commission (NIPC) facilitated a strategic planning process to identify issues and strategies to address the complex and often interrelated water resource issues facing our region. This process, funded in part by a grant from the Illinois Department of Commerce and Community Affairs, involved a wide spectrum of public and private stakeholders within and adjacent to the six-county area. The goals were to develop a regionwide consensus to influence state policy on behalf of the region, to improve management at the regional and local level, and to enhance public understanding of water issues.

The resulting *Strategic Plan for Water Resource Management* is intended to guide the region in responding to its water resources issues: water quality, flooding, and water supply. In each of these areas, the plan recommends a series of strategies and identifies the entities to implement them. A Water Resources Advisory Committee and three task forces have worked with NIPC Commissioners and staff to identify a total of 34 issues and 133 associated strategies. Recommendations include new legislation, funding for research, changes in agency practices or funding allocations, and improved public education. A summary of the three issue categories follows. A complete list of detailed issues and related strategies is contained in the plan.

STORMWATER AND FLOODING

Flood prevention and stormwater management in northeastern Illinois can be particularly challenging due to the region's flat topography and broad floodplains. In the past, intensive agricultural development and urbanization did not fully consider the long-term consequences of altering the region's landscape. On an annual basis, current flood damages are estimated at nearly $40 million. Ongoing and future development pose new challenges due to the reduction of the landscape's ability to absorb precipitation and the continuing pressure to develop flood prone areas. Suggested strategies include improving watershed planning and coordination, increasing funding for floodplain mapping, and educating public officials and the public on stormwater and flooding issues.

WATER QUALITY

Historical accounts describe a region with clean and abundant water resources. Rivers, lakes, and wetlands teemed with fish, birds, and aquatic plants. While agriculture can impair water quality due to the effects of erosion, channelization, and wetland loss, more severe impacts are caused by urbanization and associated discharges of pollutants from wastewater and stormwater sources. At one

time, water quality became so degraded that many of the region's rivers and lakes supported little desirable aquatic life and would not be considered for recreational uses. Fortunately, over the last 20 years, significant water quality changes have occurred. In particular, pollutant concentrations from point sources and discharges from combined sewer overflows have been reduced dramatically. However, many of our region's rivers and lakes, particularly those in urban and suburban watersheds, still are not safe for swimming and do not support diverse, healthy fish communities. Nonpoint source pollution contributions such as agricultural runoff, urban stormwater runoff, and erosion from construction sites are now the major sources of water quality impairment. Suggested strategies include establishing more protective water quality standards, increasing funding for wastewater treatment plant construction, and educating local officials, engineers, and the public on best management practices.

WATER SUPPLY

Although the Chicago metropolitan region lies adjacent to one of the world's largest freshwater sources, Lake Michigan, the region faces potential water supply shortages. Laws limit withdrawals from Lake Michigan, withdrawals from rivers and streams are regulated to maintain baseflow, and groundwater withdrawals are naturally constrained by the quantity of recharge they receive. In addition, experience has shown that the quality of surface and groundwater can suffer as watersheds urbanize. As land is consumed by an increasing population, greater demands will be placed upon available surface water and groundwater supplies. NIPC predicts that the six-county Chicago metropolitan area will grow by 1.3 million people between 1998 and 2020. Water supply resources may become inadequate to meet the region's needs. Suggested strategies include educating the public on the availability/non-availability of Lake Michigan water, increasing funding for research on the region's groundwater and surface water supplies, and protecting groundwater recharge areas.

IMPLEMENTATION

Now that the plan has been adopted, implementation will begin. Primary implementers for each strategy were identified during the planning process. Since over 100 strategies were designated as high priority during the planning stage, at the beginning of the implementation stage it will be critical to review those priorities. Implementers will be approached as a group to determine realistic priorities based on balancing funding, practicality, cost-effectiveness, and staff availability for implementation.

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1

Introduction

Water has shaped northeastern Illinois. The glaciers gave us Lake Michigan, broad river valleys, numerous small lakes and wetlands, and the gravel ridges of McHenry County. An easy portage from the Great Lakes to the Illinois River attracted both Native American and European traders and settlers. Preservation of the lakefront has given us one of the most spectacular cityscapes in the world. Lake Michigan and plentiful groundwater have supported steady growth in population and employment. Our waterways and the lands along them comprise one of the great recreational systems in the country. Our wetlands are part of an extraordinarily diverse ecological heritage.

We can continue to be a region in which abundant water sustains a strong economy, a high quality of life, and a healthy environment. But we will not accomplish this without persistent, coordinated effort. For as surely as water has shaped the region, so we have altered the water resource. Development in our broad, flat valleys has reduced the space available to store flood waters while increasing the rate and volume of those waters. The demands of

households and businesses have placed growing pressure on groundwater supplies in parts of the region not served by Lake Michigan. Treated wastewater, industrial discharges, and runoff from parking lots and farm fields have reduced the quality of many lakes and streams, limiting their recreational use and their biological integrity. The addition of a million jobs and more than a million people to the region by 2020 will add to these pressures.

This *Strategic Plan for Water Resource Management* is intended to guide the region in responding to its interrelated water resources issues. This plan was developed to provide NIPC's ands its' partners current thinking on water resource management. It is not intended to require regulations that would exceed local, state, or federal regulations. In some instances, recommendations are made which may require new legislation, funding for research, changes in agency practices or funding allocations, and improved public education. The plan identifies critical issues facing the region in three areas: water quality, flooding, and water supply. In response to each of these issues, the plan presents a series of recommended strategies and suggests the entities responsible for their implementation. The plan's principal target audience is decision-makers at the state and local government levels that will be principally responsible for plan implementation. The plan also is directed to private citizens, landowners, and developers with the intent of educating and improving regional water management practices.

It is necessary to recognize that many resources and technologies were not available in the past, and that past mistakes must be the responsibility of the entire region and not be the burden of only new growth and development. Therefore, all new regulations should be based on sound scientific information, an analysis of cost-effectiveness, and an open collaborative planning process. This process should result in recommendations that are affordable to the "end users."

NIPC, throughout its history, has played a leading role in the development of water resource policy for northeastern Illinois. *The Water Resource in Northeastern Illinois: Planning its Use* (1966) was the first comprehensive examination of water resource issues in the metropolitan area. It led to the development of a series of technical reports and then to adopted policy plans dealing with overbank flooding and stormwater drainage (1976), water supply (1978),

and water quality management (1979). By the mid-1990s, these policy plans had become, to varying degrees, outdated. Revisions were needed to address updated local, state, and federal laws and policies, to reflect improved understanding of evolving technical issues, and to build on twenty years of experience in devising innovative techniques to better manage water resources. The recognition of this need was one factor in the Commission's decision to prepare this strategic plan.

If this plan is successful, it will improve the way the region perceives and manages water, consistent with the principles of sustainability, multi-objectivity, cost-effectiveness, and inter-governmental cooperation. Ultimately, water in all its forms and uses, including wastewater and stormwater, will be viewed as a resource to be appreciated and wisely utilized, rather than as a problem to be disposed or hidden from view.

This document provides an overview of the issues and strategies developed as part of the planning process and lays the groundwork for developing an implementation plan. After an overview of the planning process, the chapters cover the three major issue categories: stormwater and flooding, water quality, and water supply which are followed by a chapter on additional issues. Each chapter starts with a historical context for the issues and then provides the listing of the issues and strategies with background information.

Chapter

2

Planning Process

The strategic plan is the product of a three-year planning process during which NIPC collaborated with a wide spectrum of public and private stakeholders within and adjacent to the six-county region to identify water-related issues, opportunities, and strategies. Although NIPC facilitated the plan, the elements of the plan were developed by consensus by these stakeholders. The intent was to develop a regionwide consensus that can effectively influence state policy on behalf of the region, to effect improved management at the regional and local level, and to enhance public understanding of the issues pertaining to water. The process encouraged buy-in to plan recommendations, which, in turn, greatly improves the implementability of the plan.

In 1997, NIPC began the process to identify a representative list of important water resources issues confronting northeastern Illinois. To assist in this process, NIPC invited water resource technical and policy experts from throughout the region to serve on the Water Resources Advisory Committee. These individuals represented sanitary districts, municipalities, federal, state and county agencies, stormwater management agencies, soil and water conservation districts, river and land conservation constituencies, environmental groups, and consultants.

NIPC also circulated a survey form to regional contacts to solicit input on the preliminary issues list and to identify new issues. NIPC then assembled a series of three task forces to address the topics of stormwater and flooding, water quality, and water supply. These task forces, comprised of local, state, and federal experts from both the public and private sector, discussed, revised, and prioritized the issues. Based on the comments of survey respondents and task force members, NIPC staff also revised the issues under the category of political/institutional/financial.

An iterative approach involving task forces, the Advisory Committee, NIPC staff, and Commissioners was used to identify strategies. Task force members first suggested recommendations to address each of the identified issues. NIPC staff then organized and clarified the initial recommendations. Where appropriate, staff cited or added relevant strategies that had been formally adopted by NIPC or were directly inferred from adopted Commission policies. After reviewing the resultant strategy language, the task forces offered suggestions, and worked toward consensus.

Once the strategies were developed, each task force member was asked to identify high priority strategies. Strategies designated as high priority by the majority of the task force members are noted in bold in the text of this document. The revised strategy recommendations were

presented to the Water Resources Advisory Committee and NIPC's Water Resources Committee for review and endorsement. Finally, staff incorporated the approved strategies into a draft strategic plan that was reviewed by the task forces and Advisory Committee before final drafting and release for public review.

Land development and related water resource planning are at different phases throughout the six-county region. In some older, developed areas water resource plans and techniques are largely focused on remediating existing problems. In newly developing areas, the focus is on sustainable techniques that will minimize or prevent future problems. In light of this, not all strategies will be relevant for every area of the region. During the plan implementation phase, strategies can be prioritized and targeted to the parts of the region that would most benefit from their implementation.

Many of the issues and strategies developed fall into more than one of the three broad topics of stormwater and flooding, water quality, and water supply. For this document, they usually are identified in only one of the topics with a reference to a second topic in italics.

There are some issues and strategies that relate to all three of the broad topics. One example is the effect of land use changes on stormwater and flooding, water quality, and water supply. As a result of the planning process used in the developing this plan, the interrelated effects from these activities and the strategies to address them are covered in each section. It is critical that these overlapping strategies be integrated as an implementation plan is developed in the coming years.

Appendix A contains a chart cross-referencing identified strategies and primary implementers. This chart provides a quick reference for organizations to determine where their input and participation will be needed most during the implementation phase.

Chapter

3

Stormwater and Flooding

OBJECTIVE: Reduce the Impacts of Stormwater and Flooding

Prevention of flooding and management of stormwater in northeastern Illinois can be particularly challenging due to the flat topography and broad floodplains present in the region. Past actions, including both intensive agricultural development and urbanization, did not fully consider the long-term consequences of altering the region's landscape, resulting in serious flooding and drainage problems. It is estimated that the region's average annual flood damages are close to $40 million (Figure 1). Ongoing and future development poses new challenges due to the cumulative reduction of the landscape's ability to absorb precipitation and the continuing pressure to develop flood prone areas.

The following provides an historical context for development of the stormwater and flooding elements of this plan. It is followed by the specific issues and strategies developed through the process.

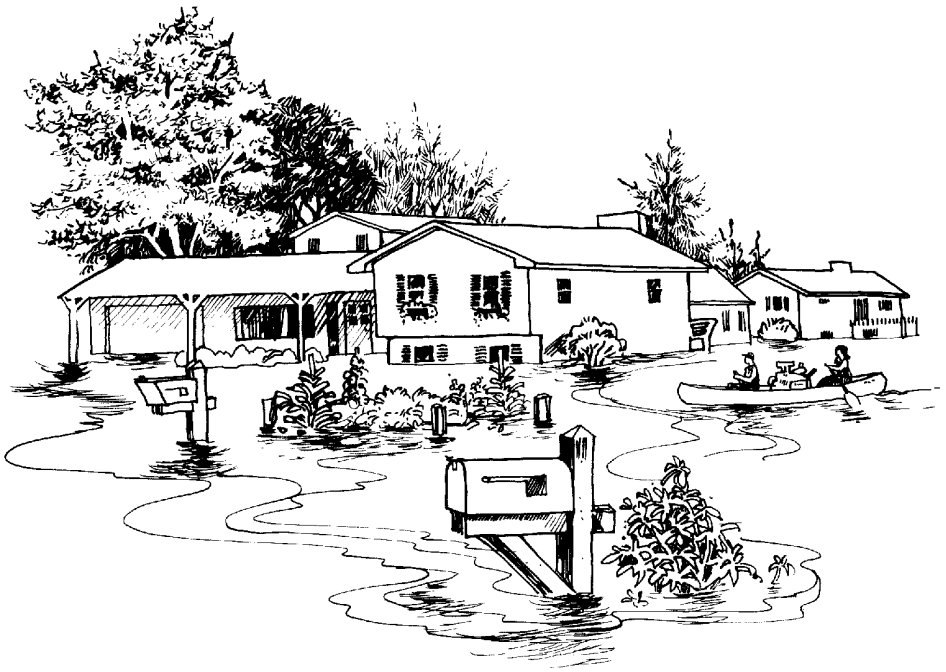


Figure 1
Average Annual Flood Damages

Historical Context

Regional Overbank Flooding and Stormwater Drainage Policy Plan

In 1976, the Commission followed the adoption of its *Comprehensive General Plan* with the development of the *Regional Overbank Flooding and Stormwater Drainage Policy Plan.* This plan was developed with input from the Commission's Water Resources Technical Advisory Committee, a review by the Planning Committee, a questionnaire sent to approximately 3,500 public officials in the region, and a "Storm and Flood Water Planning Conference" in 1973 that solicited input on alternative planning and management recommendations.

The plan identified the goals and objectives in the box below that are the basis for its recommendations:

Regional Overbank Flooding and Stormwater Drainage Policy Plan

Goal:	***Protection of life and property from storm and floodwater damages***
Objectives:	Prevent urban development in flood prone areas.
	Reduce flood damage in already developed flood prone areas.
	Reduce damages caused by inadequate stormwater drainage facilities.
Goal:	***Protection of ground and surface waters from flood and storm related pollution***
Objectives:	Improve the quality of stormwater runoff entering lakes and streams.
	Prevent the storage of waste materials where they can pollute ground and surface waters.
Goal:	***Effective utilization of resources for storm and floodwater management***
Objectives:	Coordinate the activities of agencies and units of government involved in storm and floodwater planning and management.
	Increase the opportunity for the region's citizens to participate in the identification of storm and floodwater problems and in the formulation of programs to alleviate these problems.

The plan then provided policies and more specific action recommendations to reach the goals and objectives. Specifically, it addressed the following issues and policy subjects:

?? **Overbank Flooding:** floodplain mapping, floodplains and open space, regulation of floodplain development, flood insurance, basin planning, structural flood control measures, relocation and floodproofing, and channel maintenance;

?? **Stormwater Drainage:** stormwater quality considerations, erosion and sedimentation, stormwater drainage deficiencies, combined sewers, and on-site stormwater detention; and

?? **Public Involvement.**

The descriptions of conditions and problems and their corresponding policies and recommendations contained in this plan are remarkably relevant to the current situation. Perhaps the most significant changes since the 1976 plan adoption are the Commission's updated positions regarding floodplain and stormwater management regulations and the related improvements in local government development regulations. Further, the Commission also has a formally designated role in reviewing countywide stormwater plans, which was established by the legislature in 1987. Several regional achievements are notable, particularly the accomplishments of countywide stormwater committees (CSWCs) in DuPage and Lake Counties in implementing countywide ordinances and initiating extensive watershed planning. Kane, McHenry, and Will Counties also have established stormwater committees and currently are developing countywide ordinance programs. In Cook County, the South Suburban Mayors and Managers Association (SSMMA) has taken the lead in its region in developing stormwater and floodplain plans and ordinances.

Stormwater Management Policy Advisory Committee (1988-1990)

This committee was created after the disastrous floods of 1986 and 1987 and the subsequent passage of legislation (PA 85-905) that authorized the creation of countywide stormwater committees and revised the floodway management rules for northeastern Illinois. One of the principal policy-related actions of the Commission's committee was the adoption of "Interim County Stormwater Management Plan Review Criteria" in 1988 to guide the Commission's review of countywide stormwater plans. These criteria addressed consistency with statutory requirements; consistency with NIPC adopted plans and policies; general conformance with NIPC "Model County Stormwater Plan" topics; consistency with NIPC's detention performance criteria; and consistency with NIPC's floodway management policy.

Updated Action Agenda on Flooding and Drainage

On November 5, 1986, in response to severe flooding in northeastern Illinois, the Planning and Policy Development Committee endorsed an "Action Agenda" on flooding and drainage. This "Action Agenda" was subsequently updated in response to flood disaster declarations in 1993 affecting Cook, Lake, and McHenry Counties. The updated "Action Agenda" contains 18 recommendations that address issues ranging from congressional appropriations to needs for improved floodplain mapping and flood prevention.

Model Ordinances

As part of its technical assistance to local governments, the Commission developed and updated a series of model ordinances for local governments to consider for addressing the topics of floodplain management, stormwater drainage and detention, stream and wetland

protection, and soil erosion and sediment control.

These model ordinances are generally based on, and consistent with, NIPC's existing policy plans. However, the ordinances also contain certain provisions that reflect significant elaborations and/or expansions of the policy plans. Many of these provisions are responsive to an improved awareness of the impacts of development and an evolving body of experience with innovative development standards, both regionally and nationally. For example, understanding of nonpoint source impacts and appropriate control measures has evolved substantially since the Commission's adoption of the *Areawide Water Quality Management Plan* in 1979. Similarly, current ordinance standards for stormwater control, floodplain management, and wetland protection reflect, in part, dramatic changes in regional, state, and federal policies that have occurred since the adoption of the policy plans. Further, the Commission has developed numerous publications on related topics such as stormwater best management practices (BMPs) and flood hazard mitigation.

This leads to the current strategic plan that has identified the following issues and strategies.

STORMWATER AND FLOODING ISSUES AND STRATEGIES

CATEGORY 1: PREVENTION

Floodplain Management Issues

A. *Many of the region's regulatory floodplain maps are out of date and substantially underestimate actual 100-year flood stages. Contributing factors include outdated land use information, and in some cases outdated hydrologic and hydraulic methods, inadequate topographic information, and changing climate trends. Further, current floodplain maps commonly do not identify many flood prone areas with drainage areas less than one square mile and often do not identify non-riverine depressional flood prone areas.*

B. *Minimum state and federal floodplain regulations, and many local regulations, are not adequate to prevent increases in flood damages. For example, in some jurisdictions compensatory storage is not required for fill in the flood fringe and/or there is no freeboard requirement to safely elevate structures above the base flood elevation.*

Background

Floodplains, while commonly viewed as constraints to developments, are also natural assets. The primary purpose of floodplains is to store and attenuate floods. Under natural conditions, streams and rivers overflow their banks onto floodplains on a regular basis, on average once every year or two. Flooding becomes a problem only when human activities are placed in floodplains. Floodplains and their associated stream, wetland, and shoreline areas provide other valuable functions. The edges of streams and rivers are the natural habitat of wildlife, songbirds, and many native plants. Strips of natural vegetation adjacent to streams, especially native grasses and trees, also are highly effective in filtering sediment and other pollutants washing off of adjacent lands. Many floodplains also are effective recharge zones for underlying groundwater aquifers.

Floodplain maps can show historical areas of flooding or potential flood hazards. NIPC and the United States Geological Survey (USGS) prepared the first series of flood maps for the

region. This "Hydrologic Investigations Atlas" series shows the floods of record on all major streams up until the early 1970s. They provide good historical data but have generally been replaced.

Today, the official floodplain maps are the Flood Insurance Rate Maps (FIRMs) that show the area potentially affected by a flood having a one-percent chance of occurrence in any given year (the base flood). These maps are prepared by the Federal Emergency Management Agency (FEMA). They are used in state and local regulatory programs, by insurance agents to set flood insurance rates, and by lending institutions to determine if flood insurance is required as a condition of a loan.

Although FEMA has a goal to assess and, when necessary, revise maps every five years, over the past years only two percent of maps have been revised nationally. Since the original mapping effort in the 1970s, more detailed topographic and climatic data as well as improved modeling capabilities have been made available, which would lead to more accurate floodplain mapping. Some maps are based on data that are more than 25 years old. Due to rapid development in the region since the original FEMA maps were developed, the floodplain boundaries have expanded in most watersheds. In some areas, development makes even recent maps outdated. Without revised maps, accurate guidance for siting new developments is much more difficult, and local communities may allow developers to unknowingly build homes in flood prone areas.

In northeastern Illinois, the Illinois Department of Natural Resources, Office of Water Resources (IDNR/OWR) and NIPC developed and updated a *Model Floodplain Ordinance* that encouraged the Commission's conservative floodplain management approach (e.g., no unnecessary construction in the floodway and required compensatory storage in the flood fringe). Since completion, the NIPC-recommended provisions in the ordinance that exceed the State's provisions have been adopted by a majority of communities in the six-county region.

RECOMMENDED STRATEGIES
FLOODPLAIN MANAGEMENT

(Strategies designated as "high priority" by the majority of the task force members are denoted in bold)

1. FEMA should aggressively implement its floodplain map modernization program. The map modernization program will reduce long-term costs, improve map accuracy, and improve accessibility of the maps to the public. NIPC should take the lead role in coordinating and encouraging the Illinois Municipal League, individual communities and counties, CSWCs, and others to lobby Congress and the Illinois General Assembly to appropriate additional funds to implement the map modernization program.

2. CSWCs, communities, counties, and IDNR/OWR should partner to prioritize and address the most critical floodplain mapping needs and to leverage limited FEMA funding resources.

3. Local governments and CSWCs should map depressional storage areas and headwater floodplain areas. Compensatory storage and elevation requirements should be enforced in these areas by local governments and CSWCs.

4. FEMA should support and IDNR/OWR, CSWCs, and communities should use conservative representation of future watershed land use conditions and state of the art analysis techniques when preparing updated floodplain maps. Maps should be verified and routinely updated when new storm/flood information becomes available.

5. FEMA should take steps to increase participation in the Cooperating Technical Partners (CTP) program where components of the floodplain mapping program are delegated to qualified local agencies (e.g. CSWCs, regional agencies, and state agencies). These steps could include marketing, targeting limited floodplain mapping funding to CTP communities, and providing technical assistance. CSWCs, regional agencies, and state agencies should identify means by which they can participate in CTP.

6. Communities should share data and results from local floodplain studies performed as part of the development process or for other uses. The CSWCs should act as a repository for these local studies.

7. IDNR/OWR and FEMA should perform more Community Assistance Visits (CAV) and develop a prioritization strategy for community visits.

8. NIPC should promote the adoption, by communities and CSWCs, of standards consistent with the updated IDNR/NIPC *Model Floodplain Ordinance* (1996), emphasizing the Commission's conservative floodplain management approach (e.g., no unnecessary construction in the floodway and required compensatory storage in the flood fringe).

9. IDNR/OWR should modify their northeastern Illinois rules to require compensatory storage in the flood fringe and should recommend a minimum of 2 feet of freeboard.

10. IDNR/OWR, CSWCs, and NIPC should encourage greater participation in the National Flood Insurance Program (NFIP) and Community Rating System (CRS) by northeastern Illinois communities. (CRS provides for reductions in flood insurance rates in communities performing floodplain and stormwater management activities that exceed minimum requirements.) FEMA should facilitate greater participation in CRS by further

simplifying the application requirements, providing technical assistance, and offering greater incentives. FEMA also should consider disincentives for failing to adequately enforce floodplain management ordinances.

11. See Water Quality Strategy 24 addressing the need for state water law revisions to protect aquatic habitat and natural floodplain functions.

12. See Water Quality Strategy 22 recommending that CSWCs and communities adopt regulations to protect stream and wetland functions not addressed by the U.S. Army Corps of Engineers (USACE).

Stormwater Management Issues

C. While modern stormwater detention requirements can effectively control runoff rates and prevent development-related increases in flood damage in small riverine watersheds, detention cannot prevent increases in the total volume of runoff which is contributing to increased flooding in larger watersheds such as the Des Plaines and Fox Rivers as well as in lake watersheds and depressional areas.

D. While the runoff reduction and groundwater recharge benefits of alternative stormwater management approaches, such as natural drainage and landscaping, are considerable in appropriate conditions, some residents, property owners, developers, and local governments may not be willing to accept them because of aesthetic concerns and perceived cost and maintenance issues. In addition, current information and commonly used analysis tools may not be adequate for quantifying the benefits of these alternative approaches and their influence on detention requirements.

E. It is often difficult to implement conventional stormwater standards on sites with natural drainage constraints, such as natural depressions, hydric soils, or steep slopes. As a result, the negative impacts of development are often inadequately mitigated on these sites.

Background

Conventional urban development dramatically increases the amount of stormwater runoff generated compared to other land uses. The principal causes of this effect are impervious surfaces—streets, parking lots, and buildings—and compaction of the soil due to construction activities. Instead of soaking into the ground, rain that falls on an impermeable surface is converted quickly to surface runoff and is eliminated from the site via sewers and manmade channels. These channels are not designed to carry the 100-year flow and therefore residents are given a false sense of security during smaller storms.

In recognition of the effect that increased runoff has had on flooding, new development often incorporates stormwater detention to slow the release of runoff to downstream rivers. While beneficial in controlling flood peak flows, this still leaves several runoff-related problems including the impact on water quality, the impact on groundwater recharge, and runoff volume inadequately addressed. The increased volume of stormwater affects flooding in large rivers that flood due to long-duration events. This increased volume increases both the peak and the duration of flooding in these situations, which is what occurred during the Des Plaines River flood in 1986. Particularly in watersheds predominately developed before modern stormwater detention requirements, large regional methods of stormwater management

such as regional detention may be necessary to reduce flood damages.

NIPC has taken the lead in educating the region on alternative, holistic stormwater management techniques for developing areas over the past 15 years, but barriers to wide acceptance remain. The emphasis of the regional efforts has been on promoting alternative site design techniques that minimize impervious surface coverage and use BMPs to allow for more of the stormwater to infiltrate naturally into the soil. This results in stormwater being used as a resource for groundwater recharge and irrigation rather than a waste product to discharge to downstream communities. While these techniques can significantly reduce runoff volumes and increase the water quality of runoff, they generally should be combined with detention storage to maximize stormwater mitigation benefits.

RECOMMENDED STRATEGIES

STORMWATER MANAGEMENT

13. NIPC should promote the adoption, by local governments and CSWCs, of comprehensive plans and improved stormwater management regulations consistent with the objectives and standards of the Commission's *Model Stormwater Drainage and Detention Ordinance* (1994). In particular, these plans and regulations should better address runoff volumes and water quality in addition to runoff rates.

14. CSWCs should identify and enhance regional storage facilities to address increases in in-stream flows that cannot be prevented by on-site measures. These strategies also should be coordinated with IDNR/OWR, FEMA, and USACE to address flood remediation needs.

15. Communities, coordinating with the CSWCs' watershed planning efforts, should require an analysis of downstream impacts as part of the development review and approval process. This should reduce future downstream problems and at the same time raise the level of awareness of these impacts.

16. CSWCs should require site planners to use available information to evaluate the infiltration potential of development sites and map areas suitable for infiltration practices.

17. CSWCs and communities should promote, identify examples, and provide incentives for sustainable development practices that reduce imperviousness, enhance infiltration, utilize natural drainage approaches, and protect natural drainageways and corridors.

18. NIPC should coordinate research with CSWCs, state agencies, watershed organizations, and universities on the long-term effectiveness and benefits of sustainable site design and drainage approaches. The research should address the

water quality, water quantity, and cost implications of the alternative site design approaches. The results of these efforts should be distributed to communities, highway departments, and developers to expand utilization of these practices. State, federal, and local agencies should contribute funding toward these research and information outreach activities.

19. FEMA should modify its CRS credit criteria to encourage maintenance approaches and development standards that protect and enhance natural drainage systems, and provide more examples in their model CRS programs of floodplain and stormwater management activities that preserve and protect the natural and beneficial functions of floodplains and drainage ways.

20. As part of their review, CSWCs and communities should require site planners to identify sensitive areas (e.g., wetlands, floodplains, and streams) on development sites and perform natural resource impact assessments.

21. CSWCs and NIPC should provide guidance on analyzing depressional storage.

Planning and Enforcement Issues

F. Inadequate attention is being devoted to prevention of stormwater and flooding problems. In particular, enforcement of stormwater and floodplain regulations is lacking in some areas, watershed planning is often inadequate to identify potential future problems and develop comprehensive prevention strategies, flood hazard mitigation plans have not been prepared, and sustainable development principles are not being widely applied.

Background

Planning is a rational process that ensures that stormwater management programs and projects are appropriate for the situation and properly designed. There are numerous positive examples of stormwater planning in this region, including the watershed planning efforts by groups such as the Conservation Foundation, the SSMMA, the Butterfield Creek Steering Committee, and CSWCs such as those in Lake and DuPage Counties.

Despite these successes, and the increasingly progressive regulatory programs in individual communities, much remains to be done to more effectively prevent increased flood damages from development. One of the important tools is watershed planning. Effective watershed planning can assess, for example, whether stormwater controls required at the local level will be effective in preventing flooding increases in downstream communities. Similarly, flood hazard mitigation planning can identify approaches to limit flood damages (e.g., through warning systems, retrofitting, acquisitions) even if floods themselves cannot be prevented.

RECOMMENDED STRATEGIES

PLANNING AND ENFORCEMENT

22. NIPC should encourage additional land acquisition and conservation easements for stream corridors and floodplain areas, as called for in the *Northeastern Illinois Regional Greenways Plan,* using state, forest preserve district, park district, municipal, township, and other open space funding, as well as federal (FEMA Hazard Mitigation Grant Program and Flood Mitigation Assistance Program) and state buy-out and relocation funding. They also should support and participate in the acquisition of high priority isolated wetland sites, particularly where these sites are not protected by local or state regulations.

23. CSWCs should develop coordinated, watershed-based stormwater and resource plans in all six counties. Watershed plans should comprehensively address issues of stormwater detention, stream and wetland protection, floodplain management, natural stream morphology, flood remediation, and nonpoint source pollution and identify solutions to respond to these issues.

24. The Illinois General Assembly should provide all counties the authority of 55 ILCS 5/5-1062, which grants stormwater planning and regulatory authority to those counties that have CSWCs and have adopted countywide stormwater management plans. This authority is currently limited to the five counties surrounding Cook.

25. NIPC should develop model subdivision and zoning code ordinances that provide greater incentives for innovative stormwater management techniques and sustainable development practices and that address conflicts that often exist between existing code and countywide stormwater management ordinances. The communities and counties should incorporate the model codes into their own code framework.

26. Communities, with assistance from NIPC and emergency management agencies, should prepare multi-objective mitigation plans as part of their comprehensive plans using the Commission's *Flood Hazard Mitigation in Northeastern Illinois* (1995) as a guide.

27. The Illinois General Assembly should place greater emphasis on and offer incentives for sustainable water resource management in its "Illinois Growth" (smart growth) initiative and provide support and guidance to local land use planning efforts.

28. CSWCs should enhance their regulatory programs and require certification of communities that wish to enforce countywide ordinances.

29. NIPC and the counties should develop model comprehensive plans to provide more regional coherence on water resource objectives and inclusion of sustainable development principles. The communities should utilize these models when revising their comprehensive plans.

CATEGORY 2: FLOOD REMEDIATION

Flood Mitigation Issues

G. In evaluating flood remediation alternatives, there has been an historical predisposition to emphasize and implement structural flood control projects over non-structural alternatives. This tendency continues today within some agencies, due both to agency constraints on funding non-structural measures (e.g., flood-proofing) and the inability to adequately account for open space and ecological benefits in benefit-cost calculations. Further, many current mitigation planning efforts focus almost exclusively on flood reduction and do not evaluate multi-objective opportunities such as enhancement of water quality, habitat, and open space.

H. While past flood damage reduction feasibility studies have identified substantial flood damages in numerous communities, many of the studies concluded that there either were no cost-effective remedial structural projects or that such projects would only reduce flood stages and damages by a small degree.

Background

Flood mitigation may be defined as "everything that can be implemented to reduce property damage and the threat to life and public health from flooding." The history of the response to flooding in northeastern Illinois offers cogent examples of mitigation and the many measures that can be used. Communities in the area have typically relied on two broad kinds of measures:

1. Remedial structural measures, such as reservoirs and channel improvements, which keep floodwaters away from damage-prone development.
2. Nonstructural measures, such as regulating development to keep it away from the floodplain, detaining stormwater on the sites of new developments, removing flood prone structures from the floodplain, and acquiring flood prone lands for open space.

Each mitigation measure is appropriate in different situations. Structural flood control projects can be the most efficient way to protect an existing critical facility or a concentration of damage-prone buildings. Structural approaches

may give residents a false sense of security, leading them to stop purchasing flood insurance because they believe that a flood will never occur if the project is in place. Nationally, these projects are beginning to focus on more than flood damage reduction benefits, and also are including other community benefits such as increased recreation and wildlife habitat or water quality enhancement. The use of cost-effective non-structural solutions for individual home-owners such as floodproofing or buy-outs often cost less in the end, but they often are not as readily acceptable to homeowners. There is the perception that the beneficiary (i.e., the homeowner) may be unduly financially burdened in the process. In addition, historically USACE has favored structural solutions through its use of an inflexible cost-benefit approach to funding projects.

RECOMMENDED STRATEGIES
FLOOD MITIGATION

MULTI-OBJECTIVE FLOOD MITIGATION

30. FEMA, the state, and CSWCs should develop better regulatory, administrative, and funding mechanisms to remove substantially and repetitively damaged buildings and provide technical assistance to local officials in applying those mechanisms.

31. USACE, FEMA, and IDNR/OWR should establish a flood control hierarchy that encourages consideration of non-structural solutions (e.g., acquisition or flood proofing) over structural solutions (e.g., levees, channel improvements, dams), where cost effective, for projects receiving state or federal funds.

32. IDNR/OWR, NIPC, CSWCs, and communities should support FEMA and Congress in their proposals to condition subsidized flood insurance premiums for repetitive loss buildings on implementing measures to reduce flood damages and risk. Over time, this can reduce or eliminate the number of repetitive loss structures.

33. NIPC and CSWCs should encourage use of flood hazard mitigation funding for the removal or elevation of structures in floodplains to prevent future recurrence of flood damage, reduce disaster assistance needs, and provide public open space and access to water ways. Repetitive loss information available from IDNR/OWR and FEMA and information on the public benefits of non-structural projects could be used to encourage local officials to pursue this funding.

34. USACE and IDNR/OWR should research methods to incorporate non-structural and non-flood reduction benefits, such as ecosystem restoration benefits, into benefit-cost analyses and identify case studies where these methodologies have been successfully implemented.

35. IDNR/OWR, USACE, FEMA, and CSWCs should convene a summit to coordinate funding sources to obtain multiple benefits from flood reduction projects and introduce funding sources that would improve the financial attractiveness of non-structural projects. Flood damage reduction benefits and funding sources should be coordinated with recreation, economic development, and transportation benefits and funding sources.

36. Communities should consider the ancillary benefits of flood reduction projects, such as community attractiveness, safety, and emergency services cost reductions, when traditional benefit-cost analyses indicate that the project is not cost effective, and communities should utilize local funds to proceed with projects.

IMPROVED WATERSHED COORDINATION

37. Communities should work together and with CSWCs to address flood mitigation projects on a watershed basis so that projects in one community can more readily be considered to address flooding in another community. This can provide opportunities to identify additional alternatives that may be more cost effective.

38. The communities and CSWCs should identify opportunities to reduce downstream flooding as part of new development. For example, detention basin capacity could be increased at a moderate cost to address specific downstream flooding problems. Any additional cost for justified detention basin expansions would be borne by public agencies.

39. IMAG (Illinois Mitigation Advisory Group, the overall committee that sets criteria for use of Hazard Mitigation Grant Program (HMGP) and Community Development Block Grant (CDBG) funding for mitigation) should fund all types of mitigation measures that are shown to be cost-effective rather than only one approach per area.

STREAM CHANNEL MAINTENANCE

40. USACE, IDNR/OWR, and CSWCs should require implementation of channel maintenance agreements as a condition for communities benefiting from regional flood control projects. CSWCs and NIPC should encourage routine channel maintenance programs throughout the region and promote natural vegetation methods for streambank stabilization.

41. Communities, CSWCs, and other organizations should restore stream corridors to enhance natural flood control functions while at the same time improving water quality, aesthetics, and aquatic habitat.

Emergency Response Issues

I. The lack of locally based emergency response plans is a missed opportunity to reduce flood damages in many communities.

Background

All counties in northeastern Illinois and many cities and villages have emergency management offices to coordinate warning, response, and recovery during a disaster. The Illinois Emergency Management Agency (IEMA) coordinates this work at the state level. The National Weather Service coordinated the flood threat recognition work on large rivers such as the Des Plaines, Fox, Kankakee and Little Calumet. Communities on smaller rivers must develop their own flood threat recognition system to provide early warning to emergency managers such as by installing in key locations rain and river gauges that gather data electronically or manually. Once a flood threat is recognized, the first priority is to alert others through a flood warning system and then to respond with actions that can prevent or reduce damage or injury. This may include persuading people to evacuate in a timely fashion so as not to put themselves or potential rescuers in danger. These actions might include sandbagging areas that tend to flood, removing objects of importance from basements prone to flooding, and moving cars from low-lying areas.

RECOMMENDED STRATEGIES
EMERGENCY RESPONSE

42. CSWCs and emergency management agencies, with assistance from USGS, should develop flood warning systems using countywide rainfall and stream gage networks, and the communities should build flood warning into their emergency response plans.

43. CSWCs and IEMA should identify good flood warning and emergency response programs and utilize them as models for other communities.

44. Post-flood assessment of stormwater management facilities should be performed to identify design problems and/or repairs that may be needed.

45. Communities should coordinate collection of flood and damage information with emergency response procedures to improve the response to future floods and to identify and assess flood mitigation alternatives and needs. Aerial photographs should be incorporated into the data collection effort.

Combined Sewer Area Issues

J. In combined sewer areas, the Tunnel and Reservoir Plan (TARP) alone may not be sufficient to eliminate flood damages. This is due to the limited capacity of many local sewers to convey excess flows to the TARP system and to the federally determined designs for storage reservoirs that do not provide for storage of the 100-year event.

Background

Chicago and a large ring of Cook County suburbs are served by combined sewer systems that convey both sanitary sewage and stormwater in single pipes. During periods of wet weather, flows may exceed local sewer system capacity, causing backups, typically into basements and onto streets. Historically, such heavy flows also overload local sewers and interceptor sewers flowing to treatment plants, resulting in combined sewer overflows to area waterways. Extremely heavy storms may cause river back flows to Lake Michigan, resulting in beach closures.

For the 375 square mile combined sewer area within the city of Chicago and adjacent suburbs, TARP is being built to reduce the water pollution and flooding problems caused by overflows. During periods of wet weather, overflows are stored in the tunnel and partially constructed reservoir system and subsequently conveyed to treatment plants.

However, while TARP provides a major outlet for flood waters, it is the responsibility of each individual community to maintain and, where necessary, expand its own local sewers to fully utilize the tunnel system. Construction of these local facilities will help alleviate sewer backups and other local stormwater drainage problems.

RECOMMENDED STRATEGIES
COMBINED SEWER AREA

46. Communities should utilize the Metropolitan Water Reclamation District of Greater Chicago's (MWRD) and the state's revolving loan program and other sources of funding to upgrade and maintain their local sewers within the TARP area in order to increase capacity and fully realize the benefits of the TARP system.

47. Cook County and its communities should support congressional appropriations and allocate the required local / state match for completing all phases of TARP.

48. Cook County and its communities should establish and fund a countywide stormwater program to remediate flooding not adequately addressed by TARP or existing flood control reservoirs.

CATEGORY 3: FUNDING

K. There are serious funding constraints to effectively implement most countywide stormwater management programs. While state stormwater legislation provided authority for a tax levy to implement these programs, many of the counties are unable to utilize the levy due to the legislative tax cap.

L. Federal financial support for flood mitigation projects is dwindling nationwide and the local match requirement has recently increased from 25 percent to 35 percent. While more money is being made available for buyout of flood prone structures and ecological restoration projects that have some flood reduction benefits, the increase in funding for these programs is substantially less than the reduction in overall flood control funds from federal sources.

Background

A property tax-based funding system was legislatively authorized for the five collar counties. DuPage and Lake Counties implemented this authority before the tax cap limitations were passed in 1990. The DuPage County budget provides for both operating and capital costs while the much smaller Lake County budget provides principally for operating costs. Kane, McHenry, and Will Counties currently are not using property tax funds as authorized by stormwater planning legislation. In the legislation that authorized stormwater planning in Cook County, there was no provision included for funding.

RECOMMENDED STRATEGIES

FUNDING

49. The Illinois Municipal League, the counties, NIPC, and others should encourage the Illinois General Assembly to increase funding, funding mechanisms, and direct technical assistance to communities and countywide stormwater programs to facilitate greater use of watershed planning.

50. Communities, CSWCs, NIPC, and state agencies should support legislation enabling alternative financing of countywide stormwater programs, such as by authorizing user charges as promoted by the Governor's Land and Water Resources Priorities Task Force, the Illinois Municipal League, and the Illinois Association of Metro Counties.

51. CSWCs and NIPC should research the true cost to residents of not having a stormwater program and use that information to educate voters and county elected officials on the need for adequately funded countywide stormwater programs. The research should identify how much is being spent on prevention versus remediation.

52. NIPC should convene a "Blue Ribbon" committee to identify and implement an overall funding strategy.

53. Federal flood mitigation funding should be targeted to communities that are demonstrating local efforts to prevent and mitigate flood damages. As further incentive, the federal cost share for projects should reflect the local level of effort. The maximum federal share for USACE projects should be restored to 75 percent.

54. Communities and CSWCs should establish a local match fund to better enable them to take advantage of state and federal funding.

CATEGORY 4: EDUCATION AND COORDINATION

Education

M. Many people do not have a full understanding of the complex inter-relationships between development and flooding, particularly in terms of the cumulative watershed-wide impacts of development on flooding. This problem is true of local officials, legislators, academia, and the general public, as well as developers and design professionals.

Background

There is a sense in many communities that existing stormwater detention ordinances prevent increases in flooding associated with new development. In fact, many existing ordinances allow fairly liberal stormwater release rates that provide only local protection. In general, even with very conservative detention storage and release rate requirements, the total quantity of runoff leaving a development site is substantially greater than before development. The result is increased flows and damages many miles downstream.

While additional stormwater controls, such as infiltration practices, can reduce these effects, it is important that decision-makers take appropriate actions to counter increasing runoff. For example, additional safety margins could be employed for development in or near a floodplain. Effective watershed planning is an important predictive tool to enable decision-makers to be more aware of their actions.

RECOMMENDED STRATEGIES

EDUCATION

55. NIPC, the Illinois Association for Floodplain and Stormwater Management (IAFSM), and other professional organizations should coordinate with the Illinois Municipal League to educate municipal officials on stormwater management and floodplain issues and programs. NIPC and CSWCs should provide education opportunities for county officials.

56. CSWCs, professional organizations, and NIPC should provide additional education and training for local government officials regarding ordinance enforcement, especially in developing areas.

57. CSWCs and NIPC should educate the legal community (judges) on the purposes of stormwater standards and the need for enforcement in an effort to obtain better legal backing during enforcement-related litigation.

58. FEMA should sponsor improved training of realtors and insurance agents in the National Flood Insurance Program.

59. NIPC and CSWCs should educate economic development agencies and chambers of commerce on the stormwater and flooding impacts of development and the benefits of sustainable development practices.

60. Communities and CSWCs should work with realtors to develop and implement strategies to increase the property-buying public's awareness of and access to flood risk information such as flood history data and floodplain and stormwater studies. The public also should be made aware of the need for and benefits of flood insurance.

61. School districts should incorporate natural resource education, including the causes and sources of flooding, into their recommended curriculum.

62. Professional organizations should communicate to universities the need for interdisciplinary coursework within civil engineering, agricultural engineering, and planning programs, including courses in the natural sciences and public policy.

Coordination

N. There remains some weaknesses in coordination between agencies and among programs within some agencies. Examples include local governments not coordinating with each other and conflicts between the goals, roles, and regulatory programs of departments within state and federal agencies. Some of this may be the result of conflicting laws and rules related to the authorities of the various offices and agencies.

Background

Historically, there were serious conflicts between flood control projects (such as channelization) and aquatic habitat objectives. Current agency guidelines have greatly reduced such conflicts. One current area where coordination could be improved is inter-county flood mitigation. While county stormwater committees are encouraged by statute to coordinate their plans with adjacent counties, there is no clear mechanism for achieving such coordination. Conflicting objectives add to the coordination challenge, such as in the case of flood control plans proposed by DuPage County for Salt Creek that were perceived to conflict with natural resource objectives of Cook County. A promising model of effective inter-agency, multi-county, and multi-objective coordination is the ongoing Phase 2 flood damage reduction study of the Upper Des Plaines River. While this process is still a work in progress, the degree of stakeholder involvement is encouraging.

RECOMMENDED STRATEGIES

COORDINATION

63. NIPC should seek funding to reestablish its previous role as a regional forum for coordination and resolution of policy and technical issues including conducting quarterly meetings of CSWCs and IDNR to discuss stormwater and flooding issues and coordinate activities. Communities, CSWCs, and state agencies should support requests for funding from the Illinois General Assembly to perform these activities.

64. IDNR/OWR should reconvene the Natural Resources Coordinating Council to coordinate policies and activities of the various state agencies.

65. CSWCs should develop a forum for communities to coordinate activities and share information.

66. IAFSM, with assistance from NIPC and CSWCs, should incorporate more stormwater- and flooding-related public policy sessions into its annual conference.

67. NIPC, IAFSM, and other professional organizations should promote public and private partnerships to facilitate reduction of flood risks.

Chapter

4

Water Quality

OBJECTIVE: ***Protect and Improve Water Quality and Uses of Surface Waterbodies***

Historical Context

Historical accounts describe a region of clean and abundant water resources. Rivers, lakes, and wetlands teemed with fish, birds, and aquatic plants. While agricultural development began to exert a toll on water quality due to the effects of erosion, channelization, and wetland loss, the most severe impacts were caused by urbanization and subsequent discharges of pollutants from wastewater and stormwater sources. At its worst, water quality became so degraded that many rivers and lakes supported little in the way of desirable aquatic life and would not even be considered for most recreational uses.

In the late 1970s, the Commission, with the support of numerous constituents and stakeholders, developed the *Water Quality Management Plan for Northeastern Illinois* (NIPC, 1979). This plan was prepared in response to Section 208 of the "Federal Water Pollution Control Act Amendments of 1972," subsequently known as the Clean Water Act. It identified regional policies and strategies as well as numerous local actions, many

directed to individual units of local government. The plan's findings and recommendations were based on extensive water quality sampling, complex technical assessments, and the input of over 30 advisory committees and task forces, including NIPC's Water Resources Technical Advisory Committee, and the guidance of a newly established "208 Steering Committee."

The plan identified the following goals that were the basis for its recommendations:

- Restoration and maintenance of the chemical, physical, and biological integrity of the region's waters.
- Elimination, by 1985, of all pollutant discharges into the region's waterways.
- Water quality that provides for the protection and propagation of fish, shellfish, and wildlife and provides for human recreation, wherever attainable, by July 1, 1983.
- Elimination of all discharges of wastes or pollutants into Lake Michigan.

The plan's recommendations addressed numerous issues related to point sources (i.e., pollution coming from a discrete source or pipe). These included:

- combined sewer overflows
- excess wastewater flows
- management of municipal point source discharges
- operation and maintenance of wastewater facilities
- privately owned discharges
- treatment of industrial wastes in municipal systems
- industrial wastewater treatment plant effluent standards
- phosphorus
- areawide planning for point source control
- energy requirements
- water conservation and reuse of effluents

The plan also addressed pollution from nonpoint sources (i.e., coming from the landscape in a diffuse manner), including the following general categories:

- urban stormwater runoff
- agricultural runoff
- septic wastes
- surface waste disposal
- air deposition
- other nonpoint sources

Further, the plan recommended a comprehensive management framework to implement its recommendations. This framework included local management agencies, countywide water quality committees, advisory committees, interim coordinating bodies, NIPC, areawide advisory groups to the Commission, and the State of Illinois.

In 1997, the Commission undertook an assessment of the status of the *Water Quality Management Plan for Northeastern Illinois*. It noted that there had been dramatic changes since the adoption of the plan in 1979 that affected the relevance of numerous plan recommendations and also raised questions regarding the achievability of plan goals. Point source controls, particularly municipal wastewater treatment plant improvements, had been implemented largely in concurrence with plan recommendations. However, nonpoint source control recommendations, which admittedly were based on an inadequate understanding of water quality consequences at the time of plan development, were relatively weak and loosely defined. Therefore, it is probably not surprising that serious nonpoint source problems remain and that the plan's goals of achieving "chemical, physical, and biological integrity of the region's

waters" and the restoration of "fishable/swimmable" conditions have not been achieved.

Further, the *Water Quality Management Plan for Northeastern Illinois* recommended a comprehensive program for continued planning and plan implementation at the watershed and regional levels. This has never been realized, largely due to inadequate funding. Therefore, while the Commission has attempted to serve as a regional leader in water quality planning and has achieved some notable successes, its overall effectiveness in coordinating the implementation of the plan and achieving plan goals has been limited. Over the past decade, one promising trend is that local watershed groups (Table 1) have been taking the initiative to develop watershed plans that include provisions for improving water quality.

This leads us to the current strategic plan that has identified the issues and strategies that follow.

Table 1: Ongoing Watershed Planning/Management Initiatives in Northeastern Illinois*

Watershed	Lead Entity
North Branch Chicago River (Cook and Lake)	Friends of the Chicago River/ Lake County Stormwater Management Commission
Upper Des Plaines River	Upper Des Plaines Ecosystem Partnership
Indian Creek (Lake)	Indian Creek Watershed Committee
Bull Creek (Lake)	Lake County Stormwater Management Commission
Mill Creek (Lake)	Lake County Stormwater Management Commission
Lower Des Plaines River (Cook and Will)	Lower Des Plaines Ecosystem Partnership
Long Run Creek (Cook and Will)	Long Run Creek Watershed Planning Committee
Grant Creek (Will)	Openlands Project/Midewin
Salt Creek (Cook and DuPage)	Salt Creek Watershed Network
Upper DuPage River (DuPage and Will)	DuPage River Coalition (The Conservation Foundation)
Lower DuPage River	The Conservation Foundation
Fox River (Lake, McHenry, Kane, Kendall)	Fox River Ecosystem Partnership
Nippersink Creek (McHenry)	Nippersink Creek Watershed Planning Committee
Boone Creek (McHenry)	Openlands Project
Sequoit Creek (Lake)	Lake County Stormwater Management Commission
Flint Creek (Lake)	Flint Creek Watershed Committee
Tyler Creek (Kane)	Fox Valley Land Foundation/Openlands Project
Waubansee Creek (DuPage, Kane, Kendall)	Waubansee Creek Watershed Planning Committee
Ferson Creek (Kane)	Openlands Project
Blackberry Creek (Kane and Kendall)	Blackberry Creek Watershed Committee
Big Rock Creek (DeKalb, Kane, Kendall)	The Conservation Foundation
Kishwaukee River (McHenry, Boone, DeKalb, and Kane)	Kishwaukee River Ecosystem Partnership/ Openlands Project
Piscasaw Creek	Boone County Soil and Water Conservation District
Thorn Creek (Cook and Will)	Thorn Creek Ecosystem Partnership
Butterfield Creek (Cook)	Butterfield Creek Steering Committee
Kankakee River (Will)	Kankakee River Ecosystem Partnership
Prairie Creek (Will)	Prairie Creek Preservation Group

* This list does not include the numerous watershed-based flood control planning initiatives that are underway by countywide stormwater agencies, the Illinois Department of Natural Resources, and the U.S. Army Corps of Engineers.

WATER QUALITY ISSUES AND STRATEGIES

General Issue

A. *The vast majority of the region's urban and suburban streams and rivers, and many of its lakes, still do not meet the goals of the federal Clean Water Act. The principal federal goal is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters," which "provides for the protection and propagation of fish, shellfish, and wildlife." This is assumed to be equivalent to meeting a Biological Stream Characterization (BSC) rating of A or B. Furthermore, some waters do not support their designated uses as established by the Illinois Pollution Control Board.*

Background

This issue statement is derived from an assessment performed by NIPC staff (Dreher, 1996) and is based on information reported by the Illinois Environmental Protection Agency (IEPA) in its *Illinois Water Quality Report, 1994-1995* (IEPA, 1996). The Water Quality Task Force recommended the use of the BSC rating, arguing that the BSC is the most suitable, currently accepted indicator of "fishable" conditions and the biological health of streams, rivers, and lakes. The BSC, which is utilized by IEPA and IDNR, is based on both fish and macroinvertebrate indices.

For context, the BSC has been embraced as the principal stream indicator by Kane County in its *2020 Land Resource Management Plan* and the Conservation Foundation in its watershed plan for the upper DuPage River. NIPC and numerous other entities around the country have used the BSC or similar biotic indices in establishing quantitative correlations between stream quality and urbanization levels (NIPC, 1997).

Alternative, biologically-based measures of the quality of our waterbodies also are being considered. The Metropolitan Water Reclamation District of Greater Chicago and the Illinois EPA are evaluating a "metric-based" approach in an ongoing "use attainability analysis" of the lower Des Plaines River. This approach utilizes individual biological metrics such as the number of species of fish and macroinvertebrates.

In comparison, the IEPA currently uses a "use support" rating system (ranging from "full support" to "nonsupport") in assessing whether waterbodies are meeting their designated uses. For aquatic life uses, the determination of use support is based on a complex flow chart that considers chemical water quality data, a fish index, a macroinvertebrate index, and a physical habitat index. Figure 2 shows the most recent available use attainment information for the region's streams and rivers.

Figure 2
Stream Use Attainment

Regardless of the choice of indicator, it is clear that multi-billion dollar investments in wastewater and combined sewer overflow controls during the 1970s through the 1990s substantially reduced the worst pollution problems in the region. However, many of our region's rivers and lakes, particularly those in urban and suburban watersheds, still are not safe for swimming and do not support diverse biological communities (i.e., class A or B). In some waterways, particularly those used heavily for commercial navigation, these uses may never be practicably attainable due to conflicting waterway uses and physical habitat impairments. However, in the bulk of our natural waterbodies, significant improvements still may be possible.

RECOMMENDED STRATEGIES
GENERAL ISSUES

(Strategies designated as "high priority" by the majority of the task force members are denoted in bold)

1. IEPA should continue to develop scientifically-based biocriteria, in conjunction with water chemistry parameters, as a principal approach for evaluating use impairment and waterbody quality.

2. The Illinois Pollution Control Board (IPCB) should establish more-protective scientifically-based water quality standards (e.g., for nutrients, temperature, and sediment) and more-restrictive effluent standards for discharges to low-flow streams. This will require the support of water quality advocacy groups and the involvement of IEPA scientists.

3. IEPA should periodically evaluate waterbody use designations and criteria of secondary contact waterbodies and recommend to the IPCB updates when supported by water quality trends and actual uses.

4. IEPA should provide more aggressive implementation of existing water quality programs (e.g., NPDES stormwater, non-degradation, and total maximum daily loads).

5. IEPA and IDNR/OWR should take the lead in establishing a task force to develop an improved, expanded monitoring and data sharing strategy for surface waterbodies in northeastern Illinois, including consideration of data collected by volunteers and municipal dischargers.

6. Resource agencies and watershed organizations should provide improved education to schools, local officials, and the public regarding the relationships between water quality, use attainment, and the causes and sources of impairment, as well as effective strategies for improving water quality locally.

Nonpoint Sources Issues

Urban Nonpoint Sources

B. The cumulative impacts of nonpoint sources of pollution, particularly urban stormwater runoff, pose significant water quality problems for the region. These impacts are heavily influenced by local decisions and continue to increase due to urban development.

C. Adequate enforcement of erosion and sediment control requirements remains a critical challenge in many areas under development.

D. Numerous drainage facilities and detention basins are presenting maintenance and management challenges to communities, and these facilities often are not fully functional.

Background

As previously indicated, nonpoint sources are substantial contributors to the present state of impairment of suburban and urban waterbodies in the region. Principal types of nonpoint sources include urban stormwater runoff, erosion from construction sites, and physical modification of natural streams, lakes, and wetlands. These nonpoint sources cause impairments such as eutrophication, turbidity, sedimentation, and hydrologic imbalance.

Historically, nonpoint sources have not been regulated by IEPA. While local governments have generally regulated the release rates of stormwater runoff from new development and construction activities in the floodplain, their regulations, until recently, have not addressed nonpoint source impacts. For example, most new detention basins in the region are designed to effectively limit discharge rates to less than pre-development levels, but these basins commonly do not incorporate BMP design features, such as wetland plantings, to remove runoff pollutants. Similarly, most developed landscapes are still designed to rapidly convey runoff offsite rather than utilizing on-site practices such as filter strips, swales, and natural landscaping that can infiltrate precipitation and runoff into the ground.

Concern over the adequacy of BMPs for new development is heightened because of the substantial growth that is ongoing and forecasted in Kane, Lake, McHenry, and Will Counties. These high-growth areas contain many high quality waterbodies and wetlands. Experience indicates that the quality and beneficial uses of these water resources will be lost unless effective BMPs for site development are effectively and expeditiously implemented.

An area where local governments have made significant strides over the last two decades is the implementation of ordinances to control soil erosion and sediment loss from construction sites. Despite these ordinances, however, it has been observed that most communities do not provide adequate inspection of construction sites and

enforcement of ordinance violations. Similarly, many contractors are not adequately installing required preventative practices and are not providing routine maintenance and repair of these practices. Hence, construction site erosion remains a serious problem in much of the region.

Similarly, while more communities now have ordinance requirements for effective control of stormwater runoff, there is commonly inadequate maintenance of detention and other stormwater facilities. As a consequence, some stormwater facilities are experiencing problems, such as clogging, sediment and debris buildup, and erosion, which often lead to reduced effectiveness in protecting downstream water quality. Some of these problems are the result of inadequate administrative and financial arrangements for long-term maintenance. A related problem is that many communities and landowners are not familiar with the maintenance needs of naturalized landscapes found in some of the modern facilities.

RECOMMENDED STRATEGIES

URBAN NONPOINT SOURCES

7. Local governments should implement demonstration projects incorporating preferred BMP designs in watersheds throughout the region, with funding coming from programs such as USEPA's Section 319, IDNR's and Illinois Department of Agriculture's (IDOA) Conservation 2000, the National Fish and Wildlife Fund, and the Urban Resources Partnership, as well as from developers.

8. Local governments should provide zoning and/or other incentives (such as density bonuses for cluster development) to encourage BMP designs in new development and retrofit applications.

9. See Stormwater/Flooding Strategy 13 addressing the adoption of improved land use plans and stormwater ordinances.

10. See Stormwater/Flooding Strategy 24 addressing the development of multi-objective, watershed-based plans.

11. Watershed organizations, soil and water conservation districts (SWCDs), NIPC, and natural resource agencies should develop and implement education programs for landowners, the public, schools, local governments, developers, and agricultural producers about the sources and impacts of nonpoint source pollution and the costs and benefits of BMPs.

12. CSWCs, the Natural Resources Conservation Service (NRCS), SWCDs, watershed groups, NIPC, as well as colleges, should train engineers and site planners to utilize designs that reduce impervious area and infiltrate and re-use stormwater on-site rather than discharging it from the site as surface runoff.

13. The Illinois General Assembly should explicitly enable and encourage CSWCs to address water quality issues, as well as flooding, in their plans and ordinances.

14. IEPA should establish numerical pollutant control goals (but not standards) for stormwater runoff. NIPC and CSWCs should work with IEPA to develop a regional approach for implementation of the National Pollutant Discharge Elimination System (NPDES) Phase 2 program, including the establishment of minimum design requirements for BMPs and the identification of design manuals, penalties, rewards, and funding, as means to accomplish pollutant reduction goals.

15. CSWCs, counties, municipalities, and state agencies should require better inspection, maintenance, and enforcement of erosion and sediment control measures.

16. The Illinois General Assembly should provide funding to SWCDs to provide increased training, technical assistance, plan review, and site inspection directed to local governments and contractors to improve soil erosion and sediment control (SESC) on construction sites.

17. IEPA, with the assistance of other agencies, should establish a required statewide program for training and accreditation of designers, reviewers, and inspectors of SESC practices.

18. NIPC, SWCDs, NRCS, and CSWCs should provide education and technical assistance on the design and maintenance of naturalized stormwater management facilities, including guidance on retrofitting problem facilities.

19. Local governments and CSWCs should update ordinances to require better designs for detention facilities, including flatter side slopes and native vegetation landscaping, to minimize future maintenance and water quality problems.

Agricultural Nonpoint Sources

E. Nonpoint source pollution problems remain in agricultural areas, including historical impacts such as wetland loss and channelization and the on-going effects of nutrient, pesticide, and sediment runoff.

Background

As previously discussed, in northeastern Illinois water quality and waterbody use conditions are generally much better in rural watersheds dominated by agricultural land uses than in more urbanized watersheds. Nonetheless, some significant problems remain in agricultural areas.

Some problematic nonpoint source impacts, particularly wetland draining and stream channelization, occurred largely in the early to middle twentieth century. These impacts are better controlled now due to incentive and regulatory programs administered by the U.S. Department of Agriculture (USDA) and USACE. There also is improved awareness among landowners of the adverse effects of these modifications. Nonetheless, maintenance drainage and dredging of wetlands and headwater streams, and cropping and grazing up to stream edges, still cause adverse impacts.

Similarly, traditional cropping practices can result in the runoff of pesticides, fertilizer, and sediment into area waterways and wetlands. Modern conservation farming practices, if effectively employed, can minimize these impacts.

RECOMMENDED STRATEGIES
AGRICULTURAL NONPOINT SOURCES

20. Congress and the Illinois General Assembly should provide the funding for increased education, technical assistance, and cost share assistance at the federal, state, and local levels (NRCS, IDOA, and SWCDs) to better address agricultural nonpoint source issues.

21. Counties and watershed groups in northeastern Illinois should develop additional, locally-based incentives, such as cost sharing, for farmers to implement BMPs.

Stream, Lake, and Wetland Impacts

F. Streams, wetlands, and lakes are being adversely affected by hydrologic modifications, particularly stormwater and wastewater discharges, physical disturbances, and inadequate management /maintenance. Excessive water withdrawal for water supply and irrigation is a potential future problem.

G. Impounding structures across waterways have been shown to adversely affect water quality and some recreational uses and constrain our ability to restore aquatic integrity.

Background

In addition to urban and agricultural runoff, direct alteration of streams, lakes, and wetlands is a category of nonpoint sources that has seriously impaired aquatic ecosystems in the region. For example, it has been documented that over 40 percent of the stream miles in the region have been significantly altered by channelization and approximately 90 percent of the state's wetlands have been destroyed. Such physical modifications can greatly reduce or eliminate the ability of aquatic systems to provide habitat for fish and aquatic organisms. The impacts of these physical modifications have been exacerbated by the more subtle, long-term loss of stabilizing native vegetation in riparian areas, replaced by undesirable non-native or invasive species such as European buckthorn, reed canary grass, and purple loosestrife.

While federal and state regulations have placed restrictions on certain physical disturbances (i.e., filling), other disturbances (e.g., draining, buffer destruction, excavation) are not well controlled in much of the region. An exception is the control provided by progressive municipal or countywide stormwater ordinances in some areas. Also, state regulations protecting the natural characteristics of waterways only apply to the few large rivers that are designated "public" waterways (e.g., the Fox River, the lower Des Plaines River, and portions of the Chicago River/Sanitary and Ship Canal system).

A related physical disturbance is the construction of dams across waterways. Dams can create several adverse consequences, including limiting the natural movement of fish, encouraging sedimentation, promoting the excessive growth of aquatic plants and algae (eutrophication), and diminishing dissolved oxygen levels. Fortunately, fewer new dams are being constructed on larger waterways, but headwater streams are increasingly threatened with impoundments for stormwater detention.

A particular concern regarding wetlands is the recent U.S. Supreme Court decision removing federal protection for numerous "isolated" wetlands nationwide. While the final definition of isolated wetlands has not yet been resolved by the federal agencies, it is clear that isolated wetlands have special characteristics that make them particularly valuable with respect to water quality mitigation, hydrologic functions, and aquatic habitat. There are some current efforts to amend countywide stormwater ordinances and to investigate possible state regulations to protect isolated wetlands.

Waterbodies and wetlands also have been seriously affected by changes in their flow characteristics, or hydrology. Various modifications of the surrounding landscape, particularly creation of impervious areas, have resulted in more erratic flows (i.e., higher high flows and lower low flows). The resultant instability has caused serious erosion of banks and shorelines and flow patterns unsuitable for sensitive aquatic organisms. Also contributing to changes in natural flow patterns are the increased low flows coming from wastewater treatment plants, and withdrawals for water supply and irrigation purposes.

RECOMMENDED STRATEGIES

STREAM, LAKE, AND WETLAND IMPACTS

22. CSWCs, counties, and municipalities should develop and implement regulations to prohibit dredging, draining, and other wetland and stream disturbances not regulated by USACE, and should develop effective protections for isolated wetlands. These agencies also should require effective riparian buffers and should work to restore wetlands and streams through voluntary public land acquisition, buffers, and cost sharing. Local initiatives should utilize the *Model Stream and Wetland Protection Ordinance* (1988) and other technical/policy tools developed by NIPC.

23. Local governments, forest preserve districts, and park districts, with the support of watershed groups, should play a more active role in managing and maintaining wetlands, stream corridors, and naturalized detention basins.

24. IDNR/OWR should work with the Illinois General Assembly to revise state water law to require comprehensive regulation of floodplains and waterbodies. The revised law should explicitly provide for protection of aquatic habitat and natural conditions in both public and non-public rivers and streams in the state, particularly addressing the issues of dams, onstream detention, channelization, and recreation. In addition, the law should be updated to include provisions for statewide protection of isolated wetlands and should identify the most appropriate agency to administer wetland regulations.

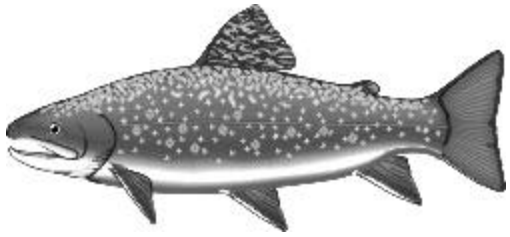
25. IDNR/OWR should establish criteria for evaluating dam reconstruction and replacement proposals as part of a comprehensive policy that, at a minimum, requires consideration of alternatives and their impacts on water quality and aquatic life.

26. IDNR/OWR, watershed organizations, and CSWCs should educate local officials, the public, and interest groups regarding the effects of dams. These groups also should identify existing dams, evaluate their impacts, and develop comprehensive plans to remove or modify those dams that provide no "functional" values and, impair natural waterbody functions.

Miscellaneous Nonpoint Source Issues

H. The true economic costs of nonpoint source pollution and current control strategies are not fully known, and what is understood has not been adequately conveyed to local decision-makers, environmental professionals, and the general public.

I. Atmospheric deposition is the principal source of several critical pollutants (e.g., PCBs and certain pesticides) that adversely affect waterbodies, particularly Lake Michigan.



Background

While water resource professionals generally understand that nonpoint sources contribute significantly to waterbody impairments, there is relatively little awareness of this issue among the public or local government decision-makers. Further, there is even less awareness of the economic impacts of nonpoint source pollution or the costs of BMPs. For example, NIPC and others have provided documentation that many BMP designs, such as natural stormwater drainage or landscaping measures, cost less to install and maintain than conventional designs. Few members of the development community or local government officials seem to be aware of these facts.

One of the more significant sources of nonpoint source water pollution is deposition of particles and pollutants from the air. Air deposition, notably, is the most significant contributor of certain pollutants that affect large waterbodies such as Lake Michigan. The typical sources of such pollutants are industrial operations and volatilization of chemicals from the land. While air pollutants are regulated to minimize their impacts on human health through breathing, the regulations may not address air deposition impacts on waterbodies.

RECOMMENDED STRATEGIES

MISCELLANEOUS NONPOINT SOURCE ISSUES

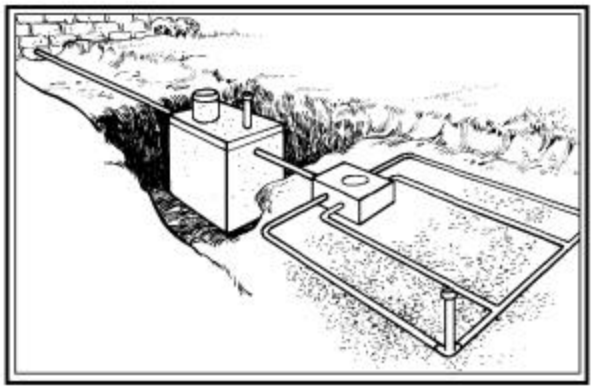
27. USEPA, IEPA, and research organizations should perform benefit-cost analyses of nonpoint source pollution and BMP implementation and effectively communicate the results to stakeholders.

28. NIPC and local governments should urge Congress to provide adequate funding to better quantify the effects of air deposition on lakes and other waterbodies and to educate the public and decision-makers regarding these effects.

Point Source/Wastewater Issues

On-site Wastewater Treatment Issues

J. Improperly located, designed, constructed, maintained, and inspected on-site wastewater systems (e.g., septic fields and mechanical systems) are both public health and water quality concerns in many areas. Inadequate funds commonly constrain inspection programs and limit the ability to provide alternative sanitary sewer service.



Background

On-site wastewater systems built before the development of more-protective modern standards are often located on small lots or unsuitable soils that are incapable of safely absorbing and processing their pollutant loadings. As a consequence, such systems may regularly or intermittently pollute surface water or underlying groundwater.

Even where systems are well designed and installed, there is a need to regularly inspect and maintain the systems (e.g., pumping out septic tanks) to avoid malfunction. The responsibility for ensuring routine inspection falls to health departments, commonly at the county government level. Unfortunately, not all counties have adequate resources to regularly inspect individual on-site systems, or the waters to which they discharge.

A related concern is that the responsibility of health departments generally is limited to protecting public health. For example, health departments can assess whether fecal coliform levels meet drinking water standards in shallow aquifers underlying septic fields. However, health departments typically do not evaluate whether on-site systems are contributing pollutants such as phosphorus, nitrogen, solids, or pathogens that could impair surface waterbodies and wetlands. Such impacts could be particularly damaging to small lakes or streams.

Even where problems resulting from on-site systems are effectively detected and remedial options are identified, resources to remediate the problems may be lacking. For example, the cost of abandoning an on-site system and connecting to a sanitary sewer system can easily approach $10,000 for a household. This may not be affordable to fixed- or low-income households, and public funds generally are not readily available.

RECOMMENDED STRATEGIES

ON-SITE WASTEWATER TREATMENT ISSUES

29. **The Illinois Department of Public Health (IDPH) should upgrade its standards for on-site wastewater systems to better address water quality impacts on surface waterbodies, in addition to public health concerns.**

30. The Illinois General Assembly should continue to maintain the authority of county health departments to regulate to levels higher than IDPH minimum standards.

31. Counties, and those municipalities that have been granted permitting authority through the IDPH, should develop comprehensive plans to address local on-site wastewater systems that include maintenance criteria and adequate funding mechanisms to remediate problems.

Wastewater Treatment Facility Issues

K. As wastewater treatment and conveyance facilities age, additional demands will be placed on local capital budgets to make needed infrastructure upgrades and replacements, as well as to address infiltration/inflow and maintenance issues.

L. Varying effluent quality of small wastewater treatment plants and the lack of total nitrogen and total phosphorus regulations on most discharges may pose an additional threat to surface water quality in nutrient-enriched waterbodies or in some existing high-quality waterbodies.

Background

The components of modern wastewater treatment plants require regular maintenance and occasional replacement. Machinery, such as pumps, may need replacement every five to ten years whereas sewers, pipes, and tanks may last 20 to 50 years. Many public wastewater facilities in this region were constructed with the infusion of federal funds through the construction grants program of the 1970s and 1980s. Thus, many of these components soon will be in need of replacement or rehabilitation.

While many facilities effectively budget for future replacement and rehabilitation costs through creation of a sinking fund, this is not always the case. In communities that do not plan ahead, especially with small facilities, maintenance and replacement are not done on a timely basis. Consequently, treatment systems will operate less efficiently or fail, water quality will suffer, and fishkills and other impairments may be observed.

Effective, consistent wastewater treatment is particularly critical for discharges to low-flow, high quality waterbodies. Such waterbodies commonly do not have adequate dilution to absorb occasional perturbations in plant operation, particularly during warm, low-flow conditions where water pollutants cause more stress upon aquatic life.

Smaller, conventional treatment facilities raise particular concerns regarding consistent effluent quality. Small facilities commonly do not have full-time operators to adjust treatment processes or detect problems. Small conventional treatment plants also commonly have little redundancy in their treatment units, making them more prone to failure if a single unit or pump malfunctions. In contrast, large regional facilities commonly have three or more units operating in parallel, allowing much more flexibility to respond to malfunctions or perform routine maintenance.

One solution for small facilities is to utilize design technologies, such as aeration ditches, that need less regular adjustment or maintenance and are proven to be more reliable. Alternatively, system designs that reclaim or reuse wastewater, such as land application systems, not only can provide more reliable treatment but also can utilize pollutants such as phosphorus as a resource.

IEPA's *Illinois Water Quality Report* identifies excess nutrients as a significant cause of impairment in nearly all the waterbodies in the region that are not meeting their waterbody use designations. While the question of nutrient-caused impairment is being debated nationally, there is little question that area waterbodies are nutrient enriched in comparison to

those found in undeveloped watersheds. Currently, there are no water quality standards for nutrients in streams and rivers, nor is there a requirement for nutrient removal from wastewater unless the discharge directly impacts a lake or reservoir. Through modeling done as part of the *Areawide Water Quality Management Plan*, it was shown that treatment plants, in comparison to nonpoint sources, contribute the vast majority of phosphorus, the nutrient most responsible for eutrophication, to waterbodies in moderately to fully developed watersheds.

RECOMMENDED STRATEGIES

WASTEWATER TREATMENT FACILITY ISSUES

32. NIPC and local governments should urge Congress and the Illinois General Assembly to provide adequate funding through the State Revolving Loan Program for construction of needed wastewater treatment facilities.

33. Operating authorities of municipal-type wastewater facilities should set aside adequate funds for ongoing maintenance and replacement, based on the newly adopted accounting procedures of the Governmental Accounting Standards Board, Standard 34.

34. IEPA should provide incentives for alternative wastewater treatment technologies, such as land treatment and wastewater reuse, which eliminate or reduce the direct surface discharge of treated wastewater into waterbodies. Further, as it makes revisions to the facility planning area (FPA) process, IEPA should ensure that planning requirements not impede the implementation of preferred alternative treatment technologies.

35. IEPA should upgrade its construction design standards for small treatment plants (i.e., encouraging designs that need minimal operation and maintenance) to ensure reliable treatment that meets effluent standards on a consistent basis.

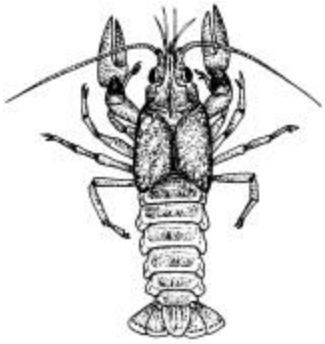
36. NIPC should work with wastewater authorities and partners such as the Campaign for Sensible Growth to affirm support for continuation of the wastewater FPA process and to identify and support reforms to the current process that will better protect water quality and address watershed-level impacts of FPA amendments.

37. IEPA, through its facility plan review authority, should implement criteria to encourage regional wastewater treatment facilities and discourage new conventional treatment plant discharges.

38. IEPA should require that a local unit of government has formally-accepted financial responsibility for any new private wastewater system, excluding larger wastewater utilities certified by the Illinois Commerce Commission, to provide for operation of the system in the event of malfunction or failure.

Miscellaneous Issues

M. Non-native species, such as zebra mussels, rusty crayfish, carp, and Eurasian water milfoil have invaded many area waterways resulting in adverse impacts to water quality, biological diversity, and water supply.



Background

Non-native species of animals and plants, originating principally from European and Asian regions, have invaded aquatic systems throughout the United States. In their new environs, and without the predators from their region of origin, such species tend to spread rapidly and sometimes dominate native species. While this raises significant ecological concerns, invasive species also can cause significant water quality and water use problems. For example, the common carp is a bottom feeder that stirs up sediment and uproots plants, resulting in increased water turbidity that degrades conditions for native darters and game fish. Eurasian water milfoil, an aquatic plant that has spread voraciously after escaping from home aquariums, crowds out native plants and virtually chokes off boating and fishing uses in many shallow lakes.

Recently, there has been progress in identifying biological controls for some invasive species. For example, there is a beetle that favors Eurasian water milfoil as its food source. This beetle can be introduced as a control agent in lakes impacted by milfoil infestation.

RECOMMENDED STRATEGIES

MISCELLANEOUS ISSUES

39. The Illinois General Assembly should adequately fund the implementation of the state's invasive species plan, including continuing research.

Waterbody Use Issues

N. State water law still does not adequately address several important regional concerns such as the protection of the physical habitat of waterways and the right to public access of many waterways for recreational use (e.g., canoeing).

O. Intense recreational activities (especially power boating) threaten water quality and ecosystem balances, particularly in lakes.

Background

As already discussed, physical modifications and disturbances of rivers and lakes are some of the leading causes of water quality and waterbody use impairment in the region. The state's authority to control such impacts is derived from Illinois water law that distinguishes between public and non-public waterways. Although interpretation of Illinois water law is both complicated and sometimes controversial, it is generally understood that the state has the authority and responsibility to control physical disturbances that will adversely affect natural habitat conditions, such as channelization, only on public waters. Public waters are those that historically have been used for commercial navigation, including the Fox River, the lower Des Plaines River, and portions of the Chicago River waterway in northeastern Illinois. The natural conditions of other important waterways, such as the DuPage River, the upper Des Plaines River, and Nippersink Creek, are not protected by state regulations. The state does, however, regulate the flood storage and conveyance capacity of all waterways that have official floodplain maps.

Similarly, public access is legally assured only on those waterways that are considered public. Therefore, many rivers and streams that are physically navigable by non-motorized boats are not explicitly authorized for public recreational access unless riparian land is owned by a public agency. In contrast, under the water laws of Wisconsin the rule of thumb is that recreational boating access is authorized if the waterway is of sufficient width and depth to physically float a canoe.

A related issue in northeastern Illinois, particularly on some navigable lakes and rivers, is that overuse by motorizes watercraft can severely impact water quality. This is caused principally by boat-generated waves that exacerbate shoreline erosion and by the turbulence caused by propellers that stirs up bottom sediments. These problems are serious enough in some waterways, like the Fox Chain O'Lakes, that local controls have been instituted to limit boat speeds near sensitive shorelines, in shallow channels, or during high water periods.

RECOMMENDED STRATEGIES

WATERBODY USE ISSUES

40. The Governor should appoint a task force to reevaluate public water issues in northeastern Illinois. Special emphasis should be placed on the waterways in the region that have substantial public ownership of riparian areas and which have strong public support for expanded access.

41. NIPC, Openlands Project, local governments, park districts, forest preserve districts, and property owners should work to implement the *Northeastern Illinois Water Trails Plan*, while also giving adequate consideration to private property rights.

42. See Stormwater/Flooding Strategy 22 addressing land acquisition and conservation easements along waterways.

43. IDNR/OWR and NIPC should provide education on the adverse effects of motorized watercraft and on alternative programs and techniques to minimize boating use conflicts.

44. The Illinois General Assembly should authorize the creation of waterway agencies, like the Fox Waterway Agency, for other navigable waterways in the region.

Chapter

5

Water Supply

OBJECTIVE: ***Assure adequate quantity and quality of groundwater and surface water supplies.***

Although the Chicago metropolitan region lies adjacent to one of the world's largest freshwater sources, Lake Michigan, the region is facing potential water supply shortages. Laws limit withdrawals from Lake Michigan, withdrawals from rivers and streams are regulated to maintain flow, and groundwater withdrawals are naturally constrained by the quantity of recharge they receive. As the region's population increases in not only number but also areal extent, greater demand will be placed upon available surface water and groundwater supplies. Between 1998 and 2020, when the Commission predicts that the six-county Chicago metropolitan area will grow by 1.3 million, water supply resources may become inadequate to meet the region's needs.

Historical Context

The Commission has a long history of interest in the water supplies of northeastern Illinois. In 1960, preparation began on *The Water Resource in Northeastern Illinois: Planning Its Use*. Published in 1966, the report presented a comprehensive view of managing water resources so that a supply of water, adequate in both quantity and quality, would be available for the region's citizens. An update of that report's information was presented in the Commission's 1974 *Regional Water Supply Report*. This document covered the then-current water supply situation for the six-county northeastern Illinois region. It also contained numerous suggested planning guidelines and recommendations for a regional water supply plan. Additionally in 1974, the Commission devoted its annual conference to the water supply issue.

In 1978, as part of the Commission's *Comprehensive General Plan for the Development of the Northeastern Illinois Counties Area*, the *Regional Water Supply Plan* was developed. In addition to the *Regional Water Supply Report*, another background document produced by the Commission—*Estimated Future Water Supply Demands for Northeastern Illinois* (1976)—as well as Commission-directed studies conducted by consultants, supported this plan. Guidance also was provided by the Commission's Planning and Policy Development Committee and the Water Resources Technical Advisory Committee.

The *Regional Water Supply Plan* identified water supply problems including physical, institutional, and economic issues; and developed numerous policies and "action recommendations" for meeting future water supply needs on an areawide scale. Specifically, it addressed the following issues and policy subjects:

- **Surface Water Sources:** Lake Michigan, inland lakes and rivers;
- **Groundwater Sources:** groundwater mining, groundwater importation, Mt. Simon aquifer development, combined surface water and groundwater systems, groundwater recharge,;
- **Water Quality:** Safe Drinking Water Act, wastewater reuse;
- **System Implementation and Management:** water supply and comprehensive regional planning, local planning, organizational considerations, costs and financing, state role, Lake Michigan water service area expansion, growth decisions; and
- **Water Conservation:** metering, leakage control, industrial water conservation, domestic conservation, pricing, public information and education, Illinois Division of Water Resources requirements.

The plan also listed three goals derived from the *Comprehensive General Plan:*

- safe and dependable water supply systems,
- balanced impact on regional development, and
- continued local control and management.

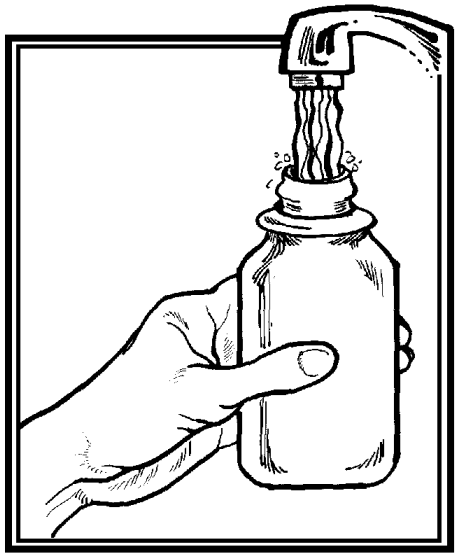
The plan also presented criteria and standards as guidelines for the development and operation of water supply system plans, programs, and projects:

- General System Development Criteria: water consumption, design periods, population densities, service areas, storage, distribution systems, treatment, pumping equipment, leakages;
- Public Water Supply Standards (adopted by reference the standards of the Great Lakes-Upper Mississippi Board of State Sanitary Engineers); and

?? Public Water Supply Regulations (adopted by reference state and federal drinking water regulations).

Finally, the plan identified recommended sources of water supply for each municipality in the region based primarily on cost-effectiveness, and recommended six new subregional water supply systems for distributing water from surface water sources. The water supply sources identified were Lake Michigan, the Fox River, the Kankakee River, and groundwater (shallow aquifer and deep aquifer).

Many of the policies and recommendations contained in the *Regional Water Supply Plan* are still applicable to the current situation. However, the strategies recommended for regional water supply and subregional systems differ significantly from today's reality. In particular, there is a greater reliance on Lake Michigan water than envisioned in the plan, and the actual subregional distribution systems are considerably different than proposed in the plan. Nonetheless, the current situation reflects laudable examples of intergovernmental cooperation in establishing integrated water distribution systems, particularly in Cook, DuPage, and Lake Counties.



Past Trends and Current Situation

At the time the 1978 *Regional Water Supply Plan* was written, Lake Michigan was the major source of public water supply in northeastern Illinois in terms of both quantity supplied and population served. The plan noted that in 1974, the average daily pumpage from the lake was approximately 1,075 million gallons per day (mgd), serving about 4.7 million people in northern and central Cook County and eastern Lake County. This equaled about 84 percent of the region's total public pumpage of 1,284 mgd that year. The remaining 16 percent (about 209 mgd) of the region's total public pumpage represented groundwater withdrawals (total groundwater withdrawals equaled about 268 mgd). Of the total groundwater withdrawals, about 11 percent came from shallow sand and gravel aquifers (28 mgd), nearly 33 percent from the shallow bedrock aquifer (88 mgd), and about 57 percent from the deep bedrock aquifer (152 mgd). At the time, groundwater was the exclusive water supply source for DuPage, Kane, McHenry, and Will Counties, as well as central and western Lake County and northwestern and southern Cook County, serving nearly 2 million people. None of the region's inland lakes, rivers, or streams was used for public water supply. In 1978, water supply problems were not anticipated for those areas being served by Lake Michigan water, other than the possibility of increased demands resulting from service extensions to inland communities.

However, the areas supplied with groundwater were a concern. Since 1950, as water well development had increased with suburban growth, groundwater withdrawals had nearly doubled. In several areas, both the shallow dolomite aquifer system and the deep bedrock aquifer were being pumped at rates in excess of recharge, and significant declines had occurred in water levels and well yields. Withdrawals from the deep bedrock system in the eight-county area of Cook, DuPage, Grundy, Kane, Kendall, Lake, McHenry, and Will Counties reached a peak of 182.9 mgd in 1979 (Visocky, 1997), far exceeding the Illinois Department of Natural Resources State Water Survey's (IDNR/SWS) estimated 46 to 65 mgd practical sustained yield of the deep bedrock system in northeastern Illinois. Communities using the deep bedrock aquifer were discovering that well water levels were declining at an alarming rate. In addition, water quality in some aquifers was a concern: many wells exhibited radium concentrations in excess of the 1976 standard, and water hardness was typically high.

By the late 1970s, it became apparent that additional Lake Michigan water would be needed to meet the domestic water supply needs of the region. The State of Illinois petitioned the U.S. Supreme Court for a modification of the 1967 Court decree governing Illinois' diversion of water from Lake Michigan. In 1980, an amended decree was approved by the Court, which allowed Illinois to grant an additional 86 permits to suburban communities to use Lake Michigan water (prior to 1980, there were about 110 Lake Michigan allocation permittees). The new allocations added approximately 1.3 million people to the Lake Michigan service area. Over the next decade, these communities constructed the necessary water transmission facilities to enable them to hook up to a Lake Michigan supply. The prospect of improved water quality also helped sell the cost of conversion projects to the public.

Although the number of northeastern Illinois residents using Lake Michigan water has increased dramatically over the last 20 years (1980-2000), the total amount of Lake Michigan water used for domestic purposes has remained relatively constant, largely due to increased efficiency in distribution networks (less leakage) and residential use (metering, water conservation) (Injerd, 2000). In fact, all Illinois communities using Lake Michigan water must adopt water conservation measures to promote the efficient use of their Lake Michigan water allocation. Additionally, industrial demand for Lake Michigan water has declined as water-intensive industries have closed or moved out of the Lake Michigan service area, and as industrial processes have evolved to require less water through leakage control and water reuse.

Water supply sources currently being used within the six-county northeastern Illinois region are Lake Michigan, inland surface waters, and underground sources (aquifers). In 1998, water withdrawals for non-cooling purposes totaled about 1,390 mgd. Lake Michigan supplied approximately 1,152 mgd (about 83 percent) of this total, while inland surface waters supplied about 27 mgd (2 percent), and groundwater supplied about 211 mgd (15 percent) (Meyer, 2000; Johnson, 2001).

Projected Conditions

The significant growth experienced in the six-county northeastern Illinois region during the past 20 years is anticipated to continue. The Commission predicts that the region's population will reach more than 9 million by the year 2020, an increase of almost 15 percent over the 1998 population. Employment in the region also is projected to increase significantly, reaching a level of almost 5.3 million employees by 2020. The latest 2020 forecasts (NIPC, 2000) indicate that the largest gains in population will occur in Cook and Will Counties. Will and McHenry Counties will experience the largest percentage gains in population. Gains in the number of jobs will be largest in Cook County, followed by DuPage and Lake Counties.

This continued growth is expected to result in corresponding increases in the demand for water throughout the region. In particular, significant increases in demand are expected in the far western parts of the region that are beyond the likely extent of Lake Michigan water supply systems. In these areas, future increases in demand will have to be met primarily through increased withdrawals from groundwater sources or inland water sources such as the Fox and Kankakee Rivers.

Important Note: *The reader is advised that the year 2020 water demand/availability analysis is a conceptual planning analysis with numerous levels of assumptions and is not intended for the detailed design or development of specific water supply facilities.*

Historical water use data reveals that total consumptive (i.e., non-cooling) water usage within the six-county region was about 1,343 million gallons per day (mgd) in 1974 and approximately 1,390 mgd in 1998 (Figure 3). These totals include water supplied from Lake Michigan systems, water supplied by public water systems using other surface water or groundwater sources, and water withdrawn via private wells.

Numerous assumptions had to be made when estimating future water availability, population and economic growth, per capita water demand, and the resultant water surplus/shortage analysis. For example, demand forecasts assumed that future per capita water use rates would not change dramatically from rates observed in recent years. In addition, the only significant allowance for major new development of self-supplied commercial/industrial/institutional was associated with the potential development of a third regional airport in the Peotone area. Groundwater availability data assumed maximum sustainable development of shallow aquifers and a reduction in use of the deep aquifer system to a practical sustained yield of 46 mgd. The groundwater availability data also did not reflect constraints that may be related to water quality issues. Inland surface water availability data from the Fox and Kankakee Rivers assumed maximum withdrawals without allowing a reduction in streamflow to less than the seven-day, ten-year low flow. These and several other assumptions are described in further detail in Appendix B, and must be considered in future planning efforts for effective utilization of the available water resources. Analysis results are presented by study unit, which is roughly equivalent to township except with respect to the City of Chicago (Figure 4 and Table 2).

Based on an analysis of demographic projections of population growth and economic activity in the region, future consumptive (i.e., non-cooling) water demands were estimated to increase about 14 percent to nearly 1,584 million gallons day (mgd) in 2020 (Figure 3 and Table 2). This represents an increase of 194 mgd over total 1998 water use. Lake Michigan withdrawals exhibited the largest absolute increase of 218

mgd (a 19 percent increase) to reach a total of 1,370 mgd. Inland surface waters showed the greatest percent increase (74 percent, a 20 mgd increase) up to 47 mgd. The analysis actually projected a 44 mgd decrease (21 percent) in total regional groundwater withdrawals, predicting 167 mgd. The 2020 non-cooling water demand projections are detailed in Table 2 and illustrated in Figure 5.

The IDNR/SWS (Meyer, 2000) and a consultant (Johnson, 2001) conducted an analysis of water availability from Lake Michigan, inland surface waters, and groundwater. By comparing the projected 2020 demand to the estimated water availability, a relative estimate of 2020 water surplus or shortage could be predicted. Figure 6 presents these potential shortages and surpluses by study unit/township. While the analysis results indicate that for the region as a whole, water supply may be adequate to accommodate 2020 demands, there are several study units/townships with potential shortages. In particular, there are potential water shortages in McHenry County in Grafton and Algonquin Townships; in Kane County in Rutland, Dundee, St. Charles, Geneva, and Batavia Townships; in Cook County in Hanover and Rich Townships; in DuPage County in Naperville Township; and in Will County in DuPage and Joliet Townships. An overview of selected assumptions used in the analysis is presented in Appendix B.

In summary, the analysis results indicate that future increases in demand for non-cooling water in the region will be significant. Approximately 194 mgd of additional water is projected to be required in the region by 2020. While some areas show apparent surpluses, other areas exhibit potential water shortages, revealing the need over the next 20 years to plan and develop sustainable water supply capacity with a regional awareness and vision.

Figure 3
Total Non-Cooling Water Use

Figure 4
Study Units Used in Water Demand Assessment

Table 2
Projected 2020 Non-Cooling Water Demand Data by Study Unit/Township

Table 2
Projected 2020 Non-Cooling Water Demand Data by Study Unit/Township (continued)

Figure 5
Projected 2020 Non-Cooling Water Demand

Figure 6
Relative Estimate of 2020 Water Surplus or Shortage by Study Unit (Township)

WATER SUPPLY ISSUES AND STRATEGIES

Water Availability

A. With immense increases in population forecasted for the outer collar counties (70 to 100 percent increases by 2020), the adequacy of groundwater and surface water supplies is an important concern. More specifically, there is only a limited understanding of the capacity or extent of shallow aquifers. Estimates of groundwater availability from the deep bedrock aquifer system are also out of date. There are concerns that some communities, electricity-generating utilities, quarries, and other commercial and industrial facilities could legally "over-pump" aquifers to the detriment of their neighbors. Additionally, the diversion of surface water supplies (e.g., from the Kankakee River) and potentially withdrawals from shallow aquifers may be constrained by requirements to maintain minimum baseflows in waterways. Drought conditions could further exacerbate such situations.

Background

IDNR/SWS is the lead agency in Illinois for both surface and groundwater resource investigations, and IDNR/SWS is the only agency in Illinois that collects water withdrawal data. Water withdrawals by both public water supplies as well as private industry and commercial entities have been systematically collected and archived by the ISWS since 1978, and historical data collections extend back to the turn of the twentieth century.

Primarily, four major aquifer systems serve the groundwater needs of Kane, McHenry, and Will Counties, as well as communities in central and western Lake County, northwestern and southern Cook County, and western DuPage County. Communities in the region draw their well-water from unconsolidated aquifers (local surficial sand and gravel aquifers), from the shallow bedrock or "Silurian dolomite" aquifer (tapped in parts of DuPage, Kane, McHenry, Will, and southern Cook Counties), from the deep bedrock or "Cambrian-Ordovician" aquifer, and some even draw from the very deep Elmhurst-Mount Simon bedrock aquifer (which has poor water quality below elevation -1300 msl).

The deep bedrock aquifer system is the region's major groundwater resource, and, according to IDNR/SWS, has an estimated practical sustained yield of *up to* 65 mgd for an *ideally distributed* network of deep bedrock pumping wells. However, IDNR/SWS also estimated that the practical sustained yield from the actual 1958 well network—a less than ideal pumping well configuration—was only 46 mgd.

By 1979, withdrawals from the deep bedrock aquifer had reached an all-time high of 182.9

mgd, with the mining of the aquifer leading to lowered aquifer levels and the need for ever-deeper pump settings. After Lake Michigan water became more accessible to suburban communities in 1980, withdrawals from the deep bedrock aquifer declined to 67.1 mgd in 1994, with IDNR/SWS reporting that the deep bedrock aquifer's levels increased an average of about 15 feet between 1991 and 1995, rising in 83 percent of the wells measured (Visocky, 1997). In 1998, deep bedrock withdrawals totaled 70.5 mgd (Meyer, 2000). Though the 1994 and 1998 totals represent a substantial decline in withdrawals from the 1979 peak, withdrawals continued to exceed the estimated 46 to 65 mgd practical sustained yield of the deep bedrock system in northeastern Illinois. While estimates of the deep bedrock aquifer's practical sustained yield have not been updated since 1958, it nonetheless appears that the deep bedrock aquifer cannot be relied upon as a sustainable source of additional water to accommodate the region's future demands.

As the historical overpumpage and large-scale depletion of the deep bedrock aquifer shows, this groundwater resource is limited in its capacity to supply inland communities with adequate water, especially in Will and southern Cook Counties. But, according to IDNR/SWS, adequate groundwater might exist to accommodate future growth in that portion of the Chicago metropolitan area through greater use of the shallow Silurian dolomite aquifer (Roadcap et al., 1993). IDNR/SWS concluded that "[P]roper planning and a thorough knowledge of the regional ground-water *[sic]* flow system should enable almost all of the communities within the study area to safely meet increased water demands well into the future." IDNR/SWS further noted that water supply problems might arise, however, in the expanding urban areas between the DuPage and Des Plaines Rivers (where the populations of Romeoville, Plainfield, and Lockport are expected to triple by 2010, with substantial gains also anticipated in Bolingbrook and Joliet). These water supply problems are also likely to include water quality as well as quantity issues, since the shallow Silurian dolomite aquifer is especially susceptible to contamination where its overlying glacial materials are composed of highly permeable outwash sand and gravels (also see Issue B).

The other significant surface water resources in the region besides Lake Michigan include the Fox and Kankakee Rivers. Elgin and Aurora use the Fox River as a water supply resource. The Kankakee River currently is tapped as a water supply source by Wilmington and the Kankakee Division of Consumers Illinois Water Company. Both rivers, though, have limited quantity and relatively poor water quality. IDNR/SWS has noted, however, that some of western Will County's localized problems in further tapping the deep bedrock and shallow Silurian dolomite aquifers to meet projected population increases might be reduced were the water supply systems of Joliet and Lockport switched to the Kankakee River or even to ever more constrained Lake Michigan water (Roadcap et al., 1993). In fact, following a recent study, the City of Joliet has committed to using the Kankakee River as their water supply and will be discontinuing the use of its deep wells except for drought emergencies. Nonetheless, increased use of the region's surface water resources for water supply purposes may be constrained further by legal and environmental requirements to maintain existing river and stream baseflows for water quality, navigational, recreational, and aquatic habitat purposes.

With the apparent constraints upon the deep bedrock aquifer and surface water resources, the region's shallow aquifer systems appear to be the water supply resources most likely to be used to meet additional demand. However, little is known about how additional water demands might compare to shallow aquifer locations and their respective water yields.

Even less is known about how additional groundwater development may impact the other groundwater aquifers and surface waters in the region. Hence, in order to facilitate community and regional water supply planning, detailed geologic maps are needed to delineate the location, boundaries, depth, and thickness of the shallow aquifer in northeastern Illinois. The aquifer and encasing geologic materials have never been mapped in most of the region, and the few existing maps are of little use in assessing the setting and characteristics of the aquifer that impact its potential for recharge, yield, or contamination. Although geologic mapping is underway or proposed in selected areas, present rates of progress will not yield available maps for decades for most of the region (Berg et al., 1999).

Drought conditions can introduce additional pressures to surface and groundwater supplies by reducing the supply and increasing the demand. IDNR/SWS has calculated that a drought lasting 12 months in northeastern Illinois would be at 72 percent of normal annual precipitation for a once-in-10-year-drought, at 64 percent for a once-in-25-year-drought, and at 56 percent for a once-in-50-year-drought (Changnon, 1987). The Chicago area has had several decades of adequate rainfall with the stronger droughts occurring in the 1930s and 1950s. As a result, most of the water supply systems currently in place have not been tested by severe drought (25-year frequency or longer). A return to drier conditions could force communities to address drought issues such as those faced by Springfield, Illinois, in the spring of 2000 (controversial, severe water restrictions and hastily developed alternate water supplies). Certainly, a proactive approach to drought planning and preparedness is preferred. The National Drought Policy Commission recently released a detailed report outlining the challenges faced and offering recommendations in responding to drought at the federal, state, and local level.

RECOMMENDED STRATEGIES

WATER AVAILABILITY

(Strategies designated as "high priority" by the majority of the task force members are denoted in bold)

1. The Illinois General Assembly should allocate sufficient funding to IDNR/SWS and Illinois Department of Natural Resource, State Geological Survey (IDNR/SGS) to support research/data collection and report writing regarding a) surface water availability including assessment of reliable surface water yields, low flow analysis, and instream flow needs; b) groundwater availability on a countywide basis including detailed geologic mapping to determine the location, depth, thickness, and spatially distributed sustainable water withdrawal rates of shallow aquifers; and c) a better understanding of the deep aquifer recharge system on a regional basis in order to better quantify recharge rates and spatially distributed sustainable withdrawal rates.

2. Counties and municipalities should evaluate the water demand aspect of land use plans within their planning areas and identify the source of supply to meet the long-term demand.

3. IDNR/SWS, in concert with local agencies, should assess the potential for expansion of water supply use from surface waters, particularly the Fox and Kankakee Rivers, which still is protective of instream flow needs.

4. The Illinois General Assembly should allocate sufficient funding to IDNR/SWS to support water withdrawal data collection, analysis, and reporting to enhance and expedite compilation of water withdrawal, use, and transfer data.

5. The IEPA, USGS, IDNR/SWS, and county and municipal governments should work together to utilize Source Water Assessment Program/Consumer Confidence Report (CCR) data and regional water plans to identify opportunities for conjunctive use of groundwater and surface water.

6. NIPC, consultants, economists, regulatory agencies, county health departments, municipal leagues, and professional associations should educate the public about water conservation. Methods include public service announcements, written public education and awareness materials, conference agendas, and school curricula.

7. If further assessment of water withdrawals indicates a problem or if research indicates that aquifer supply is inadequate to support population growth, the IDNR/OWR should work toward the enactment of state and/or region-wide regulatory measures within the northeastern Illinois region to control inland surface and groundwater withdrawal rates to maintain withdrawals at sustainable rates.

8. NIPC, with the assistance of Water Supply Task Force members, should develop guidelines for mandating minimum water conservation practices/water demand modifications.

Recharge Area Protection

B. Based on historical experience in areas like DuPage County prior to the introduction of Lake Michigan water, it may be difficult to maintain the water quality and quantity of shallow (sand/gravel/dolomite) aquifers as their recharge areas urbanize. This problem is exacerbated by commercial and industrial land uses and inadequate identification, preservation, and protection of recharge areas.

Background

Because shallower aquifers (especially surficial aquifers in sand and gravel deposits with high transmissivity) have fewer natural mechanisms available to attenuate any pollution introduced at the ground surface, groundwater contamination risks may be greater than in the case of deeper, confined, bedrock aquifers. Groundwater protection measures are promoted through the Groundwater Protection Act provisions of the state's Environmental Protection Act, which creates setback zones around wellheads and allows IEPA to designate recharge areas where land uses with high pollution potential become subject to more stringent regulation (including increased groundwater monitoring and even closure for very high risk activities). But even with this legislative initiative, a recent *Illinois Groundwater Protection Program: Biennial Comprehensive Status and Self Assessment Report (1998),* by IEPA's Interagency Coordinating Committee on Ground Water, notes that traces of volatile and synthetic organic compounds were found in 35.5 percent of community water systems tapping unconfined aquifers, and in ten percent of systems tapping confined aquifers. More significantly, this report also noted that "[A]pproximately 79% of recharge area acres that support unconfined aquifer wells are threatened by potential contamination sources."

Questions regarding how urbanization may affect shallow groundwater recharge quantities have begun to be addressed by the USGS as part of their National Water Quality Assessment (NAWQA) program studies. The USGS has recently developed a model to predict recharge potential of surficial and shallow bedrock aquifers as land uses change. Model simulation results in the Upper Illinois River basin have shown that as areas became more urbanized, a decrease in recharge potential generally occurred (Arnold and Friedel, 2000). When recharge potential decreases, runoff to surface waters increases and groundwater recharge decreases. Hence, this model could be used to estimate how land use changes might affect recharge potential over time. This estimation would be valuable to planners in helping to anticipate changes to groundwater recharge and runoff to surface waters as areas urbanize, as well as to estimate aquifer susceptibility to contamination.

RECOMMENDED STRATEGIES

RECHARGE AREA PROTECTION

9. IEPA, IDNR/SWS, and IDNR/SGS should identify capture zones surrounding public water supply wells and map groundwater contamination potential throughout the region.

10. Local governments should implement recharge area protection programs—including land use planning, open space preservation, zoning, and BMPs—through local authority or enabled through the regulated recharge area authority as provided under the Illinois Groundwater Protection Act.

11. NIPC should prepare a model ordinance and guidelines to assist municipalities in developing appropriate ordinances and making decisions that protect prime groundwater recharge areas.

12. Land acquisition organizations (e.g., park districts, forest preserve districts, private land trusts) should incorporate aquifer protection objectives into land acquisition decisions.

13. The Interagency Coordinating Committee on Groundwater Education Subcommittee should educate local government officials and the public about recharge areas.

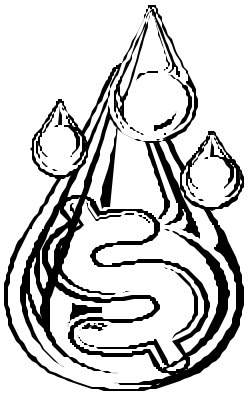
14. IDNR/OWR, in conjunction with IDNR/SWS and IEPA, should assess the feasibility of and opportunities for artificial recharge of shallow aquifers.

15. Illinois Department of Public Health (IDPH) should establish administrative rules to require the proper sealing of private wells after connection to a municipal/community water supply.

16. IEPA, in conjunction with other state agencies and NIPC, should distribute and supplement information on technologies, public health factors, and associated benefits and implementation costs involved in the reuse of treated wastewaters for various purposes and promote such reuse.

Economics of Local Water Supply

C. There is a lack of understanding of the economics of water supply both locally and regionally. At the same time, there are a number of disparate factors that affect local water supply investment decisions, including the quality of the source and the retention of local control. Further, despite the wide disparity in local water costs, at current prices demand appears to be relatively unresponsive to price.



Background

When water becomes scarce, as may soon be the case in the growing metropolitan Chicago region, it is not necessarily the infrastructure arrangement that allocates water at the lowest cost that is the most significant planning objective. Rather, it is the infrastructure arrangement that results in the most socially efficient allocation—i.e., the one that generates the maximum net social benefits—that is most important for regional water supply sustainability. We do not currently have the capacity to estimate these net social benefits for the region, but our reliance on traditional water resource planning models that only seek to minimize water supply infrastructure costs may only encourage local governments to maximize their water use in the short-term, an approach that can exacerbate unsustainable water use over the longer-term.

Water provision in the Chicago metropolitan region, as in the eastern United States, is done primarily on a quantity basis, with little consideration given to responsiveness to price. Each municipality, or joint water action agency, forecasts the total quantities that may be demanded, with a margin of safety for extreme summertime droughts, and then builds the water infrastructure or seeks external supplies to provide that quantity. Also, the price charged to water users does not necessarily reflect the fundamental economics of water. The price a municipal water agency charges for water generally is determined by the cost of its water supply infrastructure. These water charges are based on the revenue stream needed by the municipal water authority to retire the bonds it issued to pay for its capital investments and the annual budget needed to administer and maintain the water system.

Thus, given the public perception within the region that water resources are limitless, it is not surprising that little public attention is given to what is the optimal social provision of what is, in actuality, a scarce resource that is likely to be growing scarcer. It would be useful for the Chicago metropolitan region to know if a socially optimal water supply arrangement could be reached over time as the region develops. Having the capacity to do this type of economic optimality analysis would enable policy-makers and water supply managers to better assess their individual water supply policies as they relate to the region as a whole, and also might facilitate the development of cooperative water supply arrangements across the region. Alternatively, local decision-makers may choose to maximize net social benefits by modifying the types and patterns of land use within their communities, so as to more sustainably tailor projected water demand to meet their existing least-cost water supply infrastructure policies.

RECOMMENDED STRATEGIES

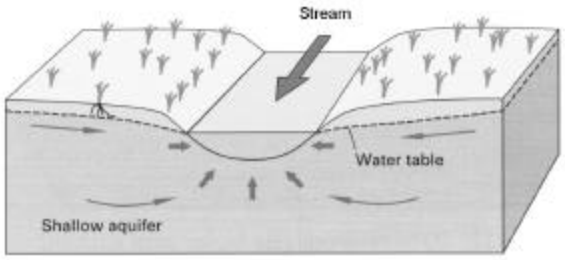
ECONOMICS OF LOCAL WATER SUPPLY

17. Communities and other water supply entities should utilize available data and collect additional information as necessary regarding all costs of supplying water to a) enable more cost-effective, timely, and long-term infrastructure investment including possible joint projects with neighboring communities, and to b) avoid infrastructure investment that will become obsolete if the water source is not sustainable or socially acceptable in the future.

18. NIPC, engineering consultants, municipal conferences, professional societies, and public works departments should encourage local communities to share marginal cost information.

Groundwater/Surface Water Interaction

D. The interruption or contamination of groundwater recharge areas and the over-pumpage of groundwater aquifers can adversely affect the ecological health of streams, lakes, and wetlands



Background

Water resource management typically has focused on groundwater or surface water as if they were separate entities. However, groundwater interacts with nearly all types of surface waters (streams, lakes, reservoirs, and wetlands). Such water bodies can receive groundwater inflow, lose water by seepage loss to groundwater, or both. Hence, actions upon one part of the hydrologic system can have unintended consequences upon the other parts of the system. As development of land and water resources intensifies, it is becoming increasingly important to manage groundwater and surface water as a single entity.

Withdrawing water from shallow aquifers that are directly connected to surface water bodies can have a significant effect on water movement between these two water bodies. While the effects of pumping a single well or a small group of wells on the hydrologic regime are local in scale, the effects of many wells withdrawing water from an aquifer over large areas may be regional in scale. Withdrawing water from shallow aquifers near surface water bodies can diminish the available surface water supply by capturing some of the groundwater flow that otherwise would have discharged to surface water, or by inducing flow from surface water into the surrounding aquifer system. Furthermore, changes in the direction of flow between the two water bodies can affect transport of contaminants associated with the moving water. Groundwater chemistry and surface water chemistry cannot be considered separately where surface and subsurface flow systems interact. The transfer of chemicals affects the supply of carbon, oxygen, nutrients such as nitrogen and phosphorus, and other chemical constituents that affect the biological and chemical processes in both the groundwater and surface water. This transfer ultimately can affect the biological and chemical attributes of aquatic systems downstream.

Groundwater/surface water interaction is a particularly important aspect of wetland and riparian zone hydrology and biodiversity. The National Research Council (1997) noted that "Ground water [*sic*] often makes significant contributions to valuable ecological services. . . . Because the groundwater processes that affect ecosystems are not well understood, combined hydrologic/ecologic research [is needed] to clarify these connections and better define the extent to which changes in ground water *[sic]* quality or quantity contribute to the change in ecologic values."

RECOMMENDED STRATEGIES

GROUNDWATER/SURFACE WATER INTERACTION

19. The Illinois General Assembly should allocate sufficient funding to IDNR/SWS and IDNR/SGS to enable them to identify aquifer recharge areas, investigate the potential impacts of urbanization of these recharge areas, investigate the potential impacts of the hydrologic interconnection between shallow aquifers and surface waters, and determine the implications of the interconnectivity on water supply quantity and quality.

Lake Michigan Water Supply Allocations

E. Lake Michigan water supply allocations are reaching their limit. While the supply should be adequate to meet the needs of existing permittees, Lake Michigan water may not be available to many newly expanding communities in the outer collar counties. Further, resolution of the accounting issues related to Lake Michigan diversion has important water supply ramifications. In particular, a new decree adopting the proposed methodology for lakefront-based accounting could be favorable to Illinois.

Background

The region's use of Lake Michigan for water supply purposes is limited by legal constraints stemming from the Chicago Sanitary District's reversal of the Chicago and Calumet Rivers in the early twentieth century. This diversion of Lake Michigan water to the Mississippi River watershed provided navigational flow to the Chicago Sanitary and Ship Canal and protected the quality of the city of Chicago's water supply by preventing entry of a significant volume of contaminated surface runoff via the Chicago and Calumet Rivers into Lake Michigan. The diversion also generated considerable litigation before the U.S. Supreme Court when it was challenged by other Great Lakes states. As a result of two of these lawsuits, the U.S. Supreme Court decreed that the state of Illinois can divert no more than 3,200 cubic feet of water per second (cfs) from Lake Michigan, as averaged over a 40-year accounting period (measured from the 1980 decree to the year 2020).

Illinois' compliance with these mandatory diversion limits is managed under the state's Level of Lake Michigan Act. This statute requires all users of Lake Michigan water to possess a valid allocation permit from IDNR/OWR. Most of the initial water allocation permits were issued by IDNR/OWR for the entire forty-year period addressed by the 1980 Supreme Court Decree, and Lake Michigan allocations may not be modified or transferred without the approval of IDNR/OWR (Figure 7). Because Illinois exceeded its diversion limit during 11 of the 15 years from 1981 through 1995, a Memorandum of Understanding (MOU) was adopted in 1996 between Illinois and the other Great Lakes states under threat of renewed litigation before the Court. Under the MOU, Illinois agreed that it will not only continue to meet its mandated 3,200 cfs limit but will further reduce its Lake Michigan diversion during the remaining 20-year averaging period of the Decree to make up for this overuse.

IDNR/OWR planners are optimistic that improvements in infrastructure (such as rebuilding the seawalls and locks at the mouth of the Chicago River to minimize leakage) and changes in the diversion's accounting procedures (such as allowing the diversion to be measured at the lakefront instead of downstream along the Sanitary and Ship Canal) will permit Illinois to comply with its diversion limits while accommodating demand increases within the Lake Michigan service area (Injerd, 1999). NIPC population estimates indicate that the population served by public water supply systems presently receiving Lake Michigan water will increase by about 12 percent between 1997 and 2020 (Harza Environmental Services, 1998). It is unlikely, however, that the Lake Michigan service area will be significantly expanded from its present limits. Thus, other sources of water will be needed to accommodate regional growth in northeastern Illinois.

RECOMMENDED STRATEGIES

LAKE MICHIGAN WATER SUPPLY ALLOCATIONS

20. IDNR/OWR should evaluate the potential need to request additional Lake Michigan water diversion based on continuing documentation of efficient water management and usage, and future increased water supply demand.

21. IDNR/OWR and NIPC should educate public officials and their constituents regarding the availability/non-availability of Lake Michigan water.

22. IDNR/OWR should continue its efforts to amend the Supreme Court decree consistent with the 1996 Memorandum of Understanding that was signed by the Great Lakes states and the U.S. Department of Justice.

Figure 7
Year 2020 Municipal Drinking Water Sources

Chapter

6

Cross-cutting Issues

Northeastern Illinois is unique in its number and complexity of local governments. This presents a challenge for effective and equitable management of our water resources. There also is recognition that the physical and political circumstances related to water resources are different in many respects in northeastern Illinois in comparison to the rest of the state. This has resulted in state legislation and regulations as well as local programs that are substantially different in the six-county region than in the remainder of the state.

In addition to the issues and strategies that were the focus of the three task forces, several other political, institutional, and financial issues were identified during the strategic planning process. Some of these issues have been implicitly or explicitly addressed in the prior three chapters. Below is a list of three issues that were not formally addressed in the task force working sessions, and another listing the issues that we implicitly or explicitly addressed.

Additional issues and strategies not addressed in the previous chapters:

1. *There is a need for better integration of regional issues (e.g., water quality and transportation).*
2. *There is a need for regional criteria and/or programs to ensure consistent local controls (i.e., a level playing field).*
3. *Some state agencies do not adequately address the issues or program needs of northeastern Illinois.*

Issues implicitly or explicitly addressed in the prior chapters:

1. *There is a critical need for improved education of public officials, plan commissioners, the public, academia, developers, and design professionals.*
2. *There is a need to share the seriousness and negative consequences of improper water resource management to stimulate citizen energy and involvement.*
3. *There is a need for a stronger focus on cost-effective preventative measures to avoid the need for expensive remedial measures.*
4. *There is a need for better integration between various water resource issues (e.g., stormwater and water quality).*

5. *Improved implementation and enforcement is needed at the local government level.*

6. *Government cannot solve all the problems; some will require grassroots solutions.*

7. *Adequate funding is a critical need in order to achieve implementation.*

8. *There is a need to distinguish needs and solutions appropriate to developed areas versus developing areas.*

9. *Addressing water resource issues following an approach based on political boundaries often is not adequate since water follows watershed boundaries.*

GLOSSARY

Aquifer – Sand, gravel, other geologic materials capable of storing and transmitting significant quantities of water. In Illinois, aquifers are commonly found in bedrock (such as sandstone, dolomite, and limestone) and/or in overlying unconsolidated deposits (such as sand and gravel).

Baseflow - The sustained portion of stream flow that is not due to stormwater runoff or wastewater effluent. In most streams, baseflow is composed largely of groundwater seepage.

Base flood - The flood having a one-percent probability of being equaled or exceeded in any given year. The base flood is also known as the 100-year frequency flood event.

Best management practice (BMP) – An action or technique that most effectively prevents or minimizes pollution.

Biodiversity - The diversity of life and all the interconnections that make life on earth possible. Biodiversity can be measured by the totality of genes, species, and ecosystems in a region.

Buffer/buffer strip – An area closest to a sensitive environmental site (e.g., wetland, river, lake, etc.) in which human activities are prohibited or limited in order to minimize the negative impact from adjacent land uses (e.g., erosion, runoff pollutants).

Capture zone - The land area that contributes water to a well while it is being pumped.

Channel – A natural or artificial waterway that periodically or continuously contains flowing water.

Channel modification - Alteration of a channel by changing the physical dimensions or materials of its bed or banks. Channel modification includes damming, riprapping (or other armoring), widening, deepening, straightening, relocating, lining, and significant removal of bottom or woody rooted vegetation. Channel modification does not include the clearing of debris or removal of trash.

Combined sewer – A sewer system that carries both sewage and stormwater runoff. Normally, its entire flow goes to a wastewater treatment plant, but during a heavy storm, the stormwater volume may be so great as to cause overflows called combined sewer overflows (CSO). When this happens, untreated or partially treated mixtures of stormwater and sewage flow into receiving waters.

Community well - A public water supply well serving residents year round. A public well is any well with 15 or more service connections or that serves 25 people for at least 60 days per year.

Compensatory storage – An artificially excavated, hydraulically equivalent volume of storage within the floodplain used to balance the loss of natural flood storage capacity when fill or structures are placed within the floodplain.

Conservation easements – A documented agreement through which private landowners may voluntarily restrict their land from specific activities.

Dam – A structure built across a waterway to impound water. Dams are used to control water depths for navigation or to create space to store water for flood control, irrigation, water supply, hydropower, or other purposes.

Depressional area - Any area which is lower in elevation on all sides than surrounding properties (i.e., does not drain freely), or whose drainage is severely limited such as by a restrictive culvert. A depressional area will fill with water on occasion when runoff into it exceeds the rate of infiltration into underlying soil or exceeds the discharge through its controlled outlet. Depressional areas may provide significant stormwater or floodplain storage.

Detention basin - A facility constructed or modified to provide for the temporary storage of stormwater runoff and the controlled release by gravity of this runoff at a prescribed rate during and after a storm.

Drought - A persistent and abnormal moisture deficiency having adverse impacts on vegetation, animals, and people.

Effluent - Treated water discharged from a municipal or industrial treatment plant.

Erosion – The wearing away of the earth's surface and transportation of rocks and soil debris by wind, rain, or running water.

Eutrophication – Lake aging through nutrient enrichment and sedimentation that may lead to excessive plant/algae growth.

Flood fringe - That portion of the floodplain outside of the regulatory floodway.

Floodproofing – Any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures, and their contents.

Floodplain – Lands adjoining the channel of a river, stream, watercourse, or lake that have been or may be inundated by floodwater during periods of high water that exceed normal bank-full elevation and other areas subject to flooding.

Floodway – The channel of a watercourse and those portions of the adjoining floodplain that are reasonably required to carry and discharge the design flood.

Freeboard - An increment of elevation added to the base flood elevation to provide a factor of safety for uncertainties in calculations, unknown localized conditions, wave actions, and unpredictable effects such as those caused by ice or debris jams.

Groundwater – Water found underground in 1) shallow silt, sand, and gravel deposits, or 2) deep, fractured, or porous rock.

Hardness - A characteristic of water representing the total concentration of calcium and magnesium ions expressed as milligrams of calcium carbonate ($CaCO_3$) per liter (mg/L).

Hydraulic characteristics - Features of a watercourse that determine its water conveyance capacity. These features include but are not limited to: size and configuration of the cross-section of the watercourse and floodway; texture and roughness of materials along the watercourse; alignment of the watercourse; gradient of the watercourse; amount and type of vegetation within the watercourse; and size, configuration, and other characteristics of structures within the watercourse.

Hydrologic cycle - The exchange of water between the earth and the atmosphere through evaporation, transpiration, and precipitation.

Hydrology – The science dealing with the properties, distribution, and circulation of water on and below the surface of the land and in the atmosphere. Hydrologic computer models are used to simulate the effects of rainfall, infiltration, evapotranspiration, and runoff.

Impervious areas – Land cover that does not allow water infiltration, such as roadways and rooftops.

Inland surface water - Any waterbody in the northeastern Illinois region except Lake Michigan

Mining water - Extraction of groundwater at a rate exceeding recharge.

Mitigation - Those measures necessary to minimize the negative effects which stormwater drainage and development activities might have on the public health, safety, and welfare. Examples of mitigation include compensatory storage, soil erosion and sedimentation control, and channel restoration.

Net Social Benefit of Water - A measure of the total value of water to consumers. It is measured by calculating the difference between the total dollar amount consumers as a whole are willing to pay for water, and what they actually pay for it. Generally, the difference is a positive number, indicating that consumers get real value for the water provided to them.

Nonpoint source pollution – Pollution that enters a waterbody from sources that cannot be defined as discrete points, such as rain, runoff from adjacent lands, or air deposition.

Nonstructural measures – Actions or policies that lead to flood control, flood prevention, and protection as opposed to construction of dams, reservoirs, or other structures. Nonstructural measures include flood insurance, flood warning systems, floodplain zoning or acquisition, floodproofing, relocation, building codes, and other land use controls or restrictions for achieving project objectives.

Point source pollution – Source of pollution with a specific location, such as a factory or sewage treatment plant.

Practical sustained yield - A maximum amount of water that can be continuously withdrawn from existing groundwater pumping centers without eventually dewatering the most productive water-yielding formation or exceeding recharge.

Recharge - Replenishment of aquifers by water seeping from the land's surface down into the groundwater. Groundwater is recharged from rainwater and snowmelt or from water that seeps through the bottom of some lakes and rivers.

Recharge area – Ground where the soil and geology permit rain and surface waters to infiltrate and thus replenish the groundwater.

Retrofitting – To install a new best management practice or improve an existing best management practice in a previously developed area.

Riparian – An area adjacent to a body of water (e.g., shoreline property).

Septic system – Wastewater treatment systems that use septic tanks and drainfields to dispose of sewage in soil.

Setback zone - A defined land area surrounding a community water supply well within which certain land uses are restricted. The setback zone provides a buffer between the well and potential sources or routes of contamination. In Illinois, the minimum setback zone for community wells is either 200 or 400 feet depending on the well's vulnerability to contamination. The maximum setback zone can extend up to 1000 feet from the well.

Sewage – Waste and wastewater discharged into sewers from homes and industry.

Sewer – A channel or conduit that carries wastewater and stormwater runoff from its source to a treatment plant or receiving stream.

Stormwater detention facilities – Typically, artificial basins and devices designed to keep runoff from overloading sewers and/or to reduce the rate at which stormwater is conveyed to waterways.

Stormwater runoff - The waters derived from melting snow or rain that are in excess of the soil's infiltration capacity, which flow over the surface of the ground or are collected in channels or conduits.

Structural flood control measures – Projects such as dams, diversions, basins, dikes, ponds, pipelines, conduits, channels, control gates, and outlet structures constructed to control floodwater.

Surface water - Water flowing or stored on the surface of the landscape in streams, rivers, lakes, ponds, and wetlands.

Swale - Broad, vegetated channel used for the conveyance, infiltration, and filtering of runoff.

Transmissivity – The capacity of an aquifer to transmit water; equal to the hydraulic conductivity times the aquifer thickness.

Wastewater - The spent or used water from an individual home, a community, a farm, or an industry that contains dissolved or suspended matter.

Water hardness - *see* Hardness.

Watershed – A land area that drains into a particular river system; a region or area bounded peripherally by a divide and draining ultimately into a particular watercourse or waterbody.

Water table - The level below which all ground is saturated with water; the top of the saturated zone in an unconfined aquifer.

Wetlands - Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

BIBLIOGRAPHY

Angel, James, personal correspondence, Illinois State Water Survey, Champaign, 2000.

Arnold, Terri L. and Michael J. Friedel, *Effects of Land Use on Recharge Potential of Surficial and Shallow Bedrock Aquifers in the Upper Illinois River Basin*, U.S. Geological Survey Water-Resources Investigations Report 00-4027, Urbana, Illinois, 2000.

Berg, R.C., N.K. Bluer, B.E. Jones, K.A. Kincare, R.R. Pavey, and B.D. Stone, *Mapping the Glacial Geology of the Central Great Lakes Region in Three Dimensions: A Model for State-Federal Cooperation*, U.S. Geological Survey Open File Report 99-349, 1999.

Changnon, S.A., *Detecting Drought Conditions in Illinois*, Illinois State Water Survey Circular 169, Champaign, 1987.

Dreher, D. W. and T. H. Price, *Best Management Practice Guidebook for Urban Development*, Northeastern Illinois Planning Commission, Chicago, 1992.

———, *Reducing the Impacts of Urban Runoff: The Advantages of Alternative Site Design Approaches*, Northeastern Illinois Planning Commission, Chicago, 1997.

Harza Environmental Services, *Regional Lake Michigan Water Demand Study: Preliminary Report*, prepared for Illinois Department of Natural Resources, Chicago, 1998.

Illinois Department of Natural Resources and Northeastern Illinois Planning Commission, *Model Floodplain Ordinance*, Chicago, 1996.

Injerd, Daniel, personal correspondence, Illinois Department of Natural Resources, Office of Water Resources, Chicago, 2000.

———, "Lake Michigan Water Diversion: A Case Study," *Buffalo Environmental Law Journal*, v. 307, 1993.

Interagency Coordinating Committee on Ground Water, *Illinois Groundwater Protection Program: Biennial Comprehensive Status and Self Assessment Report 1996-97*, Illinois Environmental Protection Agency, Springfield, 1998.

Jaffe, Martin, *Background Paper on Water Supply Issues*, prepared for the Northeastern Illinois Planning Commission, unpublished, Chicago, May 1999.

——— and Daniel McGrath, personal correspondence, University of Illinois at Chicago, College of Urban Planning and Public Affairs, 2000.

Jeer, J., M. Lewis, S. Meck, and J. Witten, *Nonpoint Source Pollution: A Handbook for Local Governments*, Planning Advisory Service Report Number 476, American Planning Association, 1997.

Johnson, T.J., personal correspondence, Harza Engineering Co., Chicago, 2001.

Lake County Stormwater Management Commission, *Lake County Watershed Development Ordinance*, Libertyville, Illinois, 1999.

Meyer, Scott, *Contributions to Report on Comparison of Water Availability and Projected Demand in Northeastern Illinois in 2020*, prepared by the Illinois State Water Survey for the Northeastern Illinois Planning Commission, unpublished, Chicago, 2000.

National Drought Policy Commission, *Preparing for Drought in the 21st Century*: Executive Summary U.S. Department of Agriculture, Washington, D.C., 2000.

National Research Council, *Valuing Ground Water—Economic Concepts and Approaches*, National Academy Press, Washington, D.C., 1997.

Northeastern Illinois Planning Commission, *Comprehensive General Plan for the Development of the Northeastern Illinois Counties Areas*, Chicago, 1977.

———, *Estimated Future Water Supply Demands for Northeastern Illinois*, Chicago, 1976.

———, *Flood Hazard Mitigation in Northeastern Illinois - A Guidebook for Local Officials*, Chicago, July 1995.

———, *Model Soil Erosion and Sediment Control Ordinance*, Chicago, September 1991.

———, *Model Stormwater Drainage and Detention Ordinance*, Chicago, 1994.

———, *Model Stream and Wetland Protection Ordinance for the Creation of a Lowland Conservancy Overlay District*, Chicago, 1988.

———, *Recommended 2020 Forecasts of Population, Households and Employment for Municipalities and Counties in Northeastern Illinois*, Chicago, September 27, 2000.

———, *Regional Overbank Flooding and Stormwater Drainage Policy Plan*, Chicago, 1976.

———, *Regional Water Supply Plan*, Chicago, 1978.

———, *Regional Water Supply Report*, Technical Report No. 8, Chicago, 1974.

———, *Water Quality Management Plan for Northeastern Illinois*, Chicago, 1979.

———, *Water Quality Management Plan Amendment Process and Procedures*, Chicago, Updated June 1996.

———, *The Water Resource in Northeastern Illinois: Planning its Use*, Technical Report No. 4, Chicago, 1966.

———, and Butterfield Creek Steering Committee, *Draft Technical Policy Directive for Maintenance and Monitoring of Naturalized Stormwater Management Facilities Vegetated with Wetland and Prairie Plantings*, Chicago, 1999.

Roadcap, George S., Stuart J. Cravens, and Edward C. Smith, *Meeting the Growing Demand for Water: An Evaluation of the Shallow Ground-Water Resources in Will and Southern Cook Counties, Illinois*, Illinois State Water Survey Research Report 123, Champaign, 1993.

Schicht, Richard J., J. Rodger Adams, and John B. Stall, *Water Resources Availability, Quality, and Cost in Northeastern Illinois*, Illinois State Water Survey Report of Investigation 83, Urbana, 1976.

Schueler, T.R., *Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs*, Metropolitan Washington Council of Governments, Washington, D.C., 1987.

———, *Site Planning for Urban Stream Protection*, Metropolitan Washington Council of Governments, Washington, D.C., 1995.

Singh, Krishan P., Thomas A. Butts, H. Vernon Knapp, Dana B. Shackleford, and Robert S. Larson, *Considerations in Water Use Planning for the Fox River*, Illinois State Water Survey Contract Report 586,Champaign, 1995.

Singh, Krishan P. and J. Rodger Adams, *Adequacy and Economics of Water Supply in Northeastern Illinois: Proposed Groundwater and Regional Surface Water Systems, 1985 - 2010*, Illinois State Water Survey Contract Report 229, Champaign, 1980.

U.S. Environmental Protection Agency, *Constructed Wetlands for Wastewater Treatment and Wildlife Habitat*, Washington, D.C., 1993.

———, *Guiding Principles for Constructed Treatment Wetlands: Providing Water Quality and Wildlife Habitat (Final Draft)*, Washington, D.C., 1999.

U.S. Geological Survey, *Strategic Directions for the U.S. Geological Survey Ground-Water Resources Program: A Report to Congress*, Reston, Virginia, November 1998.

Visocky, A.P., *Water Level Trends and Pumpage in the Deep Bedrock Aquifers in the Chicago Region, 1991-1995*, Illinois State Water Survey Circular 182, Champaign, 1997.

Winter, Thomas C., Judson W. Harvey, O. Lehn Franke, and William M. Alley, *Ground Water and Surface Water: A Single Resource*, U.S. Geological Survey Circular 1139, Denver, 1999.

ACRONYMS

BMP	Best Management Practice
BSC	Biological Stream Characterization
CAV	Community Assistance Visit
CCR	Consumer Confidence Report
CDBG	Community Development Block Grant
CRS	Community Rating System
CSWC	Countywide Stormwater Committee
CTP	Cooperating Technical Partners
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FPA	Facility Planning Area
HMGP	Hazard Mitigation Grant Program
IAFSM	Illinois Association for Floodplain and Stormwater Management
IDNR	Illinois Department of Natural Resources
IDNR/OWR	Illinois Department of Natural Resources, Office of Water Resources
IDNR/SGS	Illinois Department of Natural Resources, State Geological Survey
IDNR/SWS	Illinois Department of Natural Resources, State Water Survey
IDOA	Illinois Department of Agriculture
IDPH	Illinois Department of Public Health
IEMA	Illinois Emergency Management Agency
IEPA	Illinois Environmental Protection Agency
IMAG	Illinois Mitigation Advisory Group
IPCB	Illinois Pollution Control Board
MOU	Memorandum of Understanding
MWRD	Metropolitan Water Reclamation District of Greater Chicago
NAWQA	National Water Quality Assessment
NFIP	National Flood Insurance Program
NIPC	Northeastern Illinois Planning Commission
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
SESC	Soil Erosion and Sediment Control
SSMMA	South Suburban Mayors and Managers Association

SWCD	Soil and Water Conservation District
TARP	Tunnel and Reservoir Plan
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

APPENDIX A

CROSS REFERENCE OF IMPLEMENTERS AND STRATEGIES

APPENDIX A

CROSS REFERENCE OF IMPLEMENTERS AND STRATEGIES (continued)

APPENDIX B

METHODOLOGY AND SELECTED ASSUMPTIONS FOR WATER DEMAND AND SUPPLY ANALYSIS

The following provides a brief summary of the basis for projections of future water demands and water supply availability for the six-county northeastern Illinois planning area developed by Harza Engineering (Johnson, 2001), IDNR/SWS (Meyer, 2000), and NIPC. This analysis is a conceptual planning analysis and is not intended for the detailed design or development of specific water supply facilities.

Demand Analysis

Estimates of consumptive water requirements for the study area in 2020 were developed based on an analysis of current water use patterns and projected population, household, and employment conditions for the region. Demand forecasts assumed that future per capita water use rates would not change dramatically from rates observed in recent years. Total consumptive water demands for the area were estimated to equal the sum of the demands for eight groups of users. The basis for demand projections for each group is summarized below.

Municipal Systems with Lake Michigan Water Allocation Permits: Projections of 2020 water requirements for municipal systems with Lake Michigan Water Allocation Permits were based on the set of allocation permit values issued in 1999 by the Illinois Department of Natural Resources under Lake Michigan Order (LMO) 99-3. For the purpose of this analysis, water requirements for these users were distributed spatially based on projected population distributions and a single per capita water demand rate for each municipality. Demands within each municipality were then distributed among study units using geographic information system (GIS) spatial analysis tools. This approach relies on the assumption that water demand within each municipality is generally equally distributed over the municipality's area according to population.

Non-municipal Systems with Lake Michigan Water Allocation Permits: Projections of 2020 water requirements for non-municipal allocation permittees also were based on the LMO 99-3 allocation figures. These demands were distributed spatially by assigning the demand for each permittee to the study unit(s) within which its service area is generally located.

Municipal Systems Served from Sources Other than Lake Michigan. Year 2020 demand projections for municipal systems served from sources other than Lake Michigan were developed using a simplified version of the regional forecasting procedure developed for IDNR's periodic updates of Lake Michigan allocations. In general, historic water use data for each municipality was used to develop a system-specific adjustment factor for use in conjunction with a regional forecasting equation. The regional equation used projected population, household, and employment data as basic input. The adjustment factor provided for a smooth transition of the projected demand from historic use patterns for individual systems. Projected 2020 demands for non-Lake Michigan municipalities were distributed spatially based on average per capita demand rates and a GIS-based analysis of municipal and study unit boundaries, similar to the technique used for the Lake Michigan municipalities.

Non-municipal Systems Served from Sources other than Lake Michigan: Projections of future service population were not readily available for non-municipal systems without Lake Michigan allocation permits. As a result, future water requirements for these systems were estimated together with future water requirements for private well users based on estimates of 2020 population in unincorporated areas beyond the Lake Michigan service area. Representative per capita water use rates for these classes of users in each county were developed from 1998 pumpage and service population data provided by the Illinois State Water Survey. The 1998 per capita rates were then adjusted upward to establish 2020 per capita rates that reflected the general trend toward increased per capita water use in the study area.

Self-supplied Commercial/ Industrial/ Institutional Users with Lake Michigan Allocation Permits: Projections of 2020 water requirements for self-supplied commercial/ industrial/institutional Lake Michigan allocation permittees were based on the LMO 99-3 allocation figures. These demands were distributed spatially by assigning the demand for each permittee to the study unit(s) within which its service area is generally located.

Self-supplied Commercial/ Industrial/ In-=stitutional Users Served from Sources Other than Lake Michigan: The Illinois State Water Survey (IDNR/SWS) provided 1998 water use data for self-supplied commercial/ industrial/ institutional users in the study area by study unit. The aggregate data was compared against known pumpage for Lake Michigan allocation permittees to develop estimates of 1998 use by non-Lake Michigan systems. Given the limited data available to project future demands for these users, growth factors were developed for each county based on projected increases in total employment. These factors were then applied to the 1998 pumpage estimates to establish estimates of 2020 demand by study unit for these entities. The only significant allowance for major new development of self-supplied commercial/ industrial/institutional was associated with the potential development of a third regional airport in the Peotone area.

Lake Michigan Users without Lake Michigan Water Allocation Permits: Pumpage data provided by the IDNR/SWS for inland surface water withdrawals included data for several users known to rely on Lake Michigan water, but without allocation permits. A portion of this use is associated with the operation of the Naval Training Center at Great Lakes, and was exempt from the allocation permitting process. Other users could not be directly assigned to individual systems. Future requirements for the Naval Training Center were taken from a recent planning study performed for the Navy. Estimates of future use for other unidentified users in this category were prepared based on study unit changes in employment as described above.

Individual Users Served from Private Wells: Water demands associated with individual users served from private wells were estimated based on representative per capita consumption rates determined for each county from historic water use data for non-municipal, non-Lake Michigan systems. As indicated above, demands for this user class were computed together with demands for the non-municipal, non-Lake Michigan systems. Population data for unincorporated area were obtained from the NIPC forecasts for 2020.

Supply Analysis

Estimates of available water supply in north-eastern Illinois for 2020 were developed based on data from a variety of sources. Brief descriptions of the basis for these estimates follow.

Lake Michigan Water Supply: The supply of Lake Michigan water available for consumptive use in the study area is limited by agreements reached between the State of Illinois, other Great Lakes states, and Canada. For the purpose of this analysis, the Lake Michigan supply available in 2020 was assumed to be equal to the sum of the Lake Michigan allocation permits granted under LMO 99-3, plus allowances for other users of Lake Michigan water not currently required to have allocation permits. The largest of these "other users" is the Naval Training Center at Great Lakes. The spatial distribution of the Lake Michigan supply was achieved by distributing municipal allocations over the study units based on 2020 estimates of municipal boundaries, and assigning other allocation and "other use" amounts to individual study units based on approximate service area.

Other Surface Water Supplies: Other surface water supplies assumed to be available for use in 2020 included primarily the Fox River and the Kankakee River. A modest allowance was also included for supply capacity provided by several small surface water sources (ponds, quarries, etc.) in use during 1998. Supply capacity for the Fox and Kankakee Rivers was developed through an analysis of historical flow data and review of previous analyses of these streams. In general, it was assumed that withdrawals from these rivers would not be allowed to reduce the streamflow to less than the seven-day, ten-year low flow. Results of the analysis of historic flow data were compared with results from previous IDNR/SWS investigations (Singh, 1980, and Singh, 1995) and used to adopt representative estimates of available surface water yield for consumptive water supply in these two watersheds.

The available supply from the Fox and Kankakee Rivers was distributed spatially based on consideration of current withdrawals and the extent of the natural watersheds located in the study area. Supply capacity equal to current withdrawals was assigned to the study units where the existing withdrawal was located. The remaining supply capacity was evenly distributed to all of the study units in each watershed.

Groundwater Supply Capacity: Groundwater supply capacity throughout the study area was estimated by the IDNR/SWS based on reviews of previous studies and investigations. Details of the methods used to generate study unit estimates of available groundwater capacity are presented in documentation developed by the IDNR/SWS (Meyer, 2000).

Population Forecasts

The 2020 population-based forecasts were derived from NIPC's 2020 forecasts for the South Suburban Airport alternative as endorsed by the Commission in September 2000. In that alternative, each quarter section was assigned in its entirety to a place or unincorporated area. The per capita demand figures for the place or unincorporated area were applied to generate a water demand per quarter section. The quarter section results were then aggregated to the geographic analysis units suggested by Harza (a combination of political and surveyor townships).

Two types of adjustments were required. The first adjusted the population forecasts for Joliet, Addison, and Schaumburg townships. A review of the preliminary results revealed that the 2020 population forecasts for these townships had been surpassed by the 1990 to 1998 growth in population. The population totals were adjusted by assuming the average annual population forecast as endorsed but applied to the 1998 base population for those townships. The demand was then recalculated using these adjusted totals.

The second adjustment was made to the study townships containing Bedford Park. This community has a very large industrial base and a very small residential population. The resulting per capita demand figure was very large. This extreme per capita projection when applied to only a very small change in population resulted in a very large and unrealistic increase in demand. In the case of Bedford Park, a whole quarter section assigned to Bedford Park contained people residing in Bedford Park and an adjacent community with a much smaller per capita demand. Consequently, the per capita demand number for this particular quarter section was recalculated and the demand was adjusted.

Cover photo credit: Brewster Creek at Pratt's Wayne Woods Forest Preserve, Forest Preserve District of DuPage County