

2030 Land Resource Management Plan

PLANNING ISSUES—WATER RESOURCES

Objectives

1. To recognize an interacting system of land and water resources is a major component of our natural environment.
2. To preserve and protect the quantity and quality of potable groundwater and potable surface water supplies and to ensure sustainable yields for current and future generations.
3. To protect and improve the surface water quality and beneficial uses of ponds, lakes, rivers, streams, and wetlands.
4. To reduce point and non-point source discharges of pollutants into lakes, rivers, and streams.
5. To preserve and protect the recharge of our groundwater aquifers for current and future potable water supply needs of Kane County.
6. To maintain or achieve for every stream in Kane County a Class B or better water quality rating as defined by the Biological Stream Characterization system of the Illinois Environmental Protection Agency.
7. To conserve water resources via lawn watering restrictions, water-conserving plumbing fixtures, and reuse and recycling of reclaimed wastewater.
8. To promote watershed based planning in a holistic manner for water supply, stormwater management, and wastewater reclamation.
9. To promote stormwater management practices that maximize groundwater recharge potential.



Chapter Focus



The Fox River and its tributaries along with the tributaries of the Kishwaukee River are Kane County's major surface water resources and one of its greatest natural assets. Beneath the earth's surface is an equally important natural asset, the groundwater resource in the shallow and deep aquifers that will provide potable water for current and future generations. A primary challenge facing Kane County is to manage future growth to ensure that all necessary steps are taken to maintain high water quality in our surface water and sustainable yields in our subsurface resource. Kane County has provided leadership in utilizing Best Management Practices in the county's watersheds and in implementing countywide stormwater management. Watershed planning is the most effective means of addressing countywide water quality because it is a holistic approach that encompasses (1) minimizing impervious surfaces, (2) utilizing Best Management Practices, and (3) cooperative governmental planning for the management of streams, lakes, wetlands, floodplains, stormwater, and wastewater throughout an entire watershed.

This chapter examines:

- Water resources
- Water supply
- Water resource management
- Watershed planning



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Water Resources

The hydrological cycle is the movement of water from the oceans to the atmosphere and land, then back to the oceans. It is a complex and interrelated system essential to life on earth. The importance of our nation's water resources was highlighted in 1972 when Congress approved the Clean Water Act, which set very high water quality goals for the U.S. The Clean Water Act required that plans for restoring and maintaining water quality be prepared at the regional and state level. In compliance with that mandate the 208 Areawide Water Quality Management Plan was endorsed by Kane County and adopted in 1979 by the Northeastern Illinois Planning Commission (Refer to Figure 57). The 208 Plan recommends strategies to local governments to control both point and non-point sources of pollution (Refer to Figure 58).



The two major components of Kane County's water resources are surface waters and groundwater aquifers (Refer to Figure 59). Surface water and groundwater aquifers have undergone significant changes since early settlement times in Kane County. Intensive farming and industrial activities between 1830 and 1940 were responsible for altering many of the county's creeks, wetlands, and of course, the Fox River. Settlers cut down woodlots, plowed under most of the native prairie, drained the majority of wetlands, and dredged the creek channels. Runoff from farm fields eroded topsoil into the streams and river. The raw and partially treated effluent from industries and cities was discharged into the Fox River.

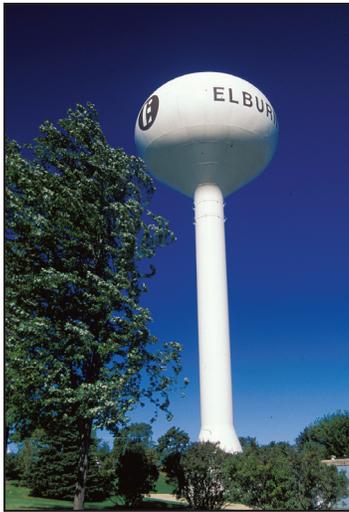
In recent years, the quality of Kane County's surface water resources has improved. Municipalities have made progress in the treatment of wastewater and elimination of combined sewer overflows. However, urban and suburban development continues to strain the ability of surface waters to remain clean and stable. Wastewater treatment plants, while having made major advances in protecting public health and the health of our streams and rivers by improving the quality of treated wastewater, wastewater treatment plants still discharge excess nutrients and other traces of pollutants into streams and rivers. Groundwater aquifers are affected by the activities occurring on or around the recharge areas which replenish the water. The surrounding land uses, over pumping, and pollution affect the groundwater aquifers. These issues must be addressed by protection of the recharge areas, not exceeding sustainable yields, and land use management.

The quantity of water for drinking and other uses has historically been adequate in Kane County. However, recent population forecasts and the localized lowering of some of the aquifers in the county and surrounding areas indicate that by the year 2030 the potential for potable water shortages exists in certain areas of the county depending on groundwater for their water supply. Because the historic data is either too old or has not been compiled in a computerized database, detailed geologic and aquifer information is currently not available to address these potential shortages (Refer to Figure 60).

Water Supply

The most important use of our water resources is providing potable water for human consumption. Because Lake Michigan water will not be available, the county must remain self-sufficient for its potable water needs and confront the relationship between new suburban growth and long-term, sustainable water supply. The two chief sources of potable water in Kane County are groundwater and Fox River water. Groundwater is tapped by private and public wells from two aquifer zones: 1) the shallow aquifer zone located roughly 30 to 400 feet below the ground surface, and 2) the upper sandstone aquifer located from 600 to 2,000 feet below the ground surface.

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All Kane County municipalities supply potable water through public water supply systems, except for Big Rock, Lily Lake, Pingree Grove, Virgil, Wayne, and a portion of Barrington Hills. The county encourages public water supply extensions into developing areas annexed to municipalities. Potable water withdrawal rates from the Fox River and from high capacity municipal, industrial, and irrigation wells have historically increased and are projected to continue rising. Not only has Kane County's population increased, but the gallons of water used for each person per day living in Kane County has increased (Refer to Figure 61).

Most Kane County municipalities have depended primarily on groundwater from the upper sandstone aquifer that is 600 to 2,000 feet deep. Both water quantity and water quality problems have arisen with this aquifer in Kane County. Water quantity problems include the regional decline in water supply due to over pumping in northeastern Illinois and local declines in water supply due to over pumping in southeastern and northern Kane County. Water quality problems include radium levels and barium levels that sometimes exceed U.S. Environmental Protection Agency standards. The lower sandstone aquifer, which contains water below 2,000 feet, also contains salts and minerals making it non-potable.

Due to these water quantity and water quality problems, some Kane County municipalities have begun utilizing the Fox River or the shallow aquifers, which have a faster recharge rate and contain insignificant levels of barium and radium. Another water supply solution has been to mix upper sandstone aquifer water with treated Fox River water. This option however is not totally accepted by residents because of taste and odor complaints during the summer months. The most cost-effective solution to supplying potable water in the county continues to be shallow aquifer groundwater.

Most private wells in unincorporated Kane County draw from the shallow aquifer zone, which is a dependable source of potable water. Widespread deposits of sand and gravel along with the upper portions of the fractured limestone bedrock in Kane County provide relatively shallow sources of potable groundwater and are presently used by several communities. Other shallow aquifers have the potential for future municipal and household use. However, sufficiently detailed geologic and aquifer data have not been compiled and studied to fully understand the long term water quantity and water quality issues arising from dependence on the shallow aquifer as a sustainable water supply. Water quantity issues include insufficient geologic data for evaluating the location and pumping capacity of wells, the amount of water that can be pumped from the aquifers on a sustainable basis, the location of recharge areas, the loss of recharge capability due to urbanization, and the effect of pumping on the water table, wetlands and base flows in streams. The major water quality issue is the potential for contamination from pollutants that may be introduced into the shallow aquifers from development on the land surface.

To address the problems and unknowns of the deep and shallow aquifer systems and the Fox River surface water supply in Kane County, the Illinois State Water Survey and the Illinois State Geological Survey under contract with Kane County are doing additional aquifer, geologic, and water accounting studies. Their work will compile existing and new data into a Geographic Information System (GIS) and into computer models of the geology and aquifers of Kane County to use as planning tools for future water supply and land use decision-making. Following completion of the studies, priority should be given to developing a comprehensive countywide potable water resource management policy.

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A better understanding of the hydrologic cycle under the land surface and how groundwater interacts with our surface water resources is essential for Kane County to continue to preserve and to protect its potable water resources, as well as to ensure sufficient water supply and water quality to a growing population.

Water Resource Management

Many of Kane County's water resources reach beyond county boundaries. Thus federal, state, and regional coordination is needed for effective water resource management in Kane County and across the northeastern Illinois region. At the local level, Kane County and its municipalities need to continue to strengthen implementation measures to protect and manage its water resources, especially the shallow aquifers and the Fox and Kishwaukee Rivers and their tributaries (Refer to Figure 62).

Stormwater Management

Prior to settlement, there was very little stormwater runoff in Kane County except in areas of well-defined streams and rivers such as the areas immediately adjacent to the Fox River. Runoff rates were quite low because of absorption by the undisturbed prairie soils and deep-rooted native vegetation. The volume and rates of stormwater runoff have increased greatly since pre-settlement times. This is due to farming activities that have drained fields and channelized streams, and to urbanization that has increased impervious surfaces.



Past stormwater management practices have resulted in a substantial increase in flooding and stream bank erosion, and have caused severe water quality problems. Water may be polluted from street and parking lot runoff containing heavy metals, bacteria, excess nutrients and petroleum byproducts. Federal and state requirements do not control the quantity of stormwater runoff from new developments. However, the quality of stormwater runoff is regulated by the U.S. Environmental Protection Agency.

Stormwater runoff affects the entire watershed in which it occurs. If one municipality or development within a watershed does not properly manage its stormwater, flooding and water quality problems can occur throughout the watershed. These issues, along with record flooding in Kane County in July 1996, brought about the adoption of the Comprehensive Stormwater Management Plan for Kane County in October 1998. The goals of the plan call for a uniform stormwater management framework addressing both the quantity and quality of our surface and groundwater resources. The Countywide Stormwater Management Ordinance is a product of the plan and became effective in January 2002. It provides the means for cost effective, safe, aesthetic, and reasonable stormwater drainage and erosion control that minimizes stormwater runoff, water quality degradation, and habitat loss. It also provides the ability to implement best management practices and water quality benefits for both incorporated and unincorporated areas.

Best management practices (BMPs) for stormwater runoff control include structural improvements and devices that transport, temporarily store, and treat urban stormwater runoff to remove pollutants, to reduce flooding, and to protect aquatic habitats. BMPs also include nonstructural approaches, such as public education efforts to prevent the dumping of household chemicals into storm drains.

Because agricultural development has significantly increased runoff volumes and rates, the Natural Resources Conservation Service and the Kane-DuPage Soil and

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Water Conservation District have promoted many erosion control and floodplain protection practices in agricultural areas. Farmers throughout the county have been encouraged to use conservation tillage, grassed waterways, terracing, and other methods of erosion control and floodplain protection. In May 2003, the county also adopted the Farmland Drainage Assistance Program to achieve net watershed benefits by educating and assisting farm owners with implementing stormwater BMPs and in reestablishing drainage districts.



River and Stream Management

The Fox River and its five major tributaries and the Kishwaukee River tributaries are major features of Kane County. These water resources are one of the county's greatest natural assets and must be protected.

A key Best Management Practice (BMP) in river and stream management is to protect the river and stream corridor. The corridor then acts as a buffer strip to protect stream banks from erosion, filter out pollutants, store and transport flood waters, provide wildlife and aquatic habitat, and screen sensitive areas from potential adverse effects of development.

The Fox and Kishwaukee Rivers and their tributaries have been classified as fair to good in biotic integrity by the Biological Stream Characterization (BSC) program (Refer to Figure 63). The BSC is a five-tiered classification system, ranging from excellent to very poor, developed by the Illinois Environmental Protection Agency and the Illinois Department of Conservation. The BSC rating was instituted to determine the environmental condition of streams and to monitor changes in the streams over time.

Kane County has an active role in the management of its streams through the BMPs contained in the Countywide Stormwater Ordinance and through other programs and initiatives. A stream-cleaning program was begun in 1997 to remove blockages and keeps our streams free flowing and healthy. It has also participated in several restoration projects including the removal of dams and shoreline restoration along the Fox River and its tributaries. As Kane County develops, it is essential that these programs continue so that the BSC rating for each individual stream be maintained and improved wherever possible.

Wetland Management

Wetlands are a sensitive environmental resource, containing unique ecosystems integral to the hydrologic cycle. Wetland ecosystems are periodically inundated by water. There are several types of wetlands, differentiated by duration of water inundation, soils, topography, and plant species. Wetland types found in Kane County are wet prairie, marsh, fen, bog, swamp, and riverine wetlands (Refer to Figure 64).



Wetlands provide multiple uses and benefits to the human and natural communities in Kane County. Some of these include: (1) providing temporary floodwater and runoff storage; (2) providing recharge or discharge from groundwater aquifers and completing the hydrologic cycle; (3) protecting water quality by absorbing floodwater contaminants; (4) providing important wildlife habitat through food, water, cover, nesting, and breeding grounds; (5) shaping urban form by serving as logical boundaries to development and by buffering incompatible land uses; (6) providing educational and passive recreational opportunities; and (7) enhancing the natural beauty of the area.

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Kane County has approximately 17,000 acres of wetlands, according to the 1987 National Wetlands Inventory. Currently, the emphasis of federal wetland regulations is on the dredging and filling of wetlands. At the federal level, large wetlands connected to rivers and streams are protected from major development activities by the U. S. Army Corps of Engineers. Resource limitations and recent court decisions constrain the Corps from protecting small isolated wetlands, like some found in Kane County. The Kane County Stormwater Ordinance regulates the potential impacts of development on these small isolated wetlands by requiring identification of wetlands and their quality prior to development and buffer strips, conservation easements or mitigation at the same time the surrounding development occurs. The county is also proactive in identifying high-quality wetlands prior to development interest. The Advanced Identification of Wetlands (ADID) program has been adopted in cooperation with the U.S. Fish and Wildlife Service, U.S. EPA, U.S. Army Corps of Engineers, Illinois DNR, NIPC, and Kane-DuPage Soil and Water Conservation District to alert landowners of these important water resources on their land. It is imperative that county wetlands be protected and enhanced because of their role in the hydrologic cycle and water resource management.

Floodplain Management

A floodplain is an area of low-lying, flat ground on either side of a river, stream, pond, or lake subject to periodic inundation by flooding. Floodplains perform important drainage and hydrologic functions. After heavy rains, snow melt, or ice jams, rivers and streams may overflow their banks causing considerable damage if the floodplain contains structures or other inappropriate uses. In the natural environment, floodplains store and convey floodwaters without erosion or other damaging effects to the environment. Any loss of floodplains will cause increased flooding and damage both upstream and downstream.



In addition to drainage, floodplains also (1) control pollution by settling out sediment from slow moving waters in flood storage areas; (2) allow streams and rivers to remeander over time without damage to the built environment; (3) provide wildlife habitat; (4) provide passive recreation areas for hiking, bicycling, and cross-country skiing and active recreation areas such as playing fields; (5) shape urban form; and (6) enhance scenic beauty.

Federal and state agencies provide only minimum regulations for new developments in floodplains. The Federal Emergency Management Agency (FEMA) requires only that new structures in floodplains be elevated to the level of the 100-year flood. This regulation is enforced in coordination with the Illinois Department of Natural Resources, Office of Water Resources (IDNR-OWR). The

Office of Water Resources encourages local governments to adopt more stringent standards for development in floodplains.

Kane County is following the recommendation from IDNR-OWR in its Countywide Stormwater Ordinance by adding three feet to the Flood Protection Elevation (FPE) required by FEMA on the Fox River and two feet to the FPE on the Fox River and Kishwaukee River tributaries. It also calls for appropriate uses within floodways and restricts new construction. The floodway is the area of the floodplain that conveys flood flows, as opposed to the flood fringe portion of the floodplain that simply stores flood waters. Any construction in the floodplain requires the creation of one and one half times the volume of the floodplain storage lost.

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The county recently began studies to update and improve floodplain mapping on over 20% of the county. The county has recently received digitized floodplain maps from FEMA that are now part of the county GIS. Flood reduction studies and construction has also been undertaken since the adoption of the Comprehensive Stormwater Management Plan in many areas of the county. It is important that floodplains be protected from development because of the potential for loss of life, economic loss, and environmental damage.

Wastewater Treatment

Proper wastewater treatment is vital to public health and water quality. There are three types of wastewater treatment systems generally available in Kane County: (1) conventional wastewater treatment plants; (2) private wastewater disposal systems such as septic systems and aerobic treatment plants; and (3) extended aeration wastewater recycling and reuse facilities with land application.



The construction of polishing wetlands adjacent to Gilbert's wastewater treatment plant to improve the treatment of effluent before entering Tyler Creek.



Conventional wastewater treatment plants use a central location to collect, treat, and discharge treated wastewater to a stream or river. Pollutant discharge limits are regulated by National Pollution Discharge Elimination System (NPDES) permits. The level of present technology has done an excellent job in addressing the public health issues of wastewater from the past. However, excess nutrients, mostly nitrogen and phosphorus based compounds, and other traces of pollutants continue to degrade water quality in our streams with discharges from wastewater treatment plants. Also, when wastewater volumes exceed treatment plant capacities or when the capacity of combined stormwater and wastewater sewers in some of the older Fox River communities are exceeded, excess wastewater flows may be discharged directly into a waterway and become an additional source of pollution.

As part of the 1972 Federal Clean Water Act, and the 1979 Areawide 208 Water Quality Management Plan endorsed by Kane County, adopted by NIPC, and being enforced by the IEPA, Total Daily Maximum Load (TMDL) requirements are being addressed now by wastewater authorities along the Fox River. Pollutant levels in streams can vary depending on location, temperature, and other factors. For the first time, in Kane County, a coalition of the wastewater authorities are working together to develop a set of uniform requirements along the Fox River to remove pollutants from their reclaimed wastewater. The Fox River Study Group is recognized and has received grant monies from the IEPA as part of the Integrated Management Plan for the Fox River in Illinois. The Plan is being implemented by IDNR. This planning by the wastewater authorities along the Fox River for the first time on a watershed basis will further enhance the water quality by removing additional pollutants impairing the beneficial uses of the river.

All private sewage disposal systems in Kane County are under the jurisdiction of the Kane County Code enforced by the Health Department. Private sewage disposal systems, commonly referred to as septic-systems, are the second type of wastewater treatment used in unincorporated Kane County. These systems typically occur in areas that have been developed under the traditional concept of rural subdivisions (lots of one acre or greater). Private systems may be either septic systems or aerobic treatment plants (ATPs). The county requires that each lot must contain favorable soil conditions and must be large enough to provide ample room for two disposal fields should one happen to fail. County zoning requires a minimum lot size of 40,000 square feet for private disposal systems. Where soil conditions are not favorable on

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existing platted lots or where existing systems fail, an aerobic treatment plant may be used. These plants provide circulation and aeration in addition to bacteria to decompose organic matter. The treated effluent then flows into a disposal field that may be smaller in area than a septic disposal field.

Extended aeration wastewater recycling and reuse facilities with land application are the third method of treating wastewater in unincorporated Kane County (Figure 65). The Clean Water Act of 1972 and the U.S. Environmental Protection Agency encourage these facilities because they eliminate all point source discharge to rivers and streams. They do not require a NPDES permit. Further, they reuse and recycle the treated effluent and nutrients for irrigation of plants or crops. The nutrients that remain in the effluent, mostly nitrogen and phosphorus-based compounds, are taken up by the plants and do not contaminate sub-surface water. A number of extended aeration wastewater recycling and reuse facilities are successfully operating in Kane County. It is county policy that extended aeration wastewater recycling and reuse facilities be owned and operated by a sanitary district, water reclamation district, or municipality. This ensures continued operation and maintenance of the facilities and the ability to collect user fees.

To facilitate effective wastewater planning and to protect water quality, Facility Planning Areas (FPAs) have been established in northeastern Illinois with the authorization of the federal Clean Water Act. For each FPA, a management agency (a municipality, reclamation or sanitary district) is required to develop a facility plan documenting existing and projected land use, population, and wastewater service needs. Facility Planning Areas play a role in influencing the direction and extent of future development in the county. Access to sewer service can largely determine where land developments can occur. Presently, the Illinois Environmental Protection Agency (IEPA) evaluates requests for amended FPA boundaries or expanded treatment plants based on cost-effectiveness and water quality impacts. Applications to amend an FPA are first made to the Northeastern Illinois Planning Commission (NIPC), which has established detailed criteria for FPA expansions. NIPC then makes a recommendation to the IEPA. A downside of this approach is that it is based on the economics of serving new development with wastewater treatment and collection systems, an idea originating in the 1972 Clean Water Act and that is not in line with the current level of watershed based planning in Kane County and in other levels of state government. Even though FPA amendments are sometimes development-driven, the FPA review process does require wastewater planning that otherwise might not occur. IEPA has the final authority to approve FPA amendments. There are instances where they have overridden the recommendation from NIPC.

Watershed Planning



Watershed planning:

- Promotes an ecosystem-based approach to environmental and land use planning at the watershed level.
- Gives government agencies, land developers, and agricultural operators specific water protection guidelines.
- Shifts water resource planning to a proactive approach that stresses protection, preservation and enhancement of the environment, rather than pure economics or remediation of existing problems.
- Places emphasis on the health of the environment, sustainability and the hydrologic cycle.



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Watershed planning is the most effective means of addressing countywide water quantity and water quality. The key components of watershed planning in Kane County are: (1) minimizing impervious surfaces (roads, driveways, and parking lots) in new developments; (2) utilizing BMPs - effective techniques commonly accepted and promoted by water resource management agencies; and (3) cooperative planning between various units of local government (Refer to Figure 66).

Imperviousness

Imperviousness represents the imprint of development on a watershed. Impervious surfaces include rooftops, roads, driveways, sidewalks, and parking lots and to a lesser extent turf areas. The amount of impervious surface in a watershed directly affects the quantity and quality of runoff, in turn impacting both surface water and groundwater resources within the entire watershed.



Because it can be measured, imperviousness provides a unifying theme for watershed protection that can be used by planners, engineers, landscape architects, scientists, local officials, and concerned citizens. Newly developed sites should be designed so that impervious areas are in the range of 10 to 15%. If imperviousness is greater than 15%, water quality begins to degrade.

Imperviousness affects water resources in at least four ways: (1) water quality—runoff from developed areas are often contaminated with oils, grease, gasoline spills, tire wear, de-icing salts, etc; (2) the shape of streams—flooding is more severe and more frequent, and stream channels respond by widening their banks and deepening their beds; (3) stream warming—impervious surfaces absorb heat, increasing ground and water temperatures, often adversely affecting aquatic habit; (4) aquatic biodiversity— when imperviousness exceeds 10 to 15%, streams have shown a sharply lower diversity of species; (5) Extensive impervious surfaces limits absorption of rainfall and results in rapid runoff into river systems preventing groundwater recharge.

Innovative site design methods can significantly minimize the percentage of impervious surface in a watershed. Such design methods include (1) clustering buildings to decrease road and parking lot surface; (2) reducing building setbacks to lessen the length of driveways and entry walks; (3) reducing street widths, which also lowers maintenance costs and creates a more neighborly environment; and (4) utilizing flexible street standards.

Best Management Practices

Best Management Practices (BMPs) are the second key component of watershed planning in Kane County. The goal of BMPs is to minimize the adverse impacts of development and to maximize the protection and enhancement of both surface water and groundwater resources.

An effective BMP system:

- protects floodplains and open space adjacent to waterways, in wellhead protection areas, and in significant groundwater recharge areas;
- requires buffer strips along streams and wetlands;
- stabilizes severely eroded stream banks through structural or preferably vegetative means;
- preserves and protects native plant species and encourages their use in new development; and

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- minimizes trace pollutants and controls nutrient loading into our surface water and groundwater resources from wastewater treatment facilities, new development and agricultural land uses.



Porous pavers, a BMP, in the Kane County Government Center parking lot.



The first step in the design of a BMP system that protects watersheds is selecting an appropriate and achievable watershed target. Target is a term that refers to the level of stream quality within a watershed that will exist when all development is completed. Although there are a number of possible watershed targets, the Illinois Biological Stream Characterization (BSC) rating system provides a quantifiable measure of water quality. The target for all Kane County streams should be a Class B (good) rating or better.

The second step is using the guidance provided by an aquifer sensitivity map. An aquifer sensitivity map (Refer to Figure 67) relates to geologic materials below the land surface and the sensitivity of the materials to transmitting pollutants in the runoff from developed land into aquifer systems. For example, sand and gravel, if present near the ground surface, may connect to the shallow aquifer system.

Cooperative Planning

Because watershed boundaries often overlap governmental boundaries, cooperation between various units of government is the third key component to effective watershed planning and the achievement of water quantity and water quality goals throughout Kane County. The county and various local agencies have been working cooperatively in several areas to integrate watershed and land use planning techniques in our watersheds.

The Mill Creek watershed offers extraordinary opportunities for watershed planning. The Fox Mill and Mill Creek development, as well as the soon to be developed Prairie Green site, are examples of cooperative planning with municipalities and wastewater reclamation districts. Other examples of cooperative planning based on watersheds in Kane County include the previously mentioned Fox River Study Group; the Blackberry, Waubonsie, and Big Rock Creek Watershed Plans; the Blackberry Creek Alternative Futures Plan; and, at the state level, the previously mentioned Integrated Management Plan for the Fox River Watershed as prepared by the Fox River Ecosystem Partnership and adopted by IDNR in 1999. The Kane County Forest Preserve District and local park districts are also cooperating in establishing the greenway system along our creeks and rivers. Last but not least, is the cooperative planning that was done between the county and the municipalities to adopt the Comprehensive Stormwater Management Plan in Kane County and the adoption and enforcement of a unified set of stormwater regulations across the county. The success of the stormwater management program in Kane County should be an inspiration for future cooperative planning that is needed to protect our irreplaceable surface water and groundwater resources. After completion of the ISWS/ISGS Water Resource Investigations, a comprehensive countywide source water protection plan, followed by a countywide water supply management ordinance, will be needed to help provide a sustainable drinking water supply for the future.

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Policies

1. Preserve and protect the quantity and quality of groundwater and surface water, the principal sources of potable water in Kane County, and encourage water conservation programs.
2. Develop a countywide source water protection plan, which would incorporate watershed based planning and scientific data on the geology and aquifer systems of the County in order to protect recharge areas and provide sustainable drinking water supplies for projected populations.
3. Preserve and improve the water quality of the Fox River and its tributaries and the tributaries of the Kishwaukee River in order to maximize their potential for wildlife habitat, recreational, and other uses.
4. Review and periodically update the Countywide Stormwater Management Plan and Stormwater Ordinance to incorporate new planning goals, new technology, updated regulations, and the results of watershed based planning.
5. Reclaim wastewater in an environmentally sound manner and conducive to public and aquatic health, including the encouragement of wastewater recycling and reuse systems, land applications of reclaimed wastewater, and wetland or other types of treatment to reduce and eliminate the impacts of nutrient discharges into rivers and creeks.
6. Maintain coordinated stream gauging, rainfall monitoring, and water quality stream sampling programs for all major streams in Kane County in cooperation with local, state, and federal agencies and programs.
7. Cooperate with the Forest Preserve, local government entities, and private landowners in the development of watershed preserves, conservation areas, greenways, wetlands and buffers in order to minimize the negative impacts of developing areas in our watersheds.
8. Develop watershed management plans for the remaining four major streams (Eakin, Tyler, Ferson-Otter, and Mill Creeks) in the Critical Growth Areas of Kane County.
9. Maintain a coordinated NPDES Phase II Program with local government entities under the Countywide Stormwater Management Program in order to reduce stormwater pollutants and to enhance water quality, aquatic health, and biodiversity in our streams and riparian areas.
10. Initiate legislation for the 6 county NIPC region to authorize creation of a countywide water authority in order to give the county authority to adopt a water supply management ordinance, but not including the authority to regulate the agricultural use of water.
11. Require that the Illinois Environmental Protection Agency deny amendments to any Facility Planning Area that would create a new or increased point source discharge where such discharges would prevent streams from achieving or maintaining a Class B or greater water quality stream rating.
12. Require that all FPA expansion requests include the water demand aspect of land use plans within the municipal planning area and the area of the proposed expansion and identify the source of supply to meet the long-term demand.

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13. Require that all new or expanded wastewater treatment facilities, whether conventional or reclamation and recycling, be owned and operated by a unit of local government capable of assessing property taxes and imposing user fees.
14. Protect and preserve wetlands as an essential component of the hydrological system and wildlife habitat, and restore degraded wetland areas where possible.
15. Promote and encourage the use of design techniques, Best Management Practices, and other methods to ensure that imperviousness within developing watersheds does not exceed 15%.

Figure 57

Goals of the 208 Water Quality Management Plan for Northeastern Illinois

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

Figure 58

Point and Non-point Sources of Pollution

Point Sources:

- Conventional wastewater treatment plants
- Combined sewer overflows
- Industrial plants
- Illegal septic pumpage dumping
- Yard waste dumping
- Mining operations
- Landfills
- Feed lot and livestock runoff
- Illicit connections to storm sewers

Non-point sources:

- Construction site soil erosion
- Agricultural soil erosion
- Agricultural chemical runoff
- Lawn chemical runoff
- Impervious surface runoff, including oils, grease, gasoline spills, tire wear, de-icing salts, etc. from roadways, driveways, and parking lots
- Acid rain from air pollution
- Hydrologic modifications; for example, stream channelization, wetland filling and draining, etc.

Figure 59—Preliminary Map of Major Quaternary Aquifers

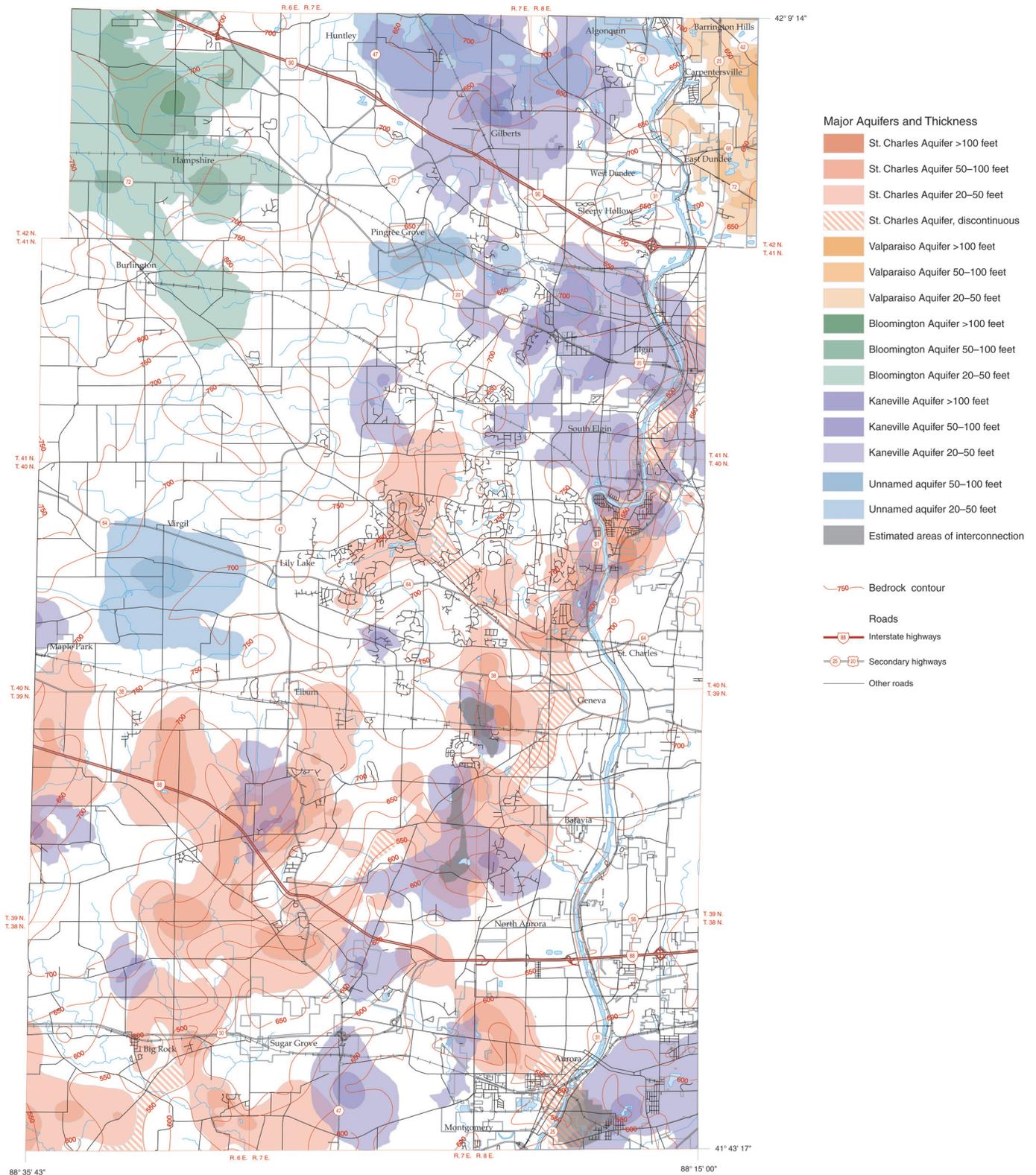


Figure 59 *continued*

Major Quaternary Aquifers

This map was produced as a part of *Kane County Water Resources Investigations: Interim Report on Geologic Investigations* (Dey et al. 2004) as part of a contract report for the *Water-Resources Investigations for Kane County, Illinois* (Meyer et al. 2002). Ongoing work by the Illinois State Geological Survey and Illinois State Water Survey will evaluate the groundwater resources of Kane County through three-dimensional geologic and groundwater flow modeling to estimate sustainable yields from major aquifers in Kane County.

According to Berg et al. (1989), in Illinois, major aquifers are defined as geologic units (sand and gravel or fractured and/or permeable bedrock) capable of yielding at least 100,000 gallons of water per day to wells completed in them (a designation consistent with the Water Use Act of 1983 P.A. 83-700). Quaternary aquifers in Kane County are thick sand and gravel deposits. At this preliminary stage of the project, it is impossible to accurately predict yield from any aquifer. The *Preliminary Map of Major Quaternary Aquifers, Kane County, Illinois* map depicts the location of large, contiguous sand and gravel deposits that may have the potential to meet the definition of major aquifer. The mapped units are greater than 50 feet thick at some points and are several square miles in extent. Boundaries were described where the aquifer thickness became less than 20 feet in order to conform to the aquifer sensitivity standard established by Berg (2001). The 20-foot thickness also was used to produce the *Preliminary Map of Aquifer Sensitivity to Contamination, Kane County, Illinois* (Dey et al. 2004).

Following the descriptions of Curry and Seaber (1990), Vaiden and Curry (1990) mapped four Quaternary aquifers that had the potential to be developed as public water supplies in Kane County:

1. The St. Charles Aquifer located in the St. Charles Bedrock Valley and its tributaries in eastern and southern Kane County. The St. Charles Aquifer is composed of sands and gravels of the Ashmore Tongue of the Henry Formation and Glasford Formation.
2. The Valparaiso Aquifer, located in northeast Kane County immediately below the ground surface. The Valparaiso Aquifer is composed of the surficial sand and gravel of the Henry Formation, the Beverly Tongue of the Henry Formation, and the Haeger Member of the Lemont Formation. Although Curry and Seaber (1990) included the Haeger diamicton in their definition of this aquifer, it is omitted on this preliminary map because too much uncertainty exists concerning the hydraulic properties of the diamicton.
3. The Bloomington Aquifer, located west of Marengo Ridge in northwestern Kane County. The Bloomington Aquifer consists of surficial sand and gravel of the Henry Formation and the Ashmore Tongue of the Henry Formation.
4. The Kaneville Aquifer (a member of the Elburn Aquiformation) is located discontinuously across Kane County. The Kaneville Aquifer is composed of surficial sands and gravels of the Henry Formation and sand and gravel deposits associated with the Batestown and Yorkville Till members of the Lemont Formation.

Methodology

The *Preliminary Map of Major Quaternary Aquifers, Kane County, Illinois* was constructed by compiling appropriate individual isopach (thickness) maps for each of the major sand and gravel units in the county. For example, the St. Charles Aquifer was delineated by combining isopach maps of the sands and gravels of Ashmore Tongue of the Henry Formation and sand and gravel deposits of the Glasford Formation. The combined thicknesses were superimposed on the bedrock topography map. The St. Charles Aquifer was identified as the thick sands in the vicinity of the St. Charles Bedrock Valley and its tributaries the Elburn and Montgomery Bedrock Valleys as well as the unnamed bedrock valley entering western Kane County near Maple Park. The crosshatching indicates probable areas of the occurrence of the aquifer, based on the geometry of the bedrock valleys but unsubstantiated by boring records.

Other potential aquifers were identified that were composed of the same sand and gravel units as the St. Charles Aquifer. These potential aquifers are not associated with the St. Charles Bedrock Valley or its tributary valleys and are identified as unnamed aquifers on the map.

The Valparaiso Aquifer was similarly delineated using isopachs of the sands and gravels defining it. The thickness is conservative since the overlying Haeger diamicton may have aquifer-like hydraulic properties. Also, other major sand and gravel units are present within the aquifer's boundaries. Forthcoming three-dimensional geologic modeling and groundwater flow modeling should clarify the interconnectivity of these units and the applicability of the Haeger diamicton as an aquifer.

In the eastern portion of the Bloomington Aquifer, the surficial sand and gravel of the Henry Formation is separated from sands and gravels of the Ashmore Tongue by more than 100 feet of Tiskilwa diamicton. In the west, the Tiskilwa diamicton is absent, and the sands and gravels form a single unit. The entire area is underlain by greater than 20 feet of sand and gravel of the Glasford Formation but is usually separated from the Bloomington Aquifer by greater than 20 feet of diamictons of the Glasford Formation. Where the aquifer extends into DeKalb County, the lower Glasford sands may be hydraulically connected to the Bloomington Aquifer. As with the Valparaiso Aquifer, ongoing investigations on this project should clarify any connection between these aquifers.

The Kaneville Aquifer is depicted where the sand and gravels defining it have a combined thickness of more than 20 feet and an area greater than 1 square mile. Three-dimensional modeling will assess where the Kaneville Aquifer has significant hydraulic interaction with the St. Charles Aquifer and other underlying aquifers. Initial estimates of these areas are indicated on the map as dark gray areas. The areas indicated are where the fine-textured units separating the St. Charles and Kaneville Aquifers are less than 3 feet thick or absent.

Application

This map is useful for county-scale planning. Three-dimensional geologic modeling and groundwater flow modeling will undoubtedly change the delineation and possibly the definition of the specific aquifers shown on the map. Groundwater modeling should provide estimates of sustainable yield from these aquifers. This map should not be used as a substitute for site-specific work. A revised version of this map is scheduled to be published in April 2005.

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Reference citation:

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Disclaimer:

Geology based on field work by authors.

Digital cartography by A. Davis, Illinois State Geological Survey

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Base map compiled from the United States Geological Survey 1:100,000-Scale Digital Line Graph Data North American Datum 1983. Transverse Mercator Projection.

This Illinois Preliminary Geologic Map (IPGM) is a lightly edited product, subject to less than the IGQ (Illinois Geologic Quadrangle) mapping products. A final product is due to be published in April 2007.

The Illinois State Geological Survey, the Illinois Department of Natural Resources, and the State of Illinois make no guarantee, expressed or implied, regarding the correctness of the interpretations presented in this document and accept no liability for the consequences of decisions made by others on the basis of the information presented here. The geologic interpretations are based on data that may vary with respect to accuracy of geographic location, the type and quantity of data available at each location, and the scientific/technical qualifications of the data sources. Maps or cross sections in this document are not meant to be enlarged.

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Figure 60

Influence of Impervious Cover on the Hydrologic Cycle

As precipitation falls, it is captured by plant leaves, infiltrates into the soil, quenches plant roots, and replenishes base flows to streams and rivers. Urban pollutants are filtered and groundwater reservoirs are recharged. Development creates impervious surfaces, such as roads, parking lots, and buildings. Impervious surfaces refer to land cover, both natural and human-made, that cannot be penetrated by water. As impervious surface area increases, precipitation is not allowed to infiltrate naturally into the soil, causing rapid surface runoff. During rains, stormwater quickly runs from impervious surfaces to storm drains and often directly into our streams and rivers. Pollutants that have accumulated on roads, driveways and urban lawns are directed into our streams and rivers. Impervious surface coverage as low as 10% can destabilize a stream channel, raise water temperature, and reduce water quality and biodiversity (EPA). Fortunately, there are many ways to minimize the damage caused by mass grading, paving, and construction.

Source: Environmental Protection Agency.

Figure 61

Kane County Projected Water Withdrawals

Compared to Population and Per Capita Usage 2010-2030

Year	Population	Total Water Withdrawals All Uses	Gallons Per Capita Per Day Water Withdrawals All Uses
1980	278,000	37.5 mgd	134.89
1990	317,000	44.5 mgd	140.38
2000	404,000	61.0 mgd	150.99
2002	443,000	67.0 mgd	151.24
2010	466,000	73.5 mgd	157.81
2020	550,000	91.1 mgd	165.71
2030	692,000	120.1 mgd	173.60

High Capacity (----->10,000 gdp)

Municipal, Industrial and Irrigation Wells

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Figure 62

Water Resource Protection Guidelines

Groundwater:

- Proper handling and disposal of chemicals and fertilizers
- Proper installation and maintenance of private sewage disposal facilities
- Lining of landfills and proper treatment of the leachate
- Sealing of abandoned wells
- Use of water conservation plumbing fixtures and repair of plumbing leaks
- Use of native plants and plants that require little or no water

Surface Water:

- Soil erosion and sediment control on construction sites
- Conservation tillage and proper application of chemicals and fertilizers for agriculture production
- Water quality standards and Best Management Practices for new site development
- River, stream, and wetland buffer strips

Both:

- Reduce air pollution from fossil fuels that create acid rain
- Reuse and recycle wastewater
- Wetland protection and recreation
- Appropriate planning and management of wastewater discharges from new development

Figure 63—Fox River & Kish River Tributaries in Kane Co. Map

FOX RIVER and KISHWAUKEE RIVER TRIBUTARIES in KANE COUNTY

and their Biological Stream Characterization

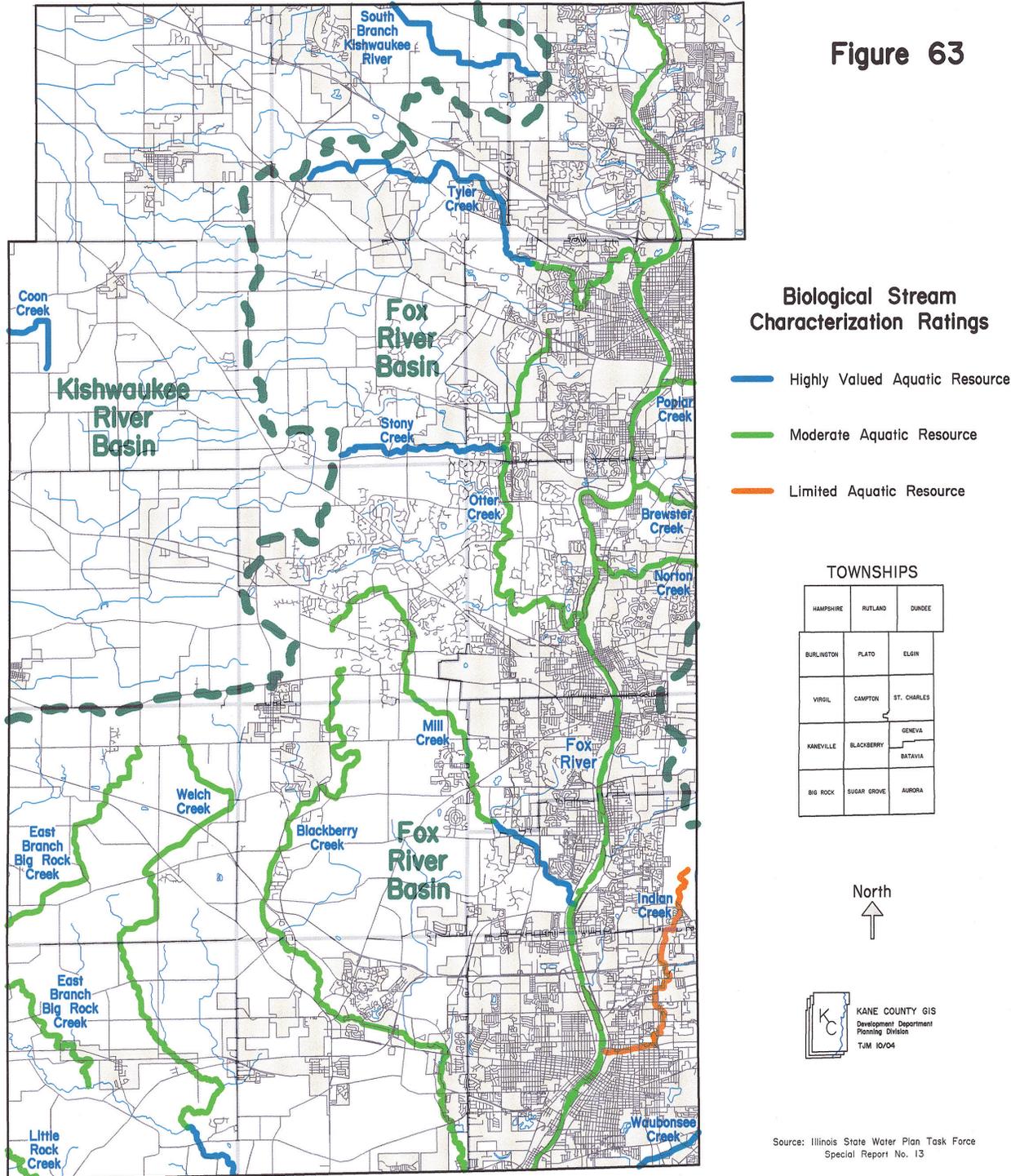


Figure 63

Source: Illinois State Water Plan Task Force
Special Report No. 13

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Figure 64

Ecological Functions of Wetlands

- Protect the quality of surface waters by slowing the erosive forces of moving water.
- Reduce flood peaks by providing a natural means of flood control, pollution filtering, and storm damage protection, thereby protecting against the loss of life and property.
- Improve water quality by intercepting and reducing water-borne sediments, excess nutrients, heavy metals, and other pollutants.
- Provide food and shelter, breeding, spawning, nesting, and wintering habitats for fish and wildlife, including migratory birds and commercially and recreationally important species.
- Provide habitat protection for many threatened and endangered species of plants and animals.

Figure 65

Extended Aeration Wastewater Recycling and Reuse Facility

An extended aeration wastewater recycling facility with land application treats wastewater as a recyclable resource rather than a disposable commodity. Extended aeration lagoons treat and store effluent. Treated wastewater is sprayed over a large area, such as a farm field, golf course, pasture, or other open space. Vegetation absorbs nitrogen and phosphorus as the water percolates through the soil. Instead of being treated and discharged to surface water where they are non-beneficial, these essential nutrients are recycled for plant growth, especially applicable to irrigation of agricultural fields, golf courses, landscaped areas, etc. While many conventional wastewater treatment plants struggle to meet federal standards, land application eliminates point source discharge to surface waters, and produces effluent that meets regulatory standards. Land application systems, through the elimination of point source discharges, help maintain and improve the quality of Kane County's major water resources, as well as provide opportunities to meet the objectives of the countywide open space system.

Figure 66

Watershed and Biodiversity Protection

Encourage local citizens to offer ideas for habitat preservation and restoration in community visioning exercises.

Identify lands with high habitat value and lands with good restoration potential and designate them as natural resource preserves in comprehensive plans and watershed plans.

Designate stream corridors, swales and hydric-soil networks as open-space links in watershed and comprehensive plans.

Adopt zoning ordinances that require developers to protect and restore natural resources, to provide buffers for wetlands and streams, to minimize impervious surfaces and to cluster home sites. Adopt subdivision regulations that require:

- inventory of natural habitats, designation of hydric soils, and location of underground tiles at the sketch-plan stage;
- design of detention areas to achieve or approach zero discharge for two-year storms;
- preservation of habitats and hydric soil systems; and
- buffers for wetlands, streams, and drainage corridors.

Creatively design annexation and development agreements to protect and restore natural resources to the highest possible degree, including immediate identification and protection of major resources and a process for identification and protection of other resources in later stages.

Adopt intergovernmental agreements between or among neighboring communities to coordinate protection and restoration of natural resources and of hydrology.

Source: Biodiversity Recovery Plan, Chicago Wilderness, 1999.

Figure 67—Preliminary Map of Aquifer Sensitivity to Contamination Map

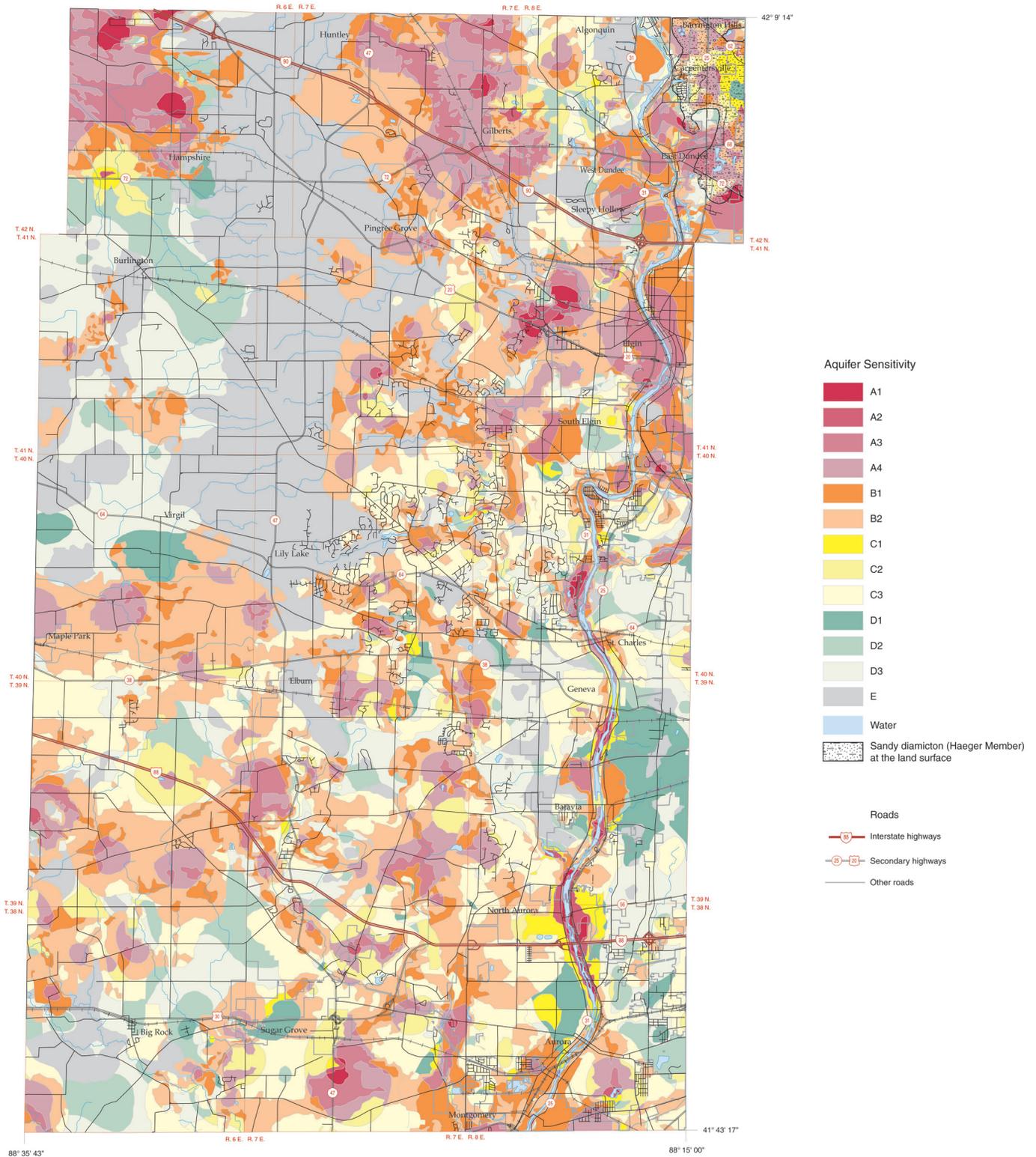


Figure 67 *continued*

Aquifer Sensitivity Map

This map was produced as a part of *Kane County Water Resources Investigations: Interim Report on Geologic Investigations* (Dey et al. 2004) as part of a contract report for the *Water-Resources Investigations for Kane County, Illinois* (Meyer et al. 2002). This map depicts relative potential for aquifers to become contaminated from sources at or near the ground surface. The method for classifying aquifer sensitivity used in this map is based upon work by Berg (2001). Aquifers are defined as geologic materials that are saturated and sufficiently permeable to yield economic quantities of water to wells or springs (Fetter 1994). In Kane County, shallow aquifers are generally composed of unlithified, well-sorted sand and gravel deposits or bedrock units of fractured carbonates. For this map, sand and gravel deposits were defined as an aquifer where the units were greater than 5 feet thick and extended over at least one square mile. Carbonate bedrock of Silurian age was defined as an aquifer where it was the uppermost bedrock unit and greater than 15 feet thick. The Silurian rock tends to be heavily fractured at its surface (Graese et al. 1988). Geologic materials that would be classified as an aquifer, but which above the water table (and therefore not saturated), were grouped with aquifers in the interpretation for this map. Glacial diamicton (an unsorted mixture of gravel, sand, silt, and clay—commonly called till), windblown silt (loess), peat, silty and clayey river and lake sediment, shale, and unfractured carbonate bedrock are not considered aquifers because they are generally fine grained and have limited potential to yield water to a well. This map was produced by combining isopach (thickness) maps of aquifers with maps that indicate the depth to the aquifer's uppermost surface.

Aquifer Sensitivity Map Units

The aquifer sensitivity classification rates sequences from Map Unit A to Map Unit E according to decreasing sensitivity to aquifer contamination (Berg 2001).

Map Unit A: High Potential for Aquifer Contamination

- Map Unit A** is defined as areas with sand and gravel or high-permeability bedrock aquifers greater than 20 feet thick and where the upper surface of the aquifer is within 20 feet below the land surface.
- Map Unit A1** Areas where aquifers are greater than 50 feet thick and are within 5 feet below the land surface.
- Map Unit A2** Areas where aquifers are greater than 50 feet thick and are between 5 and 20 feet below the land surface.
- Map Unit A3** Areas where aquifers are between 20 and 50 feet thick and are within 5 feet below the land surface.
- Map Unit A4** Areas where aquifers are between 20 and 50 feet thick and are between 5 and 20 feet below the land surface.

Map Unit B: Moderately High Potential for Aquifer Contamination

- Map Unit B** is defined as areas where aquifers are less than 20 feet thick and its upper surface is within 20 feet below the land surface.
- Map Unit B1** Areas where sand and gravel aquifers are between 5 and 20 feet thick or high-permeability bedrock aquifers are between 15 and 20 feet thick and either aquifer type is within 5 feet below the land surface.
- Map Unit B2** Areas where sand and gravel aquifers are between 5 and 20 feet thick or high-permeability bedrock aquifers are between 15 and 20 feet thick and either aquifer type is between 5 and 20 feet below the land surface.

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Map Unit C: Moderate Potential for Aquifer Contamination

Map Unit C is defined as areas where the upper surfaces of sand and gravel or high-permeability bedrock aquifers are between 20 and 50 feet below the land surface and the overlying material is fine grained.

Map Unit C1 Areas where aquifers are greater than 50 feet thick and are between 20 and 50 feet below the land surface.

Map Unit C2 Areas where aquifers are between 20 and 50 feet thick and are between 20 and 50 feet below the land surface.

Map Unit C3 Areas where sand and gravel aquifers are between 5 and 20 feet thick or high-permeability bedrock aquifers are between 15 and 20 feet thick and either aquifer type is between 20 and 50 feet below the land surface.

Map Unit D: Moderately Low Potential for Aquifer Contamination

Map Unit D is defined as areas where the upper surfaces of sand and gravel or high-permeability bedrock aquifers are between 50 and 100 feet below the land surface and the overlying material is fine grained.

Map Unit D1 Areas where aquifers are greater than 50 feet thick and are between 50 and 100 feet below the land surface.

Map Unit D2 Areas where aquifers are between 20 and 50 feet thick and are between 50 and 100 feet below the land surface.

Map Unit D3 Areas where sand and gravel aquifers are between 5 and 20 feet thick or high-permeability bedrock aquifers are between 15 and 20 feet thick and either aquifer type is between 50 and 100 feet below the land surface

Map Unit E: Low Potential for Aquifer Contamination

Map Unit E is defined as areas where no sand and gravel or high-permeability bedrock aquifer is within 100 feet below the land surface and the overlying material is fine grained.

Overprint Pattern: Sandy Diamicton (Haeger) at Land Surface

The overprint pattern indicates where the Haeger diamicton is at the land surface.

Diamicton of the Haeger Member of the Lemont Formation is a sandy loam and contains abundant, discontinuous lenses of sand and gravel. This diamicton's presence over an aquifer does not offer the same potential protection from contamination as an equal thickness of finer-grained diamicton. Areas with the pattern have higher sensitivity to contamination than areas without the pattern.

Applications

This map is intended to be used for county-scale planning and is based on generalized textural properties and assumptions about hydraulic characteristics of geologic materials and hydraulic gradients, but is not based on results from water quality or groundwater flow analysis. This map should not be used as a substitute for evaluation of individual sites. A revised edition of this map is scheduled to be published in 2007.

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PLANNING ISSUES—WATER RESOURCES

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Figure 68

Lawn Care—Water Conservation Methods

Simple water conservation and lawn maintenance techniques can greatly reduce the amount of water wasted through evaporation and surface runoff.

■ **Set mower blades high**

Maintaining grass at a 2.5- to 3-inch height helps grass and soil to retain moisture, helps grass grow deeper root systems, and minimizes weed growth.

■ **During droughts, if you have a well-established healthy lawn, let it go dormant**

Lawns naturally turn brown and become dormant to survive heat and dry spells. Your lawn will survive a drought period and will recover once rain and cooler weather return.

■ **Leave grass clipping on lawn**

Grass clippings replenish moisture and add nutrients, such as nitrogen, to the soil.

■ **Replace portions of your lawn with native plants.**

Once established, native plants grown long root systems, becoming self-sufficient.

■ **Consider a water-conserving turf grass.**

If you choose to water your lawn, use wise watering practices:

■ **Limit watering to the early morning or evening.**

Watering in the early morning or evening, during the coolest part of the day, will allow nearly all of the water you use to be effective. Watering between 10 p.m. and 8 a.m. can reduce evaporation loss by 15 to 20%.

■ **Don't water during hot or windy times of the day.**

■ **Keep your spray pattern coarse, low and slow.**

■ **It's more beneficial to water once a week for a longer period of time, than more frequently.**

This trains the grass roots to grow deeper in the soil, which is healthy for the lawn. Plants that are used to infrequent watering will grow deeper roots and get along with less water than plants that continually receive water.