BLACKBERRY CREEK WATERSHED MANAGEMENT PLAN

Volume I: Management Plan

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MISSION STATEMENT

The mission of the Blackberry Creek Watershed Resource Planning Committee is to develop and encourage the funding and implementation of a long-range plan among land owners, governmental entities, and other appropriate groups which will enhance, manage, and protect the human, ecological, and socioeconomic resources within the Blackberry Creek Watershed area.

The plan will promote the Safety of human inhabitants, stormwater management, surface and groundwater quality, aesthetic values, wildlife protection, and reduction in flood damages.

BLACKBERRY CREEK WATERSHED MANAGEMENT PLAN

EXECUTIVE SUMMARY

Introduction

In July 1996, many areas of Northeastern Illinois experienced extremely heavy rainfall causing significant flood damages in Kane, Kendall, DuPage, Will, and Cook Counties. The heaviest recorded rainfall occurred in Aurora where 16.91 inches of rainfall were reported in less than a 24-hour period. One of the hardest hit watersheds in the region was Blackberry Creek. Although a largely agricultural watershed, residential flood damages alone totaled nearly $14 million. The damages occurred as a result of 235 homes experiencing first floor flooding and many more with basement flooding.

Flood concerns highlighted by the July 1996 event along with increasing concern regarding the impacts of urbanization on watershed resources and drainage problems prompted formation of the Blackberry Creek Watershed Committee. The committee is a consortium of representatives from municipal and county governments, environmental and agricultural organizations, and private landowners all with a shared interest in protecting and improving conditions in the Blackberry Creek watershed.

The Blackberry Creek Watershed Committee, in cooperation with the Kane-DuPage Soil and Water Conservation District and the USDA Natural Resource Conservation Service, prepared a watershed management plan. The plan was prepared with assistance from numerous federal, state, regional, and county agencies. The purpose of the plan was to define the existing and future needs of the watershed, to identify a set of actions or recommendations to address those needs, and to encourage joint public and private action to implement the recommendations.

Watershed Description

Blackberry Creek is a 32-mile long stream originating north of Elburn in central Kane County and draining to the Fox River near Yorkville in Kendall County. The 73 square mile watershed is located in south central Kane County and North Central Kendall County. There are four significant tributaries to Blackberry Creek including East Run, Lake Run, and two unnamed tributaries. The watershed includes incorporated areas of Elburn, Sugar Grove, North Aurora, Aurora, Montgomery, and Yorkville as well as unincorporated areas of Kane and Kendall Counties.

The watershed is largely rural in nature with 71% agricultural and 16% urban land uses. By 2005, the land area covered by urban uses is expected to nearly double to 27%. However, the watershed is expected to remain mostly agricultural for the foreseeable future.

Goals

Based on concerns and issues identified by the Watershed Committee, the following goals were prepared.

1. Reduce Existing Flooding Problems.
2. Improve Water Quality and Stream and Wetland Resources.
3. Avoid Negative Impacts of New Development on Flooding and Watershed Resources.
4. Establish a Watershed Framework for Implementing the Blackberry Creek Goals and Objectives.

Watershed Assessments

Technical teams were assembled to inventory existing and projected future watershed conditions. The teams found that there are significant flooding problems in the watershed but the problems are generally limited to a few specific subdivisions. The flood damages as well as the potential for loss of life in these subdivisions is high.

Wetlands occupy approximately 3.5% of the land area in the watershed. Many of the wetlands are high quality based on biological conditions. At the same time most of the watershed wetlands provide flood storage and help cleanse stormwater runoff. Many help to reduce stream streambank erosion through direct stabilization of the banks as well as moderation of flow rates.

Blackberry Creek is reported by the Illinois EPA to be fully supporting its designated uses, overall. However, sampling of fish populations suggests degraded conditions in portions of the watershed due to past channelization, streambank erosion, and lack of physical habitat. Higher quality fish populations are generally found in Kendall County where Blackberry Creek is classified as a "B" stream (highly valued aquatic resource). In Kane County, Blackberry Creek is classified as a "C" stream (moderate aquatic resource).

Soil erosion was identified as being significant (approximately 3.9 tons/acre/year) and the majority of the eroded sediment is from upland sources rather than from streambank erosion. Most of the sediment produced by the watershed is accumulating within Blackberry Creek and its tributaries.

Approximately 15.9% of the watershed is covered by urban land uses. By the year 2020, both watershed population and employment are expected to double. This suggests that the area covered by urban land uses and impervious surfaces is also likely to double. Without adequate stormwater controls and natural resource protection measures, this could lead to substantial increases in flooding, further degradation of stream quality, and reduced water quality.

Watershed Protection and Enhancement Recommendations

Based on the watershed findings, 40 recommendations were developed. The recommendations fell into the following categories.

> **General:** The six general recommendations are intended to support the remaining 36 recommendations. The key recommendations in this section include preparation of a watershed hydraulic model, preparation of watershed-wide topographic mapping, and development of countywide stormwater programs in Kane and Kendall Counties. The watershed modeling is needed to evaluate flood remediation projects and update floodplain mapping. The countywide programs would provide an ongoing framework for implementing the recommendations of the plan.
>
> **Remediation/Restoration**: There are 16 recommendations to address existing watershed problems. Recommendations are included for stream and wetland restoration to improve the physical conditions of existing resources, best management practices to reduce the impacts of existing agricultural and urban runoff, and flood mitigation to reduce the health, safety, and economic impacts of flooding without sacrificing the environmental qualities of the watershed.
>
> **Prevention:** There are 11 recommendations intended to prevent potential problems associated with future development in the watershed. The recommendations include preparation of development ordinances and other regulatory tools and acquisition of high quality and restorable wetlands.
>
> **Maintenance/Ongoing:** There are seven recommendations for ongoing activities. These activities include maintenance and management of natural streams and wetlands, maintenance of constructed stormwater management facilities, and programs to reduce pollution at the source.

For each of the recommendations, specific actions for municipalities and counties, park and forest preserve districts, county stormwater committees, and resource agencies are identified. Potential funding sources are also identified for each of the recommendations.

TABLE OF CONTENTS
Volume I: Management Plan

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICIES

Volume II: Technical Committee Reports
printed under separate cover

SECTION I - INTRODUCTION

INTRODUCTION

In July 1996, many areas of the northeastern Illinois region experienced extremely heavy rainfall causing significant flood damages in southern Kane, Kendall, DuPage and Cook Counties and northern Will County. The heaviest recorded rainfall occurred in Aurora where 16.91 inches of rain were reported in less than 24 hours. Nationally, this was the second highest measured rainfall in history outside of hurricane zones. One of the hardest hit watersheds in the region was Blackberry Creek. Although a largely agricultural watershed, residential flood damages alone totaled nearly $14 million. The damages occurred as a result of 235 homes with flooding on their first floor and many more with basement flooding.

In February 1997 another storm event occurred which flooded 12 homes. While the rainfall was not exceptionally high (approximately 4 inches), the rain fell on snow covered and saturated and/or frozen ground producing very high flows in Blackberry Creek. Flooding through subdivisions was averted by strategic sand bagging efforts.

The recent flooding along with increasing concern regarding the impacts of urbanization on watershed resources and drainage problems prompted formation of the Blackberry Creek Watershed Committee. This committee is a consortium of representatives from municipal and county governments, environmental and agricultural organizations, and private landowners all with a shared interest in protecting and improving conditions of the Blackberry Creek watershed.

This document is a management plan for the Blackberry Creek watershed. The purpose of this plan is to define the existing and future needs of the watershed, to identify a set of actions or recommendations to address those needs, and to encourage joint public and private action to implement those recommendations.

WATERSHED DESCRIPTION

Blackberry Creek is a 32-mile long stream originating north of Elburn in central Kane County and draining to the Fox River near Yorkville in Kendall County. The 73 square mile watershed is located in south central Kane County and North Central Kendall County. There are four significant tributaries to Blackberry Creek including East Run, Lake Run, and two unnamed tributaries. The watershed includes incorporated areas of Elburn, Sugar Grove, North Aurora, Aurora, Montgomery, and Yorkville as well as unincorporated areas of Kane and Kendall Counties.

The watershed is largely rural in nature with only 15.9 % urban land uses (NIPC 1994) and less than 0.5 people per acre. By 2005, the land area covered by urban uses is expected to nearly double to 27% (USDA, 1989). However, the watershed is expected to remain mostly agricultural for the foreseeable future. Existing and future land uses are discussed in greater detail in Section III.

The soils over the majority of the watershed are typical of Kane and Kendall Counties outside of the Fox River Valley. The soils are generally moderately permeable. Along the creek between Elburn and Sugar Grove and in Aurora and Montgomery, the subsoils are moderately to rapidly permeable. Wetlands in the Blackberry Creek watershed are generally concentrated along the Creek and its tributaries. However, several large wetlands and numerous small ones also occur outside the floodplain.

WATERSHED PLANNING COMMITTEE AND WATERSHED PLANNING PROCESS

At the request of State Representatives whose districts lie within the Blackberry Creek watershed, the Kane-DuPage Soil and Water Conservation District (SWCD) and the Natural Resources Conservation Service (NRCS) assembled the Blackberry Creek Watershed Committee to identify concerns and prepare a plan for the watershed. Using the protocols outlined in the NRCS National Planning Procedures Handbook, NRCS led the Watershed Committee through a nominal group process to identify the most significant concerns of the committee. Although nearly 50 individual concerns were expressed, the group consolidated and prioritized the concerns to a list of eight highest priority issues. For each of the issues, lists of what was known and desired future conditions were prepared. The eight resource concerns along with descriptions of the desired future conditions are included in Appendix C.

The committee and NRCS then convened technical teams to advise and assist the watershed committee in collecting relevant data on each of the issues and developing recommendations to achieve the desired future conditions. The six technical teams worked essentially independently but reported back to a group of technical team leaders for coordination and feedback. Upon completion of their effort, the technical teams presented their findings and recommendations to the Watershed Committee.

The Watershed Committee, with assistance from the Northeastern Illinois Planning Commission, evaluated the recommendations and consolidated them into a comprehensive package of actions as outlined in this plan.

ORGANIZATION OF THE PLAN

The plan is organized into two volumes. Volume I is the Management Plan for the Blackberry Creek watershed. The management plan follows a standard watershed planning outline as described below.

- **Introduction:** The introduction provides an overview of the watershed and planning process.
- **Watershed Concerns and Goals and Objectives:** This section describes in detail the watershed concerns of the Committee and the goals and objectives for the watershed
- **Watershed Conditions and Assessments:** This section describes the analyses and findings of the technical team. Included in this section are descriptions of existing watershed conditions and analyses regarding the causes of those problems.

- **Watershed Protection and Enhancement Recommendations:** This section presents the recommendations of the technical teams and Watershed Committee to address the watershed concerns. To facilitate implementation of this plan, actions for each of the plan implementors, potential funding sources, and the priority level assigned by the watershed Committee are provided for each of the recommendations.

Volume I also includes a number of appendices. In addition to those noted in the plan, Appendix A is Glossary of Terms and Appendix B is a list of acronyms. The glossary provides descriptions of technical terms that are used in the report. Although first usage of all acronyms in the plan are spelled out, the list of acronyms is provided as a quick reference.

Volume II of the plan (printed under separate cover) is a reprint of the technical committee reports as they were submitted to the Watershed Committee. The technical committee reports present the analyses and inventories performed in support of this plan and its recommendations.

SECTION II - WATERSHED CONCERNS AND GOALS AND OBJECTIVES

MISSION STATEMENT

The mission of the Blackberry Creek Watershed Resource Planning Committee is to develop and encourage the funding and implementation of a long-range plan among land owners, governmental entities, and other appropriate groups which will enhance, manage, and protect the human, ecological, and socioeconomic resources within the Blackberry Creek Watershed area.

The plan will promote the safety of human inhabitants, stormwater management, surface and groundwater quality, aesthetic values, wildlife protection, and reduction in flood damages.

RESOURCE CONCERNS

As discussed in the previous section, NRCS assisted the Watershed Committee through a nominal group process to identify the most significant concerns of the committee. The list of almost 50 concerns along with their ranking are included as Appendix A. For convenience and clarity, the concerns have been organized and paraphrased as shown below.

- **Existing Watershed Conditions:** These concerns are related to the existing watershed conditions.
  - **Flood Damages:** Of the approximately 20,000 residents of the Blackberry Creek watershed, over 2000, live in floodprone neighborhoods. Flood damages during the July 1996 event exceeded 14 million dollars and 235 homes experienced flooding and in many ways this was the issue that brought the members of the Watershed Committee together. A technical team was formed to address the issue of flood damages and life threatening flood risk in the five most affected subdivisions. This issue was expressed both as a concern for specific flood problem areas and as a concern for existing development without stormwater controls. The Committee would like existing flooding to be significantly reduced and the safety of residents improved.
  - **Number and Quality of Wetlands:** Wetlands provide a number of watershed benefits including retention of floodwaters, filtration of runoff pollutants, stabilization of streambanks and shorelines, and unique habitat for a variety of plants and animals. The Committee indicated a need for more data on the number and quality of wetlands in the watershed and a need to increase wetland resources.
  - **Stream Conditions:** Even with relatively high water quality, aquatic and riparian habitat associated with the stream can be low as indicated by the aquatic life that is present in the stream. Reduced stream quality can result from channelization which reduces stream diversity, streambank erosion and accompanying siltation which buries natural stream substrates, and low water quality. The Committee indicated a need for more information on the impacts of past stream channelization and on appropriate techniques for managing and restoring the stream to more natural conditions.

- **Water Quality:** Water Quality in streams can be degraded from a number of sources including agricultural runoff, urban runoff, wastewater treatment plant discharges, and streambank erosion. The Committee expressed a desire to assess the water quality of Blackberry Creek and to address existing sources of water quality impairment.

- **Potential Impacts of Future Development:** These concerns are related to potential impacts that may result from future watershed development. While the primary concern was over negative impacts of development, with proper planning, incentives, and design, opportunities may exist to restore certain watershed conditions during the development process.
  - **Flooding:** Replacing pervious prairies, woodlands, and even agricultural fields with impervious roofs, streets, and parking lots increases both the volume and rate of runoff. The Committee expressed a strong desire to identify and implement appropriate stormwater management policies and standards to minimize the impacts of development on existing and potential future flooding problems.
  - **Water Quality:** Pollutants such as sediments, metals, hydrocarbons, and nutrients that accumulate on urban surfaces are readily washed off into streams and wetlands. Accumulated sediments bury natural stream substrates impairing feeding and reproduction of many fish species. Excessive nutrients lead to algae and other undesirable aquatic weeds and eutrophication of lakes. Metals and hydrocarbons accumulate in fish tissue, which can impair reproduction, cause deformities, and lead to potential human health risks. As with flooding, the Committee expressed a strong desire to develop appropriate stormwater standards to address the water quality impacts of development.
  - **Stream and Wetland Quality:** Streams and wetlands are sensitive to the higher high flows and lower low flows associated with increases in watershed imperviousness. This increased "flashiness" of streamflows leads to streambank erosion, scouring of natural substrates, and loss of baseflows in headwater streams during dry summer months. In addition to the runoff impacts of development, onsite streams and wetlands are often modified to accommodate site design. Instead of modifying the natural resources of the site to accommodate the development, the layout of the site can often be modified to protect and even restore onsite wetlands and streams.
  - **Open Space:** A sense of open space can often be lost as a watershed develops. Even with larger lots, the watershed "feels" developed, as larger tracts of agricultural and undeveloped land are subdivided. The committee expressed a desire to integrate open space benefits with measures to address flooding and stream and wetland quality.

- **Watershed Level Coordination:** These concerns are related to the need for greater watershed wide coordination.
  - **Conflicting Regulations:** There are two counties and seven municipalities that are at least partially within the Blackberry Creek watershed. Consistent standards for stream, wetland, and floodplain protection as well as stormwater management will provide a higher level of protection for Blackberry Creek and its water resources. The Watershed Committee expressed a desire for watershed wide coordination of standards.
  - **Stormwater Maintenance:** The Committee expressed concern over the current level of maintenance for stormwater facilities and suggested a need to coordinate maintenance activities watershed wide.

- **Regionalization of Detention:** Within existing developed areas and on small development sites, detention can be difficult to accommodate. Often times many small detention basins can be combined into larger regional facilities. The Committee expressed a need for greater coordination of detention siting.
- **Wetland Banking:** Federal wetland regulations require mitigation of all wetland disturbances over one third acre. In some cases it may be beneficial to combine mitigation of very small wetlands into larger wetland mitigation sites. Wetland banks can facilitate combining small mitigation projects as well as produce opportunities to restore highly degraded wetlands and place large, high quality wetlands under public ownership and management.

GOALS AND OBJECTIVES

Based on the concerns and issues identified by the Watershed Committee, the watershed assessments described in Section II, and the desired future conditions of the Committee, the following Goals and Objectives were prepared. Recommendations to achieve these Goals and Objectives are provided in Section IV.

Goal 1: Reduce Existing Flooding Problems
- **Objective 1:** Mitigate Existing Flood Damages and Life Threatening Risks
- **Objective 2:** Address Existing Developed areas with Inadequate Stormwater Controls
- **Objective 3:** Achieve Flood Control Benefits through Strategic Acquisition and Management of Natural Storage Areas
- **Objective 4:** Establish Emergency Evacuation Plans and Flood Warning Systems

Goal 2: Improve Water Quality and Stream and Wetland Resources
- **Objective 1:** Restore Aquatic and Wildlife Habitat through Management and Restoration of Stream Channels and Corridors such that Blackberry Creek achieves a "B" rating under the Illinois Department of Natural Resources (IDNR) Biological Stream Characterization
- **Objective 2:** Improve Water Quality and Aquatic Habitat through Management and Restoration of Wetlands and Wetland Buffers
- **Objective 4:** Address Existing Development with Inadequate Stormwater Controls to Reduce Urban Runoff Impacts
- **Objective 4:** Retrofit Existing Stormwater Facilities to Improve Water Quality
- **Objective 5:** Reduce Agricultural Runoff Impacts
- **Objective 6:** Reduce Direct Stream Impacts due to Agricultural and Equestrian Activities
- **Objective 7:** Target Acquisition of High Quality Stream and Wetland Resources

Goal 3: Avoid Negative Impacts of New Development on Flooding and Watershed Resources
- **Objective 1:** Prevent Development in Floodprone Areas
- **Objective 2:** Protect Existing Floodplain and Depressional Storage
- **Objective 3:** Protect Stream and Wetland Resources from Unnecessary Modifications and Mitigate all Necessary Modifications and Impacts

Objective 4: Minimize Increases in Runoff Rates and Volumes Associated with New Development

Objective 5: Minimize Water Quality and Quantity Impacts of New Development Utilizing Natural Drainage Systems as Well as Structural Measures

Goal 4: Establish A Watershed Framework for Implementing Blackberry Creek Goals and Objectives

Objective 1: Identify and Implement Funding Strategies

Objective 2: Provide for Watershed Wide Coordination of Regulations

Objective 3: Develop Mechanisms and Standards for Regional Detention

Objective 4: Develop Mechanisms and Standards for Wetland Banking

Objective 5: Coordinate Recreational, Flood Control, and Habitat Benefits through Establishment of Greenways

Objective 6: Develop Educational Programs for Management of Private Stream and Wetland Resources

Objective 7: Develop Educational Programs to Address Water Quality Impacts of Upland Activities.

SECTION III – WATERSHED CONDITIONS AND ASSESSMENTS

INTRODUCTION

To address the goals and objectives of the Watershed Committee, the technical teams were tasked with performing a number of inventories, analyzing the data, and developing recommendations. This section presents the inventories and analyses.

Existing Data and Inventories

- **Flooding:** A number of studies to evaluate flood damages and flood mitigation alternatives have been performed by various agencies. The State of Illinois, Division of Waterways (now the Illinois Department of Natural Resources (IDNR), Office of Water Resources) conducted a study in 1962 to assess flood control alternatives for Blackberry Creek. The Corps of Engineers also performed an appraisal of flooding in 1984. The Natural Resources Conservation Service (NRCS) performed a floodplain management study in 1989 to quantify flood damages, evaluate flood control alternatives, and delineate floodplains.
- **Floodplains and Depressional Storage:** Floodplains were mapped as part of the NRCS study described above. No floodplain areas with less than one square mile of drainage area are mapped. Thirteen depressional storage sites were also identified in the study. Many of the depressional storage areas are within mapped floodplains but some are not. Kane County has the floodplain areas within the unincorporated Kane County in their Geographic Information System (GIS) database.
- **Wetlands:** A number of existing wetland inventories existed prior to this study including the National Wetland Inventory (NWI) and a NRCS database for agricultural wetlands. Kane County has the NWI wetlands database within their GIS system.
- **Threatened and Endangered Species:** IDNR has a record of sites known to be used by threatened and endangered species. There are approximately six sites in the Blackberry Creek watershed.
- **Illinois Natural Areas and Dedicated Nature Preserves:** INDR has an inventory of natural areas and dedicated nature preserves.
- **Soils:** U.S. Department of Agriculture (USDA) soils surveys exist for both Kane and Kendall Counties. Kane County has produced a map of hydric soils for Kane County.
- **Vegetation:** Kane County has a GIS map of the Kane County 1840 landscape from the Public Land Survey of Plats. This map shows general vegetative cover (prairie, woodland, and wetland). Natural Areas of Kane County were inventoried as described in *Wild Plants and Natural Areas of Kane County* (Young, 1994). This is a vegetation inventory of 47 sites covering approximately 2700 acres. There is no map associated with the inventory. The book also includes descriptions of each of the plants.
- **Stream Quality:** The IDNR performs biological surveys of streams throughout Illinois, including Blackberry Creek. IDNR has two sampling sites on Blackberry Creek, one at Bliss Woods Forest Preserve in Kane County and one in Kendall County. The northeastern Illinois Planning Commission performed an analysis relating stream quality to watershed population density for 40 streams throughout northeastern Illinois (Dreher, 1996).

- **Water Quality:** Illinois EPA has a fixed monitoring station on Blackberry Creek in Kendall County where both chemical and physical conditions are monitored (IEPA, 1996). The most recent published data is from 1995. Illinois EPA also reports that data exists from a site in the Bliss Woods Forest Preserve in Kane County (IEPA, 1996). However, this data is from 1982. IEPA also has water quality data for Lake Gregory and Jericho Lake.
- **Aquifers:** Kane County has a GIS map of aquifers with potential for public water supply for Kane County. Recharge areas of the Kaneville and St. Charles aquifers are within the Blackberry Creek watershed. The Illinois State Geological Survey (ISGS) has estimated aquifer sensitivity to agricultural chemical contamination and produced a map depicting ranges of sensitivity (Keefer, 1995).
- **Land Use and Population:** The Northeastern Illinois Planning Commission has a 1990 GIS land use and population inventory for all of northeastern Illinois but does not include Kendall County (NIPC, 1994). NIPC also has population and employment forecasts for 2020 for selected watersheds, including Blackberry Creek (NIPC, 1997). Kane County has a GIS inventory of land uses for unincorporated areas of Kane County. The IDNR has a 1990 GIS map of land cover for the entire state of Illinois, including the Blackberry Creek watershed. The map is from satellite imagery. Information on crop type and tillage practice is collected as part of the IDNR and SWCD "T by 2000" surveys.
- **Regulatory Standards:** A survey of Kane County municipalities and the County was performed for the Kane County Stormwater Management Planning Committee to determine regulatory standards related to stormwater drainage and detention, floodplain management, soil erosion and sediment control, and stream and wetland protection (Kane County Stormwater Management Planning Committee, 1998).
- **Topography:** Kane County has a 2-foot contour GIS topographic map for Kane County.
- **Cultural Resources:** An inventory of formally recorded archaeological sites is on file with the Illinois State Museum. Federal and state assistance requires that proposed land-disturbing activities take into consideration any effects on historic properties.

Inventories and Analyses Performed for This Study

- **Flooding:** An inventory and analysis of flooding in five subdivisions was performed. The inventory included estimated damages for the 1996 flood and expected average annual damages.
- **Erosion:** An estimate of the sources and quantities of erosion was performed. Evaluated sources included sheet and rill erosion, gully erosion, and streambank erosion. Estimates of the quantities of sediment generated and leaving the watershed were made.
- **Wetlands:** As part of this study, approximately 100 wetlands over 2 acres in size in the Blackberry Creek watershed were evaluated in detail.
- **Stream Quality:** As part of this study IDNR performed a biological survey of Blackberry Creek (Rung and Pescitelli, 1997). Fish and macroinvertebrates were sampled at seven stations in Kane and Kendall Counties and mussels were sampled at three locations.
- **Regulatory Standards:** The Kane County Stormwater Management Planning Committee survey was supplemented with information for Kendall County municipalities and Kendall County within the Blackberry Creek watershed.

WATERSHED CONDITIONS

The following is a discussion of current and projected future watershed conditions. The discussion is based on existing data and data that was collected as part of this study. The projected future conditions are based on current trends and ordinances. This planning process suggests that the municipalities and counties may be willing to modify current codes to avert some of the potential negative impacts that could occur without changes.

Land Use and Population

Existing

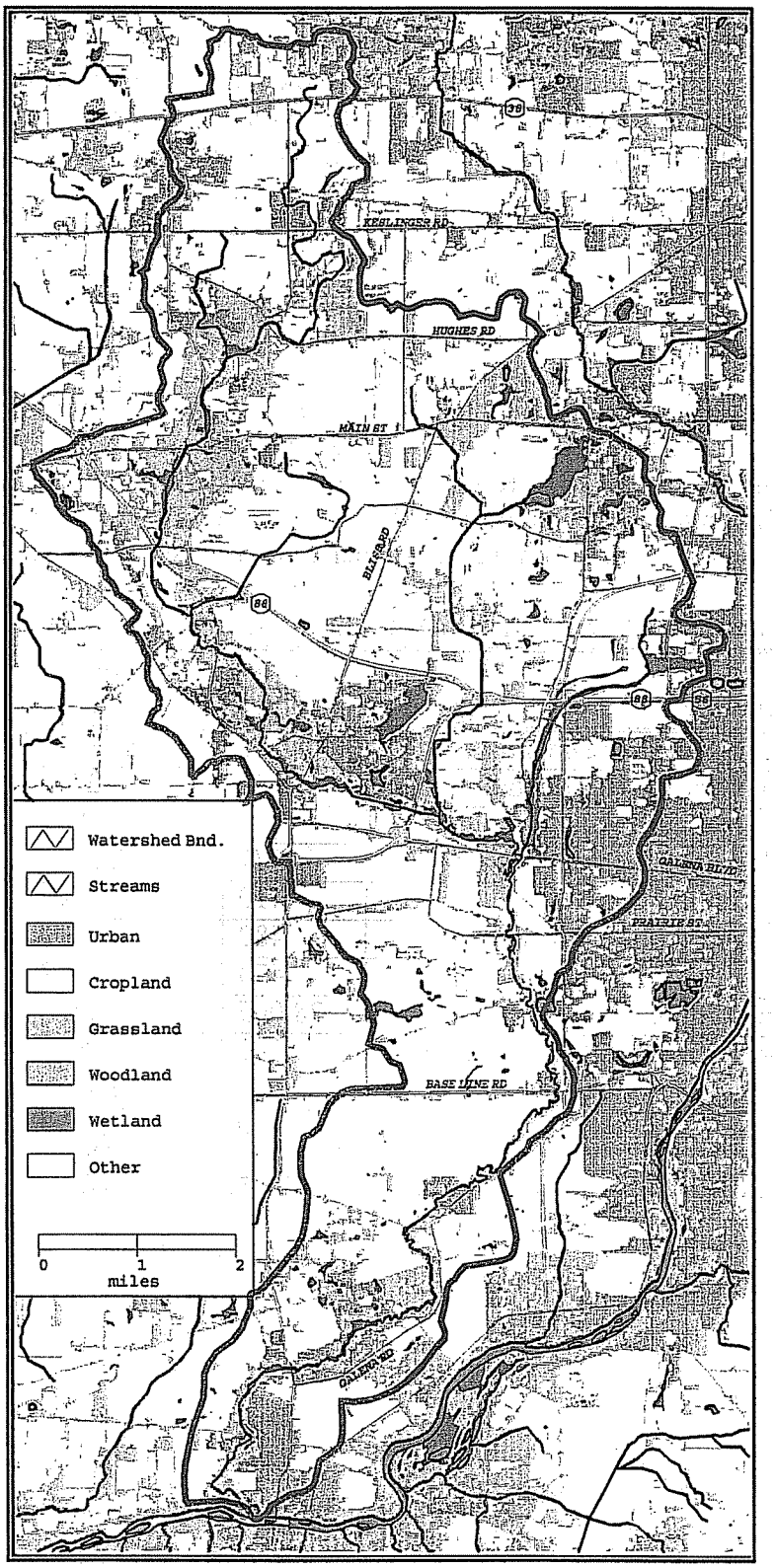
Existing (1990) land use for the Blackberry Creek watershed is shown in Figure 1. As can be seen in Table 1, within Kane County, the watershed is currently covered by 15.9% urban land uses and the 1990 population is 19,028 in Kane County (Northeastern Illinois Planning Commission, 1994). Given the 39,400 acres in the Kane County portion of Blackberry Creek, the average population density is less than 0.5 people per acre (309 people per square mile).

Table 1: Blackberry Creek 1990 Land Use in Kane County

Land Use	Land Use Area (acres)	
	acres	Percent
Single Family Residential	4,057	10.3%
Multi-Family Residential	72	0.2%
Commercial	270	0.7%
Industrial	977	2.5%
Institutional	410	1.0%
Transportation/Utility	482	1.2%
Vacant	473	1.2%
Agricultural	28,005	71.1%
Forest, Grassland, & Open Space	3,142	8.0%
Wetland	1,347	3.4%
Water	170	0.4%
Total	39,406	100.0%

Land use and population numbers for the Kendall County portion of the Blackberry Creek watershed are unavailable.

Figure 1: Blackberry Creek 1990 Land Cover



Prepared By: Kane County Development Deaprtment and University of Illinois Department of Agricultural & Consumer Economics
Source: Illinois Department of Natural Resources

Based on the 1998 IDNR and SWCD "T by 2000" transects for Illinois, the following information regarding crop type and tillage was obtained.

Table 2: Blackberry Creek Crop Acreage and Tillage

Present	Conventional		Reduced		Mulch-till		No-till	
Crop	Acres	%	Acres	%	Acres	%	Acres	%
Corn	11,501	46.9	1,403	5.7	842	3.4	281	1.1
Soybeans	4,106	16.8	1,250	5.1	803	3.3	2,618	10.7
Small grains	306	1.2	938	3.8	0	0.0	0	0.0
Forage	10	0.0	0	0.0	0	0.0	0	0.0
Total	15,923	64.9	3,591	14.6	1645	6.7	2,899	11.8

Future

By 2020, the population of the Kane County portion of the Blackberry watershed is expected to more than double to 42,300 (NIPC, 1994). This equates to approximately 1.1 people per acre (686 people per square mile). Jobs are also expected to nearly double from 6,000 in 1990 to 11,300 in 2020 indicating that significant additional commercial development is expected on top of the large increase in residential development.

The amount of land converted to urban uses is difficult to predict and will depend on the form of development that occurs over the next 20 years. Higher density developments will generally result in less land converted to urban uses for a given population increase. However, higher density development may result in greater capacity for development and higher levels of imperviousness under ultimate land use conditions.

The NRCS floodplain management study predicted that 27% of the watershed would be occupied by urban land uses by the year 2005.

Soils and Geology

The present landscape and soils within the Blackberry Creek watershed were greatly influenced by continental glaciation. The last major glaciation is called the Woodfordian substage of the Wisconsinan stage, which left this region about 12,000 years ago. These large sheets of ice carried boulders, cobbles, gravel, and soil as the ice sheets advanced and retreated over the previous land surface. When the ice melted it dropped much of its load of rock, sand, silt, and clay. This ice-deposited, unsorted material is called glacial till. Glacial till is a homogenous mixture of sand, silt, clay, pebbles, and boulders that has been somewhat compressed by the weight and pressure of the ice. Glacial till deposits in the watershed are as thick as 100 feet or more.

As the ice melted, the melt waters carried some of the boulders, rocks and soil and deposited this outwash material across the landscape. Outwash is a glacial deposit that has been sorted by the melt waters. It consists of stratified silts, sand and gravel. In some places, like Johnson's Mound in the northern part of the watershed, conical mounds called kames were formed from

very rapidly moving melt water on top and through the glacier. However, in most places in the watershed the outwash deposits are nearly level to gently sloping and overlie the glacial till. Glacial outwash is generally more permeable than glacial till since the outwash was deposited by the melt waters and was not compressed by the weight of the glaciers.

After the ice retreated and the melt waters subsided, silts were deposited on the land surface by the prevailing winds from the west. These wind-blown silts, called loess, cover most of the land surface in the watershed. The loess thickness varies from a few inches to five or more feet and overlies the glacial till and the glacial outwash.

The land surfaces that were created by the Woodfordian glaciers in the Blackberry Creek watershed are characterized by low broad moraines, sloping morainal ridges, broad flat or nearly level outwash plains and prominent kames. The watershed is in the Bloomington ridged plain of the Central Lowland Province. The northern part of the watershed is in the Southern Wisconsin and Northern Illinois Drift Plain Major Land Resource Area (MLRA 95B). The southern portion is in the Northern Illinois and Indiana Heavy Till Plain Major Land Resource Area (MLRA 110). The relief is mainly nearly level to gently sloping, but steeper areas occur along Blackberry Creek and on moraines and kames. The elevation is highest on Johnson's Mound at 898 feet and lowest where the creek meets the Fox River at 567 feet.

Most of the soils in the Blackberry Creek watershed are dark-colored soils that formed under native tall-grass prairie that developed after the retreat of the Wisconsinan ice sheet. The various parent materials from which the soils formed are loess, glacial till, glacial outwash, alluvium, and thick organic deposits. The Drummer soils are the most extensive. Drummer soils formed in 40 to 60 inches of loess and the underlying stratified glacial outwash. These soils occur on broad flats, drainageways, and depressional areas of glacial outwash plains. They are poorly drained, which means that they have a water table that is at or near the surface during much of the year. Drummer soils are also considered hydric soils and they are typical of the wet prairies that existed in Illinois before the area was settled by European immigrants. Other dark-colored soils that formed in loess and the underlying glacial outwash include the Brenton, Elburn, Blackberry (formerly Plano), and Clare (formerly Proctor) soils. Dresden, Fox and Waupecan soils are common in the southern part of the watershed adjacent to Blackberry Creek. These soils formed in a thin layer of silty material and underlying outwash deposits of sand and gravel. The Fox and Dresden soils formed under woodland vegetation and have a light-colored or thinner surface than Waupecan soils. Dark-colored soils that formed in loess and the underlying glacial till include Catlin, Danabrook (formerly Saybrook), Parr, and Octagon.

Lena muck and Houghton muck are two soils that formed entirely in thick organic deposits. These soils occur in depressional areas or along the creek and are often saturated or ponded with water. The organic deposits are unstable and have low strength. These soils are well suited as wetlands and natural storage areas for excess water. Otter soils and Sawmill soils are common within the floodplain of Blackberry Creek. These soils are also poorly drained and have a water table near the surface for much of the year. They formed in alluvium and are subject to frequent flooding.

Soil acts as a natural sponge. The pores in the soil can hold vast amounts of water and delay the release of water to the streams. However, most areas of Drummer and other soils that have a seasonal high water table have been artificially drained for agricultural purposes, reducing the amount of water held within the soil. The artificial drainage systems are an inter-connected series of perforated plastic tubing or clay tile that are buried in trenches at various depths below the soil surface. Water in the soil moves downward to the tile lines and flows to a surface outlet such as an open ditch or stream. In some depressional or low-lying areas there are surface inlets to allow water in these ponded areas to enter the drainage systems. This removes water from the depressions and soil surface more rapidly. These drainage systems do not permanently or completely remove water from the soil. The drainage systems were designed to remove excess water from the upper portion of the soil to allow for earlier farming operations in the spring and to allow farming on soils that are too wet in their natural condition. These drainage systems remove water more rapidly from the soil than would occur under natural conditions. However, the release of subsurface water to a stream or ditch following a storm event is delayed by the amount of time that it takes for the water to infiltrate and percolate through the soil into the drainage system. This discharge of subsurface water, though, does contribute to the excess surface water following heavy rains or wet springs.

If the tile lines fail or are otherwise disrupted, the historically wet conditions of the soil will return. Intentional disruption of tile systems can be used to restore former wetlands. Unintentional disruption and/or failure of tile systems can have serious consequences to homes and other structures built upon naturally wet soils.

Soil erosion rates are discussed under "Water Quality"

Vegetation

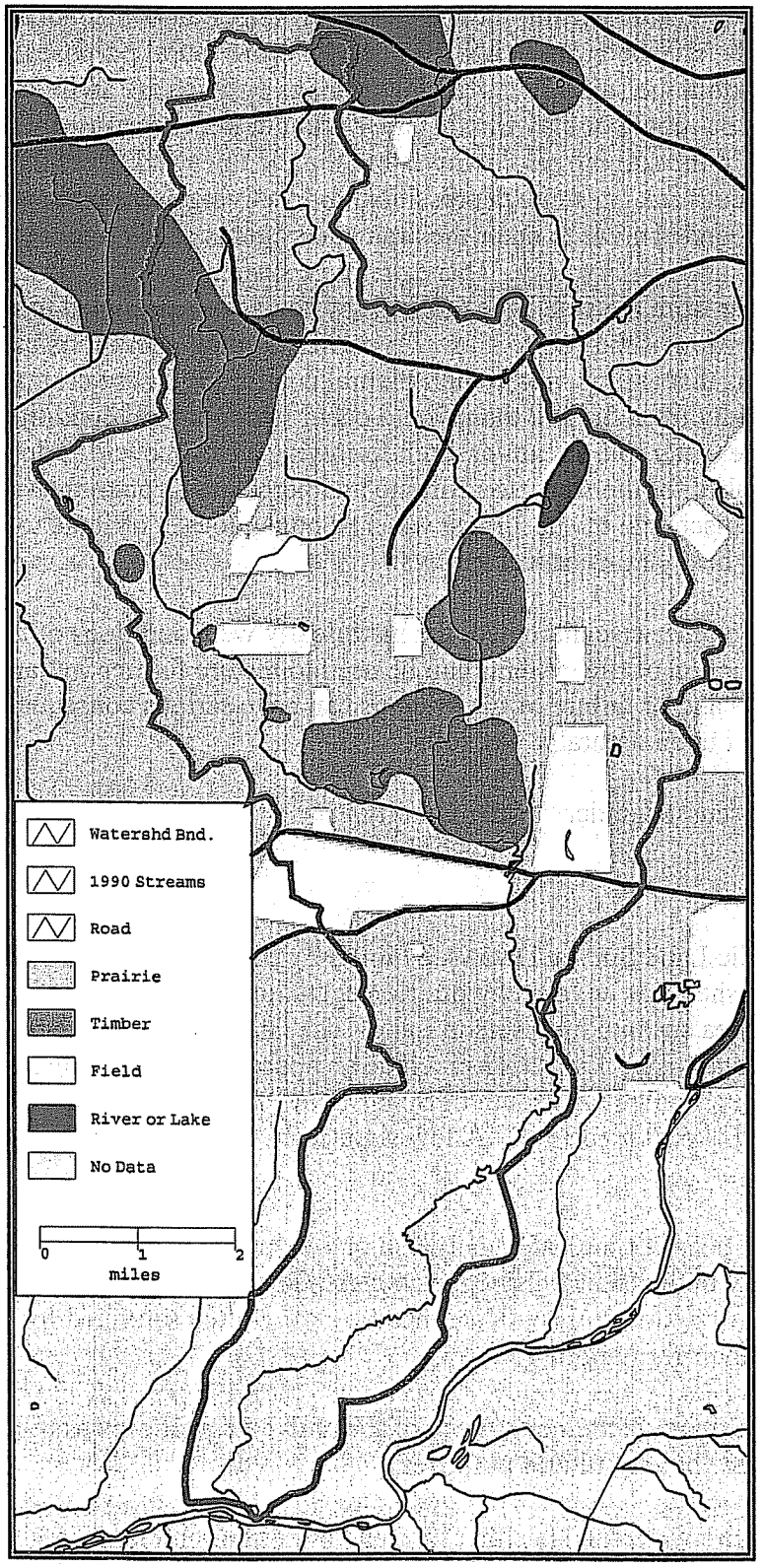
Based on the 1840 Public Land Survey Data (see Figure 2), the majority of the Kane County Blackberry Creek watershed was covered by prairie vegetation with a few significant woodland pockets, including the area surrounding Nelson Lake. The Blackberry Creek stream corridor was also largely in prairie vegetation. Exceptions include an approximately 3 mile reach south of Elburn, an approximately 3 mile reach south of Sugar Grove near the confluence with Lake Run and the majority of the Lake Run corridor. A few significant patches of agricultural field already existed in 1840.

Although the 1840 map does not indicate any marsh or wet prairie vegetation, substantial portions of Kane County in the Blackberry Creek watershed are covered by hydric soils. The physical characteristics of hydric soils indicate that they were often saturated for extended periods of time during their formation.

During the period of European settlement, much of the native vegetation was removed and the hydric soils were drained for agricultural purposes.

Today, virtually the entire watershed is either in urban or agricultural land uses with only remnants of the native land cover. Most of the remnant vegetation occurs in Forest Preserves, along existing and abandoned railway lines, and in private cemetery plots.

Figure 2: Blackberry Creek 1840 Land Cover



Prepared By: Kane County Development Department and University of Illinois Department of Agricultural & Consumer Economics
Source: Public Land Survey Plats of Townships, 1840 – 1842

Natural Areas

Illinois Natural Area Inventory (INAI) sites and dedicated Illinois Nature Preserves in the Blackberry Creek watershed are shown in Figure 3. There are four dedicated nature preserves including Johnson's Mound, Nelson Lake Marsh, Almon Underwood Prairie, and Bliss Woods. There are five INAI sites including Johnson's Mound, Nelson Lake Marsh, Lakin Hill Prairie, Kaneville Geological Area, and Bliss Woods Marsh.

Within the Blackberry Creek watershed there are approximately six sites where threatened or endangered species are known to occur. Some of these sites are within dedicated nature preserves and some are not. The State listed plant and wildlife species in the watershed are shown below.

Plant Species	Wildlife Species
Flatleaf bladderwort	Slippershell mussel
Golden Sedge	Swainson's Hawk
Arrowgrass	Sandhill Crane
American brookline	Yellow-headed blackbird
	Common moorhen
	Least bittern

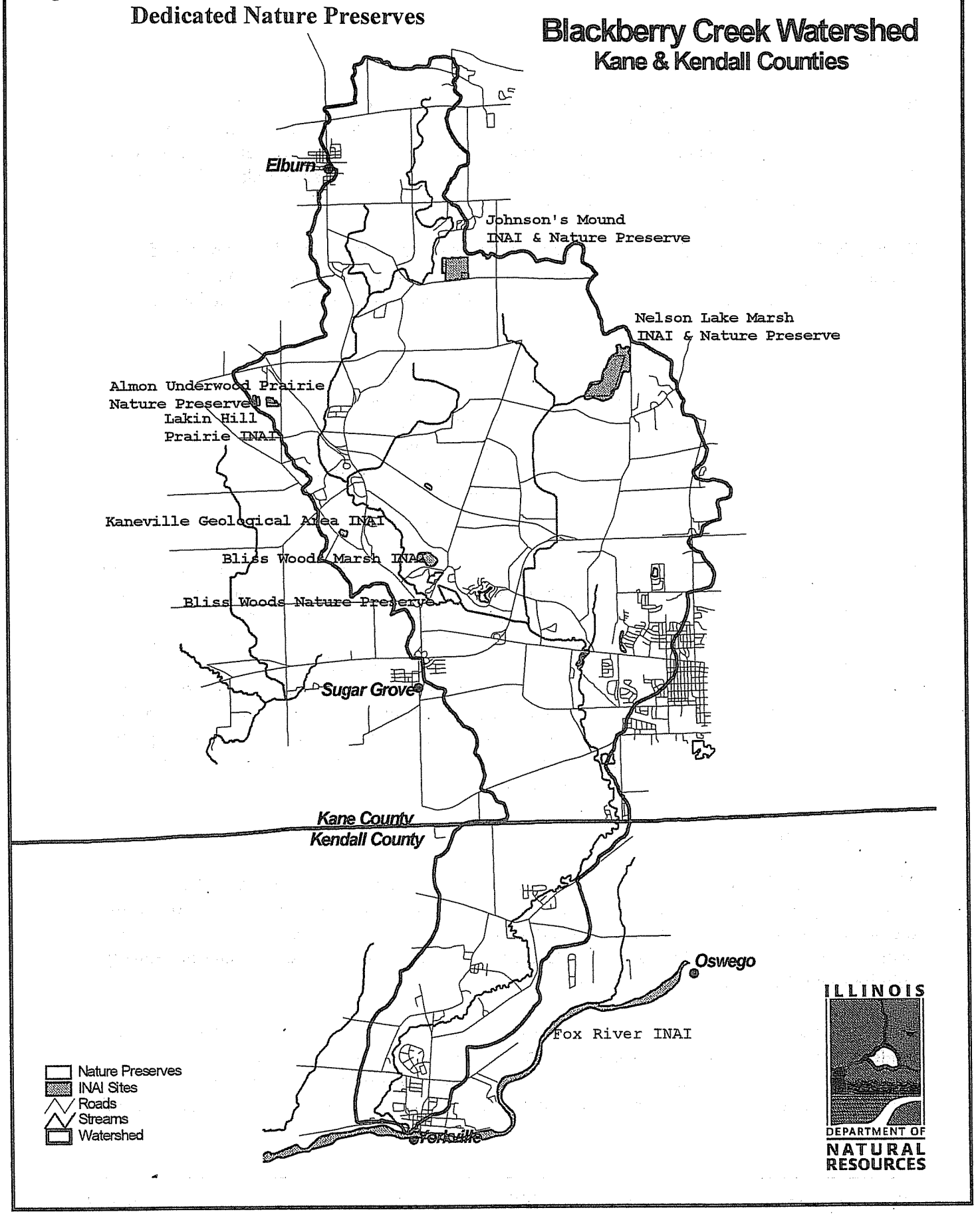
Before authorizing, funding, or performing any action (public or private) which may result in the alteration of existing environmental conditions, State laws and regulations (Illinois Endangered Species Protection Act and Illinois Natural Areas Preservation Act) require that local governments and state agencies complete a consultation process with the INDR Division of Natural Resource Review and Coordination. If state listed threatened or endangered species or Illinois Natural Area Inventory Sites (including dedicated Nature Preserves) are located in the vicinity of the action, the IDNR will determine whether the action is likely to adversely impact the protected natural resources and offer recommendations to avoid or minimize those impacts. State law (Illinois Natural Areas Preservation Act) provides stringent civil and criminal penalties for the adverse modification of a dedicated nature preserve.

Cultural Resources

There are approximately fifty recorded cultural sites in the Blackberry Creek watershed, representing 10,000 years of human settlement and land use. Some of the sites are recorded from the prehistoric Archaic, Woodland, and Mississippian periods, while other sites date from the historic pioneer period of Illinois to 20th Century commercial sites. These fifty sites are equally split between Kane and Kendall Counties.

Prehistoric human settlement frequently focused on water resources. These early cultural sites are located adjacent to rivers, lakes, and wetlands, usually on land slightly elevated above frequently flooded soils. Stream and wetland restoration projects and construction or rehabilitation of stormwater detention structures have the potential for disturbing these types of sites.

Figure 3: Illinois Natural Area Sites and Dedicated Nature Preserves



Only a small fraction of the watershed has been surveyed for cultural sites. When structural alternatives are chosen to address resource concerns, archaeological surveys will need to be conducted in each project location to identify cultural sites and determine the effects of the project on them. State and federal policies require that significant historic properties be protected or mitigated.

Flooding

Existing Conditions

The Blackberry Creek floodplain based on the flood insurance study prior to the NRCS study is shown in Figure 4. As noted previously, this map does not show floodplains for stream reaches with drainage area less than one square mile. Also, because the mapping pre-dates the NRCS study, it is not as accurate as the NRCS floodplain. In particular, it does not show that the Cherry Hill Subdivision on the west side of Aurora is in the Floodplain.

An extensive analysis of existing flooding conditions in the Blackberry Creek watershed was conducted by the technical team. The team reviewed previous studies of flooding in the watershed and analyzed flooding conditions in the five hardest hit areas of the Blackberry Creek watershed during the July 1996 flood event. The key findings are listed below.

Flooding in the Blackberry Creek Watershed:

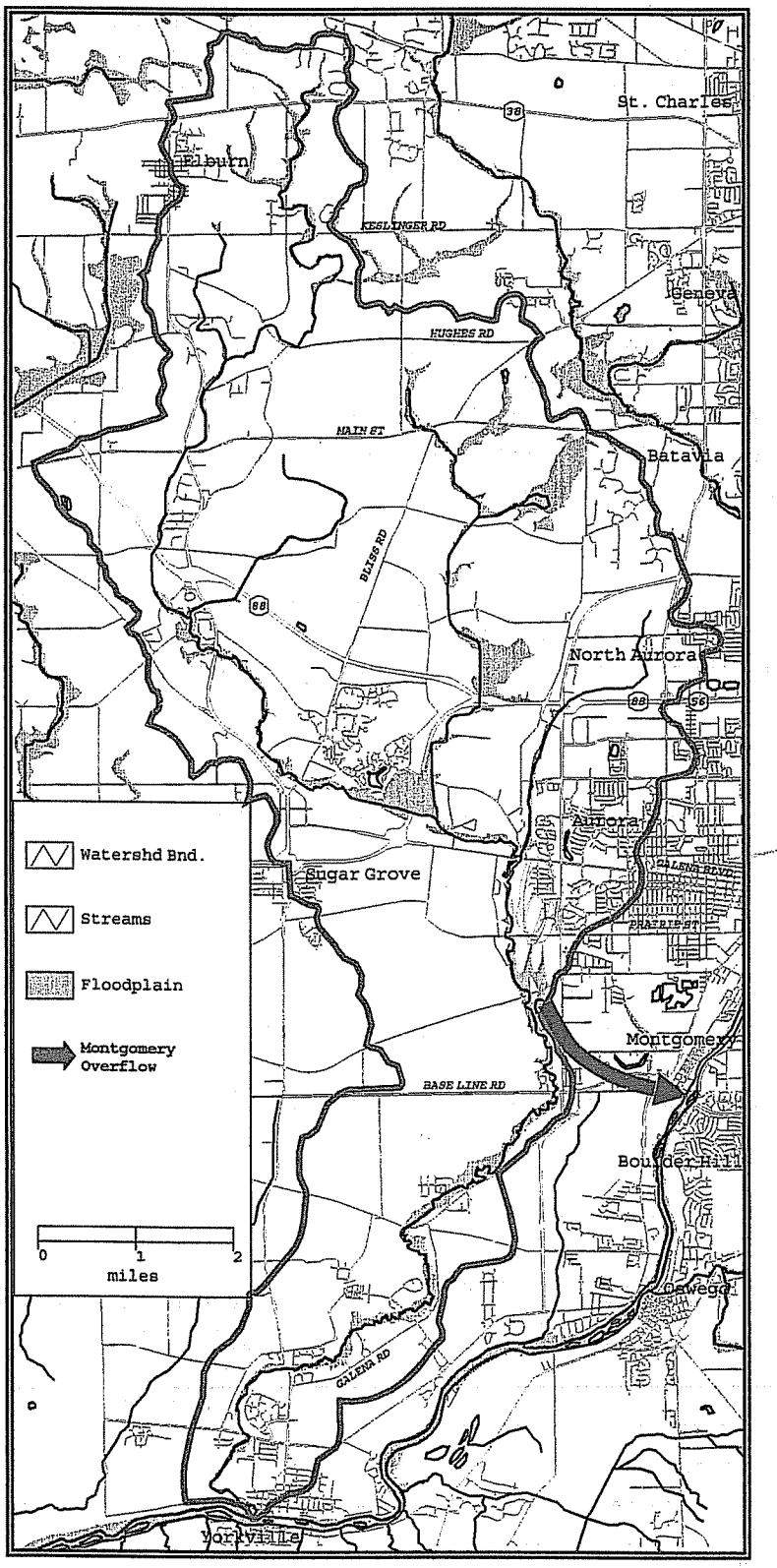
- Causes $215,000 to $400,000 in average annual property damage watershed-wide (See Table 3).
- Caused more than $300,000 in property damages in the flood of July 1983 ("Floodplain Management Study", 1989).
- Caused an estimated $18,000,000 in total property damage, including basements, in the flood of July 1996 (Homeowners Associations).
- Caused an estimated $13,800,000 in first floor property damage in the flood of July 1996 (See Table 4).
- Cost the City of Aurora approximately $50,000 in emergency flood control for the Cherry Hill and Lakeside of Sans Souci subdivisions during the February 1997 storm (City of Aurora).
- Has motivated four stormwater management studies since 1962.

Table 3: Average Annual Flood Damage by Subdivision

Subdivision	Estimated Average Annual Residential Flood Damage
Prestbury	$ 0 to $ 10,000
Willowbrook	$ 5,000 to $ 40,000
Pasadena	$ 10,000 to $ 50,000
Cherry Hills – Lakeside San Souci	$ 200,000 to $ 300,000
Total	$ 215,000 to $ 400,000

Source: Interviews with residents.
Notes: Estimates include basement and first floor damage.
July 1996 event assumed to be 500-year recurrence.

Figure 4: Blackberry Creek Floodplains



Cherry Hills overflow

Prepared By: Kane County Development Department and University of Illinois Department of Agricultural & Consumer Economics
Source: Federal Emergency Management Agency, Q3 Data

Table 4: First Floor Property Damage, July 1996 Flood

Subdivision	Total no. homes (Year established)	No. homes with first floor damage (Avg. depth of flooding above first floor)	Value of damage, first floor only	Average damage per home
Willowbrook	164 (1958)	8 (3")	$200,000	$25,000
Pasadena Drive	26 (late-1950's)	20 (18" to 24")	$910,000	$45,500
Prestbury	630 (mid-1960's)	4 (6")	$160,000	$40,000
Cherry Hill	176 (1961)	103 (4" to 60")	$7,000,000	$68,000
Lakeside of Sans Souci	102 (mid-1970's)	100 (18" to 24")	$5,500,000	$55,000
Total	1098	235	$13,800,000	$58,700

Source: Homeowners Associations data from subdivision residents.
Notes: Estimates do not include homes that incurred basement damage only.

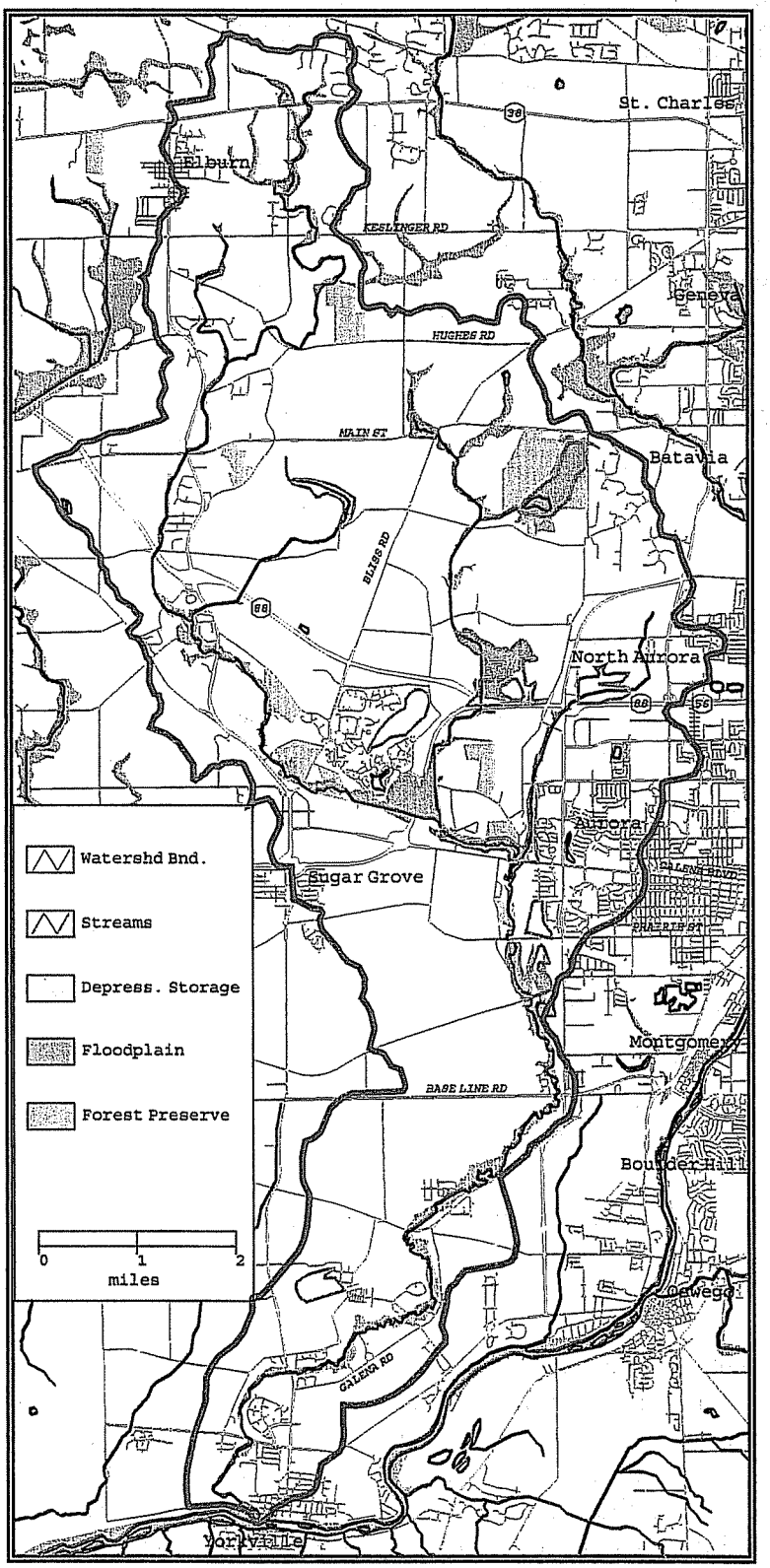
Although the four residential communities investigated in this study were inundated with record-breaking rain during the July 1996 storm, Cherry Hill-Lakeside of Sans Souci, Willowbrook and Pasadena are also vulnerable to flooding from four- to six-inch rains. These subdivisions are subject to flood damage from both local stormwater runoff and backwater flooding from Blackberry Creek. Residential flooding has been problematic since at least 1962, when a report by the Department of Public Works and Buildings, Division of Waterways noted that Blackberry Creek was totally inadequate to carry storm water runoff during average or excessive rainfall. Property damage in floodprone neighborhoods has occurred at least three times since the 1970's. (See *Table 5)*.

In addition to damage to structures, flooding in the Blackberry Creek watershed can pose significant risk of injury and life. Portions of the Cherry Hill subdivision are in a floodway of Blackberry Creek. During the July 1996 flood event, floodwaters were flowing down Manchester Way at a maximum depth estimated to be 9 feet. Although the speed of the water was not estimated, velocities between 2 and 6 feet per second are typical. Experts use a rule of thumb that says when the product of the depth of water (feet) and the speed of the flow (feet per second) exceeds 4; significant risk of drowning exists.

In the Willowbrook subdivision, residents were forced to wade through water 2 ½ feet deep that was described as "fast-flowing". The Willowbrook subdivision has only one entrance and exit and it is impassable by emergency vehicles during flood events.

The NRCS floodplain management study performed in 1989 identified 13 natural storage areas in the watershed that provide significant floodwater storage and flood protection (See Figure 5). Although other, smaller storage areas were not evaluated, it is likely that their cumulative volume is also significant. Two of the 13 are true depressional storage with essentially no surface outlet. The remaining 11 are surfaced drained but the drain is sufficiently restrictive to cause extended periods of ponding and significant storage of floodwater. The total volume of floodwater stored in the 13 storage areas during the 100-year flood event is over 3,900 acre-feet.

Figure 5: Blackberry Creek NRCS Natural Storage Areas



Prepared By: Kane County Development Department and University of Illinois Department of Agricultural & Consumer Economics
Source: Floodplain Management Study – Blackberry Creek, USDA, 1989

The floodwater storage in these storage areas is equivalent to approximately 1.0 inch of runoff distributed over the area of the entire watershed.

Table 5: Flood History

Date	Rainfall	Damage
February 21,1997	4 inches in Aurora in 24 hours.	Cherry Hill and Lakeside were protected from flooding by sandbagging Galena Blvd. Twelve Willowbrook homes flooded.
July 18, 1996	17 inches in Aurora and 12 inches in Elburn in 24 hours.	Widespread flooding. Estimated at greater than 500-year storm.
July 3, 1983	5 inches in Aurora and 4 inches in Elburn.	Expected occurrence interval of 35 years (3%). Measured 2,060 cfs discharge at Yorkville gauging station. Largest in previous 20 years of stream records.
July 2, 1978	4.11 inches in Aurora. No creek overflow.	Three feet of standing water on Manchester Way in Cherry Hill for two days, trapping residents in their homes. Led to construction of Manchester pump station.
October, 1954	9 inches.	Prior to development of Cherry Hill and Lakeside of Sans Souci.
1938	9 inches.	Prior to development of Cherry Hill and Lakeside of Sans Souci.

Source: Review of agency reports and interviews with residents.

Future Conditions

The NRCS study predicted that 100-year flood flow increases would vary from 0% to 8% between 1987 and 2005, depending on location in the watershed. Generally, the smaller the drainage area, the greater the percent increase in flood flow. These increases assumed that all new development provided at least some detention and that the volume of the 13 natural storage areas was preserved. The study assumed that 15% of the watershed was urban in 1987 and 27% of the watershed was urban in 2005.

The NRCS study went on to evaluate the impact on flood flows of losing 10 of the 13 natural storage areas. These 10 natural storage areas represent 78% of the 3900 acre-foot total volume of the 13 areas. It was found that if the volume of the 10 natural storage areas was lost, streamflows along Blackberry Creek would increase by a minimum of 10% virtually throughout the watershed and over 25% in many areas of the watershed. On the small tributary near Prestbury and on the East Run tributary, flood flows could increase by over 75%. Overall, flood damages would double and, for selected individual buildings, damages could increase by a factor of four. This assessment was based on 1987 land use conditions and the predicted flow increases

were based on the loss of natural storage areas alone. Any increases in flood flows due to urbanization would be in addition to these numbers. Fortunately, all but two of the storage areas identified in the NRCS study are within regulatory floodplains. The volume of these storage areas will generally be protected by existing floodplain regulations. The two remaining depressional storage areas are within jurisdictions that currently protect depressional storage volume.

On a more conceptual level, experience in other parts of the region as well as other parts of the country suggest that flooding problems and damages increase as a watershed develops. A number of watersheds in the region have experienced increasing flood damages despite detention requirements that have been in place since the early 1970s. Recognizing these impacts, many areas of the region have upgraded their detention requirements in an attempt to prevent increases in flood flows as their watersheds develop. In most cases, these higher standards have not been in place long enough to assess their impact on overbank flooding. However, computer modeling indicates that stream flows should not increase in watersheds up to at least 30 square miles provided current NIPC stormwater detention standards, as discussed in the floodplain and stormwater management section, are enforced (Dreher et. al. 1990).

Without watershed specific modeling, it is difficult to predict the potential for future increases in flood flows, depths, and damages in the Blackberry Creek watershed under more recent population and land use assumptions. However, it is much more likely that flood damages will not increase (and may even be reduced) if the recommendations of this plan are implemented.

If the recommendations of this plan are not implemented, the potential for future increases in flood damages is high. In particular, the existing floodplain maps are out of date and do not identify floodplains with less than one square mile of drainage area and flooding problems could increase due to building within currently unmapped floodprone areas. Also, flood flows may increase due to increases in runoff volumes associated with urbanization, exacerbating existing flooding problems.

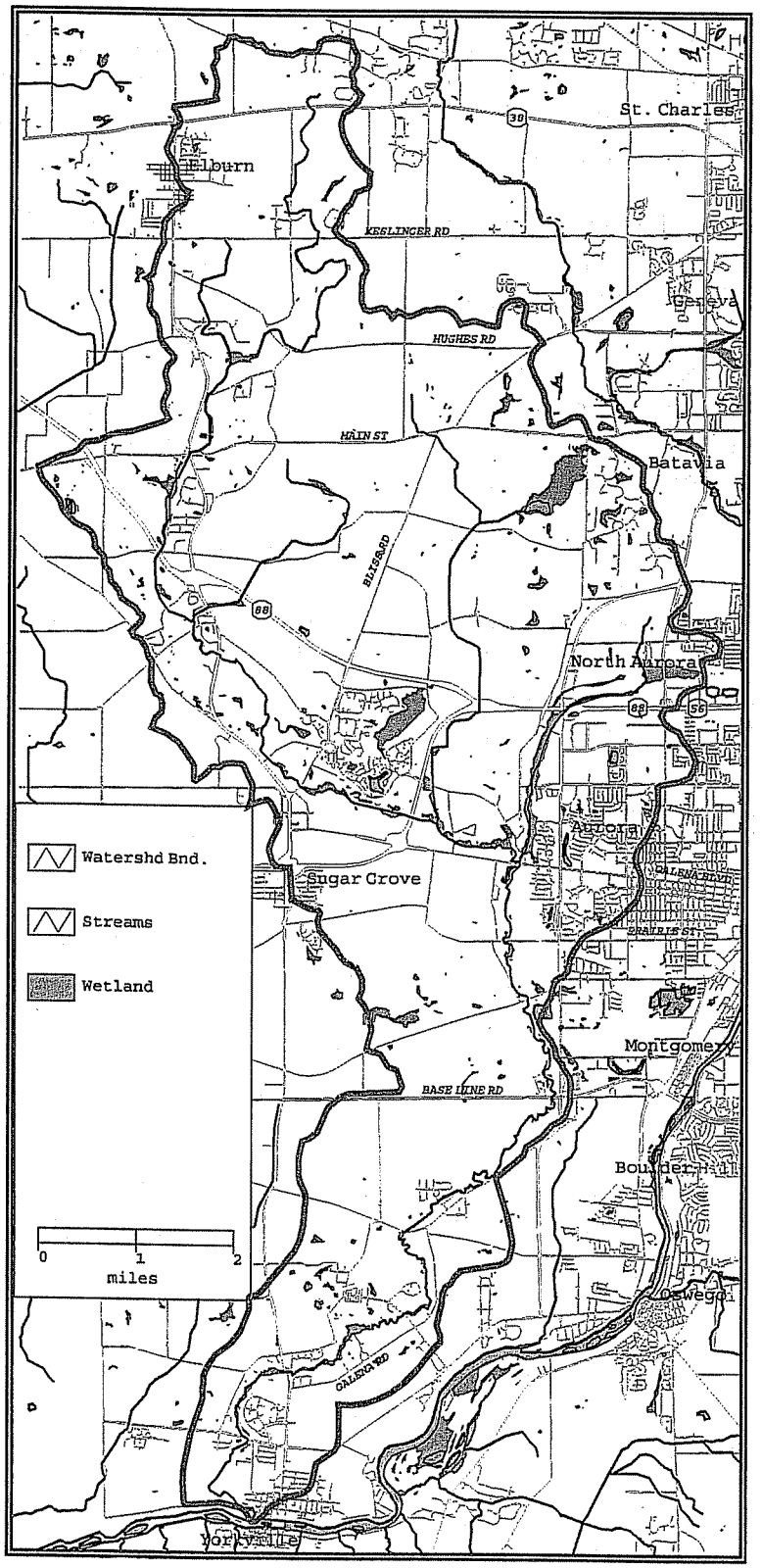
Wetlands

Existing Conditions

Wetlands based on the National Wetland Inventory (NWI) are shown in Figure 6. These wetlands occupy approximately 3.4% of the watershed. The wetlands technical team performed an inventory and analysis of wetlands within the Blackberry Creek watershed using the NWI as well as aerial photographs. No field evaluations were performed. The team identified over 300 wetlands in the watershed and evaluated in greater detail the 100 wetlands that were over 2 acres in size and not farmed wetlands or gravel pits. The functional values of the 100 wetlands were evaluated in terms of eight physical characteristics as discussed below.

1. Drainage: Wetland sites which still exhibited natural drainage patterns, such as unchannelized drainage swales, meandering streams, or were parts of natural lakes or ponds, were considered to be the least disturbed sites and received the best score. Sites that were visibly tiled or ditched and effectively drained were more disturbed and received a poorer numerical score.

Figure 6: Blackberry Creek Wetlands



Prepared By: Kane County Development Department and University of Illinois Department of Agricultural & Consumer Economics
Source: National Wetland Inventory

2. Excavation: Wetlands with no evidence of excavation were considered less disturbed and received the best numerical score while sites that had been excavated received a poorer score. Excavations do not always contribute to a degradation of wetland functions, but frequently result in lowered water tables and spoil placed in the wetland.

3. Size: Wetlands were divided into five size categories with the larger wetlands receiving the best score. The larger a wetland the more likely it was that it contained either high quality plant communities or high quality wildlife habitat. Larger wetlands have a higher likelihood of containing high quality plant communities due to the fact that interior areas of larger wetlands are buffered from disturbance. Larger wetland areas also provide better wildlife habitat and typically support greater species richness (Brown and Dinsmore 1986). Larger wetlands also have a much greater capacity to provide water quality benefits and stormwater storage. Large depressional wetlands can provide significant flood attenuation benefits.

4. Physical Intrusions and Barriers: Presence of a physical intrusion, such as fill, a berg or spoil pile, a road or railroad embankment, or some other physical barrier resulted in a lower score. Such a barrier frequently will impede wildlife movements (herptiles) and will result in hydraulic discontinuities. Non-native species frequently colonize such disturbances and result in floristic degradation. A barrier near one edge of a large wetland received a higher score than one with a barrier through the middle of a smaller polygon.

5. Surrounding Land Use: Surrounding land use within 200 feet of each wetland was categorized as either natural vegetation, old field or pasture, farmed, or developed. The less disturbed the surrounding land, the less likely it is for the wetland to be disturbed. Natural or only slightly disturbed landscapes provide good buffers from disturbance and intrusions, and also provide additional wildlife habitat. Wetlands adjacent to land uses such as urban/developed received a poorer habitat score due to the fact that these land uses typically have an adverse effect on water quality and/or disturb wildlife. Agricultural land use was considered intermediate in terms of impacts to wetland habitats since conservation tillage is not entirely prevalent. Where several land use types were within the surrounding area, the most influential or worst land use was scored.

6. Habitat Structure: Habitat structure is an excellent indicator of wildlife habitat and plant community quality/diversity. However, the habitat structure of a wetland providing high quality wildlife habitat can be quite different from the habitat structure of a site with good native plant communities. The two subsets of habitat structure are vegetative interspersion and plant/open water interspersion. The concepts and interspersion categories used here are based on the work of Golet (1976). These concepts were used in the Lake County Advanced Identification of Wetlands Study (ADID) and are further explained in the Minnesota Wetland Evaluation Technique (MWET)(COE 1988).

> Vegetative Interspersion: Wetlands in northeastern Illinois that have retained a high degree of their presettlement vegetation are often made up of several plant communities. These natural communities may include emergent marsh, wet prairie, sedge meadow, calcareous fens, springs and seeps, and forested communities. The presence of three or

more communities is a good indicator of a high quality wetland complex. For this evaluation, we used the vegetative interspersion categories from Golet (1976) and MWET (COE 1988), but with the natural communities recognized locally. Particular attention was given to areas with a phototone that suggested the presence of a rare community type such as a fen.

Plant/Open Water Interspersion: The type of wetland habitat that most frequently provides high quality habitat for a variety of wildlife, especially wetland dependent birds, is an emergent hemi-marsh. A hemi-marsh exhibits a high degree of interspersion between open water and vegetation. Many of our state endangered and threatened bird species require this type of marsh for breeding. Wetlands consisting of primarily open water or dominated by dense vegetative growth have lower habitat value and less wildlife species diversity (Weller 1981). This type of interspersion can be readily assessed using aerial photographs, and those exhibiting the highest degree of interspersion, following the categories of Golet (1976) and MWET (COE 1988) received the highest score.

7. Depressional Storage: Stormwater storage in isolated depressions is very important in reducing and delaying peak flows in rivers and streams. Water naturally retained in closed depressions is typically cleaned through settling, biological, and chemical action and is given opportunity to infiltrate. If a wetland was greater than 5 acres and outside of an obvious riparian floodplain zone, it is likely to be providing this beneficial depressional storage function. If the wetland is vegetated by persistent plants, it is more likely to be providing added water quality benefits. Therefore, if the wetland was less than 5 acres or within a riparian floodplain it received a low score; if it was greater than 5 acres and not within a riparian floodplain but unvegetated, it was given a moderate score; if the wetland was greater than 5 acres and not within a riparian floodplain and was vegetated it was given a high score.

8. Streambank Stabilization: Streambank stabilization is another important function wetlands can provide. Eroding streambanks in agricultural or mowed turf situations contribute to poor water quality and even the loss of storage capacity through siltation. Therefore, if the wetland appeared to be immediately adjacent to a streambank and had the opportunity to provide stabilization functions it was given a high score. Wetlands not adjacent to a stream were scored low for this function. It must be noted, however, that many wetlands can appear adjacent to a stream but not actually be providing stabilization due to stream entrenchment or other factors. This function cannot be confirmed without field verification. Wetland vegetation along a stream will provide water quality benefits by filtering runoff even if the banks are not stabilized.

Each wetland received a score for each of the eight functional values and a composite score was calculated for each wetland. The wetlands were evaluated based on review of aerial photographs of Kane (1993 photography) and Kendall (1988 photography) Counties.

Of the 100 wetlands evaluated in greater detail, 22 were identified as being high quality. To be considered high quality, a wetland had to have high quality plant communities and provide significant wildlife habitat in addition to providing stormwater functions. Of the 22 high quality wetlands, six are owned by the Kane County Forest Preserve District. Nelson Lake (owned by the Kane County Forest Preserve District) and Carson Marsh (privately owned) are the highest

quality wetland complexes in the watershed based upon the functions measured – primarily biological functions. State listed threatened or endangered species are known to be using these two sites. In Figure 7 the top ten scoring wetlands are shown in Dark Green. The remaining 12 are shown are shown in light green.

Virtually all of the 300+ wetlands found in the watershed, including the farmed wetlands, provide a stormwater storage benefit and most provide water quality benefits as well.

Mapping of hydric soils in the Kane County portion of the Blackberry Creek watershed indicates that as much as 35% the watershed may have been covered by wetlands at one time. The current watershed area covered by wetlands is approximately 3.5% (See Figure 6) indicating that as much as 90% of the wetland area within the watershed may have been lost.

As previously discussed, the NRCS flood study performed in 1989 identified 13 natural storage areas in the watershed that provide significant floodwater storage and flood protection. Most of the 13 natural storage areas contain at least some wetland areas.

Future Conditions

Experience around the region as well as around the country indicates that as a watershed develops, the quality of its wetlands decrease. Wetland degradation is typically the result of wetland modifications during the development process, changes in hydrology due to increased imperviousness, and polluted water running off from urban surfaces.

Wetlands are protected, to some extent, by the US Army Corps of Engineers. However, the Corps only has jurisdiction over direct wetland modifications and cannot protect against watershed induced impacts. Also, the Corps does not have jurisdiction over vegetation removal that does not involve dredge or fill activities. Finally, the Corps does not require preservation of floodwater storage when reviewing mitigation plans for wetland dredge or fill.

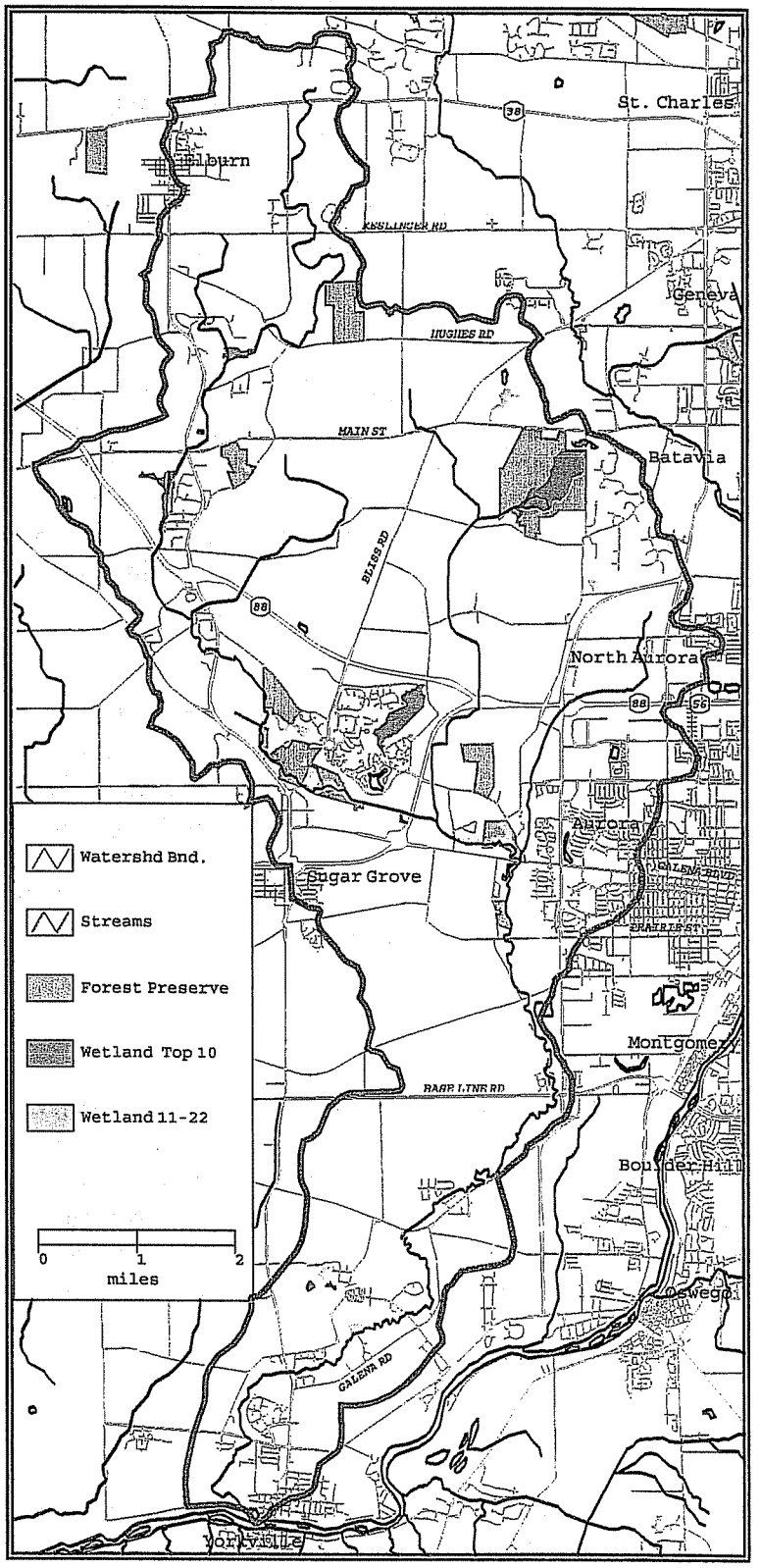
Only one of the local jurisdictions in the watershed have development standards that protect against direct wetland modifications or require wetland buffers. Two protect against placing detention basins within existing wetlands. Within Kendall County and in one municipality of Kane County, onsite depressional storage is not protected.

Lakes

There are several lakes within the Blackberry Creek watershed, but a majority of them are stormwater detention basins for which no water quality data is known to exist. Lakes for which water quality data is available include Lake Gregory within the Blackberry Historical Farm-Village south of Galena Boulevard, and Jericho Lake within Jericho Lake Park south of Jericho Road. Both lakes are owned and managed by the Fox Valley Park District.

Lake Gregory is a long, narrow lake excavated within the Blackberry Creek floodplain. It functions as a water feature and stormwater detention for the surrounding park. Constructed in

Figure 7: Blackberry Creek Wetland Ranking



Prepared By: Kane County Development Department and University of Illinois Department of Agricultural & Consumer Economics
Source: Blackberry Creek Wetlands Technical Team

1963, Lake Gregory has a surface area of 7 acres, a maximum depth of 6 feet, an average depth of 3 feet, and an estimated watershed area of 220 acres (Hudson et. al., 1993).

Jericho Lake was a sand and gravel quarry and also lies within the floodplain of Blackberry Creek. It is drains to Blackberry Creek through a channel at the lake's southwest corner. Jericho Lake was opened to the public in 1981 and provides fishing and aesthetic enjoyment. Jericho Lake has a surface area of 22 acres, a maximum depth of 26 feet, an average depth of 14 feet, and a watershed area of approximately 190 acres (Hudson, 1996).

Existing Conditions

Lake Gregory was monitored on one date in August 1992 under Illinois EPA's Lake Water Quality Assessment grant program (Hudson et. al, 1993). Data collected that day revealed low Secchi disk transparency (16 inches), and high sediment and algal turbidity. Total phosphorus was 0.060 mg/L and chlorophyll *a* was 64 ug/L that day. Based on the Secchi depth, total phosphorus, and chlorophyll *a* data, the lake's trophic state is classified as hypereutrophic—or highly nutrient-enriched. Waterfowl waste, runoff from the surrounding lawn, and in-lake sediments are likely to be the primary nutrient sources. The lake's common carp population likely contributes to the lake's turbid condition.

Jericho Lake was monitored on one date in August 1989 and on five dates between May and October 1995 under Illinois EPA's Lake Water Quality Assessment grant program (Hudson et. al., 1990; Hudson, 1996). Secchi disk transparency averaged 72 inches, and sediment and algal turbidity were low. Total phosphorus concentrations averaged 0.015 mg/L in the surface waters and 0.028 mg/L in the bottom waters. Chlorophyll *a* levels also were low, averaging of about 12 ug/L. Jericho Lake's trophic state is mesotrophic to eutrophic or moderately nutrient enriched. Reported sources of nutrient enrichment include agricultural, construction site, and urban runoff and waterfowl waste (IEPA, 1996).

Future Conditions

Although Lake Gregory and Jericho Lake may experience at least occasional overflows from Blackberry Creek, their future quality will be determined primarily by the land use and management activities within their immediate watersheds, as well as by in-lake management activities. For these lakes, near-shore land management practices, stormwater management, fisheries management, and future watershed development (within their respective watersheds) will play a larger role in lake quality than trends in the wider Blackberry Creek watershed.

Water Quality

Existing Conditions

Point Sources: The Sugar Grove wastewater treatment plant discharged to Blackberry Creek until September 1999. The permitted discharge was 0.85 million gallons per day (MGD) which is equivalent to 1.3 cfs. It has been reported that there have been operational problems at the Sugar Grove plant and it is likely that at least short term, localized water quality problems resulted. In

addition to the Sugar Grove discharge, there are five other small IEPA permitted discharges in the watershed. All five discharges are to small ditches draining to Blackberry Creek. The total discharge from these five sources is 0.0825 MGD, which is equivalent to 0.128 cfs. The discharges are from Broadview and Waubonsie Colleges, from Fisherman's Inn and Mercer's Restaurant, and from Elburn's potable water supply treatment facility.

Urban Non-point Sources: There was no monitoring of urban runoff as part of this study. However, monitoring in Illinois as part of the Areawide Water Quality Management Plan (NIPC, 1979) and more recent monitoring in Wisconsin (Bannerman et. al., 1993) indicate that urban runoff is a significant source of water quality degradation, particularly when there are no effective stormwater best management practices (BMPs). In fact, annual unit area sediment loads from urban areas often exceeds loads from agricultural areas, largely because of the greater volume of runoff from urban areas.

Agricultural Non-point Sources: One of the technical teams performed an erosion analysis. They found that erosion within the watershed is significant (3.9 tons/acre/year) and that the majority of the sediment is upland erosion rather than streambank erosion. The technical team also determined that cropland slopes greater than 5% are producing 70% of the total sediment in the watershed. Consistent with the silt and mud deposition observed during the biological survey, most of the sediment delivered to Blackberry Creek is reported to be accumulating within the Creek. Only approximately 20% of the sediment entering Blackberry Creek is being discharged to the Fox River, indicating that 80% of the watershed and streambank eroded sediment is accumulating within the creek and its tributaries. A 1998 survey (see Table 2) indicates that 65% of the cropland in the watershed is under conventional tillage practices and no-till is practiced on only 12% of the cropland.

Observed Conditions: Illinois EPA has a fixed monitoring station on Blackberry Creek in Kendall County at Route 47, north of Yorkville (IEPA, 1996). Data on both water chemistry (including toxics) and physical conditions are collected at this site. IEPA also has a station at Bliss Woods Forest Preserve. However, no data has been collected from this site since 1982. IEPA has reported that Blackberry Creek is fully supporting aquatic life based on their data at these sites.

Although the IEPA station in Kendall County provides good information for that location, it provides little information regarding water quality further upstream where the data are quite old. Recent sampling of macroinvertebrates (insects and crustaceans) at six stations as part of the IDNR biological survey (Rung and Pescitelli, 1997) provides a good indication of water quality at a number of locations in the watershed. Many of the macroinvertebrates present in the substrates of Blackberry Creek are generally intolerant of poor water quality. Mussels were also collected at three stations along Blackberry Creek as part of the IDNR survey. The diversity of mussel species, including one state endangered species, also suggests relatively high quality water flowing through Blackberry Creek at those locations. However, no macroinvertebrate or mussel sampling occurred immediately downstream of the Sugar Grove wastewater plant and reports indicate that there have been operational problems at the Sugar Grove plant.

Although, macroinvertebrate and mussel sampling did not indicate significant water quality problems in those reaches, observation of habitat conditions during the biological survey did indicate significant silt and mud deposits in the upper and middle reaches. Based on the erosion analysis cited above, it would appear that the source of sediment is primarily upland erosion and based on the relative area of agricultural land vs. urban land in the watershed, it can be assumed that the majority of the silt load is from agricultural runoff.

Future Conditions

It is difficult to predict future water quality conditions in Blackberry Creek watershed. Generally improving agricultural practices will tend to improve water quality while increasing urbanization often leads to degraded water quality conditions. Water quality is often degraded as a watershed urbanizes due to increased wastewater flows, urban runoff, and construction site runoff. However, improved stormwater management and soil erosion and sediment control practices can minimize these impacts if they are effectively enforced. Also, removal of the Sugar Grove wastewater plant should improve conditions in the reaches downstream of the plant. If future wastewater plants are constructed in the watershed, post-treatment of the effluent using created wetlands, reuse for irrigation, or similar practices can reduce the potential negative impacts from wastewater discharges to small streams.

Given the current watershed protection standards in the Blackberry Creek watershed, it is likely that water quality will decrease as the watershed develops. Although some indirect treatment of stormwater will occur as a result of stormwater detention, none of the jurisdictions currently require that stormwater management systems be designed to provide water quality benefits.

Stream and Riparian Corridor

Existing Conditions

Designated Uses and Use Support: As reported in the Illinois Water Quality Report (IEPA, 1996), the IEPA designated uses for Blackberry Creek are aquatic life and fish consumption. The designated uses for East Run and Lake Run also include swimming. Blackberry Creek and the two tributaries are reported to be fully supporting their aquatic life use and have not been evaluated for their other uses. The level of use support for Lake Run and East Run is based on "professional judgement". The level of use support for Blackberry Creek within Kane County is based on 1982 data. The Blackberry Creek use support level within Kendall County is based on 1995 data. The type and location of IEPA data collection sites was described under water quality.

Observed Conditions: As part of this watershed study, IDNR performed a biological survey of Blackberry Creek (Rung and Pescitelli, 1997). IDNR sampled fish at seven stations along Blackberry Creek. Macroinvertebrates were sampled at six of those locations. Based on the fish sampling, an Index of Biotic Integrity (IBI) (Karr et. al., 1986) was calculated and a Biological Stream Characterization (BSC) (Bertrand et. al., 1996) rating given. Mussels were sampled at three stations. As part of their report, IDNR noted habitat conditions within the stream and riparian corridor.

IDNR found that in the upper section (between Route 38 and Route 56) Blackberry Creek has been extensively channelized and there were two onstream excavated ponds. Although the stream generally has a desirable gravel and cobble streambed in this reach, virtually the entire bottom is blanketed with a layer of silt and mud. Severe streambank erosion was noted in a number of locations along this reach.

Little desirable habitat was noted within this reach as a result of the mud and silt deposits and a lack of high habitat value vegetation. Fish species tolerant of degraded habitat dominated within this reach. The sampled fish species resulted in indices of biotic integrity (IBI) of 34 and 36 at the two sampling stations in this reach. The Illinois Biological Stream Characterization (BSC) for IBI scores from 31 to 40 is Class "C" (moderate aquatic resources).

The predominant land use along this reach was agriculture. A buffer of approximately 20 feet existed along most of the reach. However the buffer was primarily vegetated with reed canary grass which is highly invasive, provides little or no habitat value, and has essentially no streambank stabilization value (may actually exacerbate streambank erosion) because of its shallow root system.

The middle section of Blackberry Creek (Route 56 to Bristol Road) is a low gradient stream within a poorly defined stream valley. Habitat is generally good in this section and included beaver dams, submerged logs, undercut banks, and some high habitat value submergent and emergent vegetation. However, mud and silt deposition in this reach is severe, degrading the otherwise good habitat. Although streambank erosion was less prevalent in this reach than in the upper reach, large clumps of bank were observed falling into the creek in some locations.

Like the upper section, the middle section was dominated by fish species tolerant of degraded habitat conditions. Although the IBI scores in this section were somewhat higher than in the upper section (40 for both sampling stations), the BSC rating remained a "C" (moderate aquatic resource).

Adjacent land uses included residential and agriculture. The buffer along this middle reach was a little wider than the previous reach (30 to 40 feet). Like the previous reach, the buffer was dominated by invasive, undesirable vegetation with little habitat or streambank stabilization value.

The lower section of Blackberry Creek (Bristol Road to the Fox River) is a moderate to high gradient stream within a well-defined valley. Habitat is good through many reaches of this section and comprised of pools, boulders, undercut banks, submerged logs, clean gravel/cobble runs, and high habitat value vegetation. The substrates within this reach were relatively clean and little mud and silt deposition was present within this reach except within the pools. Several locations of severe streambank erosion existed within this section. A 10 foot high dam is located approximately 700 feet upstream of the confluence with the Fox River. The dam currently serves no flood control function and its structural integrity is uncertain due to a scour hole on its downstream side.

Fish species within this reach were comprised of higher numbers of intolerant species and lower numbers of tolerant species than in the upper two reaches consistent with the higher quality habitat within this reach. The IBI scores in this reach ranged from 42 to 46 resulting in a BSC rating of "B" (highly valued aquatic resource). The dam is an impediment to migration of certain high quality fish species. It is difficult to predict the impact the dam has on BSC ratings of Blackberry Creek upstream of the dam. However, the dam assuredly slows the rate of biological recovery of the Creek after severe flood (or other type) events that can result in significant fish and macroinvertebrate losses.

The riparian corridor was generally quite wide within this section and up to 300 feet in some locations. Like the upper two sections, the habitat and bank stabilization value of the vegetation within this section is generally low. However, higher value riparian areas existed along selected reaches.

Causes and Sources: Although Blackberry Creek has been rated by IEPA as fully supporting the aquatic life use, significant impairments exist in the upper and middle reaches that have been given "C" ratings based on the biological assessments discussed above. Based on the observed conditions documented during the biological survey, the following causes and sources of impairment have been identified.

Causes	Sources
Habitat degradation	Channelization
Siltation	Dam construction
Suspended solids	Streambank modification/erosion
	Removal of riparian vegetation
	Agriculture
	Construction site runoff
	Urban Runoff/Storm Sewers

Future Conditions

As the watershed develops, the potential exists for "flow destabilization" (higher high flows and lower low flows) to be added to the list of *causes* of impairment and for habitat alterations and siltation to increase.

Urban runoff from impervious surfaces and compacted lawns would be the primary *source* of the expected flow destabilization. Urban runoff-induced streambank erosion along with stream and riparian zone modifications associated with land development would be the primary *sources* for increased habitat degradation. Construction site runoff and urban runoff would become more important *sources* of siltation than agricultural runoff as the watershed shifts from greater urban land use and less agricultural land use. Since urban areas without adequate BMPs generally produce greater silt loads than agricultural areas and have greater streambank erosion problems, siltation is expected to increase. These projections are based on observations in other watersheds around the region.

The previously referenced NIPC analysis showed here is a strong relationship in northeastern Illinois between stream quality, as measured by the IBI, and watershed population density (Dreher, 1997). With the current population density of the Blackberry watershed (309 people per square mile), an aquatic life rating in the "B" to "C" range would be suggested by the NIPC assessment. And, in fact, Blackberry Creek's IBIs are in this range.

If the watershed develops following historical patterns, there is concern that Blackberry Creek will shift to a "C" stream throughout for the reasons cited above. However, because virtually all of the watersheds in the NIPC analysis developed without modern stormwater and stream and wetland protection standards, it is not necessarily inevitable that Blackberry Creek will shift to a "C" stream or that Blackberry Creek could not be improved to a "B" stream throughout.

Given the current watershed protection standards in the Blackberry Creek watershed, it is likely that stream degradation will occur since few of the jurisdictions protect against direct channel modifications or even protect buffers along the stream. Although many local government jurisdictions require control of the two-year flood event, only one addresses increases in runoff volumes associated with development. As a result, the duration of high flows will likely increase and exacerbate streambank erosion.

Groundwater

Based on information provided in the Kane County 2020 Land Resource Management Plan, the Kaneville and St. Charles aquifers underlie portions of the Blackberry Creek watershed as well as many areas of Kane and Kendall Counties outside the watershed. Both these aquifers have the potential for public water supply and are known to be used by Elburn, St. Charles, Geneva, and Batavia. Appendix D provides a listing of all known community water supply wells in the Blackberry Creek watershed.

The primary focus of this plan is surface water resources. Any groundwater-based public water supply protection strategy should look at the entire recharge area of the wells of interest and not only those areas that fall within certain surface water watersheds. Never the less, it is important to consider groundwater protection when addressing surface water quality and quantity issues. In some cases, measures such as source reduction of contaminants can protect and/or improve both surface and groundwater resources. Also, infiltration of runoff recharges groundwater supplies and at the same time moderates streamflows. In some other cases, however, measures such as infiltration of stormwater runoff in areas where stormwater can come into contact with hazardous materials would improve surface water quality at the potential expense of groundwater resources.

To identify those areas within the Blackberry Creek watershed most susceptible to groundwater contamination, the Blackberry Creek watershed boundary was overlayed on a map from the ISGS depicting aquifer sensitivity to contamination by pesticide leaching (Keefer, 1995). Aquifer sensitivity was estimated based on the County soil association maps and a map of geological materials to a depth of 50 feet (Berg and Kempton, 1988). This map is shown in Figure 8.

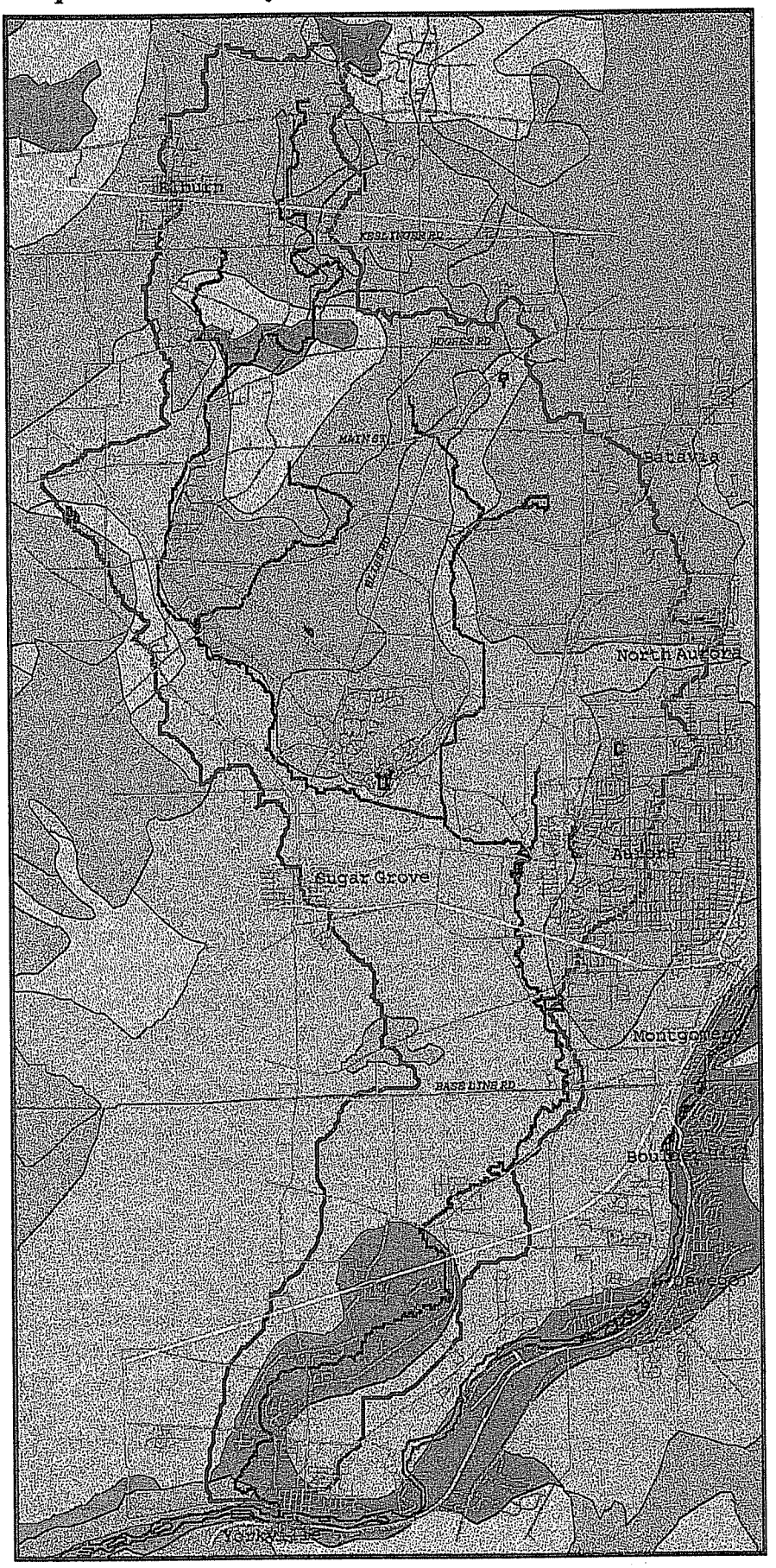
Figure 8: Blackberry Creek Aquifer Sensitivity

Aquifer Sensitivity

- Excessive
- High
- Moderate
- Somewhat limited
- Limited
- Very limited
- Disturbed

Streams

N
W E
S



Prepared By: Kane-DuPage Soil and Water Conservation District and the Natural Resources Department of the Northeastern Illinois Planning Commission

Source: Potential for Agricultural Chemical Contamination of Illinois Aquifers, Illinois State Geological Survey, 1995

It should be noted that this map is intended to provide generalized information and not be used for evaluations of areas less than 36 square miles. Thus, interpretations for smaller areas such as individual farm fields or particular wellhead setback areas would require additional site specific information.

As can be seen from the map, the aquifers in the Kendall County portion of the watershed have *high* and *excessively high* sensitivity to groundwater contamination. The Kane County portion of the watershed is more variable with aquifer sensitivity covering the full range from *excessive* to *very limited* sensitivity to contamination. North of Galena Blvd., the aquifer sensitivity to contamination is significantly less, dominated by areas with *somewhat limited* and *very limited* sensitivity to contamination.

At this time, no significant groundwater contamination problems have been reported within the Blackberry Creek watershed. As the watershed urbanizes, the potential for agricultural pesticide contamination should be reduced and the potential for contamination by urban pollutants will increase. Although it is unlikely that runoff from typical urban surfaces such as parking lots, roofs and roads will contaminate groundwater resources, there are urban "hot spots" that could be problematic. These hot spots typically include automobile filling and service stations and areas where industrial or other contaminants can come into contact with stormwater runoff.

WATERSHED MANAGEMENT ACTIVITIES

Floodplain and Stormwater Management

Kane County adopted a countywide stormwater management plan in October 1998. The plan is quite comprehensive and addresses flooding, water quality, and stream and wetland protection. Although the plan is intended to primarily address urban runoff issues, agricultural drainage issues are also discussed. At the time that this Blackberry Creek plan was being written, the Stormwater Management Planning Committee and its Technical Advisory Committee were preparing a Countywide stormwater management ordinance that will regulate development activities in both incorporated and unincorporated areas.

Kendall County has not been provided by the State legislature the same authority to fund and enforce a countywide stormwater plan as Kane and the other four Chicago metropolitan collar counties (DuPage, Lake, McHenry, and Will).

Floodplain Maps

Floodplain maps for the Blackberry Creek watershed are published by the Federal Emergency Management Agency (FEMA) by community. The source of the floodplain information in all the published maps is the 1989 NRCS study. There are no maps published for Elburn since Elburn only recently began participating in the National Flood Insurance Program (NFIP). Only those stream reaches with at least one square mile of drainage area are mapped as regulatory floodplain. The analysis in the 1989 NRCS study utilized out of date rainfall frequency

information and it is the impression of the technical teams, based on watershed experience, that the actual 100-year floodplain is wider than indicated on the regulatory maps.

Municipal and County Ordinances

The regulations technical team inventoried the watershed protection related ordinances for the Blackberry Creek watershed. A tabulation of the inventory is included in Appendix E. Note that the standards for Kane County and its municipalities may change upon adoption of a countywide stormwater ordinance.

Stormwater Drainage and Detention: All of the seven municipalities and the two counties enforce stormwater drainage and detention ordinances. All of these also have 100-year detention release rates consistent with modern standards recommended by NIPC (0.15 cfs/acre). Three municipalities utilize a more conservative 100-year release rate of 0.10 cfs/acre. Only three of the municipalities and Kane County enforce a 2-year release rate and all use a rate of 0.04 cfs/acre recommended by NIPC to minimize the potential for increases in instream flow rates as a watershed develops. Only Kane County addresses runoff volumes and none of the municipalities or counties have ordinance standards addressing water quality. Most municipalities prohibit onstream detention unless there is a regional benefit but essentially all allow detention in existing wetlands. Five of the municipalities and Kane County require preservation of onsite depressional storage in addition to detention requirements. Maintenance of stormwater management facilities is generally the responsibility of homeowners associations. However, only three require formal maintenance agreements or contracts to ensure that the maintenance is performed.

Floodplain Management: All of the seven municipalities and the two counties enforce floodplain management standards to protect against flooding and all require compensatory storage for floodplain fill. However, only Aurora and Kane County discourage onstream impoundments or channel modifications.

Soil Erosion and Sediment Control: All of the municipalities and the two counties have soil erosion and sediment control standards. However, based on information collected during preparation of the Kane County Stormwater Management Plan, it appears that enforcement is problematic in many areas. This is true around the region and country.

Stream and Wetland Protection: Only one of the municipalities and neither county have stream and wetland protection ordinances. The municipality with a stream and wetland protection ordinance is the only community that has buffer requirements for streams and wetlands. Also, all but one of the communities allow detention within existing wetlands. However, two require best management practices prior to discharge to wetlands. Although, only one community has a stream and wetland protection ordinance, all but three protect onsite depressional storage.

Agricultural Land Management

Currently, 65% of the watershed is under conventional tillage practices and only 12% is under no-till conservation practices (see Table 2). To address this issue, the NRCS and the SWCDs are working with land operators to reduce soil erosion. Although cropland erosion rates are less than the tolerable or "T" rate over a large portion of the watershed, siltation within Blackberry Creek continues to be a problem.

Stream Management and Maintenance

In 1998, the Kane County Stormwater Management Planning Committee performed stream maintenance activities from Route 30 upstream to Bliss Road covering a distance of eight stream miles. The maintenance activities were generally limited to removing debris blockages and trees that were in imminent danger of falling into the creek. A total of 6,840 cubic yards of woody material and 50 cubic yards of trash were removed. The maintenance activities were carried out in a manner generally consistent with *Stream Obstruction Removal Guidelines* (American Fisheries Society, 1983)

The NRCS and the SWCDs are encouraging land operators to take advantage of incentive programs such as Conservation 2000, the Conservation Reserve Program (CRP), and the Conservation Reserve Enhancement Program (CREP). These programs provide financial incentives to retire sensitive agricultural land, including stream and wetland buffers, from production. Cost share is also available to establish vegetation.

Natural Area Management and Restoration

Wetland and Prairie management and restoration activities in the watershed are generally limited to Forest Preserve District lands. These activities include management of invasive, non-natives plant species and prescribed burns. The only other significant wetland management activities are occurring within Carson Marsh, which is generally being managed for game waterfowl and other bird species.

SUMMARY AND CONCLUSIONS

Flooding

Flooding is a major problem in selected areas of the watershed as identified previously. The problems appear to be largely the result of constructing buildings in the floodplain prior to the existence of floodplain maps. However, some structures may have been constructed outside the regulatory floodplain but still have experienced flood damages due to inaccuracies in the mapping and/or expansion of the floodplain.

Another problem, somewhat unique to Blackberry Creek, is the presence of a flow split in Aurora and an overflow out of the watershed in Montgomery that occur during major storm events. (It has been estimated that approximately a 10-year event causes the flow split into the Cherry Hill subdivision. No estimate is available for the Montgomery overflow to the Fox

River.) Because no allowances were made for these conditions, they can lead to significant damage to infrastructure and uncertainties regarding flood flows and levels, hindering emergency operations.

Although the existing stormwater and floodplain ordinances are adequate in many respects to prevent increased flooding, the potential remains for new flooding problems to be created if floodplain maps are not updated and development occurs in currently unmapped floodplain areas. Also, without action, the existing significant flooding problems will continue to pose life-threatening risks and be an economic drain on the residents and communities. If the recommendations of this plan are implemented, the potential to avert significant increases in flood flows and reduce flood damages is good.

Wetlands

Based on the presence of hydric soils in the watershed, it appears that up to 90% of the watershed's wetland area may have been lost. Much of the wetland loss is likely the result of agricultural activities such as draining, dredging, and filling.

Many of the wetlands in the watershed are currently in a degraded condition. Although they continue to provide floodwater storage, most do not exhibit the biological and physical diversity of higher quality wetlands. The lack of biological quality is likely the result of both watershed influences and direct modifications. Although most of the wetlands are in a degraded condition, approximately 20% of the wetlands investigated were identified as being high quality based on biological conditions with Nelson Lake and Carson Marsh being the highest quality wetland complexes.

Due to current wetland regulations, significant loss of wetland acreage may not occur. However, due to the current lack of buffer protection requirements or water quality controls, it is likely that wetland degradation will continue if no actions are taken to reverse this trend.

Lakes

There are only two lakes in the watershed for which data exists. Lake Gregory is an excavated lake that functions as a water feature and a stormwater detention pond. Jericho Lake is a former sand and gravel quarry that is used for fishing and aesthetic enjoyment.

Lake Gregory is highly nutrient enriched and is classified as hyper-eutrophic. Waterfowl waste, runoff from adjacent lawns, and in-lake sediments are reported to be the lake's primary nutrient sources. Carp are also reported to be causing turbid conditions.

Jericho Lake is moderately nutrient enriched and classified as mesotrophic to eutrophic. Reported nutrient sources include agricultural, construction site, and urban runoff and waterfowl waste.

Both lakes are off-line from Blackberry Creek and have drainage areas of approximately 200 acres each. Thus, the quality of these lakes is somewhat independent of the larger Blackberry Creek watershed.

Water Quality

The biological sampling of macroinvertebrates and mussels in the bottom of Blackberry Creek indicate that water quality is reasonably high. This will be particularly true after the Sugar Grove wastewater discharge is removed from Blackberry Creek. However, the presence of a significant silt layer on the bottom of the Creek almost throughout the upper and middle reaches suggests that sediment delivery and deposition within the stream is high. This is consistent with the findings of the watershed erosion analysis performed for this plan.

Based on the existing development ordinances, which generally do not address water quality, it is likely that the water quality of Blackberry Creek will degrade if no actions are taken. Even without urbanization, water quality degradation may continue due to agricultural runoff.

Stream Quality

Within Kane County, the biological quality of Blackberry Creek, as measured by fish populations is degraded. It appears that the lack of fish diversity is due to poor habitat conditions more than due to poor water quality. The poor habitat conditions are characterized by missing pool and riffle sequences, lack of cover such as pools and native riparian vegetation, and siltation of bottom substrates. Much of this is the result of past channelization and elimination of buffers as well as sediment runoff. Because the watershed is 71% agricultural and only 16% urban, the primary source of sediment is agricultural runoff.

Further downstream, in Kendall County, the physical conditions of Blackberry Creek are better and fish populations are more abundant and diverse. As is typical in many watersheds, the lower portions of the watershed have not been modified to the degree that the headwater areas have been. However, the dam near Yorkville appears to be inhibiting fish migration reducing the potential of Blackberry Creek as an aquatic resource.

Although it is expected that some additional flooding problems will be created as the watershed develops, the potential for further stream and wetland degradation is greater.

Based on existing ordinances and trends, it is likely that biological quality of Blackberry Creek will continue to degrade as the watershed urbanizes if no actions are taken to reverse this trend.

Groundwater

Elburn, St. Charles, Geneva, and Batavia as well as numerous individual residents on private wells are know to use aquifers that are at least partially recharged within the Blackberry Creek watershed. The aquifers in the lower portions of the watershed are highly sensitive to excessively sensitive to contamination by pesticide leaching.

Water supply protection strategies should look at the entire recharge area of the wells of interest and not only those areas that fall within certain surface water watersheds. Groundwater protection should also address both the quality and quantity of the resource. As the recharge area of the wells becomes more urbanized, recharge may be reduced due to increases in impervious surfaces and compacted lawns.

SECTION IV – WATERSHED PROTECTION AND ENHANCEMENT RECOMMENDATIONS

INTRODUCTION

Based on the inventory and analyses, the technical teams made recommendations to address the resource concerns of the Watershed Committee. In addition, the Watershed Committee held a one-day workshop to review the technical team recommendations and to identify recommendations that should be included in this plan. The following recommendations are the result of that workshop. For clarity, the recommendations are subdivided into the following four categories. In some cases the categories of recommendations are further subdivided.

> **General** recommendations that apply to all of the categories.
> **Remediation/Restoration** recommendations that are related to addressing existing problems within the watershed and on the Creek. Sub-categories under this section address stream and wetland enhancement, best management practices for upland areas, and flood control.
> **Prevention** recommendations to address problems that could be created as the watershed urbanizes. Sub-categories under this section address regulations for future development and acquisition of high quality wetland areas.
> **Maintenance/Ongoing** recommendations address activities that will require an ongoing effort.

For each of the recommendations, specific actions are recommended, funding considerations and sources are identified, and prioritization considerations are discussed.

Specific actions are identified for each of the four groups listed below.

> **Municipalities and Counties:** In this context, the "county" refers to those arms of the county responsible for oversight of development activities and specifically does not include the forest preserve district or the stormwater committee.
> **Park District and Forest Preserve Districts:** Actions that these entities can take as landowners and as programmers of educational opportunities are identified.
> **County Stormwater Committees:** These entities have specific authority to regulate development activities that transcend municipal boundaries but they do not have zoning authority. The Committees also have authority to prepare and implement watershed plans.
> **Resource Agencies:** Federal, state, and regional resource agencies can be used as technical resources and some have funding.

While carrying out these recommendations, particularly those that involve construction and earth-moving, all applicable permits and reviews should be obtained and performed. For example, activities in the floodway may require IDNR Office of water Resources floodway permits. Corps of Engineers permits may be required for stream and wetland disturbances. A

consultation process with the INDR Division of Natural Resource Review and Coordination is required for any activity that may alter existing environmental conditions, particularly when threatened or endangered species or State Natural Area Inventory sites are involved. In addition cultural resource reviews are required whenever state or federal resource agencies are involved in project planning, design, or funding.

The priority level listed for each recommendation reflects the order in which the recommendations can be performed as much as the importance of the recommendation since essentially all the recommendations are deemed important. In most cases, priority two and three recommendations require that other recommended activities be completed before they can begin.

GENERAL

1) **Introduce Legislation Providing Kendall County With Stormwater Management Authority:** Legislation should be introduced providing Kendall County with similar stormwater management authority already enjoyed by the five collar counties of northeastern Illinois. This will provide a means of implementing many of the recommendations in this plan in Kendall County including enforcement of uniform stormwater standards and maintenance of stormwater facilities as well as the natural drainage system

   Actions: The following actions should be taken to implement this recommendation.

   Municipalities and Counties: Ask local representatives to introduce legislation. Assist in educational efforts to pass legislation.
   Park Districts and Forest Preserve Districts: Assist in educational efforts to pass legislation.
   County Stormwater Committees: The Kane County Stormwater Management Planning Committee should support legislation providing Kendall County with stormwater management authority.
   Resource Agencies: The resource agencies should support legislation providing Kendall County with stormwater management authority.

   Funding: No funding should be required to implement this recommendation.

   Prioritization Considerations: This is a high priority item that should be pursued immediately since this authority would greatly facilitate implementation of many of the recommendations in this plan in Kendall County.

2) **Develop Countywide Stormwater Management Programs for Kane and Kendall Counties:** Kane County should be encouraged to continue its countywide stormwater management planning efforts and to fund an ongoing program that should include regulatory, watershed planning, and maintenance components. The program should address stormwater runoff, floodplain management, and stream and wetland protection. Kendall County should develop a similar program as Kane County. The counties should act as watershed and

countywide resources for developers, municipalities, and landowners in implementing the recommendations of this plan.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Continue Kane County Stormwater Management Planning Committee in Kane County and assemble committee in Kendall County (once authority is established). Financing mechanisms should be established to fund their efforts.
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: The Kane County Stormwater Management Planning Committee should continue implementation of a countywide stormwater program.
Resource Agencies: Provide technical and financial assistance to implement countywide stormwater programs.

Funding: Countywide stormwater programs are generally funded locally through a countywide tax. Grants may be available to implement or assist with implementation of elements of the program such as development of watershed management plans and flood control projects.

Prioritization Considerations: Kane County has already prepared a countywide stormwater plan (Kane County Stormwater Management Planning Committee, 1998) and is on its way toward implementing a countywide program. Kendall County requires the authority identified in Recommendation One to proceed with this recommendation.

3) **Develop Hydrologic and Hydraulic Computer Models of the Blackberry Creek Watershed:** Computer models of the watershed are needed to support many of the recommendations below including evaluating remedial flood control projects, assessing appropriate detention release rates, and evaluating regional detention and wetland banking sites. A list of questions and issues that the model should be designed to address is included in Appendix F. Also included is a discussion of costs associated with the modeling effort.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Petition IDNR-OWR to prepare models of the watershed. Budget funds to provide cost sharing of model development.
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: Petition IDNR-OWR to prepare models and coordinate with them to develop models that will adequately address the needs of the Blackberry Creek watershed. Budget funds to provide cost sharing of model development.
Resource Agencies: INDR-OWR should prepare models of the watershed.

Funding: IDNR-OWR with potential cost sharing by the counties and municipalities.

Prioritization Considerations: The hydrologic and hydraulic models are required to implement a number of the recommendations in this plan.

4) **Prepare Aerial Photo-Based 2-foot Contour Mapping for the Entire Blackberry Creek Watershed. Also Create a Photo Mosaic of Historical Aerial Photos of the Watershed Using Kane County and Other Historical Photos:** These maps would be valuable tools for implementation of many of the subsequent recommendations. In particular, the two-foot contour mapping would be useful for the hydraulic modeling and for enforcement of floodplain management standards. The historical photographs would be useful for identifying potential wetland mitigation and banking sites as well as provide guidance for potential stream re-meandering and restoration projects.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Develop intergovernmental agreements to cost share in the recommended mapping effort.
Park Districts and Forest Preserve Districts: Provide cost share to assist in production of the maps.
County Stormwater Committees: The County stormwater committees, where they exist, should take the lead in producing the maps. Where there is no stormwater committee, the County should take the lead.
Resource Agencies: No specific action is required.

Funding: Local funds as discussed above.

Prioritization Considerations: The mapping will provide very valuable tools for implementing a number of the other recommendations in this plan. The historical photos would be very useful in stream and wetland restoration projects. The contour mapping would be very useful in developing the hydrologic and hydraulic models, preparing updated floodplain mapping, and enforcing stormwater ordinance standards.

5) **Develop a Detailed Watershed Plan for the Blackberry Creek Watershed:** The counties should be encouraged to follow up on the recommendations of this management plan to prepare more site specific plans and implement those plans. A bi-county watershed advisory committee should be formed. The detailed watershed plan should be prepared in a manner consistent with the watershed planning guidance in the Kane County Stormwater Management Plan.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Participate in bi-county watershed advisory committee.
Park Districts and Forest Preserve Districts: Participate in bi-county watershed advisory committee.
County Stormwater Committees: Organize bi-county watershed advisory committee and prepare watershed and implementation plans.
Resource Agencies: Participate in bi-county watershed advisory committee.

Funding: Preparation and implementation of local, comprehensive watershed plans is generally through countywide stormwater committees. However, assistance may be available through a variety of other sources including:

Illinois EPA for implementation of nonpoint source pollution control projects, including water quality improvement and stream restoration and stabilization projects.
IDNR-C2000 for habitat protection and restoration projects, including stream and wetland restoration.
IDNR-OWR for flood control design and implementation.

Prioritization Considerations: Kane County has plans to prepare detailed watershed plans under their countywide stormwater management program

6) **Develop and Implement Public Education Programs:** Public education programs should be developed to reduce polluting activities, gain support for watershed restoration and protection projects and activities, and develop a sense of stewardship among watershed residents. An important element of public education will be to identify demonstration projects of appropriate stormwater, stream, wetland, and buffer management.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Inform residents of Blackberry Creek watershed and its resources through newsletters and flyers.
Park Districts and Forest Preserve Districts: Provide programming for watershed appreciation, protection and enhancement activities including nature hikes, stream monitoring, landscape restoration, etc.
County Stormwater Committees: Provide municipalities with educational materials for distribution to residents. Develop a newsletter of Stormwater Committee activities. Coordinate with and Provide technical assistance to park districts and forest preserve Districts.
Resource Agencies: Provide educational materials to Stormwater Committees and municipalities. The Kendall County and Kane-DuPage Soil and Water Conservation Districts and NRCS should work directly with agricultural landowners.

Funding: Funding may be available from Illinois EPA and from IDNR through it Conservation 2000 program.

Prioritization Considerations: Broad based support for a watershed protection and enhancement program is essential for its implementation. Public education is a key element to achieving that support.

REMEDIATION/RESTORATION

Stream and Wetland Restoration

7) **Develop Guidelines and Identify Demonstration Projects for Geomorphically Appropriate and Ecologically Enhancing Stream Restoration Activities:** Guidance is needed in designing stream restoration projects to ensure that modifications such as re-establishment of meanders and pool-riffle sequences are consistent with the dynamics of Blackberry Creek. It is likely that sufficient guidance can be obtained by assembling existing information from a variety of sources as listed in the Suggested References section of this report. Demonstration projects would facilitate implementation of the guidelines and the remaining recommendations in this section.

   Actions: The following actions should be taken to implement this recommendation.

   Municipalities and Counties: Identify projects that demonstrate stream restoration activities consistent with the guidelines. Publicize the projects to other riparian landowners.
   Park Districts and Forest Preserve Districts: Identify and/or implement projects that demonstrate stream restoration activities consistent with the guidelines. Publicize the projects.
   County Stormwater Committees: Coordinate with resource agencies to develop and/or assemble guidelines. Identify and implement demonstration projects.
   Resource Agencies: Coordinate with Stormwater Committees to develop and/or assemble guidelines. Provide funding and technical assistance for demonstration projects.

   Funding: In terms of preparing guidance, the stormwater committees may be able to perform this task as part of their ongoing activities. Any guidance developed by Kane County should be applicable to Kendall County. Funding for both guidance and demonstration projects may be available from Illinois EPA or IDNR under its Conservation 2000 program.

   Prioritization Considerations: Implementation of this recommendation will facilitate the remaining recommendations in this sub-section.

8) **Encourage and Assist Riparian Landowners in Establishing and Restoring Natural Stream and Wetland Buffers:** Appropriate buffers can reduce property erosion problems for the landowner and at the same time improve aquatic and wildlife habitat. Technical assistance should be provided to both private and public landowners to inform them of appropriate plant materials, plant sources, establishment techniques, and maintenance requirements. Financial assistance should also be considered since appropriate management and maintenance by landowners may reduce future public maintenance costs associated with removal of flow obstructing debris.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Inform riparian landowners of the erosion and wildlife benefits of stream and wetland buffers through newsletters and direct mailing of materials that direct them to resources for assistance. Provide and/or coordinate technical and financial assistance in establishing and managing buffers.

Park Districts and Forest Preserve Districts: Provide programming to educate riparian landowners in establishing and managing buffers.

County Stormwater Committees: Provide technical assistance and possibly financial assistance in establishing and managing buffers. Prepare and/or assemble educational materials on the erosion and wildlife benefits of buffers and provide them to municipalities for distribution

Resource Agencies: The SWCDs and NRCS should inform riparian landowners of the erosion and wildlife benefits of stream and wetland buffers and provide technical assistance in establishing and managing buffers.

Funding: The Conservation Reserve Program (CRP) and Conservation Reserve Enhancement Program (CREP) provide financial incentives to retire sensitive agricultural land, including stream and wetland buffers, from production. Cost share is also available to establish vegetation.

Prioritization Considerations: Since vegetation plays a critical role in the streambank erosion process, native buffers should be established soon to slow the rate of streambank erosion and attendant destruction of aquatic habitat. Stream corridors with significant stands of invasive, non-native woody vegetation should be targeted since these areas often experience severe erosion. Furthermore, excessive woody debris accumulating in the creek can lead to debris blockages and additional erosion. Establishment of native buffers should be part of stream and wetland restoration projects to ensure long-term viability of those projects.

9) **Identify and Implement Opportunities to Restore Natural Stream and Wetland Conditions:** Stream and wetland restoration activities should be undertaken to improve water quality and aquatic habitat in the Blackberry Creek watershed. Streambank stabilization activities should generally be targeted towards those reaches where streambank erosion is most severe and/or reaches that have been channelized and where habitat is degraded. All restoration and stabilization activities should be carried out in a manner that is geomorphically appropriate and ecologically enhancing.

During development activities and drainage enhancement or flood control projects, there may be opportunities to restore more natural meander patterns, pool-riffle sequences, and reconnect Blackberry Creek to its floodplain that can reduce the potential for future erosion and improve aquatic habitat. Likewise, there may be opportunities to restore degraded wetlands, particularly during the development process when developers can enhance wetlands to improve marketability.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Implement stream and wetland restoration activities in existing developed areas using internal funds and grants. Work with developers to protect, enhance, and restore streams and wetlands as part of the development process.
Park Districts and Forest Preserve Districts: Implement stream and wetland restoration activities on park and forest preserve district properties using internal funds and grants.
County Stormwater Committees: Assist municipalities and rural property owners in securing grants for stream restoration activities. Provide technical assistance for stream and wetland restoration projects. Work with developers to protect, enhance, and restore streams and wetlands as part of the development process.
Resource Agencies: Provide and/or coordinate grants and technical assistance to implement stream and wetland restoration projects.

Funding: Both Illinois EPA and IDNR-C2000 provide funding for stream and wetland restoration activities. The Conservation Reserve Program (CRP) and Conservation Reserve Enhancement Program (CREP) provide financial incentives to retire sensitive agricultural land, including wetlands, from production. Cost share is also available to reestablish vegetation. Five-Star Restoration Challenge Grants between $5,000 and $20,000 are available through the USEPA. The USFWS provides grants for wetland restoration activities.

Prioritization Considerations: This is an important activity and critical to achieving the objective of achieving a Biological Stream Characterization "B" rating for the Kane County portion of Blackberry Creek. However, without adequate buffers along the restored reaches and without adequate stormwater management controls in the watershed, these restoration activities may be short-lived.

10) **Investigate the Feasibility and Desirability of Removing Yorkville Dam:** The dam on Blackberry Creek near Yorkville provides no flood control benefit and its structural integrity needs to be investigated due to a scour hole on its downstream side. The dam is also an impediment to fish migration, potentially affecting fish populations in Blackberry Creek upstream of the dam.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Kendall County and the City of Yorkville should pursue a C2000 grant to investigate the benefits, environmental and cultural impacts, and costs of removing the dam. If removal of the dam appears warranted, public meetings and/or hearings should be held to receive further input.
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: Petition the State and/or seek grants to remove the dam. Coordinate with Kendall County and/or the State to minimize short term environmental impacts of dam removal.

Resource Agencies: Provide funding and technical assistance for dam removal.

Funding: An IDNR-C2000 grant was tentatively awarded through the Fox River Ecosystem Partnership. Local cost share may be required for this grant.

Prioritization Considerations: Removal of the dam would facilitate fish migration upstream the dam which would facilitate the objective of improving the Kane County portion of Blackberry Creek to a "B" stream.

11) Coordinate with Forest Preserve District Acquisition and Development Activities: Potential exists to coordinate acquisition and development of forest preserve district sites (as well as park districts and other sites) to achieve flood control and other runoff control benefits. The following are potential coordination activities to be pursued.

- Identify sites that meet forest preserve district objectives and at the same time provide beneficial flood reduction benefits. The hydrologic and hydraulic models discussed under the "General" recommendations could assist in this effort.
- Assist the district in designing control structures that enhance the runoff storage value of existing and future forest preserve district holdings. The hydrologic and hydraulic models should be used in this effort.
- Generally encourage the forest preserve districts (and park districts) to obtain and enhance natural areas including floodplains, wetlands, woodlands, and prairies to preserve the beneficial hydrologic characteristics of these areas and at the same time provide public open space.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Encourage park and forest preserve districts to acquire sensitive natural areas. This can be facilitated by designating corridors and sensitive features as conservation areas in comprehensive plans, zoning regulations and maps.
Park Districts and Forest Preserve Districts: Coordinate with the Stormwater Committees in identifying acquisition areas that will provide flood reduction benefits.
County Stormwater Committees: As part of preparing a detailed watershed plan and utilizing the watershed models, coordinate with forest preserve and park districts in identifying acquisition sites that will provide flood reduction benefits. Assist the districts in constructing or modifying flow control structures to improve flood reduction benefits.
Resource Agencies: Provide technical assistance.

Funding: State and Federal open space funds for acquisition.

Prioritization Considerations: The first two bullets in the description above would be facilitated by the previously recommended hydrologic and hydraulic models (Recommendation 3).

Best Management Practices

12) Encourage and Support Incentive Programs to Implement BMPs on Agricultural Lands: Efforts should be made to enhance use of best management practices on agricultural lands to reduce sediment, pesticide, nutrient loads to the streams, lakes, and wetlands of the watershed. Best management practices should address the following.

- Sediment runoff from cropland.
- Runoff and discharges from livestock waste facilities.
- Exclusion of livestock from streams and wetlands.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: No specific action is required.
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: No specific action is required.
Resource Agencies: The SWCDs and NRCS should continue and enhance programs to encourage agricultural landowners and operators to implement BMPs. The SWCDS and NRCS should assist landowners in applying for state and federal incentive programs.

Funding: No funding should be required to implement this recommendation.

Prioritization Considerations: Without addressing siltation within Blackberry Creek, it may not be possible to achieve a Biological Stream Characterization "B" rating for the Kane County portion of Blackberry Creek. Runoff from cropland is currently the most significant source of sediment delivery to Blackberry Creek and this source should be addressed soon. Cropland with land slopes of 5% or greater and areas under conventional tillage should be targeted.

13) Identify and Pursue Opportunities for Detention Retrofitting: Opportunities to retrofit existing detention basins that are either undersized or were not designed to provide water quality benefits should identified. The following water quality enhancements should be considered to address typical maintenance problems.

- Establish wetland vegetation on shorelines of wet bottom detention basins to address eroding shorelines and/or excessive goose populations and high turbidity.
- Establish prairie and/or wetland vegetation in the bottom of dry bottom detention basins to address wet conditions preventing grass growth.
- Excavate small stilling basins at the entrances of dry bottom detention basins to address erosion problems and/or sediment accumulations.
- Establish prairie vegetation on side slopes of detention basins to reduce mowing needs.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Modify existing detention basins to improve water quality and flood storage using internal funds, grants, and Fee-in-Lieu funds (see recommendations 14 and 29).
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: Assist municipalities in obtaining grants and provide technical assistance.
Resource Agencies: Provide grants and technical assistance for detention retrofitting projects.

Funding: Illinois EPA Section 319 funds have been used to perform detention retrofitting for water quality benefits. IDNR-C2000 funds may be another potential source.

Prioritization Considerations: Retrofitting projects can occur at any time and should generally be scheduled with major maintenance projects.

14) Identify and Pursue Opportunities to Construct Detention Basins in Older Developed Areas: Many older areas of the watershed were developed with no detention to attenuate flow rates or provide water quality treatment. During development or redevelopment of parks or other open space there may be opportunities to construct detention basins. Also, during infill or redevelopment there may be opportunities to create detention basins to address not only the specific parcel but adjacent areas as well.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Create new detention basins to provide detention for areas that were developed without detention using internal funds, grants, and Fee-in-Lieu funds (see recommendations 14 and 29). Coordinate with park districts for locations to construct new detention basins.
Park Districts and Forest Preserve Districts: Park districts should coordinate with municipalities to identify locations where detention basins could be constructed to address areas that were developed without detention.
County Stormwater Committees: Assist municipalities in obtaining grants and provide technical assistance.
Resource Agencies: Provide grants and technical assistance for detention retrofitting projects.

Funding: Illinois EPA Section 319 funds have been used to construct detention basins for water quality benefits. IDNR-C2000 funds may be another potential source of funds to improve water quality. The IDNR-OWR small projects program may be able to assist with detention projects to address local drainage problems.

Prioritization Considerations: These projects can occur at any time and should generally coincide with redevelopment projects and projects to address local drainage problems.

15) Detention or Fee-in-Lieu of Detention should be Required for Redevelopment Projects: Over time, areas without detention can slowly be addressed during redevelopment

or conversion to other uses. With small parcels, it may be appropriate to accept funds instead of detention so that detention can be provided in another location where there is more available space or where detention from multiple small parcels can be combined. To facilitate fee-in-lieu of detention, the following tools should be provided.

- A watershed system should be established to accept and disperse fee-in-lieu of detention funds. The system should specify the conditions under which funds may stay with the municipality vs. becoming part of a watershed-wide fund.
- Guidance on appropriate use of fee-in-lieu of detention as well as recommended fees should be prepared.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Collect fee-in-lieu funds based on direction from the stormwater committees. Prior to stormwater committee guidance and development of a watershed system, collect funds and keep them in an appropriate account.
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: The countywide stormwater ordinance and technical manual should address fee-in-lieu of detention. The stormwater committee should develop the watershed-wide fee-in-lieu system
Resource Agencies: No specific action is required.

Funding: No funding should be required to implement this recommendation.

Prioritization Considerations: Ordinances and municipal code should be modified soon to provide authority to require detention or fee-in-lieu of detention for redevelopment projects.

16) **Each Community Should Pursue a Runoff Reduction Program to Reduce Surface Runoff Volumes from Existing Developed Areas:** As discussed under the preceding recommendations, many areas of the watershed were developed without adequate stormwater measures to control flooding or reduce water quality impacts. In some locations it may be possible to reduce the impact of these areas by implementing measures to "disconnect" impervious areas from the drainage system and allow the impervious runoff to be naturally filtered by adjacent pervious areas. While this may not significantly reduce 100-year flood peaks, it should significantly improve water quality and stabilize runoff rates during more frequent storm events that can affect streambank erosion. Potential measures to reduce runoff volumes from impervious surfaces include the following.

- Redirect roof downspouts from driveways and storm sewers to lawns.
- Crown new and replacement driveways to encourage runoff onto lawns rather than streets.
- Grade new and replacement parking lots to sheet drain to adjacent lawn or swale areas. Also, use depressed landscape islands within parking lots rather than elevated islands.
- Replace lawn areas with deep-rooted native prairie vegetation to enhance infiltration, reduce fertilizer and pesticide use, and reduce maintenance. Also, look for opportunities to sheet drain parking lot and other impervious runoff onto these areas. Campus

developments provide the greatest opportunity for this type of best management practice (BMP).

The runoff reduction measures above enhance groundwater recharge and utilize vegetation and the soil to treat stormwater runoff before it reaches the groundwater. This is an important benefit for the communities and individual residents that obtain their water supply from locally recharged shallow aquifers. However, care should be taken when implementing these runoff reduction measures to minimize the risk of groundwater contamination. In particular, source control measures should first be used on industrial and other sites where there is potential for harmful substances coming into contact with stormwater runoff. Only then should infiltration practices be installed.

Direct introduction of stormwater runoff into the groundwater through the use of injection wells or dry wells should be avoided, particularly in those areas of the watershed where aquifer sensitivity to contamination is moderate or higher (see Figure 8).

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Inform landowners of the flooding, water quality, and habitat protection benefits of reducing storm runoff volumes. Provide technical and/or financial assistance in implementing runoff reduction measures. Modify building codes to require runoff reduction measures during construction or reconstruction of parking lots, driveways, and building additions. Implement runoff reduction measures at municipal and county owned facilities.

Park Districts and Forest Preserve Districts: Where appropriate, convert lawn areas to native vegetation. Implement runoff reduction measures at park and forest preserve district facilities.

County Stormwater Committees: Coordinate with resource agencies to develop and/or assemble guidance on runoff reduction measures. Provide technical assistance in runoff reduction measures.

Resource Agencies: Coordinate with stormwater committees to develop and/or assemble guidance on runoff reduction measures.

Funding: Illinois EPA Section 319 or IDNR-C2000 funds may be available to implement on-the-ground projects.

Prioritization Considerations: This recommendation should be implemented soon so that runoff reduction measures can be coordinated with ongoing property improvement and maintenance activities (e.g., repaving, gutter replacement, etc.)

17) Identify and Publicize Demonstration Projects to Facilitate Implementation of the Recommendations in This Section: Demonstration projects can be very useful in conveying ideas and encouraging implementation of the BMPs recommended in this section.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Coordinate with the stormwater committees to identify and publicize projects that have good demonstration value.
Park Districts and Forest Preserve Districts: Provide demonstrations of establishment of management of native vegetation.
County Stormwater Committees: Coordinate with municipalities, park districts, and forest preserve districts to identify good demonstration projects and prepare materials to publicize those projects.
Resource Agencies: No specific action is required.

Funding: No external funding should be required to implement this recommendation.

Prioritization Considerations: As good projects are occurring, they should be publicized, particularly in the beginning to build momentum for further projects.

Flood Mitigation

The technical team identified a number of flood mitigation alternatives and prepared several recommendations. The detailed alternatives and recommendations are presented in Section V. Recommendations agreed upon by the Watershed Committee are presented below.

18) Establish a Coordinated Emergency Response System: In some of the worst flooding areas, losses from flooding could be reduced by providing advance warning of impending flooding which would allow residents and others to take action to reduce damages. The response system should include the following.

- Watershed-wide monitoring of weather and stream conditions with links directly to emergency management personnel.
- Warning system to alert residents of potential flood dangers and, when necessary, the need to evacuate.
- Emergency evacuation plans to establish evacuation routes, locations of evacuation equipment, and a communications network.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Coordinate with stormwater committees and county emergency management agency in establishing an emergency response system
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: Provide technical assistance to the municipalities and emergency management agencies in developing an emergency response plan. In support of the plan, develop a weather and stream monitoring system
Resource Agencies: The Federal Emergency Management Agency (FEMA), The Illinois Emergency Management Agency (IEMA), and the U.S. Geological Survey (USGS) should provide technical assistance in developing flood warning systems and preparing emergency response plans.

Funding: Local cost share may be required for USGS assistance.

Prioritization Considerations: This should occur soon to reduce future risk to residents.

19) **Investigate Flood Mitigation Alternatives Using Hydrologic and Hydraulic Models of the Blackberry Creek Watershed:** To better assess and design flood mitigation projects, updated models of the watershed are needed. The models should be updated and flood mitigation alternatives and recommendations should be identified as soon as possible. In addition to the site-specific alternatives presented in Section V, the following general types of alternatives should be investigated independently and in combination (in non-preferential order). Criteria that the Watershed Committee would use to evaluate alternatives are discussed under Recommendation 22.

- Detention retrofitting – As an alternative or in addition to flood control reservoirs, modifying or expanding existing detention basins throughout the watershed may be a mechanism for reducing flood damages as well as providing other open space, recreational, and aesthetic benefits.
- Acquisition of floodprone structures – Removal of structures from flood prone areas permanently addresses flooding concerns in those areas while at the same time providing potential open space, environmental, recreational, and aesthetic benefits.
- Flood proofing – In some cases, the best solution to address flooding of specific residents is to protect the specific properties. Flood proofing measures include elevating structures above flood stage, constructing small berms to keep water away from structures, and waterproofing of structures. Flood proofing programs should provide technical assistance to residents and assist them in identifying potential sources of financial assistance. A number of publications on flood proofing are listed in the Suggested References section of this plan.
- Structural measures – Structural measures fall into two basic categories – Storage and Conveyance. Storage flood control reservoirs temporarily store the water until it can pass safely downstream. Conveyance measures include modifying the stream channel or bridge crossings to pass the water at a lower stage that does not cause flooding and constructing levees that confine the flow to the channel to prevent flooding of the floodplain. Structural measures in the Blackberry Creek watershed should be designed to minimize ecological impacts to Blackberry Creek and its tributaries and wetlands. Also, use of levees are discouraged except for short berms necessary to prevent flooding of developed areas.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Petition IDNR-OWR to evaluate flood mitigation alternatives to address flooding throughout the watershed. Budget funds to provide cost sharing for this effort.

Park Districts and Forest Preserve Districts: No specific action is required.

County Stormwater Committees: Petition IDNR-OWR to evaluate flood mitigation alternatives to address flooding throughout the watershed. Budget funds to provide cost sharing for this effort.

Resource Agencies: IDNR-OWR should evaluate flood mitigation alternatives throughout the watershed.

Funding: IDNR-OWR with potential cost sharing by the municipalities and the counties.

Prioritization Considerations: This should be done in conjunction with development of the hydrologic and hydraulic models.

20) **Implement Projects to Reduce the Life Threatening Flood Risk to Residents and Flood Damages in Flood Prone Areas:** It is agreed by all members of the Watershed Committee that prompt action needs to be taken to reduce life threatening situations that occur during large storm events. The alternatives presented in Section V to address these conditions should be evaluated further and appropriate measures, consistent with this plan, implemented as quickly as possible. Recommendations that the Watershed Committee agreed could be implemented at this time without further investigation are identified below.

- Sandbag Galena Boulevard during large storm events to reduce the flow entering the Cherry Hill and Lakeside of San Souci subdivisions. This is a short-term project until more permanent solutions can be implemented.
- Raise Galena Boulevard to reduce flooding of this important arterial route providing access to emergency health services to residents west of Blackberry Creek.
- Remove brush from the creek in the vicinity of the Willowbrook Subdivision consistent with American Fisheries Society guidelines to allow safe passage of flood flows but at the same time protect and enhance stream habitat. This is a short-term project that, by itself, will not substantially reduce flood damages in this subdivision but is necessary to ensure that flooding is not exacerbated by debris blockages.
- Update the existing Willowbrook subdivision evacuation plan. Currently the only route out of the subdivision is via Willow Road, which is overtopped during large events. The updated evacuation plan should identify an alternative exit that could be used as a recreational hiking or biking path under non-flood conditions.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: The City of Aurora should continue to evaluate its plan to remediate flooding in the Cherry Hill and Lakeside of San Souci subdivisions and implement those measures consistent with this plan. Remove brush from the Creek in the vicinity of the Willowbrook subdivision. Update the Willowbrook evacuation plan.

Park Districts and Forest Preserve Districts: No specific action is required.

County Stormwater Committees: Coordinate with municipalities and/or resource agencies to design and implement projects.

Resource Agencies: Provide funding and technical assistance to design and implement projects. The Illinois Department of Transportation (IDOT) should raise Galena Boulevard.

Funding: Existing local funds for evacuation plans and projects planned by City of Aurora. State Highway funds for improvements to Galena Boulevard. IEPA Section 319 and/or

IDNR Conservation 2000 funds may be available for stream maintenance activities to remove excessive debris, particularly if the debris removal is part an overall stream maintenance and management program.

Prioritization Considerations: The bulleted items above could be implemented prior to investigating the flood mitigation alternatives discussed in the previous recommendation.

21) **Minimize Negative Environmental Impacts of Flood Mitigation Projects:** The first consideration for flood control projects should be to reduce life-threatening risks. After achieving that goal, flood control projects should be designed to minimize negative water quality and habitat impacts to wetlands and Blackberry Creek. In some cases, opportunities may exist to enhance the Creek while implementing flood mitigation projects. For example, channel projects to increase conveyance capacity during high flows could also restore stream meanders, re-establish floodplain channel/floodplain connections, and enhance floodplain storage and habitat.

Actions: No explicit action required.

Funding: No funding should be required to implement this recommendation.

Prioritization Considerations: Not Applicable

22) **Detailed Plans For All Flood Mitigation Projects Should be Submitted to the Blackberry Creek Watershed Committee, The Kane County Stormwater Management Planning Committee, and Kendall County for Review and Comment:** Flood mitigation plans for Blackberry Creek should be reviewed by the Watershed Committee as well as Kane and Kendall Counties for consistency with this plan as well as plans of the counties. In general, the Blackberry Creek Committee will use the following criteria to evaluate flood mitigation plans.

- Projects should significantly reduce life-threatening risks.
- There should be no negative flooding impacts upstream or downstream of proposed projects.
- Non-structural projects such as buyouts are generally preferred over structural projects provided that they achieve the same or better level of protection to human life. However, it is recognized that costs will often significantly influence the decision-making process.
- Onstream impoundments (dams) should be avoided due to the negative impacts on stream ecology, the potential for increased erosion downstream, and the significant maintenance requirements often associated with sediment accumulation behind impoundments.
- Levees along Blackberry Creek or its tributaries should be avoided except short berms to prevent flooding of existing developed areas. Levees should be avoided due to the negative impacts to riparian corridor ecology, the potential for increasing flow velocities and erosion during large events, and the loss of natural floodplain storage.
- Channel modifications that may be necessary as part of a flood mitigation project should also be designed to enhance stream ecology based on geomorphically sound principles.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: As members of the Blackberry Watershed Committee, flood mitigation plans should be reviewed for conformance with the goals, objectives, and recommendations of this plan.
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: Review flood mitigation plans for conformance with this plan and countywide stormwater plans
Resource Agencies: Provide technical assistance to the Blackberry Creek Watershed Committee in evaluating proposed projects.

Funding: No external funding should be required to implement this recommendation.

Prioritization Considerations: Not Applicable

PREVENTION

Ordinances and Regulatory Tools

23) **Update the Blackberry Creek Floodplain Maps:** The floodplain maps should be updated to reflect current and future land use conditions, to reflect current information on rainfall frequencies, and to map floodplains and depressions with drainage areas less than 1 square mile.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Petition FEMA and IDNR-OWR to update the floodplain maps. Local funds should be budgeted to cost share the mapping effort to move Blackberry Creek higher up on the remapping list.
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: Petition FEMA and IDNR-OWR to update the floodplain maps. Stormwater committee funds should be budgeted to cost share the mapping effort to move Blackberry Creek higher up on the remapping list.
Resource Agencies: FEMA and IDNR-OWR should update the floodplain maps for the Blackberry Creek watershed using the updated hydrologic and hydraulic models.

Funding: FEMA and IDNR-OWR generally fund remapping studies. However, there is a significant waiting list. Local funds will improve the likelihood of receiving FEMA or IDNR funds in a timely manner.

Prioritization Considerations: The updated hydrologic and hydraulic models to be prepared under recommendation 3 are required to implement this task.

24) **As an Interim Measure, Prior to Updating Floodplain Maps, Use the 500-year Floodplain Boundary in the 1989 NRCS Floodplain Study in Kane County and on the**

FEMA Maps in Kendall County: Because it may be a number of years before the floodplain can be remapped, an interim measure is needed.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Use the 500-year floodplain in the 1989 NRCS study as the regulatory floodplain.
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: Use the 500-year floodplain in the 1989 NRCS study as the regulatory floodplain.
Resource Agencies: No specific action is required.

Funding: No external funding should be required to implement this recommendation.

Prioritization Considerations: This recommendation should be implemented immediately to minimize the potential for further building in the floodplain.

25) **Develop Guidance for identifying Currently Unmapped Floodplains and Depressional Storage Areas:** Stream reaches with less than one square mile of drainage area and depressional storage areas are not identified on current regulatory maps. Tools such as the following may be used to identify these unmapped floodprone areas.

- Hydrologic atlases that indicate inundated areas during the flood of record prior to approximately 1965.
- Aerial photographs taken shortly after the July 1996 flood by the USDA Farm Services Agency.
- One-foot contour mapping routinely prepared for site development permit applications.
- Kane County 2-foot contour mapping.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Regulate unmapped floodplains and depressional storage areas using guidance prepared by the stormwater committees and/or the tools suggested above.
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: As part of developing a countywide watershed protection ordinance and technical reference manual, guidance should be prepared for identifying and regulating unmapped floodplains and depressional areas.
Resource Agencies: Provide technical assistance in developing guidance.

Funding: Kane County funds have been budgeted for preparation of a stormwater technical reference manual.

Prioritization Considerations: The recommendation should be implemented immediately to minimize the potential for further building in flood prone areas.

26) Prepare and Adopt Comprehensive Countywide Watershed Protection Ordinances: Ordinances should be prepared and adopted to protect Blackberry Creek as well as the wetlands and lakes in the watershed from potential negative impacts of development. The ordinance should be consistent with the recommendations in this plan and the Kane County Comprehensive Stormwater Management Plan. Suggested ordinance standards in the Kane County Stormwater Plan are included as Appendix G.

A number of communities in and outside the Blackberry Creek watershed obtain their municipal water supply from locally recharged, shallow aquifers. Appropriate stormwater standards should be included in the countywide ordinances to minimize the risk of groundwater contamination where there is potential for harmful substances coming in contact with stormwater runoff.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Coordinate with the Stormwater Committees in preparing a countywide ordinance that addresses the recommendations in this plan. Kendall County and its municipalities should consider adopting the Kane County ordinance until a countywide ordinance can be prepared for Kendall County.

Park Districts and Forest Preserve Districts:

County Stormwater Committees: Kane County should continue with their plan to prepare and implement an ordinance and technical reference manual. Kendall County should prepare and implement a similar ordinance once their countywide authority is established.

Resource Agencies: Provide technical assistance in preparing countywide ordinances.

Funding: Kane County has budgeted funds for preparation of a countywide ordinance.

Prioritization Considerations: Kane County has already begun drafting a countywide ordinance. Kendall County will need to obtain legislative authority as discussed in recommendation one to enforce a countywide ordinance.

27) All the Municipalities and the Counties Should Adopt the Four NIPC Model Ordinances Until Countywide Ordinances Are Passed: The four NIPC model ordinances are listed below.

- Model Stormwater Drainage and Detention Ordinance. The model ordinance should be modified to utilize a 100-year release rate of 0.10 cfs/acre rather than 0.15 cfs/acre until watershed modeling indicates a more appropriate release rate.
- Model Floodplain management Ordinance. Both the IDNR required standards and the NIPC recommended stream and water quality protection standards in this ordinance should be adopted. Also, all watershed storage should be protected including unmapped floodplain and depressional storage.
- Model Soil Erosion and Sediment Control Ordinance. Adequate field personnel should be devoted to enforcing this ordinance.

- Model Stream and Wetland Protection Ordinance. Preservation and enhancement of adequate stream and wetland buffers with native vegetation is a critical element of this ordinance.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Adopt and enforce the NIPC model ordinances. Utilize publications from NIPC and others (see suggested references) as guidance for implementing the ordinance standards.
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: No specific action is required.
Resource Agencies: NIPC should provide technical assistance to the municipalities and counties in implementing the ordinance standards.

Funding: No external funds should be required to implement this recommendation.

Prioritization Considerations: This recommendation should be implemented immediately in Kendall County where it is unlikely that a countywide ordinance will be adopted within the next several years. In Kane County, municipalities that do not expect significant development in the near future may wish to wait until the countywide ordinance is adopted.

28) Prepare Advanced Identification of Wetlands (ADID) Studies: The studies should build on the work already done as part of this plan and provide the following.

- An updated inventory of wetlands throughout the counties
- A functional assessment of the wetlands identifying the values that each of the wetlands provide.
- Recommended strategies for protection of wetlands and their functions including wetland mitigation guidance and regulatory standards.
- Guidance on use of wetlands for stormwater storage indicating situations under which combining detention storage and wetlands may be appropriate and design standards for such combinations.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: The county and municipalities with appropriate resources should assist in preparing the ADID study.
Park Districts and Forest Preserve Districts: Forest preserve and park districts with appropriate resources should assist in preparing the ADID study.
County Stormwater Committees: Kane County should continue working with U.S. Environmental Protection Agency (USEPA) in completing an ADID study for Kane County. Kendall County should petition USEPA for preparation of an ADID study for Kendall County. A Kendall County stormwater management program would likely improve Kendall County's chances of securing a study.
Resource Agencies: USEPA, SWCDS, NRCS, and NIPC should assist in preparing the ADID study and developing recommendations for wetland protection strategies.

Funding: Expenses related to preparing the ADID study are funded by USEPA. However, significant local staff resources are required to perform many elements of the study.

Prioritization Considerations: An ADID study is already planned for Kane County. Kendall County should approach USEPA soon to prepare a study since generally only one county is studied at a time in Region V of USEPA and other counties are already requesting studies.

29) **Facilitate Appropriate Regional Detention:** Regional detention can be useful for addressing small infill and redevelopment sites where conventional detention is difficult to provide. However, for larger sites, it is generally best to provide on-site detention to avoid drainage and flooding problems between the site and the regional facility. Also, as the drainage area for the regional facility increases, the pressure to construct these facilities as onstream impoundments or in wetlands increases, which is contrary to protection and enhancement of these resources. To facilitate appropriate use of regional detention, the following should be provided.

- A watershed system to accept and disperse fee-in-lieu funds.
- Guidance on situations where use of regional detention and/or fee-in-lieu of detention is appropriate. Guidance should also address appropriate fees and conditions under which fees may stay local rather than going to the watershed fund.
- Regional detention sites should be identified in a number of sub-watersheds of Blackberry Creek as part of detailed watershed planning.
- The volume associated with regional detention should be in addition to existing watershed storage.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Use regional detention and collect fee-in-lieu funds based on guidance from stormwater committees. Prior to stormwater guidance and development of a watershed system, avoid use of regional detention except where the regional detention basin is already planned and budgeted for construction (e.g. as part of another development). Facilitate coordination of detention between developments for small developments. Collected fee-in-lieu should be held in a designated stormwater account.

Park Districts and Forest Preserve Districts: No specific action is required.

County Stormwater Committees: The county stormwater ordinance and technical reference manual should address appropriate use of regional detention and fee-in-lieu of detention. Regional detention should be addressed as part of a detailed watershed plan for Blackberry Creek (see recommendation 5).

Resource Agencies: No specific action is required.

Funding: Existing internal resources.

Prioritization Considerations: Municipalities should begin (or continue) coordinating detention between smaller developments and collect fee-in-lieu of detention where detention

is not possible immediately. Criteria for selecting regional detention and identification of specific sites should be performed as part preparing a detailed watershed plan as discussed under Recommendation 5.

30) **Encourage Site Design Measures to Reduce Increases in Surface Runoff Volumes and Provide Demonstrations:** While the recommended detention standards address the rate of runoff discharging from developments, it does not address the excess runoff volume associated with new impervious areas. To minimize increases in flood flows at the downstream end of the watershed, to protect the creek and wetlands from the hydrologic impacts of development, and to minimize stormwater quality impacts, the measures outlined in *Alternative Site Design Measures for Stormwater Management* (NIPC, 1997), the Kane County Stormwater Management Plan, and other publications in the Suggested References should be incorporated into new development where feasible. These measures include:

- Minimization of impervious areas.
- Disconnection of impervious surfaces
- Utilization of natural drainage measures
- Utilization of native landscaping
- Utilization of natural detention basins
- Cluster Development

The runoff reduction measures outlined in *Alternative Site Design Measures for Stormwater Management* are designed to enhance groundwater recharge and utilize vegetation and the soil to treat stormwater runoff before it reaches the groundwater. This is an important benefit for the communities and individual residents that obtain their water supply from locally recharged shallow aquifers. However, care should be taken when implementing these runoff reduction measures to minimize the risk of groundwater contamination. In particular, source control measures should first be used on industrial and other sites where there is potential for harmful substances coming into contact with stormwater runoff. Only then should practices designed to enhance infiltration be implemented.

Direct introduction of stormwater runoff into the groundwater through the use of injection wells or dry wells should be avoided, particularly in those areas of the watershed where aquifer sensitivity to contamination is moderate or higher (see Figure 8).

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Review subdivision and zoning code to identify conflicts that would discourage these measures. Work with newly elected and appointed officials to inform them of the benefits of these measures. Work with developers to implement these measures.

Park Districts and Forest Preserve Districts: No specific action is required.

County Stormwater Committees: Assemble and prepare educational materials to assist municipalities in educating officials. Provide technical assistance in implementing these measures. Provide guidance in implementing these measures in the stormwater

ordinance technical reference manual. Identify and promote projects around the region that demonstrate these measures.

Resource Agencies: NIPC should provide technical assistance in implementing these measures. NIPC should identify and promote projects around the region that demonstrate these measures.

Funding: IDNR-C2000 and IEPA Section 319 funds may be available to implement on-the – ground projects, particularly those with good demonstration value.

Prioritization Considerations: This recommendation should be implemented immediately to maximize the number of developments incorporating these principles. As sites are developed incorporating some or all of these principles, they should be acknowledged and publicized, particularly those occurring within the Blackberry Creek watershed.

31) **Develop a Wetland Bank Within the Blackberry Creek Watershed:** A public or private wetland bank within the Blackberry Creek watershed would minimize the loss of wetland resources to other watersheds and may provide an opportunity to attract additional wetland resources to the watershed. At the same time, public wetland banks can provide added public open space.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: No specific action is required.

Park Districts and Forest Preserve Districts: Consider initiating a wetland bank or accepting a private bank.

County Stormwater Committees: Coordinate with private parties and/or forest preserve and park districts to create a wetland bank in the watershed. Coordinate with the Corps of Engineers to ensure that sites being considered will meet Corps regulatory requirements.

Resource Agencies: Provide technical assistance.

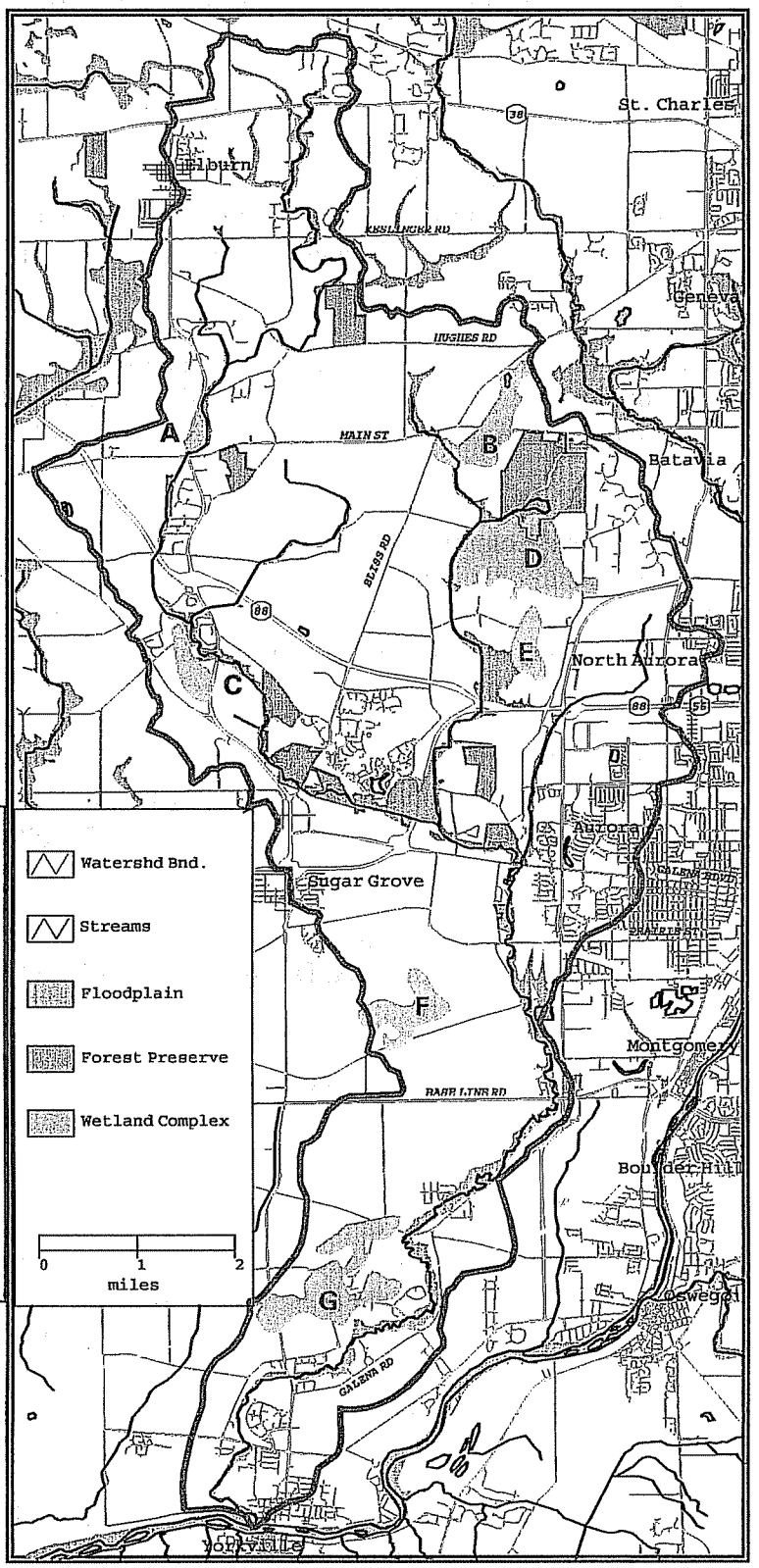
Funding: Wetland banks are typically designed to be self-funded.

Prioritization Considerations: Although this recommendation is not essential to implementation of this plan, the sooner a wetland bank is established the fewer the amount of wetland resources potentially diverted out of the watershed as the watershed develops.

Acquisition

32) **Acquire and Restore Seven Large Wetland Complexes Identified by the Wetlands Technical Team and Shown in Figure 9:** These complexes are important resources because of the significant areas of hydric soils and existing wetlands. These areas have the highest potential for wetland restoration due to their landscape position and hydric soil types. Restoration of these complexes would provide for natural water storage, improved wildlife

Figure 9: Blackberry Creek Wetland Complexes Recommended for Acquisition and Restoration



Note: The wetland complexes depicted on this map represent mapped wetlands, areas of hydric soils, and areas with high restoration potential.

Prepared By: Kane County Development Department and University of Illinois Department of Agricultural & Consumer Economics
Source: Blackberry Creek Wetlands Technical Team

habitat, educational benefits, and recreational use. The wetlands are described individually below.

Site A is located northeast of the corner of Main Street and Route 47. The land is fallow and has not been actively farmed in recent years. It includes existing high quality wetland number 60. This large complex of drained Lena muck could easily be restored to a quality fen by disabling the agricultural drainage system. This site is immediately adjacent to the main stem of Blackberry Creek and could restore greater floodwater storage if the entire site were restored to active floodplain.

Site B is located northwest of Nelson Lake. It is in a headwater position within the watershed and hence would provide excellent flood attenuation benefits downstream. It includes existing high quality wetland number 44 and consists largely of drained Drummer soils.

Site C is adjacent to Waubonsie Community College (across Route 47) and could be used for environmental education purposes if restored. It is next to a series of ponds and may include small remnant wetlands not shown on the National Wetlands Inventory. It includes drained Lena, Drummer, and Harpster soils providing excellent opportunities for diverse wetland community restorations.

Site D is a very large complex immediately south of Nelson Lake. It could provide a significant addition to Nelson Lake, the Forest Preserve's largest single holding. It consists of drained Milford, Drummer, and Houghton soil types, again providing excellent opportunities for diverse wetland restorations.

Site E is located just south of Site D, and hence could represent further addition to the Nelson Lake complex. It also consists of drained Drummer, Milford, and Houghton soil types.

Site F includes existing wetland 260, which was not rated as high quality but is a larger than average wetland within the watershed. Located on the north side of Jericho Road, it consists of drained Houghton and Drummer soils.

Site G includes several existing wetlands as well as drained hydric soils. The existing wetlands include those that received the highest functional quality rating in this study, excepting those already publicly owned. These high quality wetlands could be expanded and connected by restoration in the surrounding drained Lena muck soil.

Each of the sites should be evaluated in terms of its stormwater storage potential using the hydrologic and hydraulic models discussed in the "General" section of the recommendations.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: The identified wetlands should be designated as conservation areas in comprehensive plans and zoning and regulation maps. Require that developers working within these areas provide conservation easements or donate or offer for sale the identified wetlands to the forest preserve district, park district, or a land foundation.

Park Districts and Forest Preserve Districts: Acquire the identified sites using internal funds and/or grants.

County Stormwater Committees: Require that developers working within these areas provide conservation easements, donate, or offer for sale the identified wetlands to the forest preserve district, park district, or a land foundation.

Resource Agencies: Provide financial assistance.

Funding: State and Federal open space funds and IDNR-C2000.

Prioritization Considerations: Since at least portions of these wetland complexes are technically upland, they are not protected by current wetland regulations. Thus, fee simple ownership or conservation easements should be acquired before these areas become targets for development.

33) **Pursue Acquisition of all High Quality Wetlands in the Watershed:** Acquisition should be targeted to the 16 highest quality wetlands not in public ownership (see Figure 7). The remaining six high quality wetlands are owned by Kane County Forest Preserve District. Acquisition should be made by groups that will offer long-term protection and management of the wetland resources. Where acquisition is not possible, land donations and/or conservation easements should be sought.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: The 16 identified wetlands should be designated as conservation areas in comprehensive plans and zoning and regulation maps. Require that developers working within these areas provide conservation easements or donate or offer for sale the identified wetlands to the forest preserve district, park district, or a land foundation.

Park Districts and Forest Preserve Districts: Acquire the 16 identified sites using internal funds and/or grants.

County Stormwater Committees: Require that developers working within these areas provide conservation easements, donate, or offer for sale the identified wetlands to the forest preserve district, park district, or a land foundation.

Resource Agencies: Provide financial assistance.

Funding: State and Federal open space funds and IDNR-C2000.

Prioritization Considerations: Those wetlands under the greatest development pressure should be targeted (i.e., those wetlands adjacent to existing developments).

MAINTENANCE/ONGOING

Stream and Wetland Maintenance

34) **Develop Stream and Wetland Maintenance and Management Guidelines:** Technical guidance should be prepared for maintenance and management of stream, wetlands, and their buffers. The guidance should make use of existing materials and recognize the diversity of adjacent land uses including agricultural, recreational, residential, and commercial. Guidance should be prepared at two levels. The first level should target homeowners and other smaller landowners to identify light activities that they can perform and to inform them regarding damaging activities such as dumping yard waste in streams and wetlands. The second level should target larger entities, such as drainage districts, townships, municipalities, and park districts that can perform heavier maintenance activities.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: No specific action is required.
Park Districts and Forest Preserve Districts: Provide programming for stream and wetland maintenance and management for homeowners associations and other private organizations and individuals with streams and wetlands on their property.
County Stormwater Committees: Assemble and/or prepare guidance on appropriate stream and wetland maintenance and management activities and include the guidance in the stormwater technical reference manual.
Resource Agencies: Provide materials and technical assistance to stormwater committees preparing guidance.

Funding: No external sources of funds should be required to implement this recommendation.

Prioritization Considerations: Implementation of this recommendation will facilitate the remaining recommendations in this sub-section.

35) **Encourage and Assist Rural Riparian Land Owners in Appropriate Stream and Wetland Maintenance and Management:** Landowners or larger rural tracts should be encouraged to appropriately manage streams, wetlands, and their buffers. Technical and possibly financial assistance should be provided as necessary to achieve high rates of participation.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: The Counties should provide guidance materials and technical assistance to homeowners and homeowners associations. Perform stream maintenance activities on publicly owned land and along privately owned land where heavy maintenance is required. Coordinate with drainage districts and townships to perform appropriate stream maintenance activities.

Park Districts and Forest Preserve Districts: Perform stream and wetland maintenance on park and forest preserve property. Where appropriate provide technical assistance to landowners and municipalities.

County Stormwater Committees: Coordinate stream and wetland maintenance activities between municipalities, large landowners, drainage districts, etc. to improve effectiveness and reduce costs.

Resource Agencies: The SWCDS and NRCS should provide technical assistance and work with large rural landowners.

Funding: Existing resources.

Prioritization Considerations: Since vegetation plays a critical role in the streambank erosion process, land owners should be approached soon to reduce the potential for streambank erosion and attendant destruction of aquatic habitat. Those areas with existing buffers providing good stabilization should be targeted to ensure that these buffers continue to provide those benefits and do not revert to more degraded conditions. Areas with significant debris accumulations should also be targeted to prevent the substantial erosion damage that these blockages can cause.

36) **Perform Stream and Wetland Maintenance and Management in Urban Areas:** Urban areas can present special challenges due to numerous riparian land owners, the presence of homeowners associations, and multiple jurisdictions including municipalities, Counties, park districts, and others. Mechanisms for stream, wetland, and riparian area maintenance should be identified and implemented for urban areas.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Municipalities should provide guidance materials and technical assistance to homeowners and homeowners associations. Perform stream maintenance activities on publicly owned land and along privately owned land where heavy maintenance is required. Require access and maintenance easements for all streams and wetlands within new developments. Obtain, where necessary, access and maintenance easements in existing developed areas.

Park Districts and Forest Preserve Districts: Perform stream and wetland maintenance on park and forest preserve property. Where appropriate provide technical assistance to landowners and municipalities.

County Stormwater Committees: Coordinate stream and wetland maintenance activities between municipalities, large landowners, etc. to improve effectiveness and reduce costs.

Resource Agencies: No specific action is required.

Funding: Existing and new resources. Section 319 and IDNR-C2000 grant funds may also be available for larger projects.

Prioritization Considerations: Since vegetation plays a critical role in the streambank erosion process, land owners should be approached soon to reduce the potential for streambank erosion and attendant destruction of aquatic habitat. Those areas with existing buffers providing good stabilization should be targeted to ensure that these buffers continue to provide those benefits and do not revert to more degraded conditions. Areas with significant debris accumulations should also be targeted to prevent the substantial erosion and flooding damage that these blockages can cause.

37) **Identify and Promote Sites where Appropriate Stream and Wetland Maintenance Practices are Being Used:** Demonstration sites will provide landowners and others involved in stream and wetland maintenance with examples of appropriate practices and with resources for guidance.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: As maintenance projects are completed, publicize them and use them as examples for others. Inform stormwater committees of projects.
Park Districts and Forest Preserve Districts: Inform municipalities and the stormwater committees of projects on forest preserve and park district lands.
County Stormwater Committees: Inventory completed projects and provide the database to the municipalities.
Resource Agencies: Inventory good projects around the region and provide the county stormwater committees with the information.

Funding: Existing resources.

Prioritization Considerations: As good projects are occurring, they should be publicized, particularly in the beginning to build momentum for further projects.

Stormwater System Maintenance

38) **Develop Maintenance Guidelines and Mechanisms for Constructed Stormwater Management Systems:** Technical guidance and standards for maintenance of stormwater detention and other stormwater systems should be prepared. Guidance should address conventional stormwater facilities as well as the special needs of created naturalized systems such as wetland detention basins and wetland or prairie swales. Guidance should also address inspection schedules and documentation.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: No specific action is required.
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: Prepare guidance and include in stormwater technical reference manual.
Resource Agencies: No specific action is required.

Funding: Existing resources.

Prioritization Considerations: Implementation of this recommendation will facilitate the remaining recommendations in this sub-section.

39) **Maintain Constructed Stormwater Management Systems:** Mechanisms for facilitating and completing maintenance activities should be identified recognizing the presence of homeowners associations and other entities. The mechanisms should address both existing developed areas and special opportunities that may arise as part of new development. Mechanisms and tools may include the following.

- Drainage easements
- Public works staff financed by special service areas (SSAs).
- Homeowners associations with backup SSAs if work is not performed.
- Homeowners associations with municipal authority to perform and charge for work not performed.
- Maintenance agreements with park districts for landscape maintenance and public works inspection of structures.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Perform maintenance using one or more of the mechanisms identified.
Park Districts and Forest Preserve Districts: No specific action is required.
County Stormwater Committees: Incorporate maintenance requirements into countywide stormwater ordinances.
Resource Agencies: No specific action is required.

Funding: Existing resources.

Prioritization Considerations: Mechanisms to ensure maintenance within new developments should be identified and implemented immediately to ensure that future maintenance responsibilities are addressed in an efficient manner.

Source Controls

40) **Develop a Source Control Program to Address Nonpoint Source Pollution from Developed Areas:** Programs should be developed to address the numerous nonpoint sources of pollution in urban areas. The programs should address the following.

- Management of landscape, household, and pet waste.
- Storage of materials in floodplains and riparian zones, particularly floatable materials.
- Storage and disposal of hazardous and toxic materials, and conservative pollutants such as deicing salt.

- Application of fertilizers and pesticides, particularly in riparian areas and near drainageways (regional drains, roadside swales, curbs, etc.) and in areas sensitive to groundwater contamination (see Figure 8).

These programs should address the potential for both surface water and groundwater contamination. In particular, efforts should be made to prevent precipitation and stormwater runoff from coming into contact with hazardous materials that could contaminate surface and ground-water resources.

Actions: The following actions should be taken to implement this recommendation.

Municipalities and Counties: Work with volunteer and neighborhood organizations to perform storm sewer stenciling. Provide periodic collections for hazardous household waste and used motor oil. Prepare articles for municipal newsletters.
Park Districts and Forest Preserve Districts:
County Stormwater Committees: Develop a model source control program that can be readily implemented by municipalities. Provide educational materials for distribution by municipalities. Provide technical assistance.
Resource Agencies: Provide technical and financial assistance.

Funding: Existing resources. IEPA Section 319 funds may also be available to implement source control programs.

Prioritization Considerations: Source control programs should be targeted to those portions of the watershed discharging to lakes and high quality wetlands since lakes and wetlands tend to accumulate pollutants.

SECTION V - FLOOD MITIGATION ALTERNATIVES

INTRODUCTION

The "flooding in existing subdivisions" technical team was charged with identifying alternatives and making recommendations to reduce the risk of flooding to safeguard the health, safety, and welfare of the residents in specific subdivisions that are known to experience recurrent flooding.

The team performed inventories to assess the extent of flooding problems and their general causes. However, the team did not have the resources to perform computer modeling of the watershed or more detailed analysis of the problems and potential solutions. Instead, the alternatives and recommendations of the team were based on review of existing data and reports and simple calculations and analyses.

Without detailed analysis and computer modeling to evaluate the alternatives, the Watershed Committee was unable to choose among the identified alternatives. Instead, the committee recommended that the alternatives be investigated and evaluated using hydrologic and hydraulic models (recommendation 19), recommended that the most appropriate alternatives be implemented (recommendation 20), provided criteria that the committee would use to evaluate alternatives (recommendation 22), and included the technical team's detailed discussion of alternatives in this section. These, as well as other, potential alternatives should be analyzed and investigated further to identify the most effective solutions in terms of reducing life threatening risks with acceptable costs in terms of dollars and environmental impacts.

WILLOWBROOK SUBDIVISION

Location: Off Galena Road in Kendall County. (See *Exhibit L*).

Number of Residents and Homes: At least 30 people reside in homes in the 100-year floodplain. The subdivision includes 164 ranch and multilevel homes. Development began in 1958.

Flood History: Willowbrook is a subdivision located on the banks of Blackberry Creek. During major storm events, water exceeds the banks of the stream and flows through the subdivision causing many homes to be completely surrounded by fast-moving floodwater. The bridge on Willow Road-- the only access road-- is overtopped during large storm events. Residents are unable to exit safely and emergency vehicles cannot enter.

The July 1983 storm caused an estimated $157,500 in damages to ten properties. In the July 1996 storm, eight homes suffered first floor damage with floodwaters reaching three inches above the first floor. Water in the streets exceeded 2-1/2 feet. Damage to 20 homes, including lower levels, totaled $200,000. During that event, Willowbrook received 12-1/2 inches of rain in 24 hours. Some residents evacuated the subdivision at 3:30 p.m. on July 18th by locking arms and fording through 2-1/2 feet of floodwater. Others had to be evacuated and taken to safety via boats and canoes.

In the February 1997 storm, twelve primarily bi-level homes took on water in their lower levels. Most of these homes had just been rebuilt from the July 1996 storm.

Recommendations for Willowbrook Subdivision:

- Clean out the brush-choked creek south of Willowbrook to the Blackberry Oaks Golf Course. This channel maintenance should include removal of fallen trees and other large debris according to *Stream Obstruction Removal Guidelines* (The Wildlife Society and American Fisheries Society, 1993)), and the *Stream Preservation Handbook* (Illinois Department of Transportation, Division of Water Resources, 1981).

- Update the present evacuation plan to contain contingencies for an alternate evacuation route when the bridge is inundated and inaccessible. Create a recreational bike path/nature trail with a walkway bridge that could be used for evacuation purposes during major storm events.

- Support flood control measures that will not increase the peak flow under the Route 30 bridge or create higher flood stages downstream.

Alternative Solutions for Willowbrook Subdivision:

- Modify bridges according to recommendations in *Floodplain Management Study, Blackberry Creek and Tributaries* (1989).

  The Willow Road Bridge--one of the three bridges, which were identified in the 1989 study-- has already been widened. Greatest potential for improved life-safety, environment, and community. Moderate cost.

- Create a low levee system between the creek and homes. (See *Exhibit D*).

  Moderate flood protection to Willowbrook residents. Possible breaching during severe storms may be hazardous. Entails negative environmental impacts by confining creek to restricted floodplain. Local residents may have concerns about aesthetics. Least costly of the four alternatives.

- Buy out the six to eight homes incurring first floor damage.

  High life-safety benefit as most flood danger is eliminated. Negative community impact due to loss of long-time residents, but benefits remaining residents by restoring property values. Buyout land can be used for detention, eliminating need for other stream modifications. High environmental benefit as affords possibility for restoration of floodplain function in limited area. Likely to be the most costly alternative.

- Widen the creek channel through this subdivision.

  Moderate protection to Willowbrook residents but entails negative environmental impacts to water quality, aquatic life and habitat. Increases flood stage downstream and thus may be opposed by the larger community.

PASADENA SUBDIVISION

Location: Off Base Line Road just south of Business Route 30 in unincorporated Kane County. (See *Exhibit E*).

Number of Residents and Homes: 80 residents live in 26 homes built in the late 1950s.

Flood History: Pasadena is a subdivision located 3,500 feet east of Blackberry Creek. The homes back up to Route 30. The area is somewhat low and experiences flooding from minor rains. During major storm events, Pasadena is subject to flooding from an overflow of Blackberry Creek. This overflow starts at Jericho Lake, located just east of the main channel at Jericho Road, and flows diagonally towards the southeast through Montgomery where it ultimately reaches the Fox River. Pasadena is located in the path of the overflow, however, during moderate (10- or 15-year) rains Route 30 acts as a levee to protect the subdivision.

During the July 1996 storm, basements or other lower levels filled from the 16 inches of rain, but first-floor flooding occurred only after the Burlington Northern Railroad trestle gave way upstream near Prairie Road. The surrounding embankment and ballast failed around the double-box culvert sending floodwater racing south towards Jericho Lake and the Village of Montgomery. The large overflow cut several paths towards the Fox River. The overflow path that crossed Route 30 at about 3 p.m. on July 18th breached two feet over Route 30. The trestle failure damaged the first floor of 20 homes in Pasadena. Floodwater reached an average of 20 inches above the first floor. There was more than 4-1/2 feet of water in the streets. Property damage exceeded $900,000.

Pasadena Drive did not incur first-floor damage during the February, 1997 storm.

Recommendations for Pasadena Subdivision:

- Perform a detailed engineering study of Jericho Lake and the Montgomery overflow to the Fox River, including the restriction caused by the Route 30 bridge.

Alternative Solutions for Pasadena Subdivision:

- Provide detention at the overflow path on property along Orchard Road between Aucutt Road and Jericho Road. This storage could be developed as a wetland/recreational area. (See *Exhibit G*).

  Moderate to low protection to Montgomery and Pasadena Drive residents and businesses. Must be done in conjunction with other measures. Significant environmental benefits, recreational opportunities and aesthetic improvements.

- Buy out all 26 homes.

  The most costly alternative with the greatest life-safety protection. May be opposed by those residents who do not want to leave the community. Buyout land could be used for storage and provide environmental benefits.

- Redefine and redirect the Blackberry Creek overflow to a "low damage" route to the Fox River. (See *Exhibit F*). This may include a channel conveyance path on the north side of Route 30 to the Fox River.

  High life-safety benefits to residents. Possible negative impacts to wetlands, which would need mitigation. However, overall cost may be less than other alternatives.

PRESTBURY SUBDIVISION

Location: West of Aurora in Kane County.

Number of Residents and Homes: 630 single family and multifamily homes built in the mid-1960s.

Flood History: Prestbury is a subdivision built on rolling terrain. The community contains two aesthetic lakes, clubhouse facilities, and an 18-hole golf course. Portions of the golf course lie within the floodplain. Blackberry Creek runs along the southern boundary of Prestbury. The lower lake is fed from a slough just north of Prestbury.

Four single-family homes suffered first floor damage from the July 1996 storm. More homes took on basement water. Most of the property damage in Prestbury was to the basements of 20 townhouses in Turtle Cove, situated adjacent and just south of the lower lake. Damage to Turtle Cove totaled $500,000. The two lakes functioned relatively well during the storm; however, the lower lake's south side berm is slightly lower and allowed floodwater to spill into Turtle Cove basements.

A wastewater treatment plant serving Sugar Grove and Prestbury is located in the Blackberry Creek floodplain near the Prestbury subdivision. The location of the treatment plant, which is nearing capacity, poses health risks and impairs water quality in Blackberry Creek during large floods. Sugar Grove is in the process of building a new treatment plant and replacing the existing plant with a pump station.

Alternative Solutions for Prestbury Subdivision:

- Regrade and raise the southern berm to keep the overflow from reaching Turtle Cove. Modifications to the overflow structure may be required.

  Protects residents without significant environmental impact or great expense. May require dam safety permit and review.

- Regrade the area south of the berm and create a swale towards the overflow ditch. This will direct overflow of the lake's berm away from Turtle Cove.

  Protects residents without significant environmental impacts. Less costly than the other alternative. Does not require dam safety permit.

CHERRY HILL AND LAKESIDE OF SAN SOUCI

Location: The subdivisions of Cherry Hill and Lakeside of San Souci are located in Sugar Grove Township and in the western part of Aurora in Kane County. The subdivisions are bordered by Galena Blvd. on the north, Orchard Road on the east, Prairie Road on the south, and Blackberry Creek on the west. Blackberry Creek lies approximately 1,600 feet west of Cherry Hill. (See *Exhibit H*).

Number of Residents and Homes: About 900 residents live in 176 Cherry Hill homes and 107 Lakeside of San Souci homes. Development began in Cherry Hill in 1961 and Lakeside of San Souci was built in the mid-1970's. Cherry Hill depends on a community pumping station to drain water from minor storms out of the subdivision because portions of the community are situated on low-lying terrain. These areas act as a floodway for Blackberry Creek.

Flood History: Property damage has occurred at least three times since the early 1970's in Cherry Hill-Lakeside of Sans Souci, though estimates are not available for the extent of property damage before the 1983 flood. About two-thirds of property damage throughout the watershed occurs in Cherry Hill and Lakeside of Sans Souci. Flooding during the July 1983 storm occurred as floodwaters ponded behind the bridge over Blackberry Creek at Galena Blvd. Hours after the rain stopped, flood waters flowed into Cherry Hill from the northwest where water overtopping the Galena Blvd. bridge flowed eastward along Galena Blvd. and then south into Cherry Hill, and from East Run where ponding inundated Hankes Road and overtopped Galena Blvd. Floodwater passed through the subdivision along Manchester Way and entered the main channel approximately one mile south. Up to two feet of water ponded for several days on residential streets. Damage to most homes was limited to basements.

In the July 1996 storm, 203 homes suffered first floor damage. Flooding occurred 18 to 24 inches above the first floor of homes in Lakeside and up to five feet above the first floor in Cherry Hill. Together Cherry Hill and Lakeside incurred more than $12,500,000 in first floor property damage. Residents on the west side of Cherry Hill had to evacuate in early morning darkness by pushing through 4-1/2 feet of fast flowing water on Manchester Way, because a chainlink fence on the west side of the subdivision prevented their walking to higher ground behind the homes. Patio decks were lifted and pushed off their foundations from the force of moving floodwater. Other residents were rescued with locally owned boats the next day. An estimated peak flow of 3,000 cfs subjected Cherry Hill and Lakeside to:

- Flood damage when Blackberry Creek overtopped Galena Blvd.
- Flood damage from the East Run of the creek which extends through Orchard Valley up to Route I-88 and beyond.
- Damage from floodwater from the Chain-O-Lakes tributary.

By 2 p.m. during the February 1997 storm, floodwater upstream of the Galena Blvd. bridge overtopped sections of the road. Aurora maintenance crews worked diligently to sandbag Galena Blvd. to prevent flooding in Cherry Hill. Observations of this storm yielded an important discovery of the direction of flow. According to the *Floodplain Management Study, Blackberry Creek and Tributaries* (1989) the ratio of the peak flow of the main channel to East Run is about

10:1. As observed by resident and technical advisor Rick Hutter, floodwater actually flowed eastward from the main channel across Hankes Road into Orchard Valley and then south towards Cherry Hill. Cherry Hill and Lakeside escaped potential damage because the floodwater was held at Galena Blvd.

Recommendations for Cherry Hill and Lakeside of Sans Souci:

- In the event of a major storm before flood control measures are fully implemented, Galena Blvd. should be sandbagged as on February 22, 1997 to prevent flooding in Cherry Hill and Lakeside of Sans Souci.

Alternative Solutions for Cherry Hill and Lakeside of Sans Souci:

- Deepen the Chain-O-Lakes retention to store more floodwater.
  Potential increased storage capacity of 100 acre-feet or less. Will reduce flow from the Chain-O-Lakes but may not be large enough for significant flood risk reduction to the subdivisions. Primarily will enhance safety of Lakeside of Sans Souci residents.

- Implement the City of Aurora's Cherry Hill-Lakeside of Sans Souci improvements as outlined in *Five-Year Budget for Flood Control Improvements* (1997). Includes purchase of vacant property north of Cherry Hill and south of Galena Blvd., and construction of an earthen levee to keep floodwater from entering the subdivision. (See *Exhibit I*).
  Some negative environmental impacts from channel modifications, which may, in particular, affect historic Blackberry Farm. Significant reduction in flood risk to residents. Possible elimination of floodplain through Cherry Hill.

- Implement the *Five Year Budget for Flood Control Improvements* (1997) with the following enhancements: add storage sites, one north of Galena Blvd. and another on the Barnes property at the proposed overflow ditch. This would help to reduce and limit the main channel modifications. Acquire vacant property north of Cherry Hill and south of Galena Blvd., and build an earthen levee to hold floodwater.
  (See *Exhibit I*).
  Somewhat more costly, but reduces environmental impacts to Blackberry Creek. Significant reduction in flood risk to residents. Storage may also provide wildlife habitat and recreational opportunities for residents. Storage area may require tree clearing and mitigation. Possible affect on Blackberry Farm.

- Divert floodwater away from Cherry Hill by installing a north-side berm and creating a large storage site north of Galena Blvd. to compensate for the storage lost in Cherry Hill. (See *Exhibit J*).
  Significant protection to residents but the 2,000 to 4,000 acre-feet of required storage may not be available. Storage site may require tree clearing and mitigation. Expensive to acquire land and construct.

- Construct a box culvert beneath Manchester Way to safely carry the overflow under Cherry Hill. Create a protective levee along the west side of Lakeside of Sans Souci. (See *Exhibit K*).

  Minimal environmental consequences. Temporary disruptions to residents during extensive construction.

- Raise Hankes Road on both sides of Galena Blvd. to divert and split the main channel flow from East Run. Construct a box culvert under Manchester Way to carry East Run flow under Cherry Hill. Create a levee along the west side of Lakeside. (See *Exhibit K*).

  Smaller box culvert required so less costly to implement. Temporary disruptions to residents during extensive construction.

- Buy out 44 homes in Cherry Hill and Lakeside that are in the floodway.

  Significant life-safety protection, as those residences most vulnerable to severe flood damage would be eliminated. Can help restore depressed property values. Possible opportunity to enhance wildlife habitat and recreational/aesthetic opportunities. Costly. Negative impacts to community due to loss of neighbors.

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APPENDIX A

GLOSSARY OF TERMS

GLOSSARY OF TERMS

BASE FLOOD ELEVATION: The water surface elevation resulting from the 100-year frequency flood event.

BEST MANAGEMENT PRACTICE (BMP): A measure used to control the adverse stormwater-related effects of development. BMPs include structural devices (e.g., swales, infiltration basins, and detention basins) designed to remove pollutants, reduce runoff rates and volumes, and protect aquatic habitat. BMPs also include non-structural urban site design measures such as minimizing impervious surfaces, utilizing native landscaping, and establishing buffers along streams, lakes, and wetlands. Finally, BMPs include institutional measures such as public education efforts to stop dumping of household chemicals into storm drains.

BUFFER: A strip of land along a stream, lake, or wetland planted with native vegetation. The width of the buffer is measured from the ordinary high water mark of a perennial or intermittent stream, the ordinary high water mark of a lake or pond, or the edge of a wetland. Development within buffers is typically limited to improvements such as piers or docks necessary to allow access to the water.

CHANNEL: Any river, stream, creek, brook, branch, natural or artificial depression, ponded area, flowage, slough, ditch, conduit, culvert, gully, ravine, wash, or natural or manmade drainage way, which has a definite bed and bank or shoreline, in or into which surface or groundwater flows, either perennially or intermittently.

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, filling, straightening, relocating, lining, and significant removal of vegetation. Channel modification does not include the clearing of debris or removal of trash.

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

CULTURAL RESOURCES: All the past activities and accomplishments of people manifested in buildings, objects, locations, and structures that have scientific, historic, and cultural value.

DEPRESSIONAL STORAGE: The volume of storage available below the base flood elevation contained in low lying areas that have no drainage outlet.

DESIGN STORM: A precipitation event that, statistically, has a specified duration and probability of occurring in any given year (expressed as average frequency of occurrence in years or as probability in percent).

DETENTION BASIN: A facility designed to temporarily store runoff either on, below, or above the ground surface, accompanied by controlled release of the stored water.
DEVELOPMENT: Any man-made change to real estate by private or public entities including clearing, grading, excavation or fill, construction or reconstruction of buildings, installation of utilities, subdivision, or change in land use.

DISCHARGE: The rate at which water moves through a channel or pipe; measured by volume per unit of time (cubic feet per second).

DRY DETENTION BASIN: A detention basin designed to drain completely after temporary storage of stormwater runoff and to be normally dry over the majority of its bottom area.

DRY WELL: An open cell, usually cylindrical, formed below the ground surface, surrounded by and having a bed of granular material for infiltration and disposal of collected runoff into the ground.

EROSION: The general process whereby earth is removed by flowing water, wave action, or wind.

FEMA: The Federal Emergency Management Agency.

FLOOD INSURANCE RATE MAP (FIRM): A Flood Insurance Rate Map, issued by FEMA that is an official community map, on which FEMA has delineated both the special hazard areas and the risk premium zones applicable to the community. This map may or may not depict floodways.

FLOODPLAIN: A relatively level, continuous area adjacent to a lake or stream channel which is submerged during times of flood; and natural depressions including wetlands which are periodically inundated by stormwater.

FLOODWAY: The channel and that portion of the floodplain adjacent to a stream or watercourse which is needed to convey the anticipated existing 100-year frequency flood discharge with no more than a 0.1 foot increase in stage due to any loss of flood conveyance or storage and no more than a ten percent increase in velocities. In some cases, the floodway may include that portion of the floodplain containing 90% of the floodplain storage volume. Floodways can be calculated based on either existing or future land use runoff conditions.

FLOODWAY MAP: Map issued by FEMA that delineates the floodway, 100-year floodplain, and 500-year floodplain. Elevations for the 100-year flood are usually indicated at selected locations.

FLOOD CONTROL: Flood mitigation measures, usually structural, to reduce the extent (elevation and/or area) of flooding. Generally includes reservoirs, levees, and channelization.

FLOOD MITIGATION: An action or set of actions taken to prevent flooding or mitigate the impacts of flooding. Remedial and/or preventative actions come in the form of stormwater regulations for development, floodplain management, stormwater detention/retention, levees, and non-structural activities such as open space preservation.

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.

FLOOD PROTECTION ELEVATION: The elevation above which regulated structures within the floodplain must be elevated. The flood protection elevation is equal to the base flood elevation plus a specified amount of freeboard. The freeboard is typically one or two feet.

FLOODPLAIN MANAGEMENT: A set of actions taken to minimize damage to persons and property within the floodplain. These actions often include floodplain development regulations, floodplain acquisition and preservation and floodproofing.

FREEBOARD: An increment of elevation added to a design elevation or structure to provide a factor of safety for uncertainties in calculations, unknown localized conditions, wave actions, future development, and unpredictable effects such as those caused by ice or debris jams.

HYDROLOGY: The science of the behavior of water, including its dynamics, composition, and distribution in the atmosphere, on the surface of the earth, and underground.

HYDROLOGIC BUDGET: The components of atmospheric water which include precipitation, evaporation, surface runoff, subsurface runoff, and groundwater recharge.

IMPERVIOUS SURFACE: Man-made or natural materials through which water, air or roots cannot penetrate and which prevents the movement of surface water down to the water table.

INFILTRATION: The passage or movement of water into the soil.

LETTER OF MAP AMENDMENT (LOMA): Official determination by FEMA that a specific structure is not in a 100-year flood zone; amends the effective Flood Hazard Boundary Map or FIRM.

LETTER OF MAP REVISION (LOMR): Letter that revises the base flood or 100-year frequency flood elevations, flood insurance rate zones, flood boundaries or floodways as shown on an effective Flood Hazard Boundary Map or FIRM.

MAJOR DRAINAGE SYSTEM: That portion of a drainage system needed to store and convey flows beyond the capacity of the minor drainage system.

MINOR DRAINAGE SYSTEM: That portion of a drainage system designed for the convenience of the public. It consists of street gutters, storm sewers, small open channels, and swales and, where manmade, is usually designed to handle the 10-year runoff event or less.

NONPOINT SOURCE POLLUTION: Pollution that has no single discharge point or origin. Pollutants are usually comprised of sediment, organic compounds, toxic metals and various pathogens. Sources of nonpoint source pollution typically include urban and agricultural runoff and effluent from septic systems and landfills.

ORDINARY HIGH WATER MARK: The point on the bank or shore up to which the presence and action of surface water is so continuous so as to leave a distinctive mark such as by erosion, destruction or prevention of terrestrial vegetation, predominance of aquatic vegetation or other easily recognized characteristics.

PEAK FLOW: The maximum rate of flow of water at a given point in a channel or conduit.

POINT SOURCE POLLUTION: Pollution that is discharged from a single point or structure. Most often, a point source is a pipe delivering effluent from a wastewater treatment facility or industrial facility.

POSITIVE DRAINAGE: Provision for overland paths for all areas of a property including depressional areas that may also be drained by storm sewer.

RECEIVING WATERS: Streams, lakes, wetlands, etc., into which stormwater is discharged.

RETENTION BASIN: A facility designed to completely retain a specified amount of stormwater runoff without release except by means of evaporation, infiltration, emergency bypass or pumping.

RIPARIAN ENVIRONMENT: Land bordering a waterway or wetland that provides habitat or amenities dependent on the proximity to water.

RUNOFF: Water which moves through the landscape, either as surface or subsurface flow, which originates from atmospheric precipitation, initially in the form of rain or snow. Runoff is that portion of the hydrologic budget that produces surface water in streams, lakes, and wetlands.

SEDIMENTATION: The process that deposits soils, debris, and other materials either on other ground surfaces or in bodies of water or stormwater drainage systems.

SETBACK: The horizontal distance between any portion of a structure or any development activity and the ordinary high water mark of a perennial or intermittent stream, the ordinary high water mark of a lake or pond, or the edge of a wetland, measured from the structure's or development's closest point to the ordinary high water mark, or edge. Allowable development features within setbacks typically include minor improvements such as walkways and signs, utilities, park facilities, and lawns.

STORMWATER: Those waters that run off the land surface which originate from atmospheric precipitation, whether initially in the form of rain or snow.

STORMWATER DRAINAGE SYSTEM: All means, natural or manmade, used for conveying stormwater to, through or from a drainage area to the point of final outlet from a property. The

manmade and natural stormwater drainage system includes but is not limited to any of the following: conduits and appurtenant features, canals, channels, ditches, streams, culverts, streets, storm sewers, detention basins, swales and pumping stations.
STORMWATER MANAGEMENT: A set of actions taken to store, convey, or otherwise manage stormwater runoff to minimize the negative impacts of runoff from urban surfaces. Broadly interpreted, stormwater management encompasses both structural and non-structural measures to directly manage runoff as well as measures to protect natural water features such as streams, floodplains, lakes, and wetlands.

STORM SEWERS: Usually enclosed conduits that transport excess stormwater runoff toward points of discharge, sometimes called storm drains.

URBAN RUNOFF POLLUTANTS: Contaminants commonly found in urban runoff which have been shown to adversely affect uses in receiving water bodies. Pollutants of concern include sediment, heavy metals, petroleum-based organic compounds, nutrients, oxygen-demanding organics (BOD), pesticides, salt, and pathogens.

WATERSHED: All land area drained by, or contributing water to, the same stream, lake, or stormwater facility.

WET DETENTION BASIN: A detention basin designed to maintain a permanent pool of water after the temporary storage of stormwater runoff.

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

WETLAND MITIGATION: Measures taken to compensate for wetland disturbances such as filling, dredging, draining, impoundment, and vegetation removal. Mitigation measures include enhancement of existing wetlands (including the disturbed wetland) and creation of new wetlands.

2-YEAR EVENT: A runoff, rainfall, or flood event having a fifty- percent chance of occurring in any given year. On average, an event of this size or larger will occur once every 2 years. Rainfall depths of various frequencies and durations can be found in Bulletin 70 from the Illinois State Water Survey.

100-YEAR EVENT: A rainfall, runoff, or flood event having a one- percent chance of occurring in any given year. On average, an event of this size or larger will occur once every 100 years. Rainfall depths of various frequencies and durations can be found in Bulletin 70 from the Illinois State Water Survey.

APPENDIX B

ACRONYMS

ACRONYMS

ADID – Advanced Identification of Wetlands Study

BMP – Best Management Practice

BSC – Biological Stream Characterization

EPA, Illinois (IEPA) – Illinois Environmental Protection Agency

EPA, United States (USEPA) – United States Environmental Protection Agency

FEMA – Federal Emergency Management Agency

FEQ – Full Equations Model, a computer model for simulating flow in rivers and streams.

FIRM – Flood Insurance Rate Map

FIS – Flood Insurance Study

GIS – Geographic Information System

HEC-1 – Computer model for rainfall-runoff events

HEC-2 – Computer model for estimating flood heights in rivers.

HSPF – Hydrologic Simulation Program-Fortran, a computer model for simulation extended periods of rainfall-runoff.

HWL – High Water Level

IDNR, OWR – Illinois Department of Natural Resources, Office of Water Resources

ISGS – Illinois State Geological Survey

KCSMPC – Kane County Stormwater Management Planning Commission

NIPC – Northeastern Illinois Planning Commission

NPDES – National Pollutant Discharge Elimination System

NPS – Non Point Source pollution

NRCS – Natural Resources Conservation Service (formerly known as SCS)

NWL – Normal Water level

PDR – Purchase of Development Rights

SCS – Soil Conservation Service (now known as NRCS)

SWCD – Soil and Water Conservation District

TDR – Transfer of Development Rights

TR20 – Computer model for rainfall-runoff events

USACE – United States Army Corps of Engineers

USCOE – United States Corps of Engineers (same as USACE)

USDA – United States Department of Agriculture

USGS – United States Geological Survey

WSP2 - Water Surface Profiles 2, a computer model for estimating flood heights in rivers.

APPENDIX C

RESOURCE CONCERNS AND DESIRED FUTURE CONDITIONS

RESOURCE CONCERNS IDENTIFIED FOR BLACKBERRY CREEK

1. Road runoff enters directly into creek (both quality & quantity).

2. Increase standards used for detention/ retention (currently too low).

3. Siting of infrastructure for existing & proposed development.

4. Flooding in existing subdivisions (cherry hill, lakeside, prestbury, willowbrook & pasadena dr).

5. Stream water quality (siltation & sedimentation).

6. Farm tile systems are breaking down.

7. Floodplain delineation for 100 yr./ 500 yr. storm (lack of detail in some areas).

8. Lack of regional detention & coordination of siting.

9. Lack of aquifer protection.

10. Lack of adoption of 1989 Blackberry Creek Study.

11. Increased flow resulting from upstream channel modifications.

12. Lack of public awareness in regard to what a watershed is (individual impacts).

13. Lack of wetlands and natural areas to store floodwater.

14. Lack of stream maintenance.

15. Loss of small mouth fishery.

16. Deteriorated aesthetics of streams as a result of the flood.

17. Inability of SE overflow to run to the Fox River.

18. Lack of overall management of new development within the watershed.

19. Protect & enchance high quality wildlife habitat.

20. Lack of information by individual landowners of floodplain elevation.

21. Lack of engineering study to determine stream capacity for 100 yr. storm.

22. Preservation of existing natural areas & greenbelts.

23. Lack of local funding for aquiring, when necessary, greenbelt areas.

24. Lack of attention to maintenance of tributaries.

25. Streambank erosion has widened creek.

26. Lack of channel capacity.

27. Life/ safety issues during flood events.

28. Increased imperviousness.

29. Inadequate or outdated detention designs.

30. Lack of overflow relief considerations on roadway structures beyond 100 yr. flood.

31. Lack of erosion and sediment control for farmers.

32. Lack of public knowledge of existing regulations.

33. Lack of streambank protection and buffering.

34. Conflicting and overlapping regulations & jurisdictions.

35. Lack of incentives for farmers to control erosion.

36. Lack of regional or area jurisdiction for stormwater, drainage, erosion control and floodplain management.

37. Lack of lobbying of planning & zoning within watershed.

38. Lack of provisions for slowing down of runoff.

39. Lack of historical wetland restoration.

40. Floodplain protection.

41. Lack of open space preservation during development.

42. Lack of wetland banking and stormwater detention banking.

43. Lack of identification of natural pooling on floodplain maps.

44. Lack of identification of areas/ infrastructure of high flood risk categorizing the risk and establishing means to remove or reduce the risk.

45. Lack of identification of infrastructure.

46. Lack of emergency flood planning (identify) local needs to meet emergencies (eg rubber rafts available).

47. Lack of a center to receive emergency calls ie to receive information and distribute it back out.

Resource Concerns voting summary of the Blackberry Creek Planning Committee from the February 19, 1997 meeting at Waubonsee C.C.

11. Increased flow resulting from upstream channel modifications. **(33 pts. / 9 votes)**

13. Lack of wetlands and natural areas to store floodwater. **(32 pts. / 8 votes)**

2. Increase standards used for detention / retention (currently too low).
18. Lack of overall management of new development within the watershed.
28. Increased imperviousness.
37. Lack of lobbying of planning & zoning within watershed.
41. Lack of open space preservation during development. **(30 pts. / 9 votes)**

8. Lack of regional detention & coordination of siting.
42. Lack of wetland banking and stormwater detention banking. **(23 pts. / 6 votes)**

34. Conflicting and overlapping regulations & jurisdictions.
36. Lack of regional or area jurisdiction for stormwater, drainage, erosion control and floodplain management.
40. Floodplain protection. **(16 pts. / 5 votes)**

31. Lack of erosion and sediment control.
35. Lack of incentives for farmers to control erosion. **(13 pts. / 6 votes)**

29. Inadequate or outdated detention designs. **(11 pts. / 5 votes)**

4. Flooding in existing subdivisions (cherry hill, lakeside, prestbury, willow brook & pasadena dr.). **(10 pts. / 2 votes)**

17. Inability of SE overflow to run to the Fox River. **(9 pts. / 2 votes)**

10. Lack of adoption of 1989 Blackberry Creek Study. **(9 pts. / 3 votes)**

38. Lack of provisions for slowing down of runoff.
39. Lack of historical wetland restoration. **(9 pts. / 3 votes)**

44. Lack of identification of areas / infrastructure of high flood risk categorizing the risk & establishing means to remove or reduce the risk.
45. Lack of identification of infrastructure.
3. Siting of infrastructure for existing development. **(7 pts. / 3 votes)**

48. Lack of access.
23. Lack of funding for acquiring, when necessary, greenbelt areas. **(6 pts. / 5 votes)**

6. Farm tile systems are breaking down. **(5 pts. / 1 vote)**

21. Lack of engineering study to determine stream capacity for 100 yr. storm. **(5 pts. / 3 votes)**

12. Lack of public awareness in regard to what a watershed is (individual impacts).
20. Lack of information by individual landowners of floodplain elevation.
32. Lack of knowledge of existing regulations. **(4 pts. / 2 votes)**

1. Road runoff enters directly into creek (both quality & quantity). **(4 pts. / 1 vote)**

30. Lack of overflow relief consideration on roadway structures beyond 100 yr. flood. **(4 pts. / 1 vote)**

27. Life / safety issues during flood events. **(2 pts. / 1 vote)**

7. Floodplain & depressional areas delineation for 100 yr. / 500 yr. storm (lack of detail in some areas).
43. Lack of identification of natural pooling on floodplain maps. **(2 pts. / 1 vote)**

19. Protect & enhance high quality wildlife habitat.
22. Preservation of existing natural areas & greenbelts. **(2 pts. / 1 vote)**

14. Lack of stream maintenance.
24. Lack of attention to maintenance of tributaries. **(2 pts. / 1 vote)**

33. Lack of streambank protection & buffering. **(1 pt. / 1 vote)**

9. Lack of aquifer protection. **(1 pt. / 1 vote)**

25. Streambank erosion has widened creek. **(0 pts. / 0 votes)**

5. Stream water quality (siltation, sedimentation, nutrients & pesticides).
15. Loss of small mouth fishery. **(0 pts. / 0 votes)**

16. Deteriorated aesthetics of streams as a result of the flood. **(0 pts. / 0 votes)**

26. Lack of channel capacity. **(0 pts. / 0 votes)**

46. Lack of emergency flood planning (identify) local needs to meet emergencies (eg. rubber rafts available). **(0 pts. / 0 votes)**

47. Lack of a center to receive emergency calls (ie. to receive information and distribute it back out). **(0 pts. / 0 votes)**

49. Sewage discharge overflow & pollution of water supply. **(0 pts. / 0 votes)**

DESIRED FUTURE CONDITION OF THE WATERSHED

A. Increased flow resulting from ~~downstream~~ channel modification.

What do we know?

- Trees relatively new - used to be prairie.
- Areas of highest flow - Cause? Hughs Road South.
- Modified at Bliss road to Densmore (straightened)
- Identification of bermed or filled areas.
- Irregular flows, Man made - straighten, dredge and bridges.

What do we need to know?

- Implication of change from prairie to woodland.
- Where has modification occurred? What has impact been?
- Role of detention basins as recreation lakes.
- What vegetation is good?

Desired future condition

- Dredging and Cleaning.
- Large scale detention.
- strengthen banks with native vegetation.
- Restore natural channel where possible (longer bridges)
- Removal of undesirable trees and brush.
- Develop desired uniform cross-section for channel.
- Protect and restore pools and riffles.

B. Lack of Wetlands and Natural Areas to store floodwaters

What do we know?

- Not many existing wetlands.
- Location of hydric soils and prime farmland; can identify possible areas for location of wetlands, etc.

What do we need to know?

- Is there a database of wetlands? (location, quality/function)
- How to acquire more?
- Overlay current conditions on hydric soils and potential for restoration.
- Impact of developing wetlands on runoff and flooding.
- How do wetlands reduce peak floods and increase storage throughout the watershed?
- Relationship between prairies and wetlands.
- Where is increased flow originating?

Desired future Condition

- Target wetlands for acquisition and restoration for storage (to reduce peak flows).
- Recreation issues addressed.
- Create policies that encourage protection and restoration of wetlands.

C. Increase Standards for Detention, etc.

What do we know?

- Standards for detention are too low.
- Needs updating, i.e. weather criteria.
- May not be 'rational' release rate for creek (capacity).

What do we need to know?

- Study stream to determine approximate cfs release rate (100 year storm) to better estimate standards. Design to detain 100 year storm.
- Existing Standards.
- What are good standards for % impermeability in development.

Desired future Condition

- Develop appropriate and uniform standards for watershed and subwatersheds.
- Maintain 100 year flood level (not exceed or reduce).

D. Detention siting, wetland and stormwater banking.

What do we know?

- 1989 study.

What do we need to know?

- County Stormwater Committee, what will they address?
- Who is responsible for maintenance of detention ponds?
- Funding of regional authority?
- How is current detention and maintenance being funded?

Desired future Condition

- Establish general/regional authority for maintaining and establishing detention ponds.
- More regional planning with input from other entities.

E. Conflicting/Overlapping regulations and jurisdictions and Floodplain protection.

What do we know?

- Lack of coordination region wide.
- Lack of enforcement.
- Not looking at whole creek/watershed.

What do we need to know?

- How can our committee coordinate between two counties?
- What are the conflicts and inconsistencies between jurisdictions?
- How to coordinate funding and permitting function?

Desired future Condition

- Regional approach to regulation and enforcement.
- Increase understanding of floodplain function and importance.

F. Erosion and Sediment control.

What do we know?

- Problem is enforcement - laws exist.
- Need to look at all landowners.

What do we need to know?

- Erosion rates, existing practices in watershed.
- Where does streambank need to be stabilized?

Desired future Condition

- Motivation for Erosion and Sediment Control projects.
- Education about practices and incentives.
- Enforcement
- Leadership

G. Inadequate or outdated detention designs.

What do we know?

- Best location is high in watershed and off-channel (e.g. Countryside Shopping Center, Golden Oaks.)

What do we need to know?

- What is 'high' - siting of detention, etc.?
- How to deal with existing developments with inadequate detentions? Policy issue.
- How to do it? Funding.

Desired future Condition

- Bring existing detention ponds up to proposed standards.
- Address developments which do not have detention.

H. Flooding in existing subdivisions.

What do we know?

- Current situation is unsafe.
- Unique (floodwater through a residential area with 100 year storm).
- Cherry Hills is 'Hot Spot' of peak flow - threat to human life.
- 1989, 1984, 1962 studies.
- SE Group did study on Fox Valley Golf Course (berm elevations).

What do we need to know?

- Study and come up with ways to resolve problem. [Black, East Run, and Lake Run]
- Relative importance of different areas (see '89 study).
- Cost to buy out homes?
- Characterize human/life-safety factor.
- Revisit solutions recommended in '89 study. What is potential for implementation?

Desired future Condition

- A safe subdivision [1. No damage, 2. safe, 3. same, but prevent from worsening]
- What will it take to achieve above?

APPENDIX D

Community Water Supply Wells within the Blackberry Creek Watershed

Active and Proposed Community Water Supply Wells Located in Kane and Kendall Counties as of 08/31/1999

Wells Located in Sections Wholly or Partially Within Blackberry Creek Watershed

Facility Numb	Facility Name	Well ID	Township	Range	Section	Status	Local Well Description	County
0894070	SUGAR GROVE	20088	38N	07E	10	A	WELL 1 ACROSS RD FRM OFFICE	KANE
0894070	SUGAR GROVE	20089	38N	07E	15	A	WELL 2 NW CORNER GOLF COURSE PK LOT	KANE
0890850	SUGAR GROVE	00737	38N	07E	21	A	WELL 7	KANE
0890650	AURORA	21135	38N	07E	24	A	WELL 21 LOCATED IN PIONEER PARK	KANE
0890850	AURORA	00344	38N	07E	24	A	WELL 101 IN PIONEER PARK BY WELL 21	KANE
0890850	AURORA	21137	38N	07E	25	A	WELL 23 JERICHO AND BARNES RDS	KANE
0895149	ELBURN	00613	39N	07E	05	A	W4 770' E RT 47 & 100' S OF NORTH ST	KANE
0895149	BROADVIEW ACDMY	20023	39N	07E	10	A	WELL 1 NEAR ELEVATED TANK	KANE
0890300	BROADVIEW ACDMY	20024	39N	07E	10	A	NORTHEAST OF WELL #1 ABOUT ONE HALF MILE	KANE
0890120	MILL CREEK WTR RCLMTN DSTRCT	00951	39N	07E	12	A	TERNEY LN AND SULLEY SQUARE WELL 1	KANE
0890120	MILL CREEK WTR RCLMTN DSTRCT	01148	39N	07E	12	P	WELL 2 IS 2500 FEET NORTHEAST OF WELL 1	KANE
0890110	ELBURN	20037	40N	07E	32	A	WELL 3 E OF HWY 47 N SIDE OF VILLAGE	KANE
0935100	CTZNS MARINA VILLAGE DVN	20124	37N	08E	07	A	WELL 2	KANE
0935100	CTZNS MARINA VILLAGE DVN	20123	37N	08E	08	A	WELL 1	KANE
0894690	MONTGOMERY	00629	37N	08E	16	A	WELL 13 440 FT S ASHLAND 85 FT E RTE 31	KANE
089407C	AURORA	21138	38N	08E	08	A	WELL 25 N OF INDIAN TRAIL E OF RANDALL	KANE
0895125	AURORA	00612	38N	08E	18	A	W103 1000' N OF GALENA BLVD AND ORCHARD	KANE
0895125	AURORA	21133	38N	08E	19	A	W19 INTERSECTION PRAIRIE AND PALMER	KANE
0895185	AURORA	00610	38N	08E	19	A	WELL 119 N OF WASHINGTON JR HS	KANE
0895545	AURORA	00611	38N	08E	20	A	WELL 115	KANE
0935250	STORYBOOK HIGHLANDS	20120	37N	07E	11	A	WELL 1	KENDALL
0930250	YORKVILLE	20134	37N	07E	32	A	WELL 3 .5 BLOCK W BRIDGE ON VAN EMMON	KENDALL
0930250	YORKVILLE	20135	37N	07E	28	A	W4 NEAR WATER TOWER AND PUBLIC WORKS	KENDALL

APPENDIX E

REGULATORY STANDARDS INVENTORY

INVENTORY OF STORMWATER DRAINAGE & DETENTION REGULATIONS
GOVERNING AUTHORITIES IN BLACKBERRY CREEK WATERSHED

October 1997

SECTION OF KANE COUNTY STORMWATER MANAGEMENT SURVEY	VILLAGE OF ELBURN	VILLAGE OF NORTH AURORA	CITY OF YORKVILLE	CITY OF AURORA	VILLAGE OF SUGAR GROVE	KANE COUNTY	KENDALL COUNTY	VILLAGE OF MONTGOMERY	VILLAGE OF OSWEGO	DUPAGE COUNTY*	LAKE COUNTY*	SUMMARY OF RESPONSES: NUMBER RESPONSES	NUMBER "YES"	NUMBER "NO"	OTHER RESPONSES
General Stormwater:															
17. Does your community enforce a stormwater drainage and detention ordinance?:	Yes	Subd Ord	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11	10	0	1
18. Which of the following are addressed in the purpose statement of your ordinance?:															
A. Runoff Volume:	No	NA	Yes	Yes	Yes	---	Guidance	Yes	Yes	Yes	Yes	11	7	2	2
B. Runoff Rate:	No	NA	Yes	Yes	Yes	Yes	Guidance	Yes	Yes	Yes	Yes	11	8	1	2
C. Water Quality:	No	NA	No	---	No	---	No	---	---	Yes	Yes	11	2	5	4
19. Are formal maintenance agreements or contracts required for new detention facilities?:	No	Yes(SSA)	No (1)	No	No (1)	No	No (1)	Yes	Yes	---	No	10	3	7	0
A. Who is responsible for maintenance?	Prop Ownr	---	---	Associat.	---			Varies	Varies	---	---				
B. What enforcement mechanism is in place should the stormwater management facilities are not maintained?	?	---	---	---	---		---	---	---	---	---	0			
C. If a municipality or county is responsible for maintenance, how does the municipality budget and pay for the maintenance?	No	---	---	---	---		---	N/A	---	---	---	1		1	
D. For those municipalities or counties that provide for maintenance, who does the the work?	?	---	---	---	---		---	N/A	---	---	---	0			
E. Does the municipality or county have a regular maintenance and inspection program and is it adequate to be utilized as a model for others to use?	No	---	---	---	---		No	Yes	Yes	---	---	4	2	2	
20. Must existing depressional storage be preserved	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes	11	6	5	
21. Is there a requirement that concentrated detention basin outflows be discharged to a defined drainageway with adequate capacity?:	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	---	Yes	10	8	2	
22. Is there an acreage threshold below which stormwater detention requirements do not apply?:	Yes	Yes	No	Yes	Yes	Yes	Yes	No	---	Yes	Yes	11	9	2	
A. Residential:	Min 2.5 Ac	1 Ac	---	2 Ac	2.5 Ac	5 Ac	5 Ac	No	---	3 Ac	5 Ac				
B. Commercial/Industrial:	All	1 Ac	---	0.5 Ac	2.5 Ac	5,000SF or 250 CY	2.5 Ac	No	---	1 Ac	3 Ac				
23. What recurrence interval storm must be conveyed by the minor drainage system?:	5 Yr	10 Yr	10 Yr	10 Yr	10 Yr	5 Yr	Not Spec	5 Yr	5 Yr	10 Yr	10 Yr				
Detention Sizing Standards:															
24. What method of detention sizing is required?:															
A. Not Specified:	Yes	---	---	---	---	---	Yes	---	---	---	---	11	2	9	
B. Modified Rational Method:	---	---	Yes	Yes	Yes	---	---	Yes	Yes	---	---	11	5	6	
C. Hydrograph routing:	---	---	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes	11	6	5	
D. TR55 graphical method:	---	Yes	---	---	Yes	---	---	---	---	---	---	11	2	9	
E. Other:	---	---	---	---	---	---	---	---	---	unit det	unit det	11			2
25. Is a safety factor required on calculated detention volumes?:	No	No	1.25	Yes	No	No	No	No	No	No	No	11	2	9	
26. What is the specified release rate for the 100-year event?:															
A. MWRDGS Method (3-Year):	---	---	---	---	---	---	---	---	---	---	---	11	0	11	
B. 0.15 cfs/acre:	---	---	Yes	General	Yes	Yes	Yes	Yes	Yes	---	Yes	11	7	3	1
C. 0.10 cfs/acre:	Yes	Yes	---	Sp Areas	---	Sp Areas	---	---	---	Yes	---	11	5	6	
D. Other	---	---	---	---	---	---	---	---	---	---	---				
27. Does the ordinance require detention to control events in addition to the 100-year event?:	No	No	Yes	Yes	Yes	Negotiate	No	No	No	No	Yes	11	4	6	1
A. Size of Event:	---	---	2 & 25 Yr	2 Yr	2 Yr	2 Yr	---	---	---	---	2 Yr				
B. Release Rate:	---	---	(2)	0.04	0.04	---	---	---	---	---	0.04				
28. What rainfall data source is required?:															
A. Not Specified:	---	---	---	---	---	---	Yes	---	---	---	---	11	1	10	
B. Bulletin 70:	---	Yes	Yes	Yes	Yes	Yes	---	Yes	Yes	Yes	Yes	11	9	2	
C. TP40:	Yes	---	---	---	---	---	---	---	---	---	---	11	1	10	
D. Other:	---	---	---	---	---	---	---	---	---	Wheaton	---	11	0	10	1
29. Is the design storm distribution specified?:	No	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	No	11	6	5	
A. SCS Type I:	---	---	---	---	---	---	---	---	---	---	---	11	0	11	
B. SCS Type II:	---	Yes	---	---	Altern	---	---	Yes	Yes	Yes	---	11	4	6	1
C. Huff First:	---	---	---	---	Yes	---	---	---	---	Yes	---	11	2	9	
D. Huff Third:	---	---	---	Yes	Yes	---	---	---	---	Yes	---	11	3	8	
E. Other:	---	---	---	---	---	---	---	---	---	---	---	11	0	11	

INVENTORY OF STORMWATER DRAINAGE & DETENTION REGULATIONS
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October 1997

SECTION OF KANE COUNTY STORMWATER MANAGEMENT SURVEY	VILLAGE OF ELBURN	VILLAGE OF NORTH AURORA	CITY OF YORKVILLE	CITY OF AURORA	VILLAGE OF SUGAR GROVE	KANE COUNTY	KENDALL COUNTY	VILLAGE OF MONTGOMERY	VILLAGE OF OSWEGO	DUPAGE COUNTY*	LAKE COUNTY*	SUMMARY OF RESPONSES: NUMBER RESPONSES	NUMBER "YES"	NUMBER "NO"	OTHER RESPONSES
Detention In Sensitive Areas:															
30. Is detention allowed in the floodway?:	No	No	No	No	Yes	No	Not Spec	No	No	Yes	No	11	2	9	
31. Is detention allowed in the flood fringe?:	Yes	Yes	Yes	Yes	Yes	Yes	Not Spec	Yes	Yes	Yes	No	11	9	2	
32. Is on-stream detention prohibited unless it provides regional storage?:	Yes	Yes	Yes	Yes	No	Yes	Not Spec	---	---	Yes	Yes	11	7	4	
33. Is detention allowed in existing wetlands?:	Yes	Yes	Yes	Qual Yes	Yes	Yes	Not Spec	Yes	Yes	Yes	Yes	11	10	1	
Runoff Volume Control and Water Quality															
34. Does your ordinance emphasize a runoff volume reduction hierarchy which promotes minimization of impervious area, maximization of infiltration, and use of drainage practices over storm sewers?:	No	No	No	No	No	Yes	No	No	No	Yes	Yes	11	3	8	
35. Are detention designs required to maximize water quality mitigation benefits (e.g., preference for wet bottom or wetland basins over dry bottom basins)?:	No	No	No	No	No	No	No	No	No	Yes	Yes	11	2	9	
Floodplain Management:															
36. Does your community enforce a floodplain management ordinance?:	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11	11	0	
37. Has your community adopted NIPC's "Model Floodplain Ordinance "?:	Partially	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	11	7	3	1
38. Which of the following are addressed in the purpose statement of your ordinance?:															
A. Protection of hydrologic functions:	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	11	10	1	
B. Protection of water quality:	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes	11	7	4	
C. Protection of aquatic habitat:	Yes	Yes	Yes	No	No	No	No	No	No	Yes	No	11	4	7	
D. Protection of recreation:	Yes	Yes	Yes	No	No	No	No	No	No	No	No	11	3	8	
E. Protection of aesthetics:	Yes	Yes	Yes	No	No	No	No	No	No	No	No	11	3	8	
39. Is the list of "Appropriate Uses" for the floodway more restrictive than the full list allowed by the state?:	No	No	No	No	No	No	No	No	No	Yes	No	11	1	10	
If yes, what uses are not allowed?:															
A. Detached garages and other non-inhabitable structures:	---	---	---	---	---	---	---	---	---	No	---	1	0	1	
B. Parking lots:	---	---	---	---	---	---	---	---	---	No	---	1	0	1	
C. Roadways parallel to the watercourse:	---	---	---	---	---	---	---	---	---	No	---	1	0	1	
D. New treatment plants:	---	---	---	---	---	---	---	---	---	No	---	1	0	1	
E. Other:	---	---	---	---	---	---	---	---	---	---	---				
40. Is additional mitigation of floodway construction activities required beyond minimum IDNR/OWR minimums?:	No	No	No	Yes	No	Yes	No	No	No	---	Yes	10	3	7	
If Yes, please answer the following questions:															
A. Is a safety factor required for any compensatory storage needed?:	---	---	---	1.5 to 1	---	1.5	---	---	---	---	1.2				
B. Are off-site increases in stage or velocity prohibited?:	---	---	---	No	---	Yes	---	---	---	---	Yes				
C. Is environmental impact mitigation required?:	---	---	---	No	---	No	---	---	---	---	No				
41. Are onstream impoundments discouraged unless in the public interest.	No	---	No	Yes	No	Yes	No	---	---	---	No	7	2	5	
42. Are channel modifications discouraged unless there are no practicacl alternatives.	No	---	No	Yes	No	Yes	No	---	---	---	Yes	7	3	4	
43. Is maintenance of stream lenith, sinuosity, slope, pools and riffles required for unavoidable channel	No	No	No	Yes	No	No	No	---	---	Yes	Yes	9	3	6	
44. For the following areas, please indicate whether compensatory storage is required for all construction and specify the safety factor?:															
A. Flood fringe:	1.0	1.5	No	1.5	1.5	1.5	No	1.5	1.5	1.5	1.2				
B. Depressional storage:	1.0	1.0	No	1.0	1.0	No	No	1.0	1.0		1.0				
C. Wetlands:	1.0	1.5	No	1.0	1.0	No	No	CORPS	CORPS		1.0				
45. Do these floodplain management stds apply to non-reg. streams & floodplans	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	11	8	3	

* Not in Blackberry Creek watershed - Provided for comparison purposes only.
(1) Maintenance negotiated as part of Annexation Agreements, PUD Agreement, or by Development Agreement.
(2) Unspecified, but used 0.04 cfs/Acre (2Yr) and 0.12 cfs/Acre (25Yr)

APPENDIX F

QUESTIONS AND ISSUES TO BE ADDRESSED BY HYDROLOGIC AND HYDRAULIC MODELING

QUESTIONS FOR FUTURE BLACKBERRY CREEK HYDROLOGIC AND HYDRAULIC MODELS

Karl Visser, Natural Resources Conservation Service
and
Technical Committee C

December 1997

- New hydrologic and hydraulic modeling is required. The existing 1989 SCS TR-20 WSP2 model cannot be recalibrated to meet current demands.
- What is the 100-year and 500-year floodplain and floodway? What are the appropriate rainfall values? Should the Aurora gage values or Northeastern Illinois sectional value be used from IL State Water Survey Bulletin 70?
- What is a safe volume or rate for the Montgomery overflow? Is unsteady flow modeling needed at this point? What size bridge openings are needed?
- How does Jericho Lake affect overflows? What is the best split of water at this point? Can Jericho Lake be modified to make overflows pass safely? (I.e. create a control structure to limit peaks east of Orchard Road up to the 100-year event.)
    - Historical pattern
    - Damage considerations
    - Maintainable options
- How do current bridge openings affects flood flows? Inadvertent dams caused by bridges should be evaluated to see if changes are appropriate.
- Does the new Orchard Valley golf course cause flooding upstream of Galena Road?
- How does the new development (Blackberry Trails) adjacent to Cherry Hills affect flood flow?
- How will any proposed alternatives affect Blackberry Creek? Examples are:
    - Possible Kane County Forest Preserve storage areas
    - Aurora's new railroad bridge
    - Aurora's proposed diversion around Cherry Hills subdivision
    - Raising Galena Blvd. to keep overflows out of Cherry Hills
    - Straightened high-flow channel upstream of Galena Blvd bridge
    - Optimum storage locations

- Damage areas to model are:
  - West side of Aurora
  - Kane County subdivisions upstream of Route 47
  - Kane County subdivisions southwest of Aurora and southwest of Montgomery
  - Montgomery businesses along Route 31
  - North side of Route 30, east of Oakwood Drive
  - Subdivisions in Kendall County
  - Prestbury subdivision

- What is the optimum combination of components (highest benefit:cost ratio)?
  - Flood control reservoirs
  - Bridge modification
  - Land acquisition
  - Restoration of natural stream features - greenway
  - Buyout areas

- What impact does a 0.10 versus a 0.15 cfs/acre 100-year release rate for future development have on peak flows? What impact does a 0.03 versus a 0.04 cfs/acre 2-year release rate for future development have on peak flows? What release rate is required for in-bank flows?

- What effect will channel maintenance (clearing, snagging, debris removal) have on stages in Blackberry Creek?

- What impact will 2020 land use have on flow rates and volumes? What impact will ultimate land use have on flow rates and volumes? What is the impact of 10% and 15% impervious area on flow rates and volumes?

- How will runoff minimization measures such as using natural drainage and landscaping practices affect in-stream flow rates?

- What is the effect of existing upland depressional areas? How will in-stream flow rates be affected by loss of floodplain storage in headwater areas (less than 1 square mile drainage area)?

- How will different control structure configurations affect the hydroperiod of Forest Preserve District storage areas?

- Are low-flows sufficient to nurture the biological environment for existing or proposed wetlands and storage areas?

Other Questions and Considerations

- How much July 1996 storm high water information is available? What other high water information is available from other storms?
- Where is the available land to be purchase?
- How can habitats be restored for fish and wildlife? Should we attempt to restore habitats to pre-settlement vegetation?
- How much survey information is available in Kendall County? What level of detail is needed?
- Coordinate model with other agencies and Kane County Stormwater Committee efforts on water quality studies and models
- Extend model to Fox River and include Fox River direct tributaries on west side of Montgomery and Aurora
- Modeling should be joint effort between Kane County Stormwater Committee and Kendall County or agency above county level (i.e. IDNR-Office of Water Resources, US Army Corps of Engineers, Natural Resource Conservation Service)
- Determine what reaches (if any) require dynamic modeling versus steady state modeling
- Steady state hydrology model should be HEC1 and hydraulics model should be HEC2 (HEC-RAS) - Paul Schuch
- Dynamic model should be similar to DuPage County model.
- What impact could a flood warning system have on damages and evacuation procedures?
- Consider effects of urbanization on soils, runoff curve numbers, and other factors.
- Investigate soil loss and tile maintenance impact on runoff parameters.

APPENDIX G

RECOMMENDED ORDINANCE STANDARDS FROM KANE COUNTY STORMWATER MANAGEMENT PLAN

KANE COUNTY STORMWATER MANAGEMENT PLANNING COMMITTEE REGULATORY STANDARDS RECOMMENDATIONS

(From Public Review Draft Countywide Stormwater Management Plan, May 1998)

The following components and standards for a Countywide watershed protection ordinance are excerpted from the *Comprehensive Countywide Stormwater Management Plan* approved for public review by the Kane County Stormwater Management Planning Committee.

Comprehensive Purpose Statement

The ordinance should include a comprehensive purpose statement addressing the following concerns and objectives.

- Protect and preserve the quality and environmental values of land and water resources in Kane County.
- Protect and preserve the health and safety of residents of Kane County.
- Encourage development in a manner that promotes orderly, sustainable, and cost-effective utilization of land and water resources consistent with the 2020 Land Resource Management Plan.
- Ensure that new development in Kane County does not cause increases in flood damages, water quality degradation, and habitat loss within and downstream of the County.
- Minimize the need for expenditure of public funds on flood control projects, repairs to flood damaged public facilities, and on flood related emergency services.
- Prevent increases in economic disruption due to flooding and drainage problems.
- Maintain eligibility in the National Flood Insurance Program by equaling or exceeding the program requirements and thereby making federally subsidized flood insurance available at reduced rates.
- Protect the natural hydrologic, water quality, aquatic habitat, recreational, and aesthetic functions of streams, lakes, wetlands, and floodplains.

Floodplain Management

The ordinance should address the following standards related to floodplain management.

Ordinance Applicability: The applicability of the ordinance should be extended to include significant drainageways and depressional storage areas with drainage areas less than one square mile. Building in these areas could lead to significant flood damages to the new buildings and to a loss of floodplain storage, resulting in increases in flood flows and damages downstream.

Delineate Floodplains/Floodways Considering Future Land Use: Any modifications to the existing regulatory floodplain or floodway boundary (through map revisions or restudies) should be computed based on the worst case between existing and future land use conditions. In most cases adequate on-site stormwater management should prevent local increases in instream flow rates and flood stages. However, on larger rivers such as the Fox, flows may continue to increase

as the watershed becomes more urbanized. To prevent construction and resulting flood damages in areas that will one day be in the floodplain, an assessment should be done to determine the worst case development condition (existing or future) and the regulatory floodplain should be mapped accordingly.

Restrict Floodway Development to Reasonable Appropriate Uses: IDNR-OWR identifies appropriate uses for the floodway in the Model Floodplain Ordinance. Restricting development to these appropriate uses is required to meet minimum state standards.

Floodway appropriate uses should be limited to a restricted list that includes only public flood control projects, public recreation and open space uses, water dependent activities, and roadway and utility crossings. Additional appropriate uses allowed by IDNR-OWR such as wastewater treatment plants, parking lots, accessory structures such as garages, and roadways running parallel to the water course, may result in additional flood damages. These uses also interfere with floodway functions such as water quality mitigation and habitat protection and potentially subject the waterway to polluting substances such as untreated wastewater, gasoline, and household chemicals.

Mitigate Floodway Construction Activities: Floodway modifications can lead to increased conveyance capacity and therefore increased downstream flow rates. Channel modifications can also destroy aquatic habitat and create erosion problems as the modified stream attempts to reestablish equilibrium stream length, slope, and sinuosity.

Onstream impoundments act as sediment and nutrient traps leading to unaesthetic conditions such as low water clarity (due to high turbidity) and extensive algae blooms. Further, impoundments can impede the natural movement of fish. Also, periodic dredging may be required to maintain desired water depths. Avoidance and mitigation standards for activities in the floodway should include the following:

- Demonstrate that there is no practical alternative to the channel or floodway modification and that onstream impoundments are in the public interest.
- Compensatory storage for floodway fill at a conservative ratio greater than 1:1
- Preservation of the original floodway surface area
- Maintain or improve natural channel conditions such as stream length, sinuosity, pool and riffle pattern, and channel substrates.
- Impoundments must not prevent migration of indigenous fish species or cause degraded water quality conditions.
- A nonpoint source pollution control plan must be implemented throughout the watershed upstream of the proposed impoundment. Permanent pools should not be constructed downstream of wastewater treatment plant discharges.

These requirements are intended to prevent increases in flood flows and stages, minimize substantial maintenance burdens, and to protect the natural hydrologic, water quality, and aquatic habitat functions of streams and floodplains.

Compensate for Lost Storage in the Flood Fringe and Depressional Storage Areas: To prevent increases in flood flows and stages, hydraulically equivalent compensatory storage should be required for all fill activities in the flood fringe and depressional storage areas. As a safety factor, compensatory storage should be provided at a conservative ratio greater than 1:1.

Require a Flood Protection Elevation: To provide a factor of safety and minimize flood damage to those properties within or adjacent to the floodplain, a flood protection elevation (or "freeboard") above the base flood elevation should be required for all structures within the area that would be inundated by a flood at the flood protection elevation.

Require that a Letter of Map Revision (LOMR) be Obtained for all Floodplain Modifications: During the development process, permitted site grading or flow control may result in removal of land from the floodplain. Without a LOMR, those properties within the former floodplain will be required to obtain unnecessary flood insurance. Also, a LOMR provides an official record, filed with FEMA, of floodplain modifications.

Stormwater Drainage and Detention

The ordinance should address the following standards related to stormwater drainage and detention.

Ordinance Applicability: The stormwater drainage and detention standards (with the possible exception of detention requirements) should apply to all development, regardless of size. However, as a practical matter, the requirement that a permit be obtained may be limited to developments over a specified size.

Control the 2-year Release Rate: The 2-year discharge rate from development sites should be sufficiently low to prevent increases in instream flow rates. A 2-year release rate is specified to prevent increases in streambank erosion which is largely the result of increases in the magnitude of 2-year and smaller runoff events. In the absence of a watershed plan, a 2-year release rate equal to the lower of 0.04 cfs/acre or the pre-development onsite rate should be used. NIPC found that for a typical northeastern Illinois watershed (Upper Salt Creek), consistent use of a 0.04 cfs/acre release rate would have prevented increases in instream 2-year flow rates as the watershed developed (Dreher et al, 1989). As watershed plans are developed, the onsite release rate required to prevent increases in instream flow rates can be computed. Controlling the 2-year release rate will also improve pollutant removal within detention basins.

Control the 100-year Release Rate: The 100-year discharge rate from development sites should be sufficiently low to prevent increases in instream flood flow rates and enlargement of floodplains as the watershed develops. In the absence of a watershed plan, a 100-year release rate equal to the lower of 0.15 cfs/acre or the pre-development rate should be used. The rationale for 0.15 cfs/acre for the 100-year event is similar to the rationale for the 0.04 cfs/acre for the 2-year event. As watershed plans are developed, the onsite release rate required to prevent increases in instream flow rates can be computed and the ordinance refined as necessary.

Establish Overland Flow Routes: Overland flow routes should be identified and placed in easements to ensure that runoff events in excess of the design event are able to be accommodated with minimal damage to property. For example, detention basins should be designed with overflow structures and a route for the excess flow should be established. This will minimize the potential for flooding of buildings surrounding detention facilities by allowing excess runoff out of the basin and buildings downstream of detention facilities by preventing embankment failure due to overtopping.

Consider Downstream Drainage Conditions: Site discharges should consider the condition of downstream drainageways. For example, concentrated discharge from a detention basin could cause significant erosion on neighboring properties if runoff previously sheet drained from the site.

Minimize Increases in Runoff Volumes: Increases in surface runoff volumes should be minimized through use of a runoff volume reduction hierarchy which specifies minimization of impervious surfaces, maximization of infiltration opportunities, and use of natural drainage practices, in addition to using detention. Reducing runoff volumes converts surface runoff to beneficial sub-surface runoff, enhances groundwater recharge, and minimizes the generation of stormwater related pollutants. Site design methods for minimizing increases in runoff volumes are discussed in Section 5.4.

It should be recognized that detention is very effective in preventing increases in runoff rates but does not prevent increases in runoff volumes. This standard is intended to address this issue. In watersheds with high quality streams, lakes or wetlands, this standard will be particularly important to minimize shifts from subsurface to surface runoff. This standard will also be important in terminal watersheds ending in a waterbody with essentially no surface outlet. In some cases it may be appropriate to establish impervious area targets or limits to supplements to the hierarchy described here.

Development of specific standards for siting, designing, installing, and maintaining infiltration practices should minimize the potential for contamination of groundwater resources with runoff pollutants.

Preserve Onsite Depressional Storage: Existing onsite depressional storage should be preserved independently of required detention volumes. Even with no change in land cover, significant increases in flood volumes and rates will be experienced if watershed depressional storage is eliminated.

Minimize the Discharge of Pollutants: Runoff from urban development is contaminated with a number of pollutants including sediment, heavy metals, oil and grease, bacteria, and nutrients. Water quality BMPs such as constructed wet or wetland detention, drainage swales, and filter strips should be incorporated into stormwater management systems to retain and transform stormwater pollutants onsite. Pollutants should be retained onsite to protect downstream lakes, streams, and wetlands.

Wet and wetland detention basins have been shown to be much more effective than dry bottom basins in achieving stormwater pollutant removal. Wet basins landscaped with native wetland and prairie vegetation have been found to be particularly effective at removing pollutants and preventing inbasin shoreline erosion.

Discourage Detention in the Flood Fringe: Detention in the floodplain is difficult to design to function properly under all flood stage conditions. When detention must be placed in the flood fringe, compensatory storage should be provided for the entire floodplain volume displaced by the detention basin.

Prohibit Detention in the Floodway: As stated above, detention in the floodplain is difficult to design to function properly under all flood stage conditions. In addition, when in the floodway, the detention basin may block flood flows, reducing the conveyance capacity of the floodway. Finally, pollutants captured by the detention basin may be flushed into the stream when the basin is inundated by large instream flood events.

Prohibit Onstream Detention: Onstream detention should be prohibited unless it provides regional flood control benefits, is in the public interest, and the environmental mitigation discussed under the floodway construction activities section of the floodplain management standards is provided. Unless onstream detention is accompanied by onsite basins or other BMPs designed for stormwater pollutant removal, the stream will act as a discharge zone for runoff pollutants which is inconsistent with the objectives of this Plan and the requirements of the federal Clean Water Act. This standard will avoid the high maintenance costs often associated with onstream facilities as well as prevent degradation of stream resources.

Prohibit Direct Discharge of Stormwater Runoff to Wetlands: Stormwater runoff should be treated and detained prior to discharge to natural and mitigation wetlands. Excessive pollutant loads and significant changes in the magnitude and frequency of water level fluctuations within wetlands can severely stress wetland plant and wildlife communities. While wetlands are able to provide significant pollutant filtering benefits, excessive pollutant loads can exceed their assimilation capacity.

Detention Should be Designed Using Appropriate Hydrologic Methods: Detention basins should be designed using hydrograph routing techniques and using the most current rainfall data. Currently, the most up to date design precipitation data is from the Illinois State Water Survey Bulletin 70 publication (Huff, 1989). In a study of hydrologic design methods conducted by NIPC, it was found that non-hydrograph based techniques (e.g., the modified rational formula) significantly underestimate detention requirements (Price and Dreher, 1991). It was also found in the NIPC study that detention volumes will be significantly undersized using Technical Paper 40 (Hershfield, 1961) precipitation data.

Require Formal Maintenance Mechanisms for all New Stormwater Facilities: For stormwater infrastructure to function properly it must be maintained in its design condition. Maintenance agreements and easements as well as special service areas are among the methods that can be used to assure maintenance. Maintenance mechanisms for stormwater infrastructure

was discussed in greater detail in the maintenance section (Section 5.1.4). Assuring proper maintenance is particularly important for detention basins and infiltration systems.

Prohibit Connection of Stormwater Drainage Systems to Agricultural Tile Systems: Agricultural tile systems were designed to drain groundwater under free flow conditions and were not constructed for maintenance access. Also, many of the tiles were installed up to 80 years ago and were constructed of lower-strength materials than modern storm sewers. Surcharging of drain tiles as a result of discharge of surface stormwater runoff can rupture these tiles that are difficult to maintain and repair and do not have easements associated with them to allow maintenance access.

Soil Erosion and Sediment Control

Accumulated sediment washed from construction sites not only destroys aquatic habitat and leads to degraded water quality conditions, it also fills flood storage areas and reduces stream and culvert conveyance capacity. The ordinance should address the following standards related to soil erosion and sediment control.

Ordinance Applicability: Soil erosion and sediment control measures should be required for land disturbances of all sizes. However, as a practical matter, the requirement that a permit be obtained generally may be limited to those activities disturbing more than 5,000 square feet, unless adjacent to a waterbody or wetland.

Minimize the Area and Time of Disturbance: The area disturbed at any particular time and the duration of disturbance should be minimized through staging of construction activities and through site design which minimizes the area to be regraded.

Require Soil Erosion and Sediment Control Measures Consistent with Established Guidance: The ordinance should include explicit design and operation standards for soil stabilization, sediment control measures, conveyance channels, and other important priorities. In addition, the more detailed recommendations in the latest amendment of the "Illinois Urban Manual - A Technical Manual Designed for Urban Ecosystem Protection and Enhancement" prepared by the NRCS for the Illinois Environmental Protection Agency and in the latest amendment of "Illinois Procedures and Standards for Urban Soil Erosion and Sedimentation Control" (the Greenbook) (Northeastern Illinois Soil Erosion and Sedimentation Control Steering Committee, 1988) should also be adopted by reference.

Require Installation of Sediment Control Measures Prior to Land Disturbance: Sediment control measures such as sedimentation basins and silt fences should be installed prior to significant land disturbance activities to ensure that sediment generated during construction is captured.

Require Early Implementation of Erosion Control Measures: Soil erosion control measures such as temporary seeding, mulching, and erosion control blanket should be implemented soon after the end of active disturbance of the land and prior to final grading if final grading will not be completed for a significant period of time. This includes stabilization of soil stockpiles.

Require Routine Inspection and Maintenance of All Soil Erosion and Sediment Control Measures: For soil erosion and sediment control measures to be effective they must be routinely inspected and maintained. Although construction activities are only temporary, soil erosion and sediment control measures such as erosion blanket, silt fences, and sediment traps will commonly require maintenance or replacement several times during the construction process.

Provide Effective Enforcement Tools: Without adequate provisions for enforcement, it may be difficult to ensure that measures are adequately maintained. Effective enforcement tools include stop work orders and fines that specify each day as a separate violation and letters of credit that allow the enforcement agency to immediately address an issue using the developer's funds.

Stream and Wetland Protection

The ordinance should address the following standards related to stream and wetland protection.

Require Protection of All Wetland Functions: Require protection or mitigation of wetland functions. Wetland protection criteria should adequately protect functions such as stormwater storage, pollutant filtering, and protection of downstream aquatic resources that may not be addressed in the federal permit process.

Require Mitigation for All Significant Wetland Disturbances: All wetland disturbances, including those not directly regulated by the Army Corps of Engineers, should be addressed. Damaging wetland disturbances such as vegetation removal and impoundment are only regulated by the Corps if they are associated with a dredge or fill activity. Also, the quality and quantity of runoff discharged to wetlands should be addressed as discussed under the stormwater drainage and detention standards.

Require Protection of Natural Stream Functions: Whenever feasible, modification of natural streams should be avoided. Where avoidance is not feasible, environmental mitigation as specified under floodway modifications in the Floodplain Management section (Section 5.2.2) should be required.

Require Buffers Along All Waterbodies and Wetlands: A buffer of appropriate width comprised of native vegetation should be maintained or established along the edge of all streams, lakes, and wetlands. Exceptions to the native vegetation requirement may be allowed to facilitate water dependent activities, maintenance, or recreational access such as for beaches and boat launches, where appropriate. This standard is intended to minimize streambank and shoreline erosion, protect aquatic and riparian habitat, provide filtering of contaminated runoff, and preserve natural aesthetics.

Require Setbacks Along All Waterbodies and Wetlands: Beyond the buffer described above, a setback should be established along the edge of all streams, lakes, and wetlands. Only limited types of development should be allowed within the setback. The development types should be limited to the following:

- Minor improvements such as pedestrian or bicycle trails and educational signs.
- Maintenance access for utilities

- Parks and recreational areas
- Private and public lawns

This standard is recommended to provide a transition zone between intensive development and the natural features of the buffer. In addition to supporting the previously-stated objectives of a buffer, a setback is recommended for streams in recognition that erosion is a natural process and adequate setbacks are necessary to prevent erosion from threatening structures and their foundations. Setbacks also ease access for critical maintenance needs.