McHenry County Comprehensive Stormwater Management Plan

MCHENRY COUNTY COMPREHENSIVE STORMWATER MANAGEMENT PLAN

Approved by the McHenry County Stormwater Committee

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CHAPTER 1

AUTHORITY, PURPOSE, GOALS AND OBJECTIVES

1.1 BACKGROUND

McHenry County lies in the northwest corner of the Northeastern Illinois region. The county is approximately 611 square miles in area and had a 1990 population of 183,241. Although McHenry County has the smallest population and the lowest population density (300 people per square mile) of the six northeastern Illinois counties, it experienced the highest rate of population growth over the 1980 through 1990 period (23.9%). By 2010, the county is projected to have a population of 272,276 or a 48.6% increase over the 1990 population (Northeastern Illinois Planning Commission, 1994).

The incorporated areas of the county consist of 30 cities and villages ranging in population from 240 to 28,016. The areas of highest population density are in the southeast portion of the county. The population density generally decreases to the north and to the west.

The county has two principal watersheds: the Fox River watershed to the east and the Kishwaukee River watershed to the west. The Fox River flows near the eastern boundary of the county, has its headwaters in Wisconsin and a drainage area of 1403 square miles at the Algonquin dam at the southern end of the county. The drainage area of the Fox River as it enters Illinois is 868 square miles. Of the 535 square miles of Fox River watershed within Illinois and upstream of the Algonquin dam, 302 square miles are within McHenry County. The remaining 233 square miles are within Lake County. McHenry County contains the headwaters of the mainstem of the Kishwaukee River. A small portion of the Piscasaw Creek watershed is in Wisconsin and over half of the Coon Creek watershed is in DeKalb and Kane Counties. Both Piscasaw and Coon Creeks are tributaries to the Kishwaukee River. The total Kishwaukee River watershed area within McHenry County is 309 square miles.

Other than isolated areas along the Fox River, overbank flooding is not a widespread problem in McHenry County. However, local drainage problems have been reported by a number of communities. McHenry County has some of the highest quality rivers and streams in Northeastern Illinois with respect to water quality, aquatic life, and recreational use potential. The county also has a relative abundance of good quality lakes and wetlands. Although McHenry County does not experience major flooding and its streams and lakes are in relatively good condition, experience in other parts of the region as well as other parts of the country indicate that continued urbanization and population growth may cause significant problems to develop.

In recognition that there is a link between continued urbanization and increased levels of flooding and water quality degradation, the McHenry County Board created the McHenry County Stormwater Committee (MCSC) by resolution dated October 15, 1991. The MCSC held its first meeting in May of 1992. As required by state legislation, the MCSC has 12 members composed of six municipal representatives and six county board representatives.

1.2 AUTHORITY AND PURPOSE

1.2.1 Authority

Public Acts 85-905 and 85-1266 grant DuPage, Kane, Lake, McHenry and Will counties broad authority to manage and mitigate the effects of urbanization on stormwater drainage. These laws allow the above counties to form stormwater management committees with equal county board and municipal representation. The committees may develop countywide stormwater plans for County Board approval and direct implementation of the plans.

The County Board may adopt completed stormwater management plans by ordinance. After adoption, the County Board may prescribe by ordinance reasonable rules and regulations for stormwater and floodplain management, in accordance with the adopted stormwater management plan. Upon approval of such regulations, they shall apply both in unincorporated and incorporated areas of the county. Municipalities have the option, at any time, of retaining local control of stormwater management provided they enact and enforce ordinances which the stormwater management committee finds are at least as stringent as and consistent with the county plan.

1.2.2 Purpose

As stated in the resolution creating the MCSC, the purposes for creating the MCSC were to:

1) Consolidate the existing stormwater management framework into a unified countywide structure;

2) Set minimum standards for floodplain and stormwater management; and

3) Prepare a countywide plan for the management of stormwater runoff, including the management of natural and manmade drainageways.

These are also the purposes for preparing and implementing this McHenry County Stormwater Management Plan (Stormwater Plan). The intent of this plan is also to develop a program to fulfill the goals and objectives prepared by the MCSC and presented in Section 1.4.

1.3 ORGANIZATION OF THE PLAN

The enabling legislation does not specify the content of the county stormwater plans, rather it allows the individual counties to tailor the plan to fit their own needs. Due to the current resources of McHenry County, the county has chosen to prepare this Stormwater Plan for development of a countywide stormwater program but not proceed with detailed watershed

planning and project design at this time. Instead, the stormwater program will be implemented in phases as outlined in this Stormwater Plan.

This first chapter outlines the authority and purpose for preparation of this Stormwater Plan as well as the goals and objectives that the plan and resulting program hope to achieve. The second chapter defines a stormwater management framework with four functional categories and then describes the role that local, regional, state, and federal agencies play in each of the four categories. The third chapter is a brief assessment of the physical stormwater conditions and problems in McHenry County based on review of existing reports and a problem identification questionnaire sent to each of the municipalities. The fourth chapter is an assessment of the current status of the institutional aspects of stormwater management in McHenry County based on a level of service questionnaire distributed to each of the municipalities. The fifth and final chapter presents recommendations for a countywide stormwater management program including an implementation plan. As part of the implementation plan, three priority levels or phases are identified and the recommendations are categorized by priority level.

1.4 GOALS AND OBJECTIVES

The following presents the goals and objectives of the McHenry County Stormwater Plan as well as a description of each of the objectives. The goals and objectives were adopted by the MCSC and were intended to lay the foundation on which the remainder of this plan as well as subsequent watershed plans would be built. The goals and objectives guide development of the framework as well as the design criteria which will be used to implement the Stormwater Plan.

Goal 1

The general goal of the Stormwater Plan is to protect, preserve and restore the quality and environmental values of water resources by controlling stormwater runoff. Means of implementation of the Stormwater Plan shall be established requiring effective stormwater management methods for both existing and new systems and thereby enhance the beneficial use of surface water.

Objectives

1. **To establish minimum standards for floodplain and stormwater management.**

Minimum standards will be established using state of the art procedures and up to date information to control stormwater runoff to ensure consistent management and protection throughout the county.

2. **To consolidate the existing stormwater management practices and policies into a unified, countywide structure.**

A coordinated set of practices is required for a unified, countywide structure which provides consistent levels of management and protection throughout the county. The Stormwater Plan will address inconsistencies that may exist between municipalities through countywide stormwater management policies. When implementing stormwater management facilities that may affect unincorporated and incorporated areas in and out of McHenry County, coordination between the local governments ensures that stormwater is managed in the best possible way for all involved.

3. **To coordinate implementation of the Stormwater Plan with all municipalities within the county including multi-county municipalities and all adjacent counties.**

Stormwater runoff does not recognize geographical or political boundaries. Therefore, its management requires the cooperation and coordination of everyone including the appropriate Federal, State, Regional, local agencies and municipalities. Intergovernmental agreements and coordination between counties can facilitate this objective.

4. **To generate, compile, maintain and update pertinent stormwater management data including cooperation with other agencies.**

The Stormwater Committee shall identify, collect, catalog and maintain existing data pertinent to stormwater management. Studies may have to be undertaken to generate data that is not presently available.

5. **To develop training, education and public information programs for local officials, consultants and other parties involved in stormwater management.**

Training, education and information programs for the public, local officials, consultants and other parties must communicate the fundamental theories and relationships of stormwater to the problems that exist now and may develop in the future. As policies and standards are developed for stormwater management, training will ensure they are uniformly understood, applied and enforced. Implementation of the Stormwater Plan may be easier, as the public becomes more aware of stormwater management issues.

6. **To establish suitable and effective procedures for funding stormwater management programs.**

A source or suite of sources to provide an adequate supply of funds is necessary to implement the countywide Stormwater Plan and its watershed plans.

7. **To require compliance with the McHenry County Stormwater Plan through enforcement of the regulations adopted in conjunction with the Plan.**

The Stormwater Plan will be a blueprint for the county's management of stormwater but will not have the force of law. The creation, adoption and enforcement of a stormwater management ordinance will be one of the mechanisms for implementation of the Stormwater Plan.

8. **To develop a technical reference manual which will provide guidelines and minimum design standards for the technical procedures essential to a comprehensive stormwater management program.**

The creation of a technical reference manual will provide uniform and consistent technical guidance for all users of land in McHenry County. Further, this one source will contain current Best Management Practices (BMP's) and the technical procedures necessary to implement the minimum standards of the Stormwater Plan and its ordinance. It should be regularly reviewed and updated to reflect observed maintenance concerns and new and innovative technology.

9. **To incorporate water quality and habitat protection measures in all stormwater management activities within McHenry County.**

Natural lakes, streams and wetlands are characterized by healthy, diverse communities of aquatic and riparian plant and animal life. In addition to providing conveyance, flood storage and water quality mitigation efficiently, naturally, and at little cost, these areas provide recreational opportunities including fishing, boating, swimming, hiking and camping which are vital to the economy and character of McHenry County. Consistent with McHenry County land use planning philosophy, streams, lakes and wetlands as well as other natural areas are to be protected.

10. **To comply with the rules and regulations of the National Flood Insurance Program.**

The National Flood Insurance Act allows the Federal Insurance Administration to make flood insurance available only in those areas where the appropriate public body has adopted adequate floodplain management regulations for its flood-prone areas.

Goal 2

It shall be the goal of the Stormwater Plan to provide for watershed management systems developed as coordinated parts of district-wide stormwater management and based upon watershed principles that allow for diversities of terrain and land use.

Objectives

1. **To develop watershed plans which consider stormwater and floodplain management, flood control, floodway and floodplain mapping, stormwater detention siting, water quality, maintenance needs identification, support data for regulatory programs and support data for program cost allocations.**

Watersheds and subwatersheds involved in basin planning have different natural resource bases, land uses and population densities which affect all phases of basin stormwater management, therefore, each basin plan must include consideration of these variables. Basin plans should consider methodologies to target spending. Consideration should also be given to the role of

active and inactive drainage districts. Active drainage districts should be a participant in basin planning to the extent possible.

2. **To identify, maintain and utilize the stormwater and floodwater capacities of identified natural storage areas.**

Natural depressional storage areas provide runoff volume reduction, water quality treatment and flood reduction efficiently and at little cost. Unlike detention basins which are drained by surface outlet, natural storage areas generally drain only by infiltration and evaporation reducing the volume of storm runoff. Other natural storage areas such as floodplains also provide temporary storage of floodwater. By capturing runoff, natural storage areas also capture pollutants transported by the runoff and prevent those pollutants from being discharged downstream. For larger floods which fill depressional storage capacity, flood volumes are reduced and the timing of the flood peak is delayed such that the impacts of those floods downstream are substantially reduced.

3. **To adopt watershed specific regulations for stormwater detention to control the impacts of new development on downstream flooding, erosion and water quality.**

Basin specific regulations for stormwater detention are needed since each watershed and subwatershed contains a unique set of problems, existing conditions and a variety of land uses. Due to these variables, an approach to resolve, mitigate and prevent problems will need to be as unique and specific as the basin itself.

4. **To develop a coordinated approach to eliminate, to the maximum extent practical, nonpoint source pollution.**

Substantial improvements have been made to the water quality of McHenry County streams and lakes through public expenditures on wastewater treatment. However, beneficial uses of these streams and lakes can also be impaired by nonpoint sources of pollution. Elimination and prevention of nonpoint sources requires a comprehensive, coordinated management approach which recognizes the existing and potential sources of problems in the watershed. A coordinated approach recognizes that different waterbody types are sensitive to different sources of degradation. The location in the watershed of the source often affects the waterbodies capacity to assimilate changes in runoff characteristics.

5. **To require stormwater design solutions be prepared with recognition of the watershed and its capacities as the base design constraint.**

Understanding the watershed and its natural resource variables is the fundamental basis for effective stormwater management. Each watershed has its unique set of physical features. The first step in stormwater management is to acknowledge each watershed variable as the basis for determining the specific approach for a watershed plan.

6. **To recommend code and ordinance modifications to encourage development to meet the natural topography of the site.**

Municipal codes for control of stormwater runoff have historically evolved based on the general public's perception of runoff as a disposable nuisance. This philosophy has led to restrictive and narrowly defined development standards.

Standards which require manmade structural solutions to control runoff either ignore or give low priority to natural site features and processes, such as the use of existing swales, depressional storage and soil infiltration. Structural solutions are also more costly than making use of those natural runoff reduction processes.

Increasing the options available in municipal codes and development standards and redirecting the emphasis of those standards towards the use of natural solutions to control runoff will improve the quality as well as reduce the quantity of runoff, stimulate creativity and innovation in development planning and design, make use of existing topography and natural storage and drainageways, and lower construction and long term maintenance costs.

Goal 3

It shall be a goal to maintain to the maximum extent practical, during and after construction and development activities, the desirable pre-development stormwater discharge characteristics of a site; reducing stream channel erosion, siltation, sedimentation and flooding; reducing stormwater pollutant loadings discharged into surface waters and enhancing groundwater recharge by allowing infiltration of stormwater in those areas of appropriate geologic and physiographic land features.

Objectives

1. **To institute soil erosion and sedimentation control requirements for all new developments.**

Land modification and the associated soil disturbance will cause soil erosion and sedimentation. Because sediment can be a major source of water pollution, it must be controlled to protect and improve the water quality of McHenry County wetlands, lakes and streams; maintain stormwater conveyance systems; and protect aquatic and wildlife habitats.

2. **To control surface runoff from open storage areas containing material stockpiles.**

Material stockpiles are potential sources of sediments and contaminants for wetlands, lakes and streams. Surface runoff from open storage areas must be strictly controlled to preserve the natural functions of waterways including conveyance, water quality and aquatic and wildlife habitats. In order to utilize the most effective runoff control measures, the period of storage, the locations of

any nearby storm sewers or waterways and the nature of the stockpiled material must be taken into consideration.

3. **To minimize increases in flood velocities as well as flood volumes.**

Changes in land use, including drainage modifications, often result in increases in flood volumes and flood flowrates. Urbanization reduces the acreage of pervious areas and their capacity for infiltration and at the same time increases impervious areas, resulting in increased flood volumes. Changes in drainage systems from natural drainageways to storm sewers and channelized streams increases the speed with which runoff reaches downstream areas. The result is increased flood velocities which cause erosion and increased flood volumes and rates which increases flood damages.

4. **To require appropriate and adequate provisions for site drainage for all land development activity.**

Significant flood damage can occur along local drainageways that do not drain enough area to be designated as regulatory floodplain. This can occur when intense, short duration runoff events overwhelm the local drainage system. Areas that are drained by storm sewer without an adequate overland flow path are particularly at risk. A properly designed site drainage system that considers these factors may cost less to construct and may also minimize future maintenance costs and personal property damage.

When designating an adequate drainage system for new development, top priority should be given to maintaining and enhancing existing natural drainageways. Grassed swales should be given preference whenever practical, especially in lower density developments.

5. **To control runoff rates from new developments so that instream flow rates are not increased in the downstream watershed.**

Covering rainfall absorbing pervious ground surfaces with impervious pavement and roofs increases both the rate and volume of runoff. Because of the increased runoff volume, the cumulative impact of development must be considered when establishing allowable site release rates from new development to ensure that instream flow rates are not increased. The increased flow and velocity erodes the banks, widening the channel, carrying sediment downstream.

6. **To utilize natural systems and solutions for water quality mitigation and reduction of flood volumes in preference to structural improvements.**

Natural systems often improve water quality more efficiently than manmade structures, through plant transpiration and infiltration thereby reducing initial structural construction costs and long term maintenance. The natural system is more aesthetically in keeping with the surrounding landscape of McHenry County and can provide open space, recreational opportunities and wildlife, plant and aquatic habitat.

7. **To require regular, planned maintenance of stormwater management facilities for all new developments.**

Stormwater facilities must be properly maintained and managed to function effectively. Preventative maintenance and operational needs must be identified and addressed before damage to the facility occurs, possibly leading to system failure, local flooding and water quality degradation. A fiscally responsible party must be designated for long term management and maintenance of all stormwater facilities.

8. **To achieve effective stormwater control throughout the watershed to prevent increased erosion, downstream flooding and water quality degradation.**

To prevent increased erosion, flooding and water quality deqredation, consistent watershed-wide standards are needed which consider not only individual site conditions but also the cumulative impacts of development throughout the watershed.

9. **To protect wetlands, lakes and ponds from adverse impacts of development, maintaining their natural functions, including their stormwater and floodwater management capacities.**

Wetlands have the ability to absorb significant amounts of sediments and pollutants and are often referred to as the "kidneys" of the landscape. However, without adequate protection to avoid overloading their capacities, the stormwater management functions of the wetlands and lakes will be severely reduced. Wetlands, lakes, and other depressional storage areas also provide significant stormwater storage and attenuation capacities which reduce downstream flooding and drainage problems.

Since wetlands and lakes are an important part of the McHenry County landscape, they must be protected to preserve not only their stormwater functions but to preserve the character and recreational opportunities of the county. Adverse impacts that may occur without adequate stormwater controls include: 1) excessive sediment loads which cause reduced water depths, diminished storage capacities, burial of natural substrates, and high turbidity; 2) increases in nutrient loads which leads to increases in undesirable aquatic plant and algae growth; and 3) large fluctuations in runoff rates which changes the character of wetland plant and animal species and causes shoreline erosion.

10. **To require that each site runoff control plan be consistent with watershed capabilities to prevent further degradation of the quality of surface and ground waters.**

Environmental features will differ from watershed to watershed because each has its own character developed from existing topography, water resources, drainage patterns and land use. To protect the watershed's environmental features, site runoff control plans should be consistent in their preparation, review and enforcement.

11. To limit post-development runoff to pre-development volumes and rates as much as possible by encouraging storage and infiltration where groundwater pollution will not result.

Use of natural storage areas and ground infiltration should be considered during preliminary planning stages to minimize land disturbance. Methods to limit post-development runoff to pre-development volumes and flow rates must be combined with efficient use of the project site.

12. To minimize any adverse effects of stormwater runoff which may result from new roads and streets.

Runoff from streets, roads and highways is a significant component of stormwater runoff. Their impervious surfaces result in larger runoff volumes. Vehicle residues, road maintenance and construction materials adversely effect the quality of stormwater runoff. When establishing new streets and roads, attention should be given to minimizing the alteration of existing drainage patterns and addressing roadway runoff to protect water quality.

13. To mitigate any adverse impacts of development activity on wetlands, including replacing disturbed wetland acreage.

Wetlands provide natural stormwater storage, improve water quality and provide habitat for flora and fauna. Avoidance of impacting wetlands of any size during development is the ideal alternative. Functions of disturbed wetlands should be mitigated on site and include sufficient buffer to permanently protect the function. Mitigation should consider hydrology functions, quality of wetland vegetation, and wildlife habitat. Any mitigation proposed outside the basin should be in excess of the minimum ratio.

Goal 4

It shall be a goal to eliminate nuisance discharges of inadequately and improperly managed stormwater onto land and into surface water; minimizing flooding and other adverse impacts on private and public property and protecting public health, safety and welfare affected by improperly managed stormwater runoff.

Objectives

1. To encourage flood proofing or removal of floodprone structures.

It may be advantageous to protect or remove some structures located on properties which are damaged by severe or repeated flooding. Flood proofing and removal of floodprone structures is often more cost effective than constructing flood control facilities and is generally less damaging to the environment. Advantages of removal, such as increased open space for recreational uses or flood storage and reduced emergency services expenditures can often offset the cost of removal.

2. **To encourage acquisition of natural storage areas and wetlands as dedicated open space to assist in the reduction and management of flood and stormwater flows.**

Natural storage areas should be identified on a watershed basis and then efforts made to preserve them through acquisition by a public or private body. If acquisition is not politically or economically feasible then conservation easements restricting use should be negotiated.

Permanent open space dedication will ensure a place for stormwater to flow while providing additional benefits for recreation, wildlife habitat, improved water quality and the potential for greenway corridor development.

Acquisition or easements may be more cost effective than manmade storage areas, especially when all benefits are considered.

3. **To develop and continue surface water maintenance programs utilizing volunteers and government representatives to conduct inspections, perform maintenance and restore deteriorated water resources.**

Maintenance and restoration of the county's natural streams, lakes and wetlands is essential for them to provide their full range of natural functions including runoff conveyance, runoff storage, recreation, aquatic and wildlife habitat and water quality protection. Use of volunteer groups under qualified guidance and coordination can reduce costs for these activities as well as promote stewardship and greater appreciation of the county's natural resources.

4. **To consider structural flood control measures, only when other remedial strategies are found to be unworkable.**

Structural measures such as constructed reservoirs and stream channelization usually have flood control as their singular purpose. Other innovative alternatives such as greenways, use of detention areas for recreation and wetlands tend to be less costly, more visually appealing and have less potential for damage to property and the environment due to failure.

5. **To maintain existing stormwater management facilities to provide the full hydrologic and pollution control benefits for which they were designed.**

A fiscally responsible party must be designated to provide long term management and maintenance of existing stormwater facilities. This party must document and implement a maintenance schedule to assure that all designed benefits are consistently achieved.

6. **To investigate and implement opportunities for retrofitting existing stormwater management facilities for water quality benefits.**

Although stormwater management facilities such as detention basins have been used for many years, these facilities have generally concentrated on control of rare flood events. To address flooding and drainage problems, streambank erosion and water quality degradation that result

from uncontrolled, more frequent events, these older facilities can be retrofitted to provide a broader range of benefits. Identification and prioritization of retrofit sites should be part of the watershed planning process. Retrofitting during local rehabilitative maintenance activities may also be appropriate to reduce maintenance costs and improve water quality and aesthetics.

7. To coordinate with disaster assistance officials.

Although the MCSC may not be directly involved in disaster assistance, it is important to coordinate activities with those officials to take advantage of funding often associated with disasters and to ensure that emergency services and repairs are made in a manner consistent with the goals and objectives and watershed plans.

CHAPTER 2

DESCRIPTION OF EXISTING STORMWATER MANAGEMENT FRAMEWORK

The purpose of this Chapter is to provide a description of the current stormwater management framework in McHenry County and the role of the various local, regional, state and federal agencies within that framework. Prior to the description, a functional framework is defined which provides the basis for the subsequent discussion as well as the assessments and recommendations in later chapters.

2.1 FUNCTIONAL FRAMEWORK

To develop a comprehensive stormwater program, it is important that a functional framework in which that program operates be defined. Only then can specific tasks be organized and the function of the various agencies be defined. For the purposes of this plan, the following functional categories are described:

- Administration and Management
- Regulation
- Planning
- Maintenance

1. Administration and Management

This component represents the administrative and management functions to oversee a stormwater management program. It includes priority setting, program plan development, budgeting, identification of funding sources and management of technical staff. In addition to these basic program management activities, technical assistance, public information, countywide development data storage and disaster assistance activities fall under this functional category. Stormwater technical assistance is provided to municipalities, site designers and land owners to assist them with drainage design, review and problem remediation. Public educational programs keep the public aware of stormwater management issues and their role in addressing those issues. Development data provides information regarding watershed conditions which is necessary to provide coordination between development projects and to prepare watershed plans. Coordination with disaster officials provides technical assistance and coordination of flood fighting activities to ensure that those activities are consistent with adopted stormwater plans and policies.

2. Regulation

The regulatory component consists of administration of a permit program including development of permit review, inspection and enforcement mechanisms and providing guidance in meeting ordinance standards. It also includes coordination with other regulatory entities which include

local municipalities, the Illinois Department of Natural Resources - Office of Water Resources (IDNR-OWR), the Federal Emergency Management Agency (FEMA) regarding floodplain management and the U.S. Army Corps of Engineers regarding wetland management. This component includes review of construction documents and on-site inspection of stormwater management facilities during construction as well.

3. Planning

Comprehensive watershed planning has several purposes including preventing increased flooding and degradation of watershed resources, remediating existing flooding and water quality problems and restoring aquatic habitat. Preventative planning is performed at two levels; watershed level and site level. For example, watershed level planning is used to establish watershed specific stormwater standards while site level planning is performed to meet the watershed standards in the most cost effective manner.

In the context of this stormwater management plan, the discussion of planning is focused on countywide and watershed planning. Countywide and watershed planning objectives can include identification and remediation of problems, development of watershed specific standards, identification of significant natural storage areas, identification of high quality wetlands and potential wetland banking sites and delineation of floodplains.

Capital improvements are also included under this element. While not all watershed plans will lead to capital improvements, watershed planning should be performed prior to making any significant stormwater related capital improvements.

The watershed planning process generally consists of establishing goals and objectives for the watershed, collecting detailed data on watershed conditions, modeling the watershed to analyze floodplains and quantify problems, developing recommendations based on the goals and objectives and analysis, and developing an implementation plan.

4. Maintenance

Stormwater management facility maintenance includes such tasks as cleaning debris from detention ponds, stream channels, catch basins and storm sewers. It also includes inspection and regular upkeep and repair of facilities to maintain system performance. Maintenance and management of the natural system is also needed including inspection and removing debris from streams and addressing streambank erosion. This functional component refers to development of a mechanism to ensure maintenance of both stormwater infrastructure and the natural drainage system.

2.2 AGENCY ROLES AND RESOURCES

2.2.1 Local

MUNICIPALITIES, TOWNSHIPS AND COUNTY: The municipalities and the McHenry County Planning and Development Department play the primary stormwater management role in McHenry County.

Administration and Management: Municipalities and the county are essentially the only agencies that have stormwater administration and management roles in McHenry County. However, numerous other agencies provide support for certain elements of administration and management (particularly training).

Regulation: Virtually all municipalities have adopted some form of stormwater regulations. Municipalities also have authority to enforce soil erosion and sediment control standards and protect wetlands. However, they are not required to do so by state or federal regulations. To participate in the National Flood Insurance Program communities must regulate development in the floodplain.

Planning: Although assistance from state and federal agencies may be requested, virtually all stormwater planning activities that occur within a municipality or the county are performed by or for that local government. Planning assistance on larger waterways (Fox River) has been initiated by State agencies (Illinois Department of Natural Resources). Capital improvements to address local drainage problems are generally made by municipalities.

Maintenance: Maintenance of stormwater infrastructure within municipal boundaries is the responsibility of the municipalities. Outside the municipalities, the townships and the county generally maintain culverts and ditches within the rights of way of township and county roads.

PROPERTY AND HOMEOWNER ASSOCIATIONS: Homeowners Associations are becoming increasingly responsible for stormwater management within their subdivisions as municipalities search for ways to reduce their cost of providing services.

Administration and Management: These associations are not responsible for administration of a stormwater program.

Regulation: These associations have no regulatory authority and fall under the authority of the governing municipality or the county. However, covenants may occasionally be placed on individual lots by the developer. Covenants may include requirements to maintain drainage paths, roadside swales or native vegetation within and adjacent to wetlands that may lie on individual lots. Although the homeowners association would have certain responsibilities in this regard, enforcement activities may ultimately be performed by municipal or higher agencies. (i.e. Corp of Engineers if a wetland on the property was required for mitigation.)

Planning: These associations are rarely involved in planning activities and fall under the planning jurisdiction of the municipalities or the county. However, the Wonder Lake Master Property Owners Association has taken some initiative in this respect, working with the USGS and MCSC to collect data within the lake which may be used to prepare plans to improve Wonder lake.

Maintenance: These associations are often responsible for maintenance of components of the stormwater infrastructure; generally the detention basins. However, this varies between municipalities.

MCHENRY COUNTY SOIL AND WATER CONSERVATION DISTRICT (SWCD): The McHenry County Soil and Water Conservation District (SWCD) is entirely contained within McHenry County but is generally limited to those historically rural areas. The SWCD is governed by a board of directors elected from the land owners and occupiers within the district.

Administrative and Management: The SWCD provides technical assistance to rural and urban customers. SWCDs have the limited ability to tax through referendum to fund their activities. However, none of the SWCDs in the State of Illinois are doing so. The SWCDs are funded through grants from the county, the Illinois Department of Agriculture, and internal programs.

Regulation: The SWCDs have no regulatory authority but assist with several NRCS programs. The McHenry County SWCD has entered into Memorandums of Agreement with several municipalities for development and enforcement of adequate soil erosion and sediment control during construction.

Planning: The McHenry County SWCD has been participating in MCSC meetings and provided information during preparation of this plan. The McHenry County SWCD, along with the NRCS, has also recently been assisting local entities prepare plans for the Nippersink Creek watershed.

Maintenance: The SWCD plays no direct role in maintenance activities but does provide technical assistance and historical drainage data to urban and rural customers regarding maintenance of drainage systems.

MCHENRY COUNTY CONSERVATION DISTRICT (MCCD): The MCCD is responsible for acquisition and management of open space in McHenry County with a particular focus on natural areas. MCCD is governed by a board of five trustees appointed by the McHenry County Board.

Administration and Management: MCCD plays no role in stormwater management under this functional category.

Regulation: MCCD plays no role in stormwater management under this functional category.

Planning: MCCD plays no role in stormwater management under this functional category. However, significant opportunities may exist to coordinate MCCD's open space program to acquire areas of regional stormwater significance.

Maintenance: MCCD maintains streams, lakes, and wetlands within their properties and may be a significant technical resource for appropriate and effective maintenance and restoration practices.

MCHENRY COUNTY HIGHWAY DEPARTMENT: The McHenry County Highway Department is responsible for construction, expansion and maintenance of county roads. The Highway Department is also responsible for transportation planning within the county.

Administration and Management: The Highway Department plays no role in stormwater management under this functional category.

Regulation: The Highway Department is part of the "Staff Plat Review Committee" for all developments in unincorporated McHenry County. In addition to review for impacts on the county transportation system, the Highway Department also reviews drainage system plans involving county roads.

Planning: Although the Highway Department performs many transportation related planning activities, their role in stormwater or watershed planning is limited to highway drainage infrastructure to handle runoff draining from and onto their right-of-ways.

Maintenance: The Highway Department is responsible for maintenance of all county highway drainage systems.

MCHENRY COUNTY DEPARTMENT OF HEALTH: The Department of Health is the McHenry County agency responsible for the protection of public health. The Department of Health is governed by the Board of Health composed of eight members appointed by the County Board.

Administration and Management: The Department of Health plays no role in stormwater management under this functional category.

Regulation: The Department of Health is part of the "Staff Plat Review Committee" for all developments in unincorporated McHenry County. The Department of Health review is generally focused on elements related to the disposal of wastewater which is affected by drainage and soils.

Planning: The Department of Health plays no role in stormwater management under this functional category. However, they do issue swimmers advisories and close beaches when necessary for health reasons (high bacterial levels). Data on advisories and closings may be useful during watershed planning.

Maintenance: The Department of Health plays no role in stormwater management under this functional category.

DRAINAGE DISTRICTS: Drainage districts are the entities historically responsible for providing drainage of agricultural lands. Out of the 43 drainage districts created in McHenry County, only three are currently active. Drainage districts have the ability to tax within their districts to fund their activities.

Administration and Management: Presently, drainage districts play no role in stormwater management under this functional category. The state legislation providing the counties with authority to create county stormwater committees and plans also provides the authority for these committees to dissolve the drainage districts within their county.

Regulation: Drainage districts play no role in stormwater management under this functional category.

Planning (Capital Improvements): Drainage districts have historically been responsible for draining the land to improve agricultural productivity. Although most of the many miles of field tile in the county were installed by individual property owners, the regional drain tile system conveying runoff from the private systems was installed by the drainage districts. Many of the channelized streams and drainageways in the county are also the result of drainage district activities. While these activities are very limited at this time, the drainage districts retain authority to perform these activities.

Maintenance: Currently the few remaining active drainage districts are involved in maintaining existing infrastructure including drain tiles and drainage ditches.

2.2.2 Regional

NORTHEASTERN ILLINOIS PLANNING COMMISSION (NIPC): NIPC is the regional planning agency for the six county Chicago metropolitan area. The Commission is involved with research, planning, technical plan and policy development and review, and local government technical support. As specified by the state stormwater legislation, county stormwater plans are to be sent to NIPC as well as several other agencies for review and comment.

Administration and Management: NIPC plays no direct role in the administration and management of stormwater activities in McHenry County. However, NIPC provides

assistance to local governments to carry out these activities including technical assistance and training opportunities.

NIPC co-sponsors training opportunities including courses and workshops in design and implementation of stormwater best management practices, soil erosion and sediment control, wetland management and hydrologic computer modeling.

Although NIPC is not a direct source of funding to local governments, NIPC can assist local governments in applying for state and federal grants. In some cases, NIPC administers grants to local governments for the state or federal funding agency.

Regulation: NIPC is an advisory agency and has no direct authority to implement its plans or enforce its policies. However, NIPC has developed model ordinances that reflect its policies, including a Model Stormwater Drainage and Detention Ordinance (NIPC, 1990), Model Soil Erosion and Sediment Control Ordinance (NIPC, 1992), Model Flood Plain Ordinance (IDOT/NIPC, 1989) and a Model Stream and Wetland Protection Ordinance (NIPC, 1988). NIPC encourages municipalities and counties interested in providing protection in these areas to adopt some or all of these ordinances. NIPC provides technical assistance to local governments (and often developers) in interpreting and meeting the standards of the model ordinances.

NIPC, with the backing of the Illinois Environmental Protection Agency, can require adoption of nonpoint source pollution prevention standards as a condition of approval of amendments to wastewater treatment facility planning areas.

Planning: NIPC has historically performed watershed planning, in particular, the Areawide Water Quality Management Plans that were developed for all of the major watersheds in northeastern Illinois under Section 208 of the Clean Water Act. Currently, NIPC does not initiate development of watershed plans. However, NIPC often assists local governments in development of their watershed plans.

Maintenance: NIPC is not involved in stormwater infrastructure maintenance. However, with the assistance of state and federal grants, NIPC has worked with local governments in performing stream and shoreline maintenance and stabilization activities.

FOX WATERWAY AGENCY (FWA) (formerly Fox Waterways Management Agency): The FWA was formed to implement programs which maintain and improve the Chain O'Lakes and the Fox River from the Wisconsin border to the Algonquin Dam in southern McHenry County.

Administration and Management: FWA plays no role in administration and management of stormwater activities within McHenry County.

Regulation: FWA has no regulatory authority.

Planning: FWA has coordinated with the Corps of Engineers concerning flood control studies along the Fox River. FWA also coordinated with the Corps of Engineers in preparation of their Special Area Management Plan (SAMP) that investigated the impact of boating and increases in the number of boat slips on the ecological health of the Chain-O-Lakes.

Maintenance: FWA's primary responsibilities are dredging and shoreline protection for the purposes of maintaining navigation. More recently the FWA has become concerned with the water quality and habitat aspects of these activities.

2.2.3 State

There are two state agencies involved with stormwater management: The Illinois Department of Natural Resources (IDNR) and the Illinois Environmental Protection Agency (IEPA). The IDNR is composed of several, previously separate state agencies. Those former agencies concerned with stormwater related issues were the Illinois Department of Transportation-Division of Water Resources (IDOT-DWR), Illinois Department of Conservation (IDOC), and the Illinois Department of Energy and Natural Resources. The IDNR was officially created July 1, 1995 and the stormwater related Operational Offices under IDNR are identified and discussed below after discussion of IEPA.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY (IEPA): IEPA is the state of Illinois's agency responsible for water quality issues including regulation and management of both point and nonpoint sources of pollution.

Administration and Management: IEPA is not directly involved in administration or management of stormwater programs in McHenry County except to the extent that they may provide grants to fund certain administrative and management activities.

IEPA (with USEPA funds) has partially funded preparation of a course curriculum to educate designers and permit reviewers in the application of stormwater BMPs on urban development sites. IEPA (also with USEPA funds) has partially funded, as part of other projects, preparation of public education materials such as guidance to riparian land owners.

Regulation: IEPA is the regulatory agency for water quality and issues National Pollutant Discharge Elimination System (NPDES) permits in the State of Illinois. Recently, NPDES has been expanded to include construction activities of five or more acres. Under this recent expansion, the developer is required to prepare a "Stormwater Pollution Prevention Plan" addressing construction site runoff as well as post construction runoff and file a "Notice of Intent". There presently is little state review of prevention plans, or inspection or enforcement to ensure compliance with the prepared plans. This program is administered entirely at the state level with no local government involvement required.

However, the permit does reference compliance with local government ordinances, in addition to the state requirements. IEPA provided funding to NRCS to prepare the "Illinois Urban Manual - A Technical Manual Designed for Urban Ecosystem Protection and Enhancement" (USDA, 1995) which provides guidance in designing soil erosion and sediment control as well as stormwater best management practices for new development.

Also, certain industries (based on SIC code) must file for a permit for stormwater discharges, regardless of the time that the property was developed. The requirements for these industrial discharges are considerably greater than for construction activities. The requirements include water quality monitoring of selected storm events to characterize the runoff from the site and development of detailed pollution prevention plans that are reviewed by IEPA. Follow up water quality monitoring is required after installation of the measures in the pollution prevention plan.

Although the Corps of Engineers is the agency responsible for issuing wetland permits, IEPA makes determinations regarding water quality impacts of wetland disturbances and issues water quality certification under Section 401 of the Clean Water Act.

Planning: IEPA collects water quality data on streams and lakes throughout the state including McHenry County. The data is reported in a biannual water quality report which identifies levels of use attainment for each of the waterbodies. For lakes, the data is also reported in an annual Lake Water Quality Assessment Report. Finally, IEPA maintains the Illinois Water Quality Management Plan which includes recommendations for stormwater, soil erosion and sediment control, and stream and wetland BMPs.

USEPA provides grants for water quality related planning and demonstration projects under Section 319(h), Section 314, and 104(b)(3) of the Clean Water Act. All three of these programs are administered by IEPA and provide funds for local governments to implement projects or prepare plans.

Section 319 is the nonpoint source program and provides grants annually for water quality demonstration projects which can include treatment systems for urban runoff as well as in-stream activities to reduce erosion and sedimentation that can lead to degradation of water quality. On the preventative side, such activities as ordinance implementation and preparation of workshops on stormwater best management practices have been funded under Section 319.

Section 314 is the Clean Lakes Program which provides annual grants for Phase I lake diagnostics and alternative evaluation and Phase II implementation. While EPA encourages a watershed approach to addressing these problems, the focus of the program is on remediation of problems rather than prevention and funding is unlikely to be available to study lakes that are currently unimpaired.

Funding under 104(b)(3) is sporadic and is the only one of the programs that provides funding for watershed planning. Funding under 104(b)(3) has been used to develop

watershed management plans in several watersheds in Lake County, Illinois. These plans recommended both remedial and preventative actions to address water quality and use impairments of Flint and Mutton Creeks and their lakes and wetlands. All of the EPA programs require a local cost share (generally 40%).

Maintenance: IEPA is not directly involved in maintenance activities. However, grants have been awarded to local governments to assist in stream maintenance activities that address water quality concerns including streambank erosion. These grants have partially funded removal of debris from streams, removal of non-native undesirable riparian vegetation, and installation of erosion control measures, all to address eroding streambanks.

ILLINOIS DEPARTMENT OF NATURAL RESOURCES-OFFICE OF WATER RESOURCES (IDNR-OWR): IDNR-OWR (formerly IDOT-DWR) is the regulatory agency for floodplain construction in Illinois. OWR is also the State's flood control and flood mitigation agency. The state stormwater legislation specifies that all county stormwater plans be sent to IDOT-DWR for review and comment and this plan will be forwarded to OWR.

Administration and Management: OWR plays no direct role in the administration and management of stormwater activities in McHenry County. However, OWR often co-sponsors training opportunities.

Regulation: As stated previously, OWR is the state regulatory agency for floodplain construction in Illinois. Their authority extends only to those floodplains with drainage areas greater than one square mile. The state will delegate certain aspects of their program to municipalities and counties that have ordinances containing the minimum state standards. OWR, along with NIPC, developed a model floodplain management ordinance for those communities wishing to participate in the National Flood Insurance Program (NFIP) and wishing State permit review authority for activities in the flood fringe. OWR provides advice and technical assistance to local permit review officials.

Planning/Capital Improvements: At the request of local government(s), OWR will perform flood control studies to identify alternatives and determine financial feasibility to address overbank flooding problems. Historically plans developed by OWR have focused on structural flood control measures. For eligible flood control projects, where the benefits exceed the costs, OWR can fund 100% of project analysis, design, and construction. For projects where the benefits do not exceed the costs, OWR can fund capital improvements up to an amount equal to the benefits. OWR generally performs the analysis leading to flood control projects in-house. However, they may also fund projects recommended in local plans and meeting certain criteria.

OWR also has a small projects program that is often used to address local drainage problems and can fund flood related improvements up to $75,000. A less rigorous quantification of benefits is required under this program.

OWR also has limited flood mitigation funds for flood proofing and buyouts of floodprone structures. OWR also provides assistance in flood mitigation planning and has funded preparation of local flood hazard mitigation plans which are required to receive flood mitigation funds.

Many of the stream gages in Illinois maintained by the USGS are jointly funded by OWR. Also, OWR has a few gages that they have installed and maintain themselves.

Maintenance: OWR is not involved in maintenance activities, with the exception of facility maintenance of structures owned by the agency.

ILLINOIS DEPARTMENT OF NATURAL RESOURCES-OFFICE OF NATURAL RESOURCE MANAGEMENT (IDNR-NRM): NRM (formerly IDOC) is responsible for the preservation and enhancement of the natural resources in Illinois and manages the state parks. NRM works with a variety of public and private agencies involved in the protection of natural resources in Illinois. The state stormwater legislation specifies that all county stormwater plans be sent to IDOC for review and comment and this plan will be forwarded to NRM.

Administration and Management: NRM plays no role in the administration and management of stormwater related programs in McHenry County.

Regulation: Section 404 permit applications for wetland disturbances on sites which contain state endangered or threatened plant or wildlife species are reviewed by NRM for impacts to fish and wildlife resources.

Planning: NRM administers state and federal open space programs. The state's program is entitled Open Space Lands Acquisition and Development (OSLAD) and the corresponding federal program is entitled Land and Water Conservation Fund (LWCF but also known as LAWCON). These programs provide funding for open space acquisition and development on a 50% reimbursement basis. It may be possible to use these funds to assist in the purchase and enhancement of significant wetland, depressional storage and floodplain areas that are important to the management of stormwater in McHenry County.

Maintenance: Maintenance activities of NRM are limited to their own properties on which they generally perform stream maintenance activities. NRM may be able to provide technical assistance regarding appropriate stream maintenance and restoration activities.

ILLINOIS DEPARTMENT OF NATURAL RESOURCES-OFFICE OF SCIENTIFIC RESEARCH AND ANALYSIS (IDNR-OSRA): OSRA (formerly IDENR) conducts research, provides information and formulates policy related to Illinois' natural resources.

Administration and Management: OSRA plays no role in the administration and management of stormwater related programs in McHenry County.

Regulation: OSRA has no regulatory authority.

Planning: The OSRA can provide research and technical assistance for projects involving natural resources. The Water Survey, a division of OSRA, conducts hydrologic studies and provides design rainfall data for the state of Illinois (Bulletin 70 authored by Huff and Angel, 1989). The Natural History Survey, also a division of OSRA, is currently developing new techniques for studying soil erosion and helping to identify Illinois streams which are biologically significant. The Natural History Survey can also perform assessments of flora and fauna of natural areas.

Maintenance: OSRA plays no role in maintenance of stormwater infrastructure or natural drainage systems.

2.2.4 Federal

U.S. ARMY CORPS OF ENGINEERS: The U.S. Army Corps of Engineers is responsible for the management of navigable rivers, lakes and shorelines. The Corps is primarily involved with large flood control projects on regional river systems. However, the Clean Water Act charges the Corps with regulating activities which involve the dredging and filling of the waters of the United States, including wetlands.

Administration and Management: The Corps of Engineers plays no role in the administration and management of stormwater programs in McHenry County.

Regulation: Historically, dredge and fill have been the only activities in wetlands regulated by the Corps of Engineers. More recently, the Corps of Engineers is paying closer attention to other wetland disturbances such as drainage and excavation. Still other wetland disturbances, such as vegetation removal and impoundment, remain unregulated unless part of a dredge and fill activity. Like the NPDES program, no local government involvement is required.

Planning/Capital Improvements: The Corps of Engineers has funding available for flood control projects. After a reconnaissance level study has shown that a project is likely to be cost effective (i.e. benefits exceed costs), the Corps will proceed with project analysis which must be funded locally by 50% matching funds. For approved projects, the Corps funds 75% of design and construction costs with the remaining 25% to be funded locally. Projects are generally limited to structural flood control measures. However, the Corps has also provided design services for floodproofing of residences as part of an overall flood control project. Corps studies are generally performed with in-house staff. However, local government assistance with those studies can be applied to the local cost share.

Maintenance: The Corps of Engineers is not involved in maintenance activities except for maintenance of their own facilities.

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA): FEMA administers the National Flood Insurance Program (NFIP). The Federal Insurance Administration, a part of FEMA, produces floodplain maps which are used for both insurance and regulatory purposes.

Administration and Management: FEMA is the lead agency related to disaster assistance in terms of federal funding and technical assistance for relief and recovery programs.

Regulation: FEMA has minimum floodplain standards that must be enforced by local governments to maintain eligibility in the NFIP. Participation in the NFIP allows residents of the community to purchase flood insurance and makes the communities eligible for federal emergency relief funds if a presidential declaration has been received. Flood insurance is required for structures located within the floodplain if the owner applies for a federal grant or loan, or federally insured or subsidized loans (e.g. mortgage). In support of the local regulatory programs, floodplain mapping was produced for all communities participating in the program. Most of these maps for McHenry County were produced in the early 1980s.

Planning: FEMA has several flood hazard mitigation funding programs, including funding for plan development and an acquisition program for areas which have experienced repeated flood damage. Unlike IDNR-OWR and the Corps, FEMA generally does not develop plans in-house but may provide funding to local governments to prepare their own plans. Funding may also be available from FEMA to update floodplain maps.

Maintenance: FEMA is not involved in maintenance activities.

U.S. DEPARTMENT OF AGRICULTURE-NATURAL RESOURCE CONSERVATION SERVICE (NRCS): NRCS (formerly the Soil Conservation Service) is primarily concerned with the wise use of soil, water and other related natural resources.

Administration and Management: NRCS works through and provides technical assistance to local soil and water conservation districts to assist the agricultural community. NRCS also co-sponsors training opportunities including courses and workshops in design and implementation of stormwater best management practices, soil erosion and sediment control, wetland management and hydrologic computer modeling to support the urban community.

Regulation: NRCS utilizes a voluntary, rather than a regulatory, approach to implement its conservation program authorities. In agricultural areas, producers who want to participate in USDA programs and receive benefits must implement conservation requirements. NRCS has developed conservation practice standards and specifications that may be utilized in regulatory programs.

Planning/Capital Improvements: Under the Watershed Protection and Flood Protection Act (Public Law 93-566, as amended) NRCS has planned, designed and constructed flood

control facilities to address overbank flooding in the Chicago metropolitan region. Also under this program, NRCS has performed floodplain management studies and updated floodplain mapping for local governments.

In recent years, the NRCS has initiated an urban conservation program because of the need for urban erosion, sediment and flood control assistance. Under this program, NRCS provides (or will provide) technical assistance (and possibly financial assistance) in urban natural resource planning and restoration. To staff these activities the NRCS has opened the Chicago Metro Urban and Community Assistance Office in Palatine, Illinois. The NRCS has also provided technical assistance in development of this Stormwater Plan. Recently, NRCS has begun assisting locals in watershed planning activities for the Nippersink Creek watershed.

Maintenance: NRCS has no direct role in maintenance activities but does provide technical assistance to land users and publics works officials regarding the maintenance of stormwater management system components in both agricultural and urban areas.

U.S. GEOLOGICAL SURVEY-WATER RESOURCES DIVISION (USGS-WRD): USGS-WRD is responsible for providing the hydrologic information necessary to achieve the best use and management of the nation's water resources.

Administration and Management: Although USGS plays no direct role in administration and management, USGS has co-sponsored training courses in hydrologic modeling in northeastern Illinois.

Regulation: The USGS has no regulatory authority and is not involved in regulatory activities in McHenry County.

Planning: Through a cooperative program, the USGS-WRD (Illinois District) maintains a stream gaging network and publishes an annual report containing daily streamflow data and water quality information for selected sites around the state. The USGS also has funding for site specific hydrologic and water quality data collection and analysis. Some mapping efforts may also be fundable through USGS. USGS funds 50% of project in-house labor and expenses. USGS has recently been contracted to collect water quality, flow, and precipitation data for Wonder Lake. On a 50% cost basis, the USGS-WRD can provide technical assistance in developing watershed models and other hydrologic and water quality related assistance.

Maintenance: USGS plays no role in maintenance activities

U.S. ENVIRONMENTAL PROTECTION AGENCY: Protecting the nation's waters from pollution is one of the many concerns of the USEPA. The Clean Water Act enables the USEPA to regulate water quality on a national level.

Administration and Management: USEPA plays no direct role in administration or management of stormwater programs except to the extent that USEPA may be the ultimate source of funds used to assist in implementing certain administration and management activities such as public and professional education as described under IEPA.

Regulation: NPDES authority ultimately rests with the USEPA. However, that authority has been delegated to the IEPA in Illinois. Although not directly involved in the permitting process, the USEPA works with the U.S. Army Corps of Engineers to establish wetlands policy and has veto authority over Section 404 permits. USEPA is the only agency with staff and authority for enforcement of environmental crimes.

Planning: USEPA provides grants for water quality related planning and demonstration projects under Section 319(h), Section 314, and 104(b)(3) of the Clean Water Act as discussed under IEPA. USEPA also holds national conferences on such topics as urban runoff management, watershed nonpoint source pollution monitoring, ecological restoration, and others. These conferences are intended for state and local planners but are attended by consultants as well.

Maintenance: USEPA plays no direct role in maintenance activities. However, USEPA is the ultimate source of grant funds to assist in performing maintenance activities as discussed under IEPA.

U.S. FISH AND WILDLIFE SERVICE: The U.S. Fish and Wildlife Service (USFWS) is responsible for protection of aquatic and wildlife habitats and is actively involved in water quality and wetland preservation. USFWS also works with numerous agencies, such as NRM, on a variety of wetland protection projects.

Administration and Management: USFWS plays no role in administration and management of stormwater activities in McHenry County.

Regulation: Section 404 permit applications for wetland disturbances on sites which contain federally endangered or threatened plant or wildlife species are reviewed by the USFWS for impacts to fish and wildlife resources.

Planning: The USFWS can provide technical review and support for the planning and design of wetland restoration projects which enhance water quality and wildlife habitat. USFWS has a field office in Barrington, Illinois specializing in urban issues.

Maintenance: USFWS may be able to provide technical assistance to land owners performing stream and wetland maintenance and maintenance activities which would enhance their wildlife habitat functions.

NATIONAL PARK SERVICE (NPS): The NPS is charged with preservation of the nation's natural, cultural and recreational resources through acquistion and technical assistance. The NPS carries out their mission through acquistion, development and maintenance of the nation's parks and by providing technical assistance to state and local governments as well as private organizations.

Adminstration and Management: NPS has no role in administration and management of stormwater activities in McHenry County.

Regulation: NPS has no regulatory authority.

Planning: The Rivers, Trails and Conservation Assistance (RTCA) Program provides technical assistance in support of local conservation projects. NPS staff will work with local governments and private groups on river corridor projects to help them achieve multiple benefits including floodwater retention, wetland protection, habitat restorations, water quality improvements and recreational opportunities. NPS staff can assist with citizen involvement activities, facilitate local discussion and decision making and assist in development and implementation of plans.

Maintenance: The NPS manages and maintains steams, lakes and wetlands within the national park system and may be able to provide technical assistance related to appropriate and effective stream maintenance and restoration practices.

CHICAGO URBAN RESOURCE PARTNERSHIP (URP): URP is composed of representatives from six federal agencies: USDA Forest Service, Cooperative Extension Service, NRCS, National Park Service, USFWS, USEPA, as well as the State of Illinois and City of Chicago Department of Environment. URP advocates and assists community based action through local partnership to enhance, restore and sustain urban ecosystems in the Chicago metropolitan area.

Administration and Management: URP has no role in administration and management of stormwater activities in McHenry County.

Regulation: URP has no regulatory authority.

Planning: URP provides grants for projects related to open space, water quality, habitat enhancement and management, environmental education and stewardship and ecosystem management techniques. URP, though its member agencies, may also be able to provide technical assistance to local governments.

Maintenance: URP may be able to provide technical assistance, through its member agencies, to land owners performing stream and wetland maintenance and maintenance activities which would enhance their water quality and wildlife habitat functions.

2.2.5 McHenry County Stormwater Committee

The McHenry County Stormwater Committee (MCSC) is an intergovernmental entity with representation from both municipalities and the county. MCSC will, through adoption of this Stormwater Plan, be the ultimate authority for stormwater management in McHenry County. While many activities may continue to occur at the local level, the MCSC will establish minimum standards and coordinate local activities.

Administration and Management: The MCSC is composed of half municipal and half County Board representation. State legislation gives county stormwater committees the authority to implement countywide stormwater management plans and levee taxes to fund implementation. This authority allows the agencies to tax up to a maximum 0.20% of assessed valuation to fund their activities. However, in order to exercise that authority, either other county programs would have to be reduced or a referendum would be required due to the current legislative tax cap.

The primary role of the MCSC at this time is to develop this countywide Stormwater Plan which defines the future role of the committee as well as the role of other entities within the county relative to stormwater management.

Two advisory subcommittees have been formed under the MCSC: the Advisory Subcommittee and the Technical Advisory Subcommittee (TAC). The Advisory Subcommittee is made up of four members of the MCSC. In addition to those four, Planning and Development Department staff, NIPC, NRCS, SWCD and several area consultants have been participating in the Advisory Subcommittee meetings. The Advisory Subcommittee has been working with staff and consultants in preparing this Stormwater Plan.

The TAC has no formal membership and has been meeting on an intermittent basis. Those currently participating in the TAC are generally limited to staff and NRCS. The TAC has been working with staff on technical matters such as identifying county stormwater data sources and preparing technical presentations for the MCSC.

The county has assigned one individual within the Planning and Development Department whose primary responsibility is to staff the MCSC. That individual also assists the other county departments on stormwater issues and provides technical assistance to the municipalities and townships. That individual was also responsible for data collection and much of the background information contained within this document. The recommendations section of this document (Chapter 5) identifies in greater detail MCSC's ultimate roles related to administration and management .

Regulation: The MCSC currently has no role under this functional category. However, the state legislation allows the MCSC to adopt and enforce a countywide stormwater ordinance. See the recommendations in Chapter 5 for the recommended regulatory role of MCSC.

Planning: The primary planning activity at this time is preparation of this countywide plan. However, MCSC staff is also cuurently involved with prepartion of a countywide wetland Advanced Identification (ADID) study.

The state legislation allows the MCSC to prepare and implement watershed plans including issuing bonds and levying taxes to fund implementation of the watershed plans. See Chapter 5 for rcommendations regarding watershed planning and implementation.

Maintenance: The MCSC is not currently involved in maintenance activities. However, state legislation allows MCSC to enter onto private land to perform maintenance activities. Through this Stormwater Plan, the MCSC will develop a mechanism to ensure maintenance of stormwater facilities and the natural drainage system (see the recommendations in Chapter 5).

CHAPTER 3

ASSESSMENT OF STORMWATER CONDITIONS AND PROBLEMS

This Stormwater Plan is primarily concerned with development of an institutional framework. However, knowledge of current problems is needed both to assess the adequacy of existing stormwater programs and to prioritize activities once the framework is in place.

Surveys were sent out to each municipality regarding the types and locations of stormwater problems. The findings presented in this chapter reflect review of surveys returned by the municipalities, review of local stormwater studies, review of IEPA water quality data and personal observation of the MCSC and those participating in preparation of this plan. Before discussing three problems areas: flooding, streambank erosion and water quality, statistics on the watersheds within McHenry County are presented.

3.1 WATERSHED STATISTICS

For planning purposes, the county has been divided into six primary watersheds: Nippersink Creek, Upper Fox River, Lower Fox River, Piscasaw Creek, Kishwaukee River and Coon Creek. Nippersink Creek is a tributary to the Fox River. The Piscasaw and Coon Creeks are tributaries to the Kishwaukee River. The six watersheds are shown in Figure 3-1 along with municipal boundaries, state and federal roads and perennial streams. The statistics presented in this section are based on data contained within the Geographic Information System (GIS) database of NIPC. The data layers within the GIS and used for this project include a regional land use database (NIPC, 1994), digital streams data (USGS, 1986), digital flood insurance rate maps (NIPC 1995; ISWS, 1994), digital population data (NIPC, 1994) and watershed boundaries (MCSC, 1994).

Watershed boundaries for the six watersheds were obtained from MCSC in paper format and digitized into the NIPC GIS. Through a digital overlay of the watershed boundaries on the land use and population layers, statistics on land use area and population were computed by watershed. Table 3-1 presents the population and land use areas in acres for each of the six watersheds. Table 3-2 presents the same information in terms of percentages (and population density). A large scale color map depicting the land uses, water and wetlands, floodplains and major roads is available for viewing at the McHenry County Stormwater Committee office.

The greatest urban density, both in terms of land use and population density is in the Upper and Lower Fox River watersheds. This is no surprise since the largest urban centers, with the exception of Woodstock, are in the Upper and Lower Fox River watersheds. Woodstock is in the Kishwaukee River watershed.

All of the watersheds have a substantial agricultural component with the eastern watersheds (Upper and Lower Fox) having the least agricultural area and the remainder of the watersheds being primarily agricultural. Overall, the county is 62.8% agricultural but the percentage varies

Figure 3-1: McHenry County Watershed Planning Units

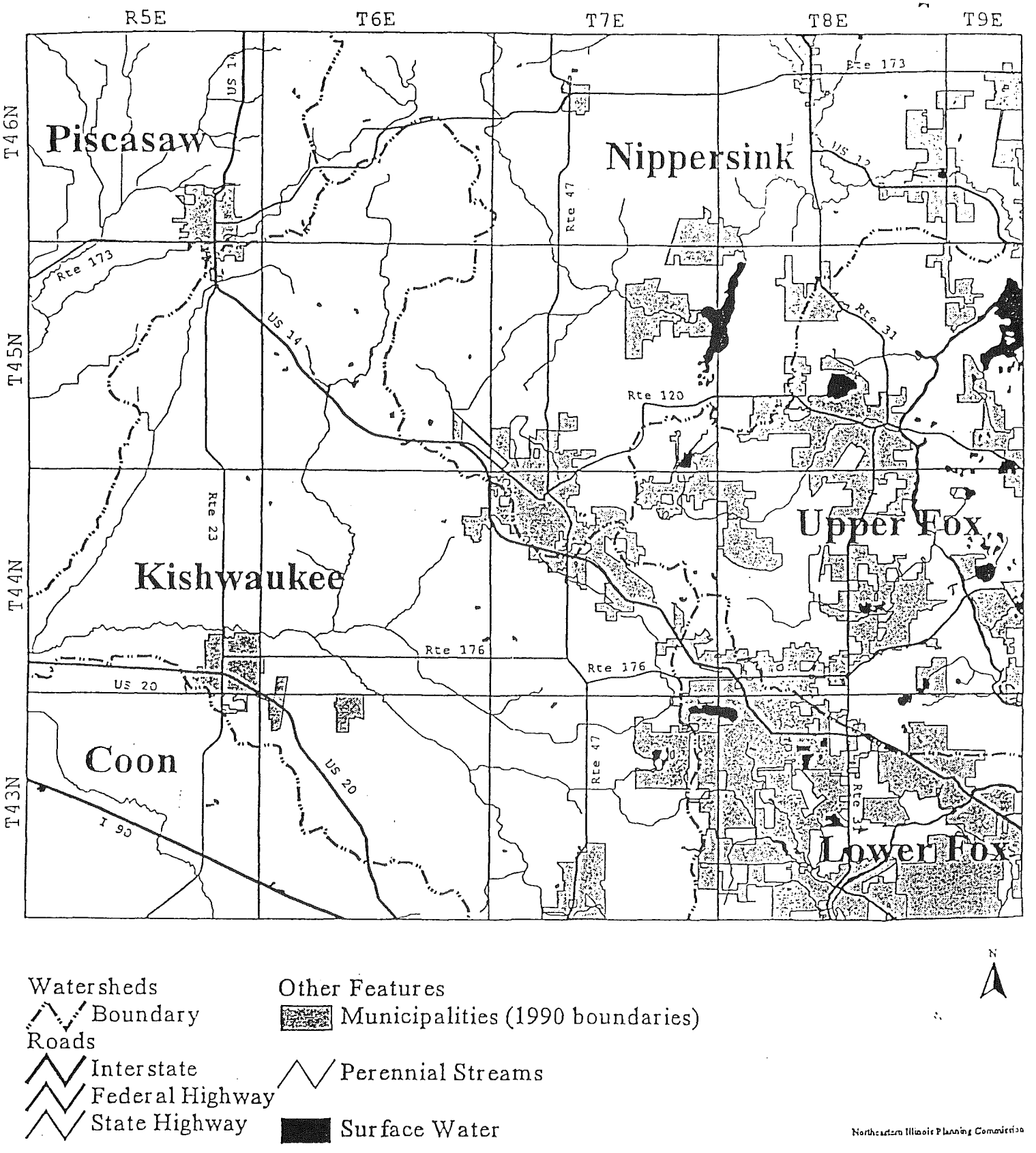


Table 3-1: McHenry County Land Use Area and Population by Watershed

Land Use	McHenry County Land Use Area by Watershed (acres)						
	Nippersink	Upper Fox	Lower Fox	Piscasaw	Kishwaukee	Coon	Total
Single Family	10481	16920	10520	1673	9293	1374	50261
Multi-Family	56	83	143	25	77	0	384
Commercial	1112	1139	788	197	783	27	4046
Industrial	1838	1683	3277	412	2903	209	10327
Institutional	448	531	800	131	371	6	2287
Transportation/Utility	237	228	234	75	144	345	1263
Agriculture	63801	23091	8665	33560	88931	27594	245642
Open Space	10308	8788	3560	2794	10742	1075	37267
Vacant	656	1239	1129	48	1042	119	4233
Wetland	7910	7349	1021	2399	9611	872	29162
Water	1145	3157	1026	40	661	63	6092
Total	97992	64208	31163	41354	124563	31684	390964
Population (people)	32591	60883	58495	8167	20588	2248	182972

Table 3-2: McHenry County Land Use Percentage and Population Density by Watershed

Land Use	McHenry County Land Use Percentages by Watershed						
	Nippersink	Upper Fox	Lower Fox	Piscasaw	Kishwaukee	Coon	County Average
Single Family	10.70%	26.35%	33.76%	4.05%	7.46%	4.34%	12.86%
Multi-Family	0.06%	0.13%	0.46%	0.06%	0.06%	0.00%	0.10%
Commercial	1.13%	1.77%	2.53%	0.48%	0.63%	0.09%	1.03%
Industrial	1.88%	2.62%	10.52%	1.00%	2.33%	0.66%	2.64%
Institutional	0.46%	0.83%	2.57%	0.32%	0.30%	0.02%	0.58%
Transportation/Utility	0.24%	0.36%	0.75%	0.18%	0.12%	1.09%	0.32%
Agriculture	65.11%	35.96%	27.81%	81.15%	71.39%	87.09%	62.83%
Open Space	10.52%	13.69%	11.42%	6.76%	8.62%	3.39%	9.53%
Vacant	0.67%	1.93%	3.62%	0.12%	0.84%	0.38%	1.08%
Wetland	8.07%	11.45%	3.28%	5.80%	7.72%	2.75%	7.46%
Water	1.17%	4.92%	3.29%	0.10%	0.53%	0.20%	1.56%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Pop. (people/Sq. Mi.)	213	607	1201	126	106	45	300

from a low of 27.8% in the Lower Fox River watershed to a high of 87.1% in the Coon Creek watershed in the southwestern portion of the county.

The Fox River and Nippersink Creek watersheds, in the eastern portion of the county, have considerably more open water area than the Kishwaukee River, Coon Creek and Piscasaw Creek watersheds in the western portion of the county. This is partially because of the size of the Fox River and its onstream lakes but also because of the greater number of inland lakes in the eastern watersheds.

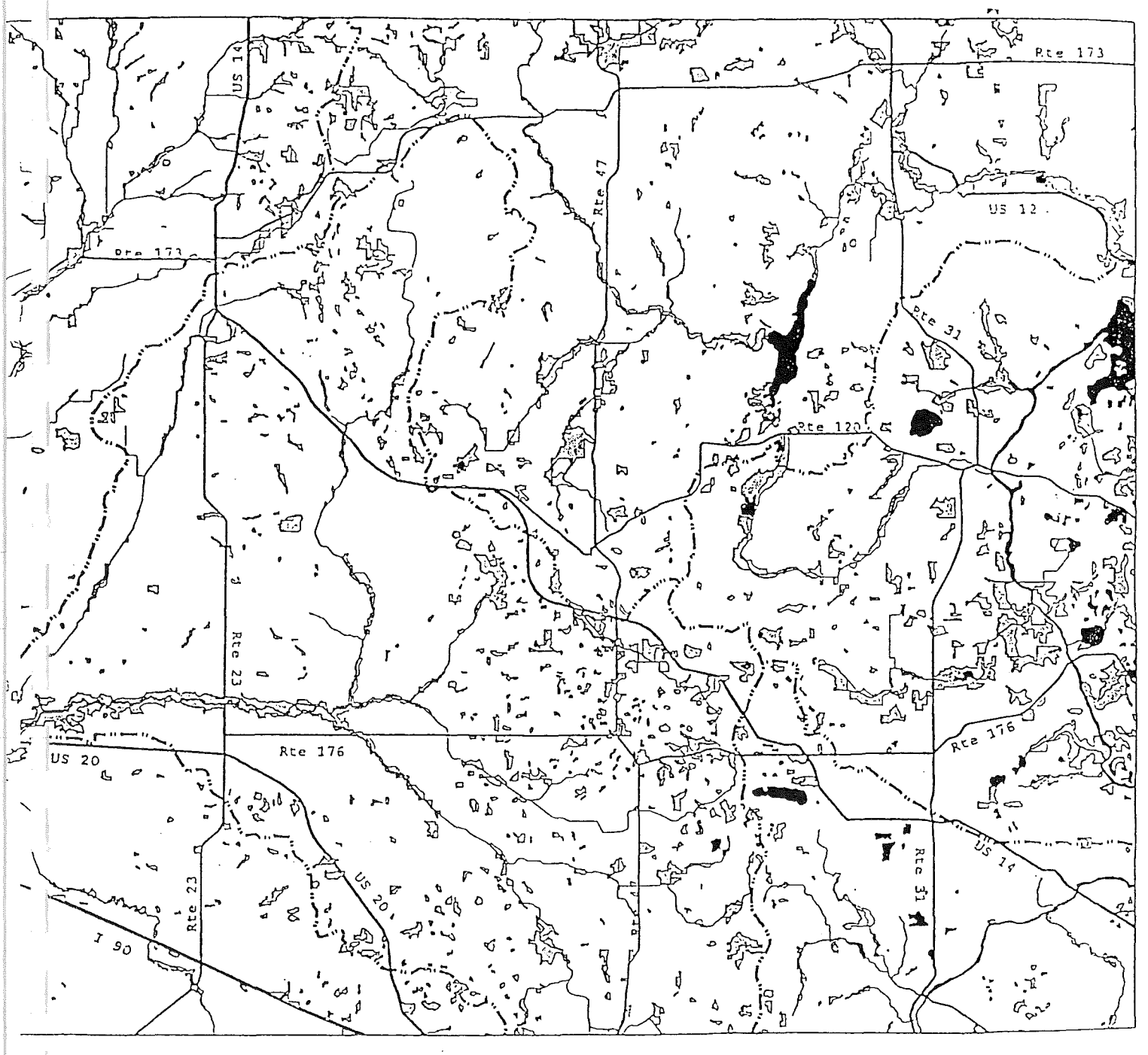
Wetlands within the county are shown in Figure 3-2. Wetlands are relatively uniformly spread throughout the county with the southern portion of the county (Lower Fox River and Coon Creek) having the lowest percentages and the Upper Fox having the highest percentage. It should be noted that only wetlands over approximately 2.5 acres in size are included in Figure 3-2 and the areas of Table 3-1. The Natural Resource Conservation Service (NRCS) is developing a wetland inventory for both agricultural and urban areas. It is expected that the total wetland area of the county will increase as a result of this inventory which will include wetlands of all sizes. However, due to map scale, wetlands smaller than 0.5 to 1 acre probably will not be shown on the NRCS maps.

Floodplains of the county as found in the FEMA Flood Insurance Rate Maps (FIRM) are shown in Figure 3-3. These FIRM floodplains were digitally overlaid on the land use layer to determine the area of each land use within the floodplain, by watershed. It should be noted that the FIRM layer only includes mapped floodplain areas. Since only floodplains with greater than approximately one square mile of drainage area are mapped, there may be considerably greater floodprone area than indicated by the FIRM maps. Also, the floodplains depicted by the FIRM maps may have expanded due to the increased level of urbanization in the county since the late 1970s to early 1980s when the flood insurance studies were performed. The discussion of current floodplain regulations in Section 4.2 discusses the status of floodplain mapping further.

Floodplain area is presented in Tables 3-3, 3-4 and 3-5. Table 3-3 shows the absolute area of each land use in the floodplain by watershed. Table 3-4 shows the area of each land use in the floodplain as a percentage of the total area of that land use in the watershed. Table 3-5 shows the area of each land use in the floodplain as a percentage of the total floodplain area in that watershed. The tables show that mapped FEMA floodplains occupy from 6.7% to 16.9% of the total watershed area, depending on the watershed. Mapped FEMA floodplain occupies 11.6% of McHenry County as a whole. The tables show that most of the floodplain is located in areas of agricultural, open space, vacant, wetland and water land uses (92% of the total floodplain area). Of these non-urban uses in the floodplain, most are in agricultural areas. In fact, agricultural land use accounts for 45% of McHenry County's mapped floodplain area. This is important considering that agricultural areas are often converted to urban land uses.

Substantial urban uses (residential, commercial, industrial and institutional) are also located in the floodplain. Figure 3-4 shows the location of urban land uses (single and multi-family residential, commercial, industrial and institutional) in the floodplain. It should be noted that when an urban land use is found to be in the floodplain, it does not necessarily mean that structures are located in

Figure 3-2: McHenry County Wetlands from NIPC Land Use Inventory



Watersheds
- Boundary

Roads
- Interstate
- Federal Highway
- State Highway

Other Features
- Wetlands
- Perennial Streams
- Surface Water

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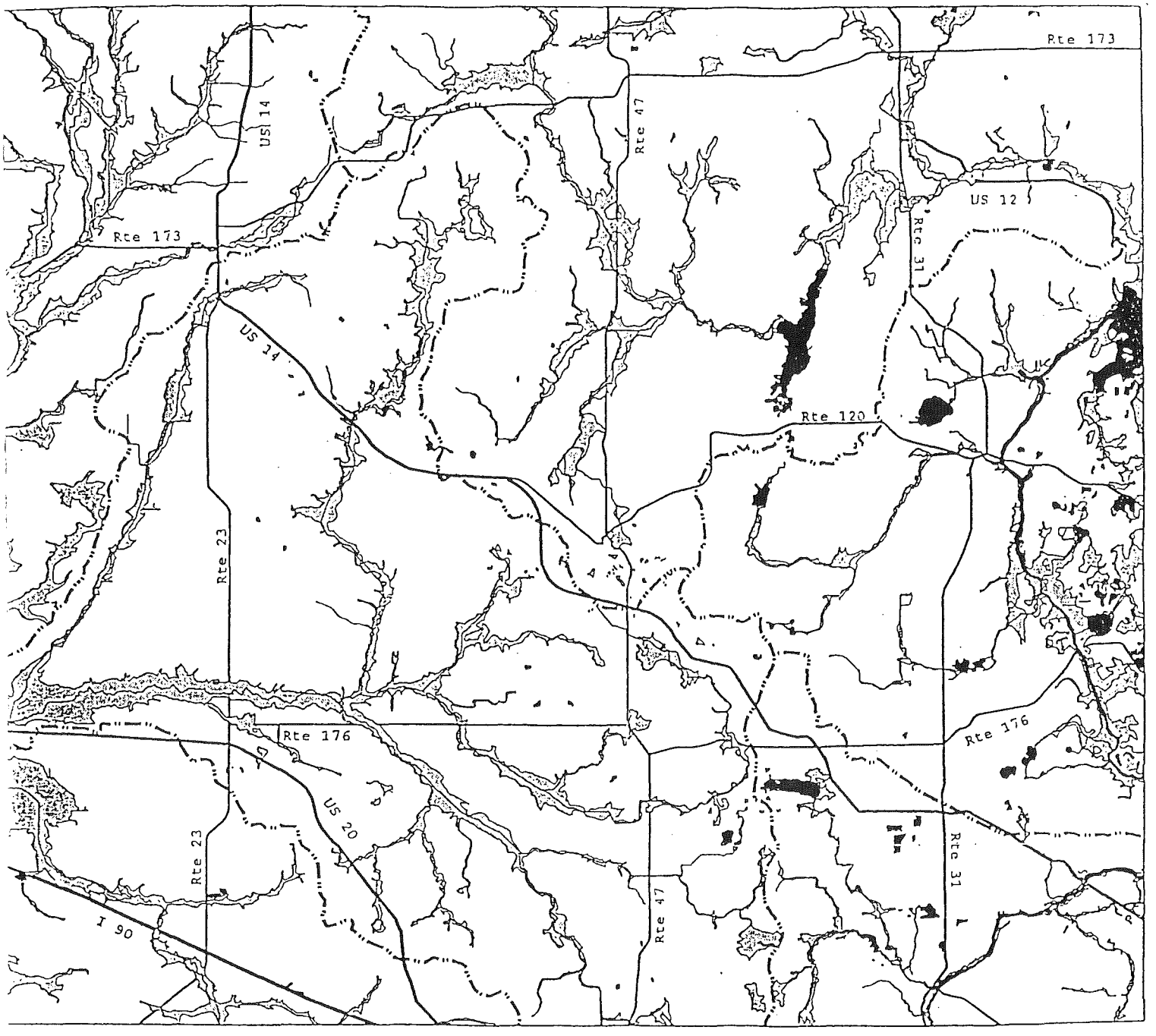
Figure 3-3: McHenry County Floodplains from FEMA Flood Insurance Rate Maps



Watersheds
Boundary
Roads
Interstate
Federal Highway
State Highway

Other Features
100-Year Floodplain
Perennial Streams
Surface Water

N

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Table 3-3: McHenry County Land Use Area within the Floodplain by Watershed

Land Use	McHenry County Floodplain Land Use Area by Watershed (acres)						
	Nippersink	Upper Fox	Lower Fox	Piscasaw	Kishwaukee	Coon	Total
Single Family	347	1413	507	59	426	41	2793
Multi-Family	3	0	0	7	2	0	12
Commercial	78	47	28	4	42	0	199
Industrial	50	105	24	38	195	0	412
Institutional	7	4	19	0	24	0	54
Transportation/Utility	0	7	17	8	15	10	57
Agriculture	3670	649	302	5429	7450	2972	20472
Open Space	1410	1118	244	246	1042	154	4214
Vacant	10	30	11	0	92	0	143
Wetland	3453	2987	328	1174	3962	300	12204
Water	967	2652	610	9	338	46	4622
Total	9995	9012	2090	6974	13588	3523	45182

Table 3-4: McHenry County Land Use Area Within the Floodplain as a Percentage of Total Land Use Area

Land Use	McHenry County Floodplain Land Use Percentages by Watershed						
	Nippersink	Upper Fox	Lower Fox	Piscasaw	Kishwaukee	Coon	County Average
Single Family	3.31%	8.35%	4.82%	3.53%	4.58%	2.98%	5.56%
Multi-Family	5.36%	0.00%	0.00%	28.00%	2.60%	0.00%	3.13%
Commercial	7.01%	4.13%	3.55%	2.03%	5.36%	0.00%	4.92%
Industrial	2.72%	6.24%	0.73%	9.22%	6.71%	0.00%	3.99%
Institutional	1.56%	0.75%	2.38%	0.00%	6.47%	0.00%	2.36%
Transportation/Utility	0.00%	3.07%	7.26%	10.67%	10.42%	2.90%	4.51%
Agriculture	5.75%	2.81%	3.49%	16.18%	8.38%	10.77%	8.33%
Open Space	13.68%	12.72%	6.85%	8.80%	9.70%	14.33%	11.31%
Vacant	1.52%	2.42%	0.97%	0.00%	8.83%	0.00%	3.38%
Wetland	36.97%	57.82%	15.31%	42.86%	49.25%	29.35%	42.89%
Water	12.23%	36.09%	59.75%	0.38%	3.52%	5.28%	75.87%
Total	10.20%	14.04%	6.71%	16.86%	10.91%	11.12%	11.56%

Table 3-5: McHenry County Land Use Area Within the Floodplain as a Percentage of Total Floodplain Area

Land Use	McHenry County Floodplain Land Use Percentages by Watershed						
	Nippersink	Upper Fox	Lower Fox	Piscasaw	Kishwaukee	Coon	County Average
Single Family	3.47%	15.68%	24.26%	0.85%	3.14%	1.16%	6.18%
Multi-Family	0.03%	0.00%	0.00%	0.10%	0.01%	0.00%	0.03%
Commercial	0.78%	0.52%	1.34%	0.06%	0.31%	0.00%	0.44%
Industrial	0.50%	1.17%	1.15%	0.54%	1.44%	0.00%	0.91%
Institutional	0.07%	0.04%	0.91%	0.00%	0.18%	0.00%	0.12%
Transportation/Utility	0.00%	0.08%	0.81%	0.11%	0.11%	0.28%	0.13%
Agriculture	36.72%	7.20%	14.45%	77.85%	54.83%	84.36%	45.31%
Open Space	14.11%	12.41%	11.67%	3.53%	7.67%	4.37%	9.33%
Vacant	0.10%	0.33%	0.53%	0.00%	0.68%	0.00%	0.32%
Wetland	34.55%	33.14%	15.69%	16.83%	29.16%	8.52%	27.01%
Water	9.67%	29.43%	29.19%	0.13%	2.49%	1.31%	10.23%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

the floodplain. Urban land uses account for 7.7% of the total floodplain area and 5.2% of McHenry County's urban land use area is in the floodplain. Most of the urban land use in the floodplain is residential. However, a significant percentage of the commercial and industrial land uses are also in the floodplain. It is notable that 28% of the multi-family residential and 9.2% of the industrial land use areas in the Piscasaw Creek watershed are in the floodplain, the highest percentages in the county. It is also notable that in the Lower Fox River watershed, residential occupies 24% of the floodplain area, more than any other land use (excluding water) in that watershed.

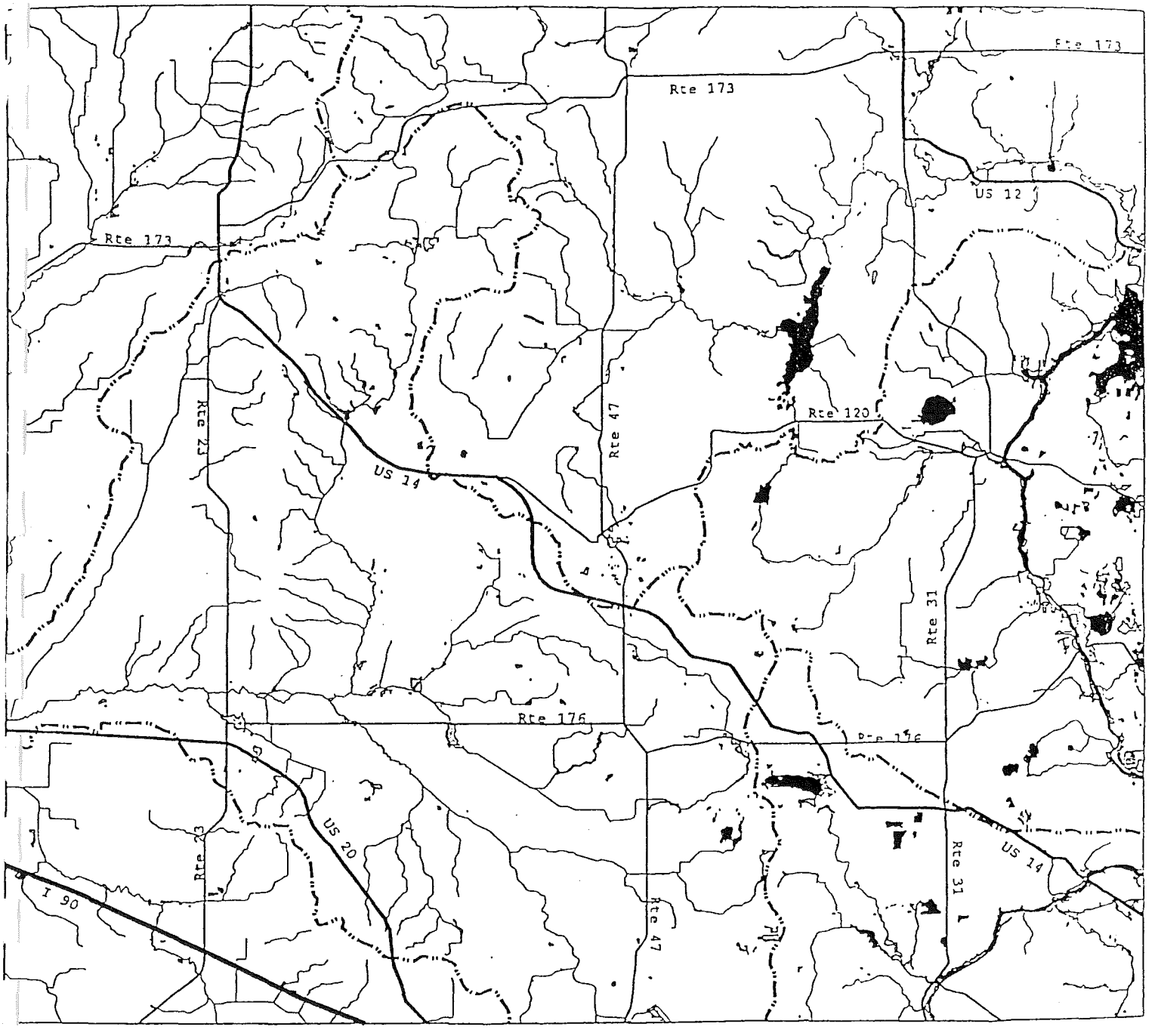
3.2 FLOODING

Flooding occurs from a number of sources including overbank flooding along streams and rivers and local drainage related flooding due to ponding in isolated depressions, high water tables and inadequate stormwater infrastructure. Basement flooding can also occur where sanitary sewer systems accept excess stormwater runoff. Flooding should be distinguished from flood damages. Floods result in flood damages only when they cause destruction, such as when they inundate developed areas. Floods damage buildings and infrastructure, threaten health and safety, destroy crops and disrupt business and traffic, making what had been a natural (and often benign) occurrence a hazard to people and modern development.

Findings:

- Overall, damage from flooding does not appear to be a widespread problem in McHenry County, particularly relative to other counties in the region. This probably reflects a number of factors including the relatively small portion of the county that is developed and the lower density of developed areas. It also likely reflects the generally greater topographic relief that exists in McHenry County relative to the rest of the region.
- Some development has taken place in the floodplains of the county's rivers and creeks. This is particularly true along the Fox River where homes that were originally constructed as seasonal residences are now being occupied year round. Perhaps because these residences were intended to be occupied for only portions of the year, the desire to be close to the river overrode concerns for flooding. Also, many of these homes may have been constructed prior to floodplain mapping.
- There is a clear correlation, as illustrated in Table 3-5, between the level of urbanization and the percentage of the floodplain that is occupied by urban land uses.
- Local drainage problems are often the result of structures located in isolated depressions and former wetlands with no surface outlet. Other local drainage problems are associated with older developments that were constructed without effective stormwater drainage systems. Finally, some local drainage problems are related to high water tables which may be the result of field tiles that no longer function properly. A recent study found that 80% of flood damage reports in Northeastern Illinois came from homeowners with residences built on converted wetlands. (IEPA, 1994)
- It has been reported that urban runoff is sometimes being discharged to agricultural drain tiles and that urban construction activities sometimes disrupt drain tiles.

Figure 3-4: McHenry County Urban Land Uses in the Floodplain



Watersheds
- Boundary

Roads
- Interstate
- Federal Highway
- State Highway

Other Features
- Urban Land Uses (residential, commercial, institutional, and industrial)
- Perennial Streams
- Surface Water

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- Nearly 50% of the existing mapped floodplain occurs in land uses that are available for development (agriculture and vacant). Flood damages could increase locally (within the development) if development occurs in these currently undeveloped floodplain areas. Flood damages could increase dramatically downstream if the floodplain storage in these areas is not preserved.
- Crop damage can also occur from flooding. Crop losses can be the result of excessively wet spring seasons preventing farmers from planting their entire fields and from extended duration floods later in the growing season that damage crops established but not yet harvested. On the other hand, drought can also cause substantial crop losses.

Conclusion: Although damage from flooding is not currently a widespread problem, experience in other parts of the region, other parts of the country and even comparison of the rural and urban portions of the county suggests that as the level of urbanization increases, flood damages may also increase. Flood damages can increase for two primary reasons. The first is that as urbanization and associated runoff volumes increase, floodplains expand to include those areas that were previously outside the floodplain. The second reason is that as the level of development and value of land increases, the potential for structures to be constructed in inappropriate, floodprone locations increases. Both of these causes of increased flood damage can be minimized through proper planning and regulation.

3.3 STREAMBANK EROSION

While erosion and deposition within a stream is a natural process, this process is greatly accelerated as a watershed urbanizes causing an increase in the frequency and duration of bankfull flow. Excessive streambank erosion can be both a water quality concern as discussed in the next section and an infrastructure concern as discussed below. Particularly in urban areas, severe streambank erosion can result in loss of adjacent private property and can even threaten structures constructed too close to the stream. At the other end of the erosion process is deposition which can lead to reduced conveyance capacity within the stream and blockage of culverts. Only limited information was obtained from the surveys related to streambank erosion and the findings below are largely based on observations by SWCD staff as well as the authors of this plan.

Findings:

- Streambank erosion was identified as being a problem in at least a few locations in the county, particularly on steep gradient and urban streams.
- Streams specifically identified by SWCD staff as having reaches of relatively severe streambank erosion include Nippersink Creek, Dutch Creek, Boone Creek, Crystal Creek, Woods Creek, Rush Creek and Coon Creek. It was reported that the locations of severe erosion typically occur immediately downstream of channelized sections. Erosion also tends to be more severe in the urban reaches.

Conclusions: Although greater topographic relief generally reduces the area of land inundated during flooding, the potential for streambank erosion and subsequent sedimentation increases with steeper streams. The problem can be greatly exacerbated by urbanization which increases the rate of runoff in already fast moving streams. Also, changes in riparian vegetation during urbanization from native, deep rooted species to shallow rooted turf grass greatly reduces the ability of the stream to withstand high velocity flow. Finally, channelization, which reduces the length and increases the slope of the stream, tends to increase erosion as the stream attempts to recreate a natural meander pattern to reestablish an equilibrium bed slope.

3.4 WATER QUALITY AND WATERBODY USE IMPAIRMENT

Water pollution problems are caused by many sources including agricultural runoff, construction site runoff, urban runoff, failing septic systems, and industrial and municipal wastewater discharges. In addition to potential human health concerns, degraded water quality leads to impaired aquatic ecosystems. In addition to water pollution, physical changes in a waterbody or watershed such as channelization, removal of riparian vegetation, excessive erosion, dredging, hydrologic destabilization and loss of wetlands can be sources of waterbody impairment.

Related to hydrologic destabilization, protection of groundwater resources is another concern. A shift from groundwater dominated hydrology to surface water dominated hydrology can significantly affect water temperatures, water chemistry and flow variability. This can have a profound affect on streams, lakes and wetlands in terms of their ability to support aquatic and recreational uses. The change in flow variability and water level fluctuation resulting from a shift from groundwater to surface water can also have a significant impact on stream, lake and wetland morphology.

Findings:

- McHenry County has some of the highest quality streams in northeastern Illinois. The Kishwaukee River is the highest rated stream in Northeastern Illinois (Grade A in the Illinois Department of Conservation's stream rating system) and is in the top 3 in the state of Illinois (IEPA, 1989). All of the streams assessed by the Illinois EPA, with the exception of Mokeler and Boone Creeks, were rated as fully supporting of all designated uses (IEPA, 1994). Mokeler and Boone Creeks were rated as having partial/minor impairment which is the second highest rating of IEPA's four category system. The causes of impairment are related to both agricultural and urban runoff as well as physical modifications.
- The lakes in McHenry County are also in generally good condition based on the 1992-1993 Illinois Water Quality Assessment Report (IEPA, 1994). However, of the 14 lakes assessed, only eight were monitored or evaluated since 1990. With that in mind, of the 14 lakes assessed, nine (64%) were fully supporting overall lake uses. Of the nine assessed since 1990, only four (44%) were considered full support. Six of the nine lakes that were full support were classified as threatened. Two of the four lakes that were full support based on data since 1990 were classified as threatened. Those lakes determined to have minor or moderate impairment (second and third categories) were Lake-in-the-Hills #1 and #2, McCullom,

- Wonder and Emerald. The causes of impairment in these lakes included agricultural, construction site and urban runoff as well as physical modifications (IEPA, 1994).
- The geology and soils of McHenry County are such that most runoff from undeveloped areas occurs as subsurface runoff. Because of this, urban development has the potential to cause greater shifts from subsurface to surface runoff than in many other parts of the Northeastern Illinois region.
- There are instances of poorly designed infiltration practices that have the potential to discharge polluted urban runoff directly to the groundwater.
- Protection of natural recharge areas of local lakes is necessary for stabilizing water levels and maintaining water quality. For example, a study of Crystal Lake (Bauer, 1975) listed protection of lake aquifer recharge conditions as its first plan formulation objective and five of the eight watershed management criteria identified in the report focused on preventing shifts from subsurface to surface runoff due to urban development.
- Streambank erosion not only results in loss of property and riparian habitat where the erosion occurs but also results in sedimentation, high turbidity and burial of natural substrates in slower moving reaches and lakes downstream.

Conclusions: Without adequate urban stormwater management practices to minimize diversions from subsurface runoff to surface runoff, substantial changes in hydrology are likely to occur, significantly affecting the streams, lakes, and wetlands of the county. However, in an attempt to maintain existing subsurface runoff hydrology, care must be taken not to contaminate groundwater resources with polluted urban runoff.

Although water quality and water body use problems are not yet severe, experience in other parts of the region, other parts of the country, and even comparison of the rural and urban portions of the county suggests that as the level of urbanization increases so does the level of stream and lake use impairment. This is due to both increases in runoff rates as well as impairments of water quality associated with urban activities. Construction site erosion is a major potential source of water quality impairment. Although construction is only temporary at a particular location, it is ongoing constantly in urbanizing watersheds.

3.5 CONCLUSIONS

McHenry County is already experiencing the effects of urbanization in terms of flooding, water quality and waterbody use attainment. It appears that older areas developed prior to modern concepts of stormwater and floodplain management are affected most by flooding. However, new flooding problems continue to be created as the county continues to urbanize. Thus timely, pro-active planning and regulation is critical to minimize further impacts of urbanization on flooding as well as water quality and waterbody use attainment.

Although stormwater management practices can minimize the impacts of development on downstream waterbodies, national experience indicates that certain effects of urbanization cannot be fully mitigated. Once an urbanization threshold is exceeded, high quality water resources will be lost (Schueler, 1994). This suggests a need for limiting urban development intensities in the

watersheds of exceptional quality waterbodies. In other watersheds, stormwater best management practices to minimize urban impacts should be required but development intensity restrictions may not be necessary.

CHAPTER 4

ASSESSMENT OF STORMWATER MANAGEMENT IN MCHENRY COUNTY

The purpose of this chapter is to assess the current status of stormwater management in McHenry County. The primary focus of this assessment is on urban stormwater. However, considering the large amount of agricultural land use in the county, agricultural runoff must also be addressed.

Each municipality was requested to fill out a level of service questionnaire that was sent out in April 1994. After several follow-ups, a response to the questionnaire was received from virtually all municipalities (See Appendix A for a copy of the questionnaire along with a summary of the responses). The following assessment is based on review of those responses as well as review of selected local water resource related ordinances, review of local water resource studies and input from McHenry County, NRCS and SWCD staff regarding local programs and conditions. The assessment is intended to reflect the adequacy of local programs with respect to achieving the goals and objectives adopted by the McHenry County Stormwater Committee and in addressing the stormwater conditions and problems identified in Chapter 3.

4.1 ADMINISTRATION AND MANAGEMENT

The findings in this section are primarily based on the level of service questionnaire, but also based on input from county and SWCD staff.

Findings:

- Municipalities are responsible for stormwater management within incorporated areas and the county is the predominant player in unincorporated areas. Generally there is very limited intergovernmental coordination of programs to identify stormwater issues, prepare studies, perform maintenance or develop regulations.
- Prevention of flooding is the top stormwater-related priority in most communities.
- While not the top priority in most communities, water quality is recognized as being an important element of stormwater management.
- There are no municipal or county programs to educate the public on stormwater and related issues and as a result there is no real perception of stormwater as an issue except by the public that is directly affected.
- Training is available for water resource professionals around the Northeastern Illinois region. Designers and permit review officials in McHenry County have taken advantage of these training opportunities to a limited degree.
- Drainage districts are primarily concerned with maintenance of existing drainage tiles and ditches within the confines of their district. Drainage districts may have records on the

- location of drainage tile and ditches. In many agricultural areas of the county, drainage districts are currently not active, resulting in little coordination of agricultural drainage activities.
- The drainage districts are primarily concerned with drainage of the land to improve agricultural production and are generally not concerned with water quality or flood drainage issues (e.g.,flooding of buildings).
- Based on the level of service questionnaire, drainage districts have made little or no attempt to coordinate their activities with the municipalities. It could be inferred that the municipalities have also made little attempt to coordinate with the drainage districts.
- The Northeastern Illinois Planning Commission provides regional coordination of programs and technical assistance to communities and stormwater planning committees but is limited in resources and authority. NIPC provides and sponsors many training and technical education opportunities.
- State and federal agencies are generally not involved in managing or coordinating stormwater programs except to the extent that the state authorized county stormwater committees to develop and enforce countywide programs. However, some state and federal agencies do provide technical assistance and sponsor training opportunities.
- The MCSC is attempting to coordinate stormwater management through development of a countywide stormwater program.
- The MCSC is currently funded at a very minimal level with a single staff person funded under the Planning and Development Department and other expenses needing approval by the County Board.

Conclusions: The current administrative framework does not meet the MCSC goals and objectives in several respects. In particular, the goals and objectives state that stormwater management should be consolidated into a countywide structure (Goal 1, Objective 2), should be coordinated between municipalities (Goal 1, Objective 3) and public education and information programs should exist (Goal 1, Objective 5). Although not always evident in current programs and policies, water quality is at least stated as being an important element of an effective stormwater management program.

Reports of urban runoff being discharged to agricultural drain tiles and urban construction activities disrupting drain tiles suggests that much better coordination between urban and agricultural runoff concerns is needed.

4.2 REGULATION

This assessment is primarily based on review of ordinances in seven municipalities and the county. The seven municipalities were chosen to provide a representative cross section in terms of size and spatial distribution around the county. Also, the level of service questionnaire included questions related to stormwater regulations.

Findings: The McHenry County regulatory program is assessed in terms of four categorical areas; 1) floodplain management, 2) stormwater drainage and detention, 3) soil erosion and sediment control, and 4) stream and wetland protection. General findings related to regulation are also presented.

Floodplain Regulations: Table 4-1 summarizes the review of seven municipal ordinance and the county ordinances with respect to floodplain management. Appendix C presents the current status of Flood Insurance Studies in McHenry County including the type and year of study, whether floodways have been delineated and whether elevations data exists for the floodplains. The information in Appendix C is presented by community. Findings related to the ordinances and floodplain mapping are discussed below.

- The minimum state floodplain ordinance requirements are not sufficient to meet the MCSC goals and objectives neither in terms of flood protection nor in terms of protection of the ecological aspects of floodplains.
- The NIPC model floodplain ordinance is generally consistent with the MCSC goals and objectives.
- All eight of the local ordinances reviewed require compensatory storage for fill in both the flood fringe and the floodway. The compensatory storage ratios vary from 1.0 to 1.5.
- All eight ordinances utilize a flood protection elevation one foot above the base (100-year) flood elevation.
- Three ordinances limit appropriate uses of the floodway more stringently than the minimum state rules.
- In general, all seven municipalities whose ordinances were reviewed have adopted a floodplain ordinance consistent with the minimum state requirements as well as some additional flooding related provisions consistent with the MCSC goals and objectives.
- All but one of the seven municipal ordinances requires mitigation for channel modifications and all but two require that channel modifications be avoided where practicable.
- All but one of the seven municipal ordinances requires avoidance of onstream impoundments and environmental mitigation for impoundments that are found to be in the public interest.
- Although in a different format, the county floodplain ordinance appears to be generally consistent with the state minimum standards and contains many environmental standards consistent with the MCSC goals and objectives.
- The flood insurance studies and associated maps for McHenry County were all prepared in the late 1970s to early 1980s with two exceptions: Huntley which was restudied in 1992 and Fox Lake which was performed in 1986. Considering the growth in the county since 1980 (nearly 24% increase in population between 1980 and 1990), many of the maps do not adequately reflect current land use conditions. Undoubtably expansions of the floodplain have occurred as a result of the changes in land use.
- In the unincorporated areas of the county, the Fox River, Nippersink Creek, Dutch Creek, Silver Creek, and Cary Creek were studied with detailed methods consisting of hydrologic and hydraulic computer models. These floodplains also have flood elevations and floodways

Table 4-1: Summary of Selected Local Floodplain Management Standards

Municipality	Comp storage ratio Flood Fringe/Floodway	Flood Protection Elevation (Freeboard)	Floodway Appropriate Uses	Channel Modification Standards	Onstream Impoundment Standards
Algonquin	1.5/1.0	1 foot	IDOT Uses minus parking lots, accessory structures, and treatment plants	Avoidance (1) Env mitigation (2) SESC plan (3)	Avoidance (4) Env. mitigation (5) Nonpoint plan (6)
Harvard	1.5/1.5	1 foot	IDOT Uses	Avoidance (1) Env mitigation (2) SESC plan (3)	Avoidance (4) Env. mitigation (5) Nonpoint plan (6)
Huntley	1.0/1.0	1 foot	IDOT Uses minus treatment plants	Avoidance (1) Env mitigation (2) SESC plan (3)	Avoidance (4) Env. mitigation (5) Nonpoint plan (6)
Marengo	1.0/1.5	1 foot	IDOT Uses	Avoidance (1) Env mitigation (2) SESC plan (3)	Avoidance (4) Env. mitigation (5) Nonpoint plan (6)
McHenry	1.5/1.5	1 foot	IDOT Uses	Avoidance (1) Env mitigation (2) SESC plan (3)	Avoidance (4) Env. mitigation (5) Nonpoint plan (6)
McHenry County	1.0/1.0	1 foot	NIPC appropriate uses and only for public use	Env mitigation SESC plan	No private dams allowed in Floodway Silent on public projects
Spring Grove	1.5/1.5	1 foot	IDOT Uses	Avoidance (1) Env mitigation (2) SESC plan (3)	Avoidance (4) Env. mitigation (5) Nonpoint plan (6)
Woodstock	1.0/1.0	1 foot	IDOT Uses minus parking lots, accessory structures, and treatment plants	None	none

(1) Must demonstrate that there are no practical alternatives - NIPC model ordinance language
(2) Must provide environmental mitigation including maintenance of stream length, sinuosity, slope, pools, and riffles - NIPC model ordinance language
(3) A soil erosion and sediment control plan is required for all activities in the floodway - NIPC model ordinance language
(4) Must be determined to be in the public interest
(5) Must not prevent fish migration or cause degraded water quality conditions - NIPC model ordinance language
(6) A nonpoint source pollution control plan must be implemented for entire upstream watershed - NIPC model ordinance language

- defined. The Kishwaukee River, Coon Creek, Piscasaw Creek as well the headwaters of Nippersink Creek and the tributaries of creeks listed here, were studied by approximate methods (See Appendix C). Approximate methods generally consisted of either regression equations or using the USGS hydrologic atlas flood of record maps (USGS, various years). The floodplains in the unincorporated areas determined by approximate methods do not have flood elevations or floodways defined.
- In the incorporated areas, the Fox River, Nippersink Creek, Dutch Creek, Silver Creek and Cary Creek were studied by detailed methods and have flood elevations and floodways associated with them in all municipalities that these waterways drain through. In addition to the municipalities with those streams listed above, Crystal Lake (portion of Crystal Creek), Fox Lake (Squaw Creek), Harvard (Mokeler Creek), Huntley (only South Branch Kishwaukee River), Island Lake (Cotton Creek), Lake in the Hills (Crystal Creek and Woods Creek), Marengo (only one of numerous tributaries of the Kishwaukee River), McHenry (portions of Boone Creek and Lakeland-Park Drainage Ditch) and Spring Grove (Spring Creek) have streams with flood elevations and floodways associated with them. Although they have flood elevations and floodways, many of the streams in these communities were studied by approximate hydrologic methods (see Appendix C).
- Municipalities with no streams that have flood elevations or floodways associated with them include Algonquin (except Fox River), Barrington Hills, Bull Valley, Lakemoor, Lakewood, Prairie Grove, and Union.
- Since the growth in many municipalities is outside the corporate boundaries that existed at the time of the floodplain studies, the level of study and existence of flood elevations and floodways for the unincorporated areas may be more important than for the incorporated areas in terms of preventing additional flooding due to new development.
- It has been estimated by county staff that only approximately 20% of the floodplain area in the county has elevations associated with it. Most of the area without elevations and floodways is in the western portion of the county since virtually all of the Kishwaukee River, Coon Creek and Piscasaw Creek floodplains do not have elevations.
- Regulating floodplain development without elevations is difficult due to the inexact location of the floodplain boundary, the difficulty in determining safe minimum structure elevations and the inability to calculate floodplain storage.
- Floodplain map amendments and map revisions are not shown on the existing floodplain maps. Floodplain map amendments are official changes made to the floodplain boundary that reflect better information regarding the location of the floodplain (i.e. better topographic data). Floodplain map revisions are changes made to the official floodplain boundary that reflect physical changes on the ground that move the floodplain boundary (floodplain fill activities).
- Floodplain boundaries are generally delineated only for stream reaches with drainage areas greater than one square mile. Although streams and drainageways with less than one square mile drainage area may not be regulated, flooding can certainly occur along these stream reaches. Also, non-riverine depressional areas subject to flooding are generally not mapped as floodplain.

Stormwater Drainage and Detention Regulations: Table 4-2 summarizes the review of seven municipal ordinances and the county ordinance with respect to stormwater drainage and detention.

- The NIPC model stormwater drainage and detention ordinance is generally consistent with the MCSC goals and objectives.
- All seven reviewed municipalities and the county have stormwater drainage and detention requirements in various code locations with varying standards.
- Three of the seven municipalities have adopted the NIPC model. From the level of service questionnaire, it is known that at least several other municipalities have also adopted the NIPC model.
- Only four of the eight ordinances specifically require control of the 2-year event. However, two others likely indirectly control the 2-year event through a very low 100-year event release rate (county release rate). All eight ordinances require control of the 100-year event.
- Only three of the eight ordinances require that site drainage and detention systems be designed to address water quality concerns or to minimize runoff volumes.
- Five of the eight ordinances require preservation of natural depressional storage. However, in all cases, except the county, the storage only need be preserved if it is contained within the boundary of a wetland.
- Only three of the ordinances discourage onstream detention and detention in the floodway or flood fringe.
- Only four of the ordinances discourage placing detention in natural wetlands.
- All but one of the ordinances require use of the now generally accepted Bulletin 70 rainfall amounts for stormwater system design.

Soil Erosion and Sediment Control Regulation: Table 4-3 summarizes the review of seven municipal ordinances and the county ordinance with respect to soil erosion and sediment control.

- Although state NPDES requirements for construction sites have the potential to be consistent with the MCSC goals and objectives, there is little inspection and enforcement of permit requirements at the state level.
- The NIPC model soil erosion and sediment control ordinance is generally consistent with the MCSC goals and objectives. Two of the eight entities have adopted at least most of the provisions in the NIPC model.
- Based on the level of service questionnaire, soil erosion and sediment control is generally recognized as a critical element of stormwater management, more critical than flood control in many communities.
- In contrast to the previous finding, of the eight ordinances reviewed in detail, only five had soil erosion and sediment control requirements. Two of those five only require controls for properties being subdivided. Related to this finding, a study by NIPC in 1991 (Dreher and Mertz-Erwin, 1991) found that of the 25 municipalities (including the county) in McHenry

Table 4-2: Summary of Selected Local Stormwater Drainage and Detention Standards

Municipality	2-Year release rate	100-Year release rate	Water Quality Design Requirements	Runoff Minimization Requirements	Depressional Storage Protection?	Onstream/ Floodway Detention Discouraged?	Flood Fringe Detention Discouraged?	Detention in Wetlands Discouraged?	Required Rainfall Data
Algonquin	0.04 cfs/acre	0.15 cfs/acre	Yes (4)	Yes - NIPC Hierarchy	Yes if associated with wetlands (4)	No but must be public benefit	No but comp storage required	Yes (1)	Bulletin 70
Harvard	0.04 cfs/acre	0.15 cfs/acre	yes (4)	Yes - NIPC Hierarchy	Yes if associated with wetlands	Yes (3)	Yes and comp storage required	Yes (1)	Bulletin 70
Huntley	0.04 cfs/acre	0.15 cfs/acre	No	No	Yes if associated with wetlands (4)	No (2)	No (2)	Yes (1)	Bulletin 70
Marengo	0.04 cfs/acre	0.15 cfs/acre	Yes (4)	Yes - NIPC Hierarchy	Yes if associated with wetlands (4)	Yes (3)	Yes and comp storage required	Yes (1)	Bulletin 70
McHenry	None	Master Plan Specified rates	No	No	No	No (2)	No (2)	No (2)	Bulletin 70
McHenry County	None	40% of 2-year existing flow rate	No	No	Yes-In Floodplain Ordinance	No private dams, levees, or flow control	Yes - Conditional use	No (2)	TP40
Spring Grove	None	40% of 2-year existing flow rate	No	No	No	No (2)	No (2)	No (2)	TP40
Woodstock	None	3-year existing flow rate	No	No	No	No (2)	No (2)	No (2)	Bulletin 70

(1) Detention allowed only in low quality wetlands and mitigation must be provided - NIPC model ordinance language
(2) Ordinance is silent on this issue and presumed permissive
(3) Onstream and/or floodway detention must be in public benefit and environmental mitigation required - NIPC model ordinance language
(4) NIPC model ordinance language

Table 4-3 Summary of Selected Soil Erosion and Sediment Control Standards

Municipality	Applicability (minimum site area)	List of Principles	Inspection Provisions	Mandated Maintenance	Specification of Standards
Algonquin	Minimum regulated site	Yes (5)	Yes (1)	Yes (5)	Yes (5)
Harvard	No Ordinance	No Ordinance	No Ordinance	No Ordinance	No Ordinance
Huntley	All Construction activities	No - Does not address erosion control	Weekly Inspections	Limited (2)	Limited (3)
Marengo	No Ordinance	No Ordinance	No Ordinance	No Ordinance	No Ordinance
McHenry	1 acre site and 5,000 ft^2 disturbance	Yes (5)	Yes (1)	Yes (5)	Yes (5)
McHenry County	All areas being subdivided	No	No	No	Require that detention be installed first
Spring Grove (County ordinance language)	All areas being subdivided	No	No	No	Require that detention be installed first
Woodstock	No Ordinance (4)	No Ordinance (4)	No Ordinance (4)	No Ordinance (4)	No Ordinance (4)

(1) Developer must notify village at specified construction stages
(2) Specifies frequency of maintenance rather than performance
(3) Specifies only when to use straw bales and silt fence
(4) No ordinance but claim to review site plans for soil erosion and sediment control
(5) NIPC model ordinance language

County, only 12 were reported as having soil erosion and sediment control regulations. However, no response was received from six of the 25.

- In only two cases is a list of principles included to establish the objectives of soil erosion and sediment control and convey a project design philosophy to minimize impacts.
- Only two entities have provisions for inspection at critical stages. However, one ordinance specifies the municipality will inspect on a weekly basis.
- Only three ordinances require that soil erosion and sediment control practices be maintained throughout the duration of construction.
- All of the five entities that have ordinances have some design standards. However, only two have a comprehensive set of design standards that specifies appropriate practices.
- Based on discussion with NRCS and SWCD staff, design, installation and maintenance of soil erosion and sediment control plans is problematic. Many of the measures identified in the soil erosion and sediment control plans are inappropriate for the situation; many measures identified on the plans are never installed and measures that are installed initially are often not maintained throughout the construction process.

Stream and Wetland Regulation: Table 4-4 summarizes the review of seven municipal ordinances and the county ordinance with respect to stream and wetland protection.

- The Corps of Engineers Section 404 regulations do not meet the MCSC goals and objectives and the Corps' resources for enforcement are limited.
- The NIPC model stream and wetland protection ordinance is generally consistent with the MCSC goals and objectives.
- Of the eight ordinances reviewed in detail, only one regulated wetlands locally or required wetland buffers and only three others required that a Corps permit be obtained before issuing a local development permit.
- Six of the eight ordinances reviewed had stream avoidance and stream mitigation requirements within their floodplain ordinances. However, these protections did not extend to non-regulatory floodplains (generally floodplains with less than 1 square mile drainage area are non-regulatory). Of these six, four required buffers along streams.

General

- Contrary to the MCSC goals and objectives (in particular, Goal 2, Objective 3 and Goal 3, Objective 6), municipal and county regulations do not appear to be tailored to address watershed-specific concerns and conditions. One known exception is the City of McHenry which has watershed specific detention release rates.
- Overall, regulatory standards and enforcement are not directly coordinated between municipalities. However, some indirect consistency has occurred through adoption of some of the NIPC model ordinances by several municipalities and adoption of the county ordinances by several other municipalities.

Table 4-4: Summary of Selected Local Stream and Wetland Protection Standards

Municipality	Wetland Buffer/Setback	Wetland Avoidance	Stream Buffer/Setback	Stream Avoidance	Stream Mitigation
Algonquin	None/None	None	25 ft/None (1)	Floodplain Ordinance (1)	Floodplain Ordinance (1)
Harvard	None/None	None	None/None	Floodplain Ordinance (1)	Floodplain Ordinance (1)
Huntley	None/None	Must obtain Corps permit before issuing building development permit	25 ft/None (1)	Floodplain Ordinance (1)	Floodplain Ordinance (1)
Marengo	None/None	None	25 ft/None (1)	Floodplain Ordinance (1)	Floodplain Ordinance (1)
McHenry	None/None	None	none/none (2)	Floodplain Ordinance (1,2)	Floodplain Ordinance (1)
McHenry County	None/None	Must obtain Corps permit before issuing building development permit	None/None	In Purpose Statement but no specific requirements	None
Spring Grove	None/None	Must obtain Corps permit before issuing building development permit	25 ft/None (1)	Floodplain Ordinance (1)	Floodplain Ordinance (1)
Woodstock	25 feet/None	yes - can only modify if renders property unusable - 1.5:1 mitigation ratio	None/None	None	None

(1) In Floodplain Ordinance. Only Applies to Mapped Floodplains (generally greater than 1 square mile)
(2) McHenry negotiates with developers for 400 foot corridor along Boone Creek.

- Comments in the level of service questionnaires indicate a desire on the part of some municipalities for strong, comprehensive regulations to prevent increases in flooding and to protect the quantity and quality of water resources of the county.
- Funding of local regulatory programs is generally through permit fees. However, a few municipalities fund permit review and inspection functions using general revenues.

Conclusions: The current regulatory environment does not provide the level of comprehensiveness, stringency, consistency or the watershed specificity envisioned in the MCSC goals and objectives. Also, the existing state and federal programs do not meet the MCSC goals and objectives since the regulatory requirements are not consistent with the goals and objectives and the state and federal agencies may not have the resources to perform adequate field inspection to ensure compliance. On the other hand, at least a few of the municipal ordinances were nearly as comprehensive and stringent as the goals and objectives. An exception to this is soil erosion and sediment control regulation, which appears to be lacking in both regulatory requirements and field enforcement. The fact that some municipalities have already adopted ordinances with water quality components may ease creation and adoption of comprehensive and consistent countywide standards.

Given the projected growth in McHenry County (nearly 50% increase in population from 1990 to 2010), updated floodplain mapping or an approach to make the best use of the existing mapping is needed to prevent construction in the actual floodplain and loss of floodplain storage.

4.3 PLANNING

Background: In the middle 1970's, watershed plans were developed by the Northeastern Illinois Planning Commission as part of the Areawide Water Quality Management Plan (NIPC, 1979). The Fox River and Kishwaukee River watershed studies covered McHenry County. Although the primary focus of these studies was on water quality, runoff rates and volumes were also modeled. These studies identified existing (1975) water quality conditions and predicted year 2000 water quality conditions based on several water quality management scenarios. Regionwide, these studies were the basis of many of the Northeastern Illinois Planning Commission's policy plans and model ordinances. Locally, implementation of these plans has focused primarily on wastewater treatment as opposed to nonpoint sources of pollution.

In the late 1970's, the Corps of Engineers prepared a Fox River watershed plan (U.S. Army Corps of Engineers, 1976; 1984). The primary focus of the plan was on flood control. However, the water quality and habitat implications of the identified alternatives were evaluated. A number of alternatives were identified that focused on removal and modification of the dams in McHenry and Kane Counties and construction of levees and seawalls. Although several cost effective projects were identified, damages were not high and none of the projects were implemented. Lack of implementation of these plans may have been due to an inability to raise the local cost share.

Recently, the Corps of Engineers has revisited the studies above, updating the analysis as well as the recommendations. In McHenry County, the Corps has recommended that modifications be made to the Fox River dams at McHenry and Algonquin. These modifications are intended to improve utilization of storage in the pools upstream of the dams and reduce flood damages.

Beginning in the late 1980's, an intergovernmental planning process was initiated by the Corps to study the Fox River Chain O' Lakes (Northeastern Illinois Planning Commission 1992). This study was prompted over water quality concerns that were reducing the recreational potential of the Chain as well as the ecological health of the Chain. To address this issue, a Special Area Management Plan (SAMP) was developed. Work groups were formed and recommendations made to balance recreational and ecological needs of the system.

In addition to the studies described above, several smaller watersheds have also been studied. These include water quality studies of Crystal Lake (Bauer, 1975), McCullom Lake (NIPC, 1992), their watersheds and a study of the watersheds draining through the City of McHenry (Baxter and Woodman, 1994) which examined stream network flow capacities.

Most other locally initiated stormwater studies have focused on local drainage problems. Many of the drainage problems studied have been related to homes and businesses that were constructed in depressional pockets with no surface outlet. The more significant studies and plans, including those discussed here, are summarized in Table 4-5.

The county has recently entered into an agreement with the USEPA to perform an Advanced Identification (ADID) wetland study for McHenry County. The study will evaluate wetland functions, identify exceptional value wetlands, and develop wetland protection and public education strategies. The ADID study is scheduled to be completed by the end of 1996.

Table 4-5: Flood Control, Drainage, and Water Quality Studies and Plans*

Title	Author, Year	Water Body, Location	Subject
Areawide Water Quality Management Plan	NIPC, 1979	Fox & Kishwaukee Rivers in McHenry, Lake, and Kane Counties	Regional Water Quality Enhancement and Protection
Plan of Study Fox River and Tributaries, Illinois and Wisconsin	Chicago District Corps of Engineers, 1976	Fox River, Illinois and Wisconsin	Flood Control Study
Feasibility Report with Final Environmental Impact Statement, Interim Report Fox River and Tributaries,	Chicago District Corps of Engineers, 1984	Fox River, Illinois	Flood Control Study

Illinois			
Chain O' Lakes - Fox River Special Area Management Plan (SAMP)	NIPC, 1992	Fox River in McHenry and Lake Counties	Water Quality and Use Conflicts Study
Crystal Lake Watershed Resources Management Study	Bauer Engineering, Inc., 1975	Crystal Lake	Water Quality and Lake Protection
McCullom Lake Restoration Plan, Phase I Diagnostic/ Feasibility Study, Clean Lakes Program	NIPC, 1992	McCullom Lake, McHenry and McCullom Lake	Lake Diagnostics and Restoration Plan
City of McHenry, Illinois Update to Master Plan - Water, Wastewater, and Storm Water Systems	Baxter and Woodman, 1994	City of McHenry Drainageways and Boone Creek, Nippersink Creek, Dutch Creek, City of McHenry	Conveyance Capacity Study and Detention Release Rate Recommendations
City of Woodstock, Report on the Expanded Silver Creek Drainage Study	Hampton, Lenzini and Renwick, 1992	Silver Creek, Woodstock	Local Drainage Flood Study
Lochwood Acres: Stormwater Drainage Investigation	Donohue and Associates, Inc., 1987	Depression in Thunderbird Creek Watershed, Crystal Lake	Local Drainage Flood Study
Stormwater and Drainage Investigation: Lake Avenue Detention Basin and Crystal Creek	Donohue and Associates, Inc., 1987	Crystal Creek, Crystal Lake	Local Drainage Flood Study
North Shore Slough Stormwater Study	Donohue and Associates, Inc., 1988	North Shore Slough, adjacent to Crystal Lake, City of Crystal Lake	Water Quality Enhancement Study

* Does not include Flood Insurance Studies which are listed in Appendix C.

Findings:

These findings are primarily based on review of the studies discussed above and the level of service questionnaires.

- Although the combined scope of the studies discussed above was relatively broad, no watershed studies have been performed that address all water resources concerns such as flooding, channel erosion, water quality and aquatic and riparian habitat in a comprehensive fashion.
- The early plans developed by NIPC and the Corps were relatively comprehensive but lacked clear implementation steps at the local level. The SAMP and Corps flood control study are relatively recent and it is too early to determine to what extent the full recommendations in those plans will be implemented.
- Locally generated plans have been more successfully implemented, perhaps due to more local involvement in development of the plans. Also, the local plans generally addressed immediate problems entirely within the jurisdiction of the entity that prepared the document. The local plans focused on remediating specific problems but lacked significant intergovernmental cooperation.
- The NRCS and SWCD have recently begun assisting local groups within the Nippersink Creek watershed. It is intended that these planning efforts will be comprehensive. However, funding for these efforts is very limited.
- Funding of capital improvements by municipalities is typically with general revenues. However, some municipalities use motor fuel tax.
- The Illinois Department of Natural Resources, Office of Water Resources has funding available for planning, designing and constructing flood control projects that are shown to have greater benefits than costs.
- The Corps of Engineers also has funding available for flood control projects. Although a local match is required for Corps projects, IDNR-OWR has acted as the local sponsor and provided the match for some Corps projects.
- Under PL 566, NRCS may have funds available for watershed planning. Historically, PL 566 has been used for planning and design of flood control projects. However, funding for more comprehensive watershed protection planning may also be available.
- FEMA provides funding for implementation of aspects of flood hazard mitigation plans including elevation and acquisition of floodprone structures. FEMA is also a source of disaster relief funds.
- The USEPA, through IEPA, has funding for nonpoint source pollution control projects. These funds have been used to retrofit detention basins to improve water quality benefits, to perform stream and shoreline restoration and maintenance activities, and other similar demonstration projects.
- The USEPA, through IEPA, has funding for planning, design, and implementation of lake restoration projects. The City of McHenry received funds under this program for a diagnostics and feasibility study and restoration activities for McCullom Lake.

- The URP has provided grants for habitat and water quality enhancement projects in Northeastern Illinois. Being a relatively new program, the long term availability of these funds and the applicability to the McHenry County stormwater program is difficult to assess at this time.
- The USGS has funding for hydrologic and water quality data collection and analysis. Some mapping efforts may also be fundable through USGS. USGS funds 50% of project labor and expenses. USGS has recently been contracted to collect water quality, flow and precipitation data for Wonder Lake.
- The Illinois Department of Natural Resources, Office of Natural Resource Management has open space acquisition and development funds which could be used to acquire (and potentially restore) sensitive natural stormwater storage areas such as floodplains and wetlands. The state reimburses up to 50% of the cost of approved open space acquisition and development projects.
- The National Park Service may also have funds available for acquisition of sensitive natural areas, particularly stream corridors.

Conclusions: Watershed planning is not being performed in a manner consistent with the MCSC goals and objectives which prescribe that planning should be comprehensive in its scope (flooding, streambank erosion, water quality, habitat, etc), identify preventative actions, and be performed on a watershed basis. Instead, stormwater is being managed on the basis of political boundaries which are generally too small to encompass major watersheds. Planning and analysis is being done to remediate problems rather than to prevent problems.

4.4 MAINTENANCE

The following findings are based on the level of service questionnaires.

Findings:

- Maintenance of stormwater facilities is generally performed by municipalities on an as-needed basis as problems occur rather than as a scheduled preventative activity. However, there are some exceptions.
- Maintenance of agricultural drainage tiles often does not occur until there is complete failure and drainage ditches are generally not maintained until major blockages accumulate to the point that the tiles discharging to them can no longer function properly.
- Property owners (i.e. homeowners associations) are generally responsible for maintenance of detention facilities in newer developments. However, some municipalities retain this responsibility. Homeowners associations often do not dedicate sufficient resources nor do they have the technical expertise to properly maintain these facilities.

- There do not appear to be any significant stream maintenance programs carried out by local government. However, some volunteer groups, often with the assistance of municipal staff, perform stream cleaning activities to remove accumulated debris.
- The Fox Waterways Agency performs dredging activities to enhance navigation of the waterway system. Historically, this has not always been done in a manner consistent with protection of water quality and riparian and aquatic habitat. However, more recently these concerns have received greater attention. Recent dredging projects have been designed to provide habitat restoration along with improving navigation. The Fox Waterway Agency has also been working to resolve use conflicts between water quality, habitat and recreational boating interests on the Fox River and its lakes.
- Funding of maintenance by municipalities is almost exclusively with general revenues.

Conclusions: To be consistent with the goals and objectives (in particular Goal 3, Objective 7), maintenance needs to be more proactive to prevent problems from occurring. Also stream maintenance needs to be addressed on a more systematic and consistent basis and in a manner which benefits all stream corridor functions.

Long term maintenance of agricultural drainage tiles needs to be addressed since urban stormwater runoff is increasingly being discharged to the tiles, significantly increasing the load on these systems that were intended to convey only groundwater.

4.5 SUMMARY

In general, few of the MCSC goals and objectives are being fully met. In terms of administration and management, the current organizational framework which is fragmented with no agency or organization playing a central coordinating role. As a result, there is little coordination between the municipalities, the county and the drainage districts.

Some of the municipalities have reasonably comprehensive stormwater related regulations. However, these regulations are not consistent countywide or even within watersheds. This results in variable levels of protection which compromises the value of the comprehensive regulations, where they do exist. Also, many of the communities are working with either inadequate (no elevation data) or out of date (significant land use changes have occurred) floodplain regulations. Again, this reduces the value of otherwise adequate regulatory standards.

Although a lot of beneficial projects are occurring in and along the Fox River and a flood control plan has been prepared, there is no comprehensive watershed plan coordinating the flood control plan with maintenance activities and regulatory controls.

Recently, limited watershed planning is beginning to occur in some areas (in particular, Nippersink Creek). It appears that there may be a growing recognition of the need to look at problems at the

watershed level and in a comprehensive manner. However, funding for these activities is very limited and there is no central entity coordinating these activities.

Stormwater infrastructure maintenance is occurring but in a reactive manner rather than in a preventative manner. Outside of the Fox River, maintenance and management of the natural stream system is virtually non-existent and there are no standards to ensure that maintenance of the natural system is being performed in a beneficial manner.

Based on comments in the level of service questionnaire, it appears that there is increasing recognition at the municipal level that better coordination is needed to address stormwater regulatory, planning and maintenance needs and that both stormwater quality and quantity are issues of concern.

CHAPTER 5

RECOMMENDATIONS FOR A COUNTYWIDE STORMWATER PROGRAM

This chapter presents the recommendations for the McHenry County stormwater program. The recommendations are based on the goals and objectives of Chapter One and the findings in Chapters Three and Four. Section 5.1 presents the programmatic recommendations of the Stormwater Plan. The recommendations are organized into the four functional categories described in Chapter Two. Section 5.2 presents recommended regulatory standards for floodplain management, stormwater drainage and detention, soil erosion and sediment control, and stream and wetland protection. Section 5.3 presents recommended planning procedures for comprehensive watershed plans. Section 5.4 presents an implementation plan for the program.

5.1 STORMWATER PROGRAM RECOMMENDATIONS

5.1.1 Administration and Management

The goals and objectives, as well as the original purpose for creating the McHenry County Stormwater Committee (MCSC) presented in Chapter One, specify a consolidated countywide stormwater management framework to provide a consistent level of service throughout the county. This is particularly important within watersheds since local actions have effects throughout the watershed. In addition, there are certain economies of scale associated with coordinated countywide efforts such as public education and technical training. Finally, the theme among many of the funding agencies is to emphasize watershed approaches. A countywide program will be in a better position to demonstrate that projects for which funding is being sought have been coordinated at the watershed level.

Enhance the Role of MCSC and Acquire and Train Adequate Staff: The MCSC, composed of half county and half municipal representation, should take the lead role for stormwater management in McHenry County. The primary purpose of the MCSC should be to provide countywide coordination of stormwater management in McHenry County to ensure consistent levels of flood mitigation and water resource protection and enhancement throughout the county's watersheds. This will provide for a consolidated countywide framework as specified in the Goals and Objectives.

The MCSC should obtain sufficient staff to manage a countywide stormwater program and implement the recommendations in this Stormwater Plan. The MCSC's activities should be categorized into the four functional categories areas identified in Chapter 2: 1) administration and management; 2) regulation; 3) planning; and 4) maintenance.

In addition to providing staff support to the MCSC, the primary roles of the MCSC staff under administration and management will be development and management of the work program and budget, technical support, public education, professional education, and data keeping.

Form Technical Advisory Committee: As technical support to the MCSC, the Technical Advisory Committee (TAC) should be expanded. Exact membership of the TAC should remain flexible to suit the needs of the MCSC. However at a minimum, the TAC membership should include technical staff from municipalities within each of the six watersheds and county agencies such as the Soil and Water Conservation District, the McHenry County Conservation District and the McHenry County Highway Department. In addition, membership or participation by consultants serving both public and private clients and local interest groups (e.g. the McHenry County Defenders) should be considered. The members should be scientists, engineers, and others knowledgeable in stormwater, natural resource management and urban planning issues. Participation and input from regional, state and federal resource agencies should also be encouraged. The TAC should provide input to staff and recommendations to MCSC on technical matters such as ordinance development and watershed planning. The TAC should be supported by the MCSC staff.

Provide Technical Support: One of the most important components of a successful stormwater program is to have knowledgeable staff well trained in all areas of stormwater management. Local officials, staff and citizens must also be part of the overall technical support program. Since the level of expertise in stormwater and natural resource matters varies among the municipalities, the MCSC staff can serve as a technical resource to the individual towns as well as to individual citizens. Technical assistance can be provided in such areas as ordinance review and implementation, stream and wetland maintenance and management, and addressing local drainage concerns.

Coordinate Professional Education: To be consistent with the goals and objectives of this plan as well as the recommended regulatory standards, training will be needed for site planners, design engineers and landscape architects in methods of BMP and site design to minimize the stormwater related impacts of development. Training should also be provided on such topics as maintenance, emergency management and flood mitigation. Training opportunities should be initiated by the MCSC using existing training resources. Several training resources exist in the region including professional organizations (e.g. the American Society of Civil Engineers), the Northeastern Illinois Planning Commission, the Natural Resource Conservation Service, and the University of Wisconsin Extension.

Develop Public Education Program: Key to long term support for a countywide stormwater program is grass roots public support. A public information program should be established to enlighten local officials and the public regarding stormwater issues and the values of streams and wetlands. The public information program should be coordinated with other county agencies such as MCCD, schools and local interest groups (e.g. the McHenry County Defenders). Although it is important to reach all citizens to address urban runoff issues such as application of fertilizers,

disposal of household hazardous waste and used motor oil, there are key citizens groups that should be targeted. These citizens groups include those that live adjacent to waterbodies and homeowners associations that may be responsible for management of waterbodies and components of the stormwater management system (e.g. detention basins).

Develop Funding Mechanism: Developing adequate funding of the stormwater management program should be assigned a high priority. While grants may be used to supplement the program, a consistent source of dedicated funding must be identified to provide for a consistent level of service and to allow for long term planning and implementation of the program. Three basic funding alternatives exist for McHenry County: 1) the existing county corporate budget, 2) the stormwater taxing authority provided for in the stormwater authorizing legislation, and 3) the stormwater service charge recently considered by the state legislature. Each of these three have advantages and disadvantages.

County corporate budget: The source of funding for MCSC activities during the current planning stage has been the county's General Corporate Fund. This source will not sustain a long term stormwater program which meets the goals and objectives nor the recommendations of this plan. The primary concern with this revenue source would be the likely need to cut other programs to fund the stormwater program and the annual uncertainty regarding funding availability.

Stormwater taxing authority: Prior to the 1991 tax cap legislation, this was a straightforward means of funding a countywide stormwater program. While the MCSC budget and tax rate would still be subject to county board approval, taxing authority would provide a dedicated source of funds that could not be diverted to other county uses. Due to the tax cap, a referendum would be required to utilize this funding mechanism, making it more difficult to implement than when the stormwater legislation was originally passed. The outcome of a referendum would depend on the amount of education provided prior to the vote and the size of the request for a typical homeowner.

A disadvantage to both of the above approaches is that they are ad valorem based systems in which property owners pay based on the value of their property. However, property value may not correlate well with the contribution of stormwater runoff and stormwater program support needs. Also, these approaches may not allow for variable taxing levels across the county to address variable funding needs among watersheds.

Stormwater service charge (user fee): Legislation has been considered by the Illinois legislature four times to allow a service charge system of funding for county stormwater programs. Although there has been increasing support with each attempt, the bill has not yet passed. The bill's sponsor reportedly intends to continue to pursue its passage.

Under a service charge system, individual properties would pay based on their stormwater contribution with impervious area generally being used as the indicator of stormwater

contribution. This would be much like any utility such as sanitary sewer service or electric service with each property owner receiving a monthly or annual bill. (However, the bill would not vary on a monthly or annual basis like most utility bills.) Under this system the charge per impervious acre could be varied by watershed based on the funding needs of the watershed. Also, incentives for developments that utilize stormwater management measures beyond those required by the countywide ordinance could be built into the fee structure. (For example, residents within developments that utilize natural swale drainage rather than storm sewers would pay a lower rate.) The primary disadvantage to this system is the substantial initial investment required to set up and implement the system. Perhaps the most costly aspect of the program is implementing the billing system. First, the amount of impervious area for each parcel of land must be calculated. Then based on the funding needs, as outlined in a financial plan, the charge per impervious acre must be determined. Finally, the system of sending bills and tracking payment must be established. While a user fee system has many advantages, the substantial up front investment may not be justified for a small program.

Recommended Funding Approach: During the initial establishment period of the program, it may be most practical to operate within the current corporate budget. As the MCSC prepares for watershed planning and capital projects, a service charge system should be considered to more equitably fund activities whose expenditures will vary by watershed. At all stages of the program, grants should be sought to assist in supporting appropriate program activities.

5.1.2 Regulation

In a largely rural yet rapidly urbanizing county such as McHenry, a primary emphasis of the stormwater management program should be to prevent exacerbation of any problems that currently exist and to prevent any new problems from being created. Two primary preventative tools are acquisition of critical water resource features such as floodplains and wetlands and a comprehensive and consistent regulatory program. Acquisition is discussed further under Planning (Section 5.1.3) and regulations are discussed here. This section focuses on the procedural elements of the regulatory program while Section 5.2 recommends regulatory standards.

There are two general types of regulatory controls: land use restrictions (e.g. zoning ordinances) and design standards (e.g. subdivision ordinances). Land use restrictions are generally used to protect sensitive landscape features such as floodplains and wetlands. Land use restrictions are intended to preserve the functions of these areas, such as stormwater storage, purification and wildlife habitat, as well as to prevent damages to property that would result if building were to occur in those areas. Design standards are primarily used to control the rate, volume and quality

of stormwater runoff and are intended to minimize the impact of development on downstream areas. Most comprehensive regulatory programs make use of both types of controls.

Land use restrictions could also take the form of land cover based regulations which might restrict the total amount of impervious area allowed in a watershed to a pre-determined level based on the assimilation capacity of the receiving waterbody(s). There is some precedence for this practice in McHenry County where the City of Crystal Lake is attempting to limit imperviousness and drainage system type within the remaining undeveloped portions of the Crystal Lake watershed. This practice may also have applicability in the Kishwaukee River watershed which could be irreparably damaged by substantial urbanization. There are obvious political and legal questions to consider before this type of restriction is pursued. A determination regarding the appropriate mix of design standards and land cover restrictions is best made at the time of ordinance development with potential watershed specific modifications made based on recommendations in the watershed plans.

Prepare and Adopt Countywide Ordinance: To provide a consistent level of protection and to provide equity throughout the county, a program for consistent countywide regulation and enforcement should be developed with standards established at the countywide level and, where appropriate, modified at the watershed level to meet watershed specific needs. A countywide regulatory program would involve development of a countywide watershed development ordinance that applies to both incorporated and unincorporated areas. To be consistent with the MCSC goals and objectives, the watershed development ordinance should be comprehensive, specifying standards for stormwater drainage and detention, floodplain management, soil erosion and sediment control, and stream and wetland protection in a single document.

Many of the FEMA regulatory floodplain maps for McHenry County are either inadequate, since they do not include elevations, or out of date due to significant land use changes. While updating of the floodplain maps should be performed as part of the watershed planning process, watershed plans may not be completed within sufficient time to prevent inappropriate floodplain development from occurring. During preparation of the countywide ordinance, interim measures such as safety factors or floodplain buffers should be developed to address the shortcomings of the current mapping and FEMA/IDNR should be petitioned to update the most inaccurate floodplain maps as soon as possible.

Prepare Technical Reference Manual: In support of the countywide watershed development ordinance, a technical reference manual should be developed to provide guidance in meeting the ordinance. The reference manual should include guidance on intent and interpretation of the ordinance as well as guidance on design methodologies and procedures. The manual should be updated from time to time as new information becomes available and as experience is gained in implementing the ordinance.

Institute Ordinance Implementation and Enforcement Structure: Once adopted, there are several approaches to implementing the ordinance. One end of the spectrum of possible methods

would be to have all permitting and inspection carried out by the MCSC with very limited involvement by municipal staff. The other end of the spectrum would be to maintain the current system with all permitting and inspection carried out at the local level and no involvement by the MCSC except to craft the minimum ordinance to be adopted by all. The first approach would take too much control away from the municipalities and would remove inspection responsibility too far from those most familiar with the development sites. However, it would provide the greatest level of regional or watershed coordination to ensure that developments are reviewed considering the larger watershed implications. The second approach could be difficult to implement since it would be difficult to force a municipality to adequately enforce a countywide ordinance developed at a higher level. Also, many municipalities may not have sufficient staff and/or financial resources to adequately enforce a comprehensive ordinance. Finally, this second approach would provide little in the way of watershed coordination of development activities.

The recommended approach is one that is between the two ends of the spectrum described above. It is recommended that MCSC maintain responsibility for all permit and enforcement activities but have a mechanism for delegating that responsibility to interested municipalities. Municipalities that adopt requirements that are at least as stringent as the countywide ordinance, and have demonstrated qualifications would receive delegation and be responsible for permit review and enforcement within their jurisdiction. Since most municipalities currently provide permit review and inspection services for stormwater drainage and detention, soil erosion and sediment control, and flood fringe development, it is anticipated that these regulatory areas would be most readily delegated to the local level. The MCSC would be responsible for permit review and enforcement in unincorporated areas of the county and in those municipalities not desiring or qualifying for delegation. (A variation of this approach, which is used in DuPage and Lake Counties, would be to treat the unincorporated areas as a municipality. Under this variation, the MCSC would be separate from the staff of the county who review permits for unincorporated areas.) This recommended approach utilizes the positive aspects of the two ends of the spectrum identified previously. It employs local knowledge and access to development sites combined with MCSC oversight to ensure that watershed perspectives are considered, to provide technical assistance and to ensure consistent enforcement throughout the county.

Permit review for stream and wetland disturbances as well as for floodways requires specialized expertise in a number of disciplinary areas including biology, soils, hydrology, and hydraulics. In general, it will not be cost effective for each municipality to maintain in-house expertise in each of these areas. As a result, costs associated with regulating those activities can be minimized and consistency in interpretation and enforcement can best be achieved by retaining permit review and inspection for streams, wetlands and floodways at the MCSC level. However, if a municipality has the qualifications and a demonstrated enforcement record, delegation for these areas could be delegated also.

Although most permits will be reviewed at the local level, there should be a provision for a pre-application meeting(s) involving both the municipal and MCSC staff, particularly for larger developments. This would provide a degree of watershed review and regional perspective as well as take advantage of the technical expertise of MCSC staff. MCSC should also maintain a central file of all permits issued within the county. This will provide for a central database which can easily be accessed by municipal and MCSC staff as a resource for the pre-application meetings and will streamline incorporation of development data into the watershed planning process.

Fund Regulatory Activities: Like funding to support the administrative and management activities of the MCSC, funding of ordinance and technical reference manual development should be through a countywide base (e.g. the county corporate tax, the stormwater taxing authority or (if available) countywide service charge). To supplement countywide funding, the MCSC should pursue funding which may be available through EPA under Section 319 of the Clean Water Act for development of the nonpoint source components of the countywide ordinance and technical reference manual. The application deadline for 319 projects is May 1 of each year. MCSC should also pursue funding to update floodplain mapping with particular attention given to those rapidly developing areas without floodplain elevations associated with them.

Once the countywide ordinance is adopted, permit review and inspections performed by MCSC and delegated municipalities should be funded through permit application fees. Fees should be established based on such factors as the type of permit (wetland vs. floodplain vs. stormwater) and area (number of acres) of development or disturbance. The fees should offset expected staff time to review permits, make routine site inspections, and perform enforcement activities. Municipalities that have received delegation may use the MCSC fee schedule or develop their own. MCSC would receive fees only for those developments that it reviews. However, a small surcharge could be added to the municipal fees to offset MCSC staff time for pre-application meetings.

5.1.3 Planning

Planning should be carried out both at the countywide level and at the watershed level by the MCSC. MCSC is the logical entity to coordinate stormwater planning since it is less inhibited by political boundaries (much larger geographic area). In terms of countywide coordination and planning, the MCSC can represent the stormwater interests of the municipalities and the county as a unified voice. In terms of watershed planning, the MCSC can more readily perform watershed level planning than individual municipalities and can facilitate preventative and remedial projects that will consider and benefit both upstream and downstream interests.

Perform Countywide Planning and Coordination Activities: In support of watershed planning and the regulatory program, certain countywide stormwater planning efforts should be undertaken. These would include advanced identification of wetlands, coordination with other planning programs (i.e. open space, transportation, etc.) and coordination with other counties.

Advanced Wetland Identification: An Advanced Identification (ADID) wetland study is currently being prepared for McHenry County. The ADID study will evaluate wetland functions, identify exceptional quality wetlands and develop wetland protection and public education strategies.

The ADID evaluation is critical to an effective wetlands protection program. The information provided in the evaluation will be invaluable in making permit decisions both at the local level and at the federal (Corps of Engineers) level. The ADID evaluation will also be a valuable component of a critical areas acquisition program that should be coordinated between MCSC and the McHenry County Conservation District.

Coordination with Other County Planning Activities: MCSC should coordinate with other county planning activities such as transportation planning and open space planning. Transportation systems can have a significant impact on the drainage system and natural resources of the county as well as provide opportunities such as creation of regional stormwater storage areas or wetland mitigation banks. The McHenry County Conservation District has an active open space acquisition program. MCSC should coordinate with the district to identify opportunities to acquire areas of regional stormwater significance as part of the District's open space program.

Hydrologic Data Collection: Another countywide planning effort that should be undertaken is hydrologic data collection that can later be used in support of watershed modeling efforts. At least several years of simultaneous rainfall and streamflow data are needed to adequately calibrate hydrologic and hydraulic computer models. Additional years of data add confidence to the accuracy of the models on which floodplain delineations and problem solving decisions are based.

While there are several daily rainfall gages, there are no reliable hourly gages within McHenry County supported by National Oceanic and Atmospheric Administration (NOAA). (NOAA has an hourly gage at McHenry Lock and Dam. However, this gage is often missing several months worth of data in a given year.) USGS, in cooperation with the MCSC and the Wonder Lake Master Property Owners Association, has recently installed a precipitation gage (and two streamflow gages) on Nippersink Creek at the upstream and downstream ends of Wonder Lake. Additional reliable hourly rainfall gages should be identified or installed in strategic locations in the county to provide distributions for the rainfall totals from the daily gages. The areal distribution of the daily gages should also be reviewed to ensure adequate coverage of the county.

In addition to the recently installed Nippersink Creek streamflow gages, there is only one recording streamflow gage in the county (located on the Fox River at Algonquin). Additional streamflow gages should be installed to provide model calibration data in the other four watersheds of the county.

Coordination With Other Counties: Although county boundaries are sufficiently large to facilitate watershed level planning, the McHenry County watersheds extend beyond the county boundaries in both the upstream and downstream directions. MCSC should coordinate with downstream counties to identify their concerns that may be impacted by McHenry County's plan. Upstream counties should be made aware of McHenry County's plans and encouraged to manage stormwater in a manner consistent with McHenry County. This plan as well as the recommended watershed development ordinance should be circulated among the surrounding counties for review and comment.

Assist Municipalities and the County in Obtaining Community Rating System Credits: The National Flood Insurance Program's Community Rating System (CRS)was created to reduce flood damages to existing buildings, to manage development in areas not mapped by the NFIP, to protect new buildings beyond the minimum NFIP protection level, to help insurance agents obtain flood data or to help people obtain flood insurance. The CRS has three goals: to encourage, by the use of flood insurance premium adjustments, community and state activities beyond those required by the National Flood Insurance Program to:

1. Reduce flood losses
2. Facilitate accurate insurance ratings
3. Promote the awareness of flood insurance

Community involvement in the CRS program is voluntary. Any community in full compliance with the rules and regulations of NFIP may apply for CRS classification. The CRS program is based on credits given to communities for activities such as:

1. Public Information
2. Mapping and Regulations
3. Flood Damage Reduction
4. Flood Preparedness

Credit points are assigned to each participating community based upon how well an activity affects the three goals of the CRS. The CRS allows for reduced flood insurance premiums for policy holders within communities that perform activities beyond the minimum FEMA requirements. MCSC should assist the county and municipalities in individually applying for credits or propose to FEMA a system of countywide CRS credits.

Perform Watershed Planning and Coordination Activities: To provide coordination within watersheds and to prepare plans for each of the watersheds, activities specific to each watershed should be carried out.

Form Watershed Boards: To improve implementability of watershed plans, to assist in project prioritization, and to provide advice and direction to MCSC staff, formal

Watershed Boards should be formed. The Watershed Boards could have between five and eleven voting members (depending on watershed population and size). The voting members should be composed of representatives from municipalities, townships, MCSC and citizens organizations within the watershed. The municipal and township representatives should be appointed by the municipalities and townships within the watershed. The citizen representatives should be appointed by the MCSC.

In addition to the voting members, staff from resource agencies should be invited to participate and could be part of an advisory subcommittee assembled during preparation of watershed plans (see section 5.3.1). Relevant county (e.g. Health Department, McHenry County Conservation District, Highway Department and the SWCD), regional (NIPC and FWA), state (IDNR, IEPA) and federal (Corps of Engineers, NRCS, USEPA and USFWS) entities should be considered.

The functions of the watershed boards should be threefold. The first function should be to provide input to the MCSC regarding prioritization of the watersheds for preparation and implementation of watershed plans as well as stream maintenance activities (proposals for allocation of funds to the watershed). In this role, the watershed board would also provide significant input regarding establishment of watershed specific service charge rates (if a stormwater service charge funding mechanism is established in McHenry County).

The second function of the watershed boards should be to guide preparation of the watershed plans and to take an active role in implementing the plans.

The third function of the watershed boards should be to provide a forum for local governments to coordinate local projects (both urban development and public works related projects) that may have regional impacts.
In addition to watershed activities initiated and performed by the MCSC and its watershed boards, studies performed by state and federal entities (e.g. IDNR or Corps funded flood control projects, IDNR or FEMA funded floodplain mapping, etc.) should be coordinated through the watershed boards.

Prepare and Implement Watershed Plans: Because development of watershed plans for all of the watersheds in McHenry County is a long term process, the watersheds should first be prioritized. The prioritization should consider potential problems that could develop in the absence of watershed plans (e.g. increased flood damages without updated floodplain maps), existing problems and watershed planning activities that are already underway. For example, the NRCS and the SWCD are currently assisting local groups within the Nippersink Creek watershed.

Watershed planning procedures should be established to ensure consistency between watershed plans. Watershed planning should consider development of improved floodplain maps, identification of regionally significant natural storage areas, identification

of potential wetland mitigation banks, identification and prioritization of remediation needs (i.e. flood control, stream stabilization and restoration, water quality and habitat enhancement, etc.,) and include an implementation plan. Standards for evaluating remedial projects should also be developed. Section 5.3 presents a recommended watershed planning approach.

Watershed plans should be prepared by MCSC staff (or their consultant) along with the watershed boards to maximize consistency between watershed planning and evaluation procedures and to improve staff knowledge of watershed conditions.

Fund Watershed Planning and Implementation Activities: Although funding may be available from several agencies for watershed planning and implementation activities, the missions of the agencies vary. For example, funding is available from IDNR-OWR and the Corps of engineers to address flooding problems while funding may be available from EPA to address water quality problems. Section 2.1 discussed each of the state and federal agencies as well as funding available through those agencies.

Because the resource agencies have variable missions that are limited in scope, utilizing funds from the resource agencies to develop comprehensive watershed plans consistent with the MCSC goals, objectives and watershed planning procedures will require substantial coordination. Perhaps the most effective approach would be to first identify the most critical problems within a watershed through the knowledge of the watershed board. If there are critical flooding problems for which IDNR-OWR or Corps of Engineers funding is likely to be available, funding should be sought from those agencies. If problems are water quality related and/or the primary concern is problem prevention, FEMA and EPA may be the best sources since these agencies fund local efforts rather than performing the studies in-house.

Because of the limited amount of funding available from the resource agencies for planning activities, these agencies should not be relied upon when preparing work program budgets for watershed planning. MCSC should be prepared to fund watershed planning with in-house funds and then pursue outside sources to supplement MCSC funds.

Utilizing funding from the resource agencies for implementation of the recommendations of the watershed plans is more readily accomplished since the appropriate agency can be approached based on the type of project.

5.1.4 Maintenance

Manmade stormwater facilities should be maintained to ensure that they function as designed. Natural systems should be maintained to prevent excess debris accumulation or erosion to ensure that they provide their full range of natural functions.

Develop Maintenance Standards: Appropriate maintenance and inspection standards and schedules should be developed at the MCSC level to ensure a consistent level of service throughout watersheds and throughout the county. This is particularly important for stream maintenance where inappropriate maintenance activities can lead to water quality and/or habitat degradation, exacerbation of downstream problems, and greater need for follow up maintenance.

Develop Mechanism to Maintain Natural Drainage System: While in an entirely natural environment natural systems are self maintaining, in the human altered environment management and maintenance is needed to counteract the affects of human influences such as modified hydrology and fire suppression. This task would address the mechanism for implementing maintenance activities according to the standards developed above. Because of its inter-jurisdictional nature, stream maintenance should be coordinated by the MCSC through the watershed boards. Stream maintenance activities should be cost shared between the municipalities, MCSC and possibly drainage districts. The streams in McHenry County should be prioritized in terms of maintenance needs to guide this long term activity.

Develop Mechanism to Maintain Stormwater Infrastructure: Because of the importance of functioning stormwater infrastructure, particularly detention and water quality management practices, the MCSC should develop a mechanism to insure that stormwater infrastructure is maintained. In general the municipalities should be responsible for ensuring that infrastructure is maintained. However, there are a variety of methods the municipalities may employ to carry out maintenance activities. For example, a municipality may wish to delegate maintenance to homeowners associations. However, the municipality should continue to inspect the facilities and have a mechanism whereby the municipality can perform unaddressed maintenance needs and charge the homeowners association. All infrastructure installed as part of new development should consider maintenance as part of the design. For example, urban stormwater drainage systems should not be tied into agricultural tile systems which are difficult to maintain and were not intended to convey surface runoff. Further, new stormwater detention facilities should not be approved without identification of parties responsible for maintenance.

5.1.5 Summary

This section described the recommendations for the McHenry County Stormwater Program. Figure 5-1 presents the general framework in graphical form with each of the four functional areas represented. Section 5.4 presents a plan for implementing the recommendations presented here.

5.2 REGULATORY STANDARDS RECOMMENDATIONS

The regulatory program recommendations (Section 5.1.2) call for a countywide watershed development ordinance that applies to both incorporated and unincorporated areas. The section also specifies that the ordinance should be comprehensive, specifying standards for stormwater

drainage and detention, floodplain management, soil erosion and sediment control, and stream and wetland protection in a single document. While preparation and adoption of ordinance language will be performed during implementation of this plan, recommended ordinance standards for new development and substantial redevelopment are presented here. These standards are intended to be the principles upon which explicit and detailed ordinance criteria and specifications will be based. These standards are presented in a manner consistent with the traditional design standard approach to regulation. These standards do not preclude the use of land cover based restrictions (limits on impervious area) in selected areas or other regulatory approaches to minimize the impacts of development and can serve as a checklist of concerns if these alternative approaches are pursued.

5.2.1 Comprehensive Purpose Statement

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

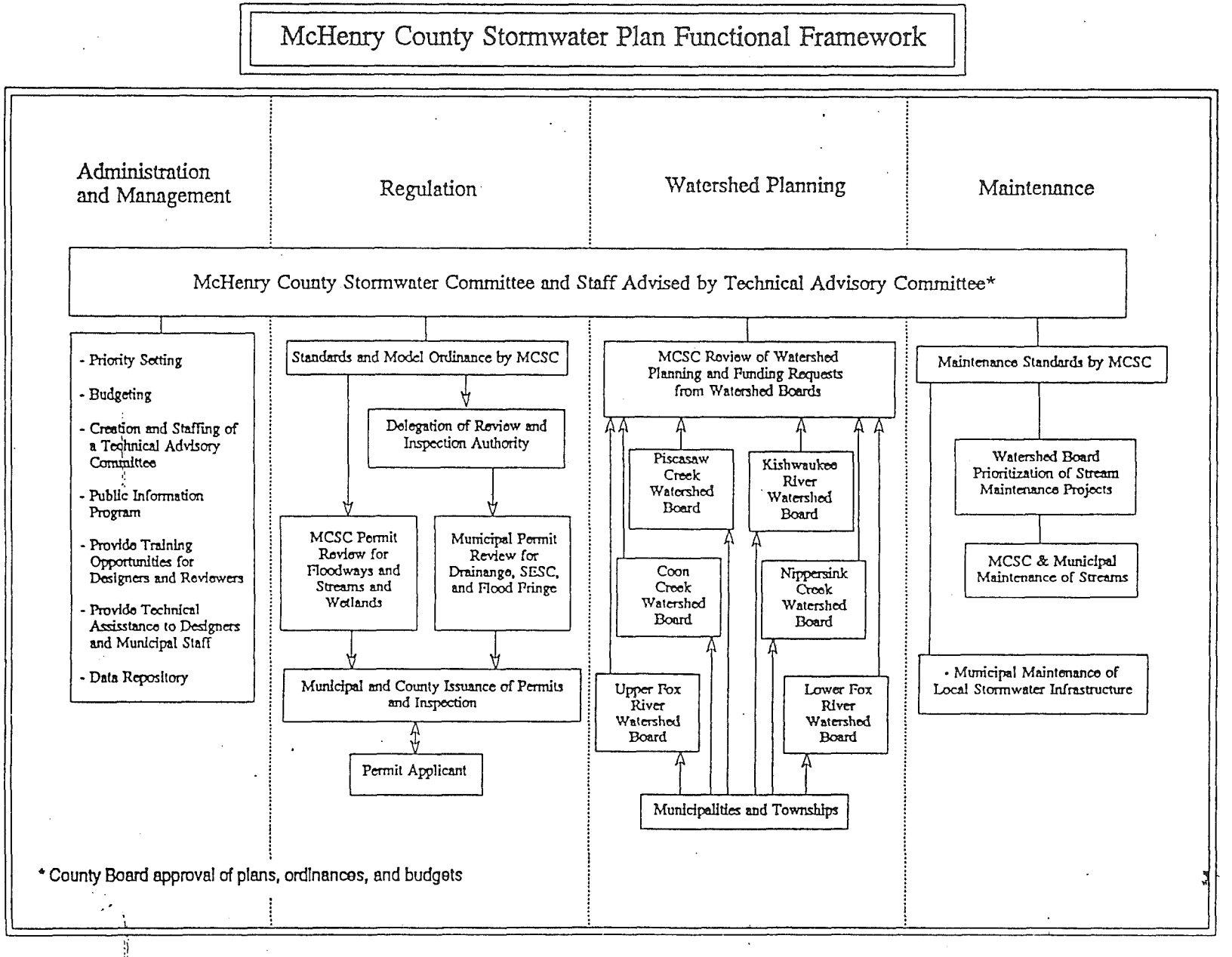
- Protect and preserve the quality and environmental values of land and water resources in McHenry County.
- Encourage development in a manner that promotes orderly, sustainable and cost-effective utilization of land and water resources.
- Ensure that new development in McHenry County does not cause 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.

5.2.2 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 new buildings constructed within these low lying areas and to a loss of floodplain storage, resulting in increases in flood flows downstream.

Figure 5-1


McHenry County Stormwater Plan Functional Framework
Administration and Management
Regulation
Watershed Planning
Maintenance
McHenry County Stormwater Committee and Staff Advised by Technical Advisory Committee*
- Priority Setting
- Budgeting
- Creation and Staffing of a Technical Advisory Committee
- Public Information Program
- Provide Training Opportunities for Designers and Reviewers
- Provide Technical Assisstance to Designers and Municipal Staff
- Data Repository
Standards and Model Ordinance by MCSC
Delegation of Review and Inspection Authority
MCSC Permit Review for Floodways and Streams and Wetlands
Municipal Permit Review for Drainange, SESC, and Flood Fringe
Municipal and County Issuance of Permits and Inspection
Permit Applicant
MCSC Review of Watershed Planning and Funding Requests from Watershed Boards
Piscasaw Creek Watershed Board
Kishwaukee River Watershed Board
Coon Creek Watershed Board
Nippersink Creek Watershed Board
Upper Fox River Watershed Board
Lower Fox River Watershed Board
Municipalities and Townships
Maintenance Standards by MCSC
Watershed Board Prioritization of Stream Maintenance Projects
MCSC & Municipal Maintenance of Streams
- Municipal Maintenance of Local Stormwater Infrastructure
* County Board approval of plans, ordinances, and budgets

Delineate Floodplains/Floodways Considering Future Land Use: Any modifications to the existing regulatory floodplain or floodway boundary (through map revisions or restudies) may be computed considering 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.

Restrict Floodway Development to Reasonable Appropriate Uses: Floodway appropriate uses should be restricted to public flood control projects, public recreation and open spaces, water dependent activities and roadway crossings. Additional appropriate uses allowed by IDNR-OWR such as expansions to treatment plants, accessory structures such as garages and parallel roadways, may result in additional flood damages and will interfere with floodway functions such as water quality mitigation and habitat protection and potentially subject the waterway to hazardous substances such as raw wastewater, gasoline and household fertilizers and pesticides.

Mitigate Floodway Construction Activities: Mitigation for activities in the floodway should include compensatory storage at a conservative ratio greater than 1:1, maintenance of the original floodway surface area and environmental impact avoidance and mitigation including the following:

- Demonstrate that there is no practical alternative to the channel and floodway modification and that onstream impoundments are in the public interest
- 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 non-point source pollution control plan must be implemented throughout the watershed for proposed onstream impoundments

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

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 damages of those properties within or adjacent to the floodplain, a flood protection elevation

above the base flood elevation should be required for all structures to be constructed within the 500-year floodplain.

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.

5.2.3 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 be required of 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 could 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 flow rates as the watershed developed (Dreher et al, 1989). Due to the increases in runoff volume associated with urbanization, it was found that the required onsite release rate had to be less than the pre-development onsite release rate to prevent increases in instream flow rates. 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. 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 could 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.

Minimize Increases in Runoff Volumes: Increases in 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 not only reduces the increase in runoff volumes leaving the site and entering the receiving waterbody but also minimizes the generation of stormwater related pollutants.

It should be recognized that detention is used to prevent increases in runoff rates but does not prevent increases in runoff volumes. This standard is intended to address this issue. In watersheds that are found to be particularly sensitive to runoff volumes and/or to shifts from subsurface to surface runoff, this standard may be particularly important. Further, numerical runoff volume targets may be warranted rather than the hierarchy described here.

Standards for infiltration practices should be considered to minimize the potential for contamination of groundwater resources in the quest to minimize changes in hydrology.

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 would be experienced if watershed depressional storage were eliminated. This standard will also be particularly important in hydrology sensitive watersheds.

Minimize the Discharge of Pollutants: Runoff from urban developments is contaminated with a number of pollutants including 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.

In some parts of the country performance standards for pollutant concentrations (e.g. concentration limits similar to those for wastewater plants) have been used with limited success. The monitoring required to verify that standards are being met can be very expensive. For this reason, design standards which specify a variety of techniques that have been shown to provide desired levels of performance (e.g. percent removal of a particular pollutant) are recommended. If a watershed has been found to be particularly sensitive to certain pollutants, target numerical performance levels could be specified. These targets could be expressed in terms of percent removal or in terms of allowable annual loads for the pollutants of concern.

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 including the detention storage and volume of the embankments required to create the detention basin.

Prohibit Detention in the Floodway: Detention in the floodway is also difficult to design to function properly under all flood stage conditions. In addition, 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.

Prohibit Direct Discharge of Stormwater Runoff to Wetlands: Stormwater runoff should be treated and detained prior to discharge to significant 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 based techniques and using rainfall data 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 underestimated using Technical Paper 40 (Hershfield, 1961) precipitation data.

Require Formal Maintenance Agreements for all New Stormwater Facilities: For stormwater infrastructure to function properly it must be maintained in its design condition. Maintenance agreements should identify responsible parties, maintenance requirements and schedules, and should identify adequate funding arrangements for long term maintenance.

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.

5.2.4 Soil Erosion and Sediment Control

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 of Disturbance: The area disturbed at any particular time 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. The 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) may 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 blankets 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, it is not uncommon for soil erosion and sediment control measures such as erosion blankets, silt fences, and sediment traps to require maintenance or replacement several times during the construction process.

Provide Effective Enforcement Tools: Without the threat of enforcement, it is often 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.

5.2.5 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 for all wetlands including those less than one acre in size which are inadequately addressed by the federal regulatory program. Although, individually, small isolated wetlands may not have high functional values, cumulatively, the functions of those small wetlands can have a significant impact on the watershed. Wetland protection criteria should adequately address functions such as stormwater storage, pollutant filtering, and protection of habitat for threatened or endangered species which may be overlooked in the current permit process.

Require Mitigation for All Significant Wetland Disturbances: All wetland disturbances, including those not directly regulated by the 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. Mitigation should be provided for all disturbances and maintenance and monitoring of all mitigation measures should be required for a period of at least five years.

Require Mitigation for All Stream Modifications: Environmental mitigation as specified under floodway modifications in the Floodplain Management section (Section 5.2.2) should be required for all stream modifications.

Require Buffers Along All Waterbodies and Wetlands: A buffer of appropriate width comprised of native vegetation should be maintained or established along the shoreline 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.

Require Setbacks Along All Waterbodies and Wetlands: Beyond the buffer described above, a setback should be established along the shoreline 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

5.3 WATERSHED PLANNING METHODOLOGY AND ISSUES

The purpose of watershed planning is to identify the unique resources and problem areas of a watershed and to develop a plan to prevent potential future problems and remediate existing problems. This section outlines a recommended planning methodology and the issues that should be addressed in a comprehensive watershed plan. The methodology is described in detail in Appendix B.

Although some watershed plan implementation activities may be performed by the MCSC, many will be the responsibility of the watershed boards composed of the local governments within the watershed. Thus it is important that the watershed plan be viewed as a product of and for the watershed board and the communities it represents.

An interdisciplinary team should be assembled to guide the watershed planning process and prepare the watershed plans. The team should be composed of the following disciplines: water resources and environmental engineering, environmental planning, biology and mapping/GIS. This team will likely be composed of MCSC staff and their consultants. However, it may also be possible to utilize local, regional, state and federal resource agencies when assembling the team. Use of MCSC staff to prepare the watershed plans will ensure consistency in methodology between watersheds.

5.3.1 Watershed Planning Methodology

The watershed planning methodology described below should be used in preparing watershed plans. The methodology described briefly below and in detail in Appendix B should not be viewed as rigid procedural requirements but as a guide to preparation of watershed plans.

1) Assemble Watershed Advisory Committee: The Watershed Board and MCSC staff should assemble a watershed advisory committee. The advisory committee may be composed of municipal and county agency staff, local consultants, resource agencies, significant land owners, local homeowners associations and environmental groups. Staff of local government and local citizens groups will have the greatest knowledge of watershed conditions and be most affected by those conditions. Consultants and resource agencies can provide additional technical expertise and experiences from other watersheds within the region. Also, the resource agencies may have funding and can provide input regarding fundable alternatives.

The purpose of the advisory committee is to assist the Watershed Board in establishing goals and objectives for the watershed plan and providing input on plan alternatives and the implementation plan for the watershed recommendations.

2) Establish Preliminary Goals and Objectives: The goals and objectives of the watershed plan should be related to the unique conditions, problems and opportunities of the watershed.

However, the goals and objectives of the watershed should begin with and be consistent with the goals and objectives of the countywide stormwater plan. The objectives identified early in the planning process should be used to guide the direction of the process. However, they may evolve over time as information on watershed conditions is collected.

3) Inventory Watershed Resources and Conditions: Previous reports and studies and background data on the watershed should be assembled and an inventory of the stream corridor conducted. Data assembled should include floodplain, wetland, land use/land cover, soils and vegetation maps as well as hydrologic information such as rainfall and streamflow data. This will provide information on watershed wide conditions and resources that affect the stream hydrology and condition. In addition to collecting this data, a stream corridor inventory should be conducted to assess the condition of the stream corridor itself and identify problems areas such as severe streambank erosion, suspicious discharges and poor habitat conditions. Stream cross-section, rainfall and streamflow data will be needed if detailed flood analysis and floodplain mapping are to be performed.

4) Analyze Watershed Characteristics and Opportunities: Based on the information collected and assembled above, watershed problems can be identified and the sources, causes and magnitude of the problems analyzed. This step may include detailed quantitative hydrologic and hydraulic modeling and GIS based analysis. The next section (5.3.2) identifies watershed planning issues that should be considered during this component of the planning methodology.

5) Analyze and Recommend Alternatives for Problem Remediation and Prevention: Alternatives for remediation and prevention of problems should be developed and should consider both watershed and site specific measures as well as structural and non-structural techniques. Alternatives should also consider their impact on other watershed resources. Costs and potential funding sources should be developed for each of the alternatives. Considering the watershed goals and objectives, financial resources and the estimated costs for projects, alternatives should be selected and recommended projects prioritized.

6) Develop an Effective Action Plan: An action plan should be prepared which identifies funding sources, the responsibilities of the various parties that will implement the plan, and a schedule for implementation. This is an extremely important step since without specific tasks assigned to specific parties, it is unlikely that the plan will be implemented.

5.3.2 Comprehensive Watershed Planning Issues

At a minimum, a comprehensive watershed plan should identify and address in a comprehensive fashion the problems, needs and opportunities in the watershed including those discussed below.

Flood Damage and Mitigation Needs: While flooding related damages may occur in specific locations, flooding is the result of runoff from the entire upstream watershed. Thus, flood

damages, particularly overbank flooding, must be analyzed on a watershed basis. Since watersheds rarely follow political boundaries, analysis of flooding problems must necessarily be addressed on an intergovernmental basis; hence creation of the MCSC. In addition to addressing existing flooding problems, potential future problems should also be identified and watershed specific regulatory standards considered to avoid potential problems.

Floodplain Mapping Status and Needs: The floodplain maps throughout most of McHenry County were prepared in the early 1980's. Generally in the more urban areas of the county, the mapping was prepared based on hydrologic and hydraulic modeling. In the more rural areas, the mapping was done by more approximate means such as regression equations and using the historic flood of record as the regulatory flood. Due to land use changes, better rainfall information, and greater sophistication in watershed modeling techniques, the accuracy of many of the existing maps is questionable. The current floodplain mapping should be evaluated in terms of:

- **Changes in land use and hydraulic conditions since the time of the mapping** (Changes in land use and the installation or removal of significant hydraulic structures since the time of the mapping may have significantly altered the flood risk within and adjacent to the currently mapped floodplain.)

- **Adequacy of the geographic coverage of the mapping** (Most regulatory maps do not extend into the headwaters of streams where the drainage area is less than one square mile.)

- **Adequacy of the hydrologic and hydraulic (H/H) analysis supporting the floodplain mapping** (Many of the regulatory floodplains in McHenry County were studied using approximate methods and do not have elevations associated with them.)

- **Recent flooding experience** (Recent experience may help identify inaccuracies in the current regulatory floodplain.)

- **The number and significance of map revisions (LOMRs) and map amendments (LOMAs) that have occurred since the time of the mapping** (LOMRs and LOMAs are not shown on existing floodplain maps and information on them can be difficult to obtain from FEMA. Also LOMRs and LOMAs are often not requested for floodplain modifications permitted by IDNR-OWR (formerly IDOT-DWR)).

If it is determined that floodplain mapping for the watershed is not adequate, funding to update the maps should be identified and new maps prepared.

Identification of Regionally Significant Storage Areas: Throughout McHenry County there exist depressional storage areas that store significant runoff volumes. If these depressional storage areas are lost, substantial increases in downstream flow rates and flood damages may

result. In a study of Butterfield Creek in southern Cook County, Illinois, it was found that 100-year discharges would increase from 35% to 100%, depending on watershed location, if watershed depressional storage was lost (USDA, 1987). The 35% to 100% increase was independent of any land use changes in the watershed. Many depressional storage areas may also be groundwater recharge zones important for stabilizing streamflows and lake levels within the watershed. Watershed planning should identify significant depressional areas and develop alternatives for their preservation.

In addition to identifying existing watershed storage areas, opportunities for creation of additional regional storage areas should be identified. For example, regional storage areas could be created behind existing or future roadway embankments to serve as regional detention for portions of the watershed.

Channel and Shoreline Erosion: Although erosion is a natural process, excessive channel and shoreline erosion often occurs in urban and agricultural watersheds. Streambank and shoreline erosion occurs as a result of both hydrologic destabilization due to urbanization and local instream factors. Hydrologic destabilization is the result of increases in volumes and rates of runoff due to urban development. Increases in runoff rates and volumes result in increased stream velocities as well as stream and lake water level fluctuations. Local instream factors include channelization and loss of deep rooted, stabilizing streambank and shoreline vegetation.

Alternatives to remediate excessive channel and shoreline erosion should consider both watershed measures to address hydrologic destabilization and instream measures. Watershed measures to address hydrologic destabilization could include retrofitting of existing detention basins to improve rate control during 2-year and smaller runoff events and creation and/or utilization of regional storage areas described previously. Potential instream measures include re-establishment of native deep rooted vegetation and bio-technical erosion control measures which use a combination of structural and vegetative measures to control streambank and shoreline erosion.

Alternatives to prevent excessive stream and shoreline erosion should also consider both watershed and instream (and riparian) measures. Watershed measures should include adequate stormwater controls to prevent hydrologic destabilization as the watershed develops. Instream measures should include stream corridor management to prevent and address invasion of non-native and undesirable vegetation, prevent disturbance of natural streams that are currently stable, and restore channelized streams that may be unstable. Finally, buffers should be established along streams and shorelines so that normal erosion does not later threaten structures and property that is developed along the stream or shoreline.

Sedimentation: Like erosion, sedimentation is also a natural process. However, excessive sedimentation can reduce the conveyance capacity of stream channels and culverts, increasing flood heights and damages. Sedimentation can also lead to loss or degradation of aquatic habitat as described below. Sedimentation is the result of erosion of upland land surface (agricultural and construction sites), washoff of pollutants from urban land surfaces (impervious areas), and

streambank erosion in upstream reaches. Watershed planning should identify the primary existing or potential causes of excessive sedimentation and identify alternatives to reduce the source of sediment.

Water Quality Remediation and Protection: Water quality problems are typically related to high concentrations of suspended sediment, nutrients, pesticides, oil and grease, organic matter, bacterial and heavy metals. Sources of these pollutants include agricultural and urban runoff, upstream streambank erosion, failing septic systems and point sources. Water quality problems can also be the result of conditions within the waterbody itself (particularly for lakes) such as resident carp populations and certain recreational activities which stir up bottom sediments and lead to high turbidity levels. Watershed planning should identify potential sources and causes of the problems as well as alternatives to remediate the problems. During evaluation of alternatives to improve water quality, other factors such as lack of physical aquatic and riparian habitat, should be considered since addressing water quality alone may not be sufficient to meet certain watershed goals and objectives such as improving recreational fisheries.

Waterbodies that may be particularly sensitive to low water quality or that may be subject to excessive pollutant loads due to anticipated upstream land uses should be identified and alternatives to prevent excessive loading developed. Adequate stormwater best management practices should be sufficient to protect most waterbodies. However, for particularly sensitive waterbodies, land use restrictions or numerical loading limits in the tributary watershed may also be necessary to provide adequate protection. Considering that water temperature and flow rate fluctuations can also have a significant impact on water quality and waterbody conditions, the quantity and source of runoff (surface vs subsurface) may also need to be addressed.

Particularly important or sensitive groundwater recharge areas should also be identified and protected to prevent contamination of groundwater resources.

Aquatic and Riparian Habitat Restoration and Protection: Impairment of stream, lake and wetland habitats can be the result of sedimentation, streambank erosion, and intentional direct modifications such as channelization and wetland destruction. High sediment loads can bury natural substrates important for feeding and spawning as well as fill in lakes and wetlands. Streambank erosion results in direct loss of riparian habitat where the erosion is occurring and also leads to sedimentation. Streambank erosion also results in widening of the stream, reducing water depths which may further impair habitat. Direct modifications destroy habitat diversity, often remove natural substrates, and can lead to streambank erosion. Restoration of aquatic and riparian habitat should consider that other factors, such as water quality and quantity, may also be limiting factors. Restoration activities should also consider the sources and causes of habitat impairment since without watershed controls, restoration may be only temporary. As watershed planning is being undertaken, regional restoration opportunities for stream corridors, lakes and wetlands should be evaluated. There may be opportunities, for example, to accomplish restoration objectives as part of flood control projects or enhancement of regional storage areas.

As discussed under water quality, particularly sensitive habitats or habitats likely to be significantly affected by projected upstream urbanization should be identified and alternatives to prevent habitat degradation developed. Adequate stormwater best management practices and restrictions on stream and wetland modifications should be sufficient to protect most habitats. However, for particularly sensitive habitats, land cover (impervious area) restrictions in the tributary watershed may also be necessary to adequate protection, particularly to minimize changes in hydrology which is often the root cause of habitat degradation.

Recreational Use Impairment: The rivers, corridors, and lakes of McHenry County are used for a number of recreational uses such as swimming, boating, fishing and hiking. These uses can be impaired due to bacterial contamination, water quality, aesthetic and physical conditions. Poor water quality and reduced aesthetics (algae blooms, high turbidity, etc.) can severely impair swimming uses and may cause health concerns. Aesthetics and physical conditions (debris blockages, overly shallow water, etc.) can reduce boating potential (such as canoeing). Water quality and physical conditions can reduce fish populations, impairing recreational fisheries. Watershed planning should address water quality, aesthetics, access and physical conditions particularly in evaluating regional projects. Whenever possible, multi-functional, watershed based solutions should be identified (e.g. incorporating a trail system into a stream restoration project. When considering recreational use enhancement, it should be recognized that certain recreational uses (particularly power boating) can affect other uses such as habitat and water quality.

Identify Coordination Opportunities with Other Programs: There are often opportunities to achieve watershed based stormwater objectives through coordination with other programs such as open space and transportation planning. Watershed planning can be coordinated with open space acquisition programs to acquire particularly important and/or sensitive natural areas such as wetlands, regional storage sites, critical floodplains and high quality stream corridors. As discussed previously, roadways can be designed to create stormwater storage areas or regional wetland banks to benefit downstream areas.

5.3.3 Summary

In summary, the key principles of this watershed planning methodology are to base recommended actions on identified flooding problems and waterbody impairments and to approach the solution of watershed problems in a holistic, comprehensive fashion.

The McHenry County Stormwater Management Plan encourages the comprehensive and consistent regulation of wetlands in areas where wetland protection is not adequately addressed by the Army Corps of Engineers. Any future decisions regarding wetland regulation and delegation is a policy issue which must be addressed by the McHenry County Board.

5.4 PLAN IMPLEMENTATION

5.4.1 Adoption of Stormwater Plan

The first step toward implementation of this McHenry County Stormwater Plan is adoption of the plan by the MCSC and approval by the County Board. The steps leading to adoption of the plan are listed below.

1) MCSC approval of the draft plan: The plan as drafted by the staff and policy advisory committee is presented to the MCSC. After incorporating comments from the MCSC members, the Stormwater Plan is approved for public review. It may be beneficial to solicit comments from the municipalities and other local governmental entities prior to releasing the document for general public review.
2) Public review period: The MCSC puts the approved draft plan out for public review during which time the plan is sent to the IDNR, NIPC, neighboring counties, and other interested agencies for review and comment. A public hearing is held during this period. Relevant comments received during the review period and hearing are then addressed in the final stormwater plan at the discretion of the MCSC.
3) Approval by the County Board: The County Board approves the final McHenry County Stormwater Management Plan.

5.4.2 Prioritization of Recommendations

In general, prioritization of stormwater plan recommendations is dependent on a number of factors including the extent of existing problems, the rate of urbanization, and available funding. Review of existing data and questionnaires distributed to the municipalities indicates that there are not a lot of flooding and water quality problems in McHenry County. However, in the more urbanized areas of the county, problems are beginning to be felt, particularly in terms of impairment of streams and lakes. Also, McHenry County is the fastest growing county in the northeastern Illinois region.

These factors suggest that the first priority should be a regulatory program to minimize new problems related to new development and avoid exacerbation of existing problems. However, certain of the administrative and management recommendations will be necessary to support the regulatory program. While the regulatory program is being implemented, the MCSC should also begin to focus on maintenance and planning needs. Table 5-1 lists each of the recommendations from Section 4.1 along with a priority ranking from one to three with one having the highest priority.

Table 5-1: Prioritization of Plan Recommendations

Plan Recommendation	Priority Ranking (1 is highest priority)
Administration and Management Recommendations	
Acquire and Train Staff	1
Form Technical Advisory Committee	1
Provide Technical Support	2
Develop Public Education Program	1
Coordinate Professional Education	2
Develop Funding Mechanism	1
Regulatory Recommendations	
Prepare and Adopt Countywide Ordinance	1
Prepare Technical Reference Manual	2
Institute Ordinance Enforcement Structure	2
Planning Recommendations	
Perform Countywide Planning Coordination Activities	1
Form Watershed Boards	2
Hydrologic Data Collection	2
Prepare and Implement Watershed Plans	3
Maintenance Recommendations	
Develop Maintenance Standards	2
Develop Mechanism to Maintain Natural Drainage System	3
Develop Mechanism to Maintain Stormwater Infrastructure	2

5.4.3 Discussion of Prioritization

Priority 1: The priority one recommendations are primarily related to preparation of a countywide stormwater ordinance and activities required to support preparation of the ordinance.

Acquire and Develop Adequate Staff: Staffing plans must be considered and developed by the appropriate officials to carry out the plan and enforcement of any future ordinance. Although acquisition of staff is listed under priority one, it will be an on-going process with staff needs changing as the program proceeds through implementation of the countywide and watershed plan recommendations.

Develop Public Education Program: A public education program should begin as soon as practical to develop grass roots support for adequate regulatory standards and increased funding levels that will be required.

Develop Funding Mechanism: To proceed with implementation of this plan a consistent, dedicated source of funding is needed. The MCSC and the County Board should proceed immediately with developing a mechanism to ensure that funding is available to implement the subsequent stages of the plan.

Form Technical Advisory Committee: Other than staff, the TAC will be the primary technical resource to the MCSC. The TAC will be needed to provide input to staff during preparation of the countywide ordinance.

Prepare and Adopt Countywide Ordinance: Staff, with consultant and TAC assistance, should prepare a countywide ordinance as soon as practical to minimize adverse effects from new development. The MCSC should apply for a Section 319 grant from the IEPA to help fund preparation of the ordinance. The MCSC should petition FEMA and/or IDNR to update the most inaccurate floodplain maps.

Perform Countywide Planning Coordination Activities: MCSC staff should perform ongoing coordination activities. In particular, MCSC staff should fully participate in development of the McHenry County wetland ADID study to ensure that information which will be needed to support the stormwater program is included in the study. MCSC should also consider establishing a hydrologic data collection network early in the program to obtain streamflow and precipitation data that will be needed for future watershed planning.

Staffing Needs: During implementation of the priority one recommendations, staff positions and a consultant (to assist in preparation of countywide ordinance language) may be needed.

Priority 2: The Priority 2 activities are primarily related to interpretation and enforcement of the countywide ordinance.

Provide Technical Support: MCSC staff will be the central technical resource for the county in terms of interpretation and enforcement of the ordinance. As such, technically qualified staff will be needed to perform that function.

Coordinate Professional Education: With the county ordinance in place, there will be training needs for both design and permit review professionals. Coordination should be provided so that these opportunities are available as ordinance implementation begins.

Prepare Technical Reference Manual: Preparation of the technical reference manual should begin as the ordinance is being adopted such that the reference manual is available on or before the effective date of the ordinance.

Institute Ordinance Enforcement Structure: This includes obtaining MCSC staff for ordinance review and proceeding with the process of delegating ordinance enforcement to the municipalities. The MCSC enforcement structure should be in place before the effective date of the ordinance.

Form Watershed Boards: The watershed boards may be formed prior to watershed planning to facilitate coordination of activities between municipalities and to provide input to the MCSC during watershed prioritization.

Develop Maintenance Standards: Having consistent standards for maintenance is important to minimize avoidable flood hazards and to discourage misguided maintenance activities that may actually exacerbate problems. Standards and acceptable procedures could be included in the technical reference manual. Dissemination of the materials prepared on appropriate standards and procedures should target drainage districts, township maintenance departments, municipalities and major land owners.

Develop Mechanism to Maintain Stormwater Infrastructure: It will be important that a mechanism to maintain the stormwater infrastructure installed as part of new development be developed and implemented to ensure the long term functioning of the infrastructure. Specification of maintenance responsibilities for stormwater infrastructure should be included in the ordinance.

Staffing Needs: Depending on permit load and the extent to which permit authority is delegated to the municipalities, additional staff positions may be needed to participate

in pre-application conferences, review permits and to perform inspections as well as to perform the other activities identified under this priority level.

Priority 3: Priority three is maintenance of the natural drainage system and watershed planning and implementation. While watershed planning and a countywide maintenance program are very important, they are also very expensive and given the lowest priority due to financial constraints. However, availability of grants and other watershed planning and implementation assistance may skew the priority given to watershed planning somewhat.

Prepare and Implement Watershed Plans: Watershed plans should be prepared based on the procedures in Section 5.3. Funding opportunities should be sought to assist in development of the plans.

Develop Mechanism to Maintain Natural Drainage System: Although standards for maintenance procedures were developed under priority 2, a mechanism is needed to actually perform the maintenance activities. Grant opportunities should be pursued for certain maintenance activities, particularly stream maintenance to address erosion problems.

Staffing Needs: Staff will be required to coordinate maintenance activities, hire and manage maintenance contractors and complete maintenance work.

The number of staff needed for watershed planning will depend on the rate at which MCSC wishes to proceed with watershed plan development and if watershed plans are prepared in house or by consultant.

There are advantages and disadvantages to preparing watershed plans in house. The advantages include increased staff familiarity of the watersheds by being closer to the process, lower level of dependence on consultants during plan update and implementation phases and the potential ability to attract a greater level of staff technical expertise to MCSC by offering staff the opportunity to actually perform the work rather than simply managing consultant contracts. The advantage to hiring consultants is the potential ability to acquire a greater level of technical expertise than could be afforded otherwise, and the ability to complete watershed plans at a greater rate.

APPENDIX A

SUMMARY OF STORMWATER MANAGEMENT LEVEL OF SERVICE QUESTIONNAIRE

SUMMARY
STORMWATER MANAGEMENT LEVEL OF SERVICE SURVEY

A level of service questionnaire developed by staff and the MCSMPC was distributed to each of the cities and villages in McHenry County. A response was received from all. The following summarizes the responses received.

After each question, first the number of true (T) and false (F) responses is given. Then narrative responses are shown. The individual responses are separated by a semicolon. If the same (or similar) response was given by more than one municipality, the number of repeats is shown in parenthesis. When the narrative response was inconsistent with the T or F response or there was no T or F response, the assumed response is shown in parenthesis.

1. There is currently a formal program to educate the public about the problem causes, needs and costs of stormwater management in your community. **T F**

If true, please describe your program.

T: 1 F: 20

Comments: One community has a local newsletter. However, it is unclear if the newsletter is specific to stormwater.

2. The general public recognizes stormwater as a serious problem in terms of water quantity and quality. **T F**

If true, please describe important local concerns.

T: 12 F: 9

Comments: Concern for quality of Fox River; Some do and some don't (F); Concern for flooding (7); Concern for local drainage problems; Concern for water quality from private wells; Concern for several lakes on the affect of runoff and septic fields on water quality; Concern for quantity and quality of runoff onto neighbors and into wetlands.

3. Stormwater management efforts are coordinated with neighboring jurisdictions. **T F**

If true, please describe coordination efforts.

T: 7 F: 14

Comments:

4. Inquiries and complaints regarding stormwater issues are handled by municipal staff. **T F**

If true, please describe inquiry/complaint follow-up system. If false, please list agencies to whom complaints or inquiries are referred.

T: 21 F: 0

Comments: Public Works or engineering; Hasn't been any (T); Investigate and follow-up; Mayor and administrator; Can't handle much; Building commission and village board; Consultant; One municipality has complaint forms.

5. Comprehensive watershed drainage plans and storm sewer drainage system plans have been prepared for your community. **T F**

If true, please briefly describe drainage plans or include copy if possible.

T: 4 F: 17

Comments: Only for new developments (F); F but storm sewer atlas is being prepared; Partial plans (F); Developed completed drainage improvement plan but engineering costs alone used all the money; One municipality delineated watersheds and established release rates.

6. Plans for new residential, commercial or industrial sites are reviewed to include analysis of stormwater impacts on adjacent governments and are not based upon the regulations and plans of the approving authority only. **T F**

If true, please describe the procedure used to assess impacts.

T: 4 F: 16 NA: 1

Comments: No land left, but work with farmers (F); Meetings held with neighboring governments and property owners; Engineering looks up and downstream; Adjacent governments concerns are considered.

7. An effort to coordinate the development of stormwater management regulations and design criteria between municipalities has been made. **T F**

If true, please describe coordination efforts.

T: 7 F: 14

Comments: Lake County SMC ordinance: 2; No land left; One municipality working with county to develop regional stormwater plan; Reviewed county, reviewed NIPC and neighbors ordinances when developing theirs; Two separate municipal pairs list agreements of coordination with neighbor.

8. The water quality of storm runoff has been specifically addressed in municipal ordinances. **T F**

If true, please describe the manner in which water quality considerations are addressed in the ordinance.

T: 7 F: 14

Comments: Only SESC; NIPC stormwater ordinance language; Lake County SMC ordinance: 2; NIPC models and early completion of detention: 2; One municipal ordinance doesn't have water quality standards but stresses desire to eliminate silt and chemicals in

stormwater; F but following statement made "quality of stormwater terrifies me."

9. There has been an adequate effort made to coordinate soil erosion and sedimentation control requirements on a regional basis. **T F**

If true, please describe coordination efforts.

T: 4 F: 17

Comments: When reviewing in 1 1/2 mile extra-jurisdictional area; Lake County ordinance (T); T, but not by us; One municipality claims strong enforcement but has no ordinance.

10. Stormwater management facility inspections and inventories are carried out on a consistent basis. **T F**

If true, please describe inspection program and schedule.

T: 5 F: 16

Comments: Full time inspector; Weekly; Every spring; Only during construction (F), almost daily; only on a complaint basis (F); Working on a schedule (F); Lack of manpower.

11. Maintenance of stormwater facilities is performed through a scheduled preventative maintenance program rather than in response to complaints. **T F**

If true, please describe maintenance program and schedule.

T: 6 F: 15

Comments: Continual maintenance specified, but not needed at present (F); Four year cycle; Most systems privately maintained (F); Every spring; Currently reditching; Regular inspection; T as budget permits; Working on schedule; Annual culvert, catch basin, and ditch cleaning; Lack of manpower.

12. Permitting decisions include regional interests and are not based upon the regulations of the approving authority only. **T F**

If true, please describe other factors considered.

T: 2 F: 18

Comments: Only for other entities (F); Engineering looks up and downstream (T); Work with Lake County SMC.

13. Enforcement of development specifications is carried out by municipal staff on a consistent basis. **T F**

If true, please describe enforcement mechanisms for non-compliant activities.

T: 18 F: 4

Comments: Full time inspector; Village staff; Consultant; Red-tag non-compliance; No land left.

14. Nearby Drainage Districts have made an adequate effort to coordinate erosion and flow control requirements with your community. **T F**

If true, please describe coordination efforts.

T: 0 F: 19 NA: 1

Comments: One municipality discharging stormwater in tiles but now drainage district reviewing plans; Unknown (not marked); One municipality claimed much communication with drainage district, but F based on their engineer's response (two responses received from this municipality).

15. Stream or channel maintenance is performed in your community. **T F**

If true, please explain the nature of these activities (staff, volunteer groups, etc.).

T: 14 F: 7

Comments: Some monitoring of stream biology (F); Street and sewer department; As needed basis; Volunteer groups; By property owners; Golf course maintains (T); Staff and volunteers; Inconsistent effort by volunteers (T).

16. List, in order of importance, the most critical elements of stormwater management as it pertains to your community.

a. Water Quality (WQ) *1st:1; 2nd: 14; 3rd: 5; 4th: 0*

b. Flood Control (FC) *1st: 9; 2nd: 4; 3rd: 7; 4th: 1*

c. Erosion\Sedimentation Control (SESC) *1st: 9; 2nd: 2; 3rd: 7; 4th: 1*

d. Other (please explain) *1st: 1; 2nd: 0; 3rd: 1; 4th: 0*

Comments on Other: Maintenance of natural conditions; Debris clogging storm sewers and ditches. Comments: All important (not marked); One municipality stated concern for lake water quality but marked FC 1st and SESC 4th; WQ 1st and SESC 4th while concern for lakes high.

17. Please describe the source of funding for the following elements of your stormwater management program. (General revenue, permit fees, Homeowners Associations, etc.)

a. Capital Improvements (sewer rehab, local flood projects, etc.)

Comments: Stream restoration negotiated as part of annexations; General revenues: 15; None: 2; Motor fuel tax: 2; Have received grants for extensions; Interested in grant programs.

b. Maintenance and Operations (culvert maintenance, street sweeping, etc)

Comments: Not applicable to; general revenues: 17; Home owners association; MFT and lake maintenance funds; MFT: 2; None; Nothing has been maintained in years.

c. Regulatory (plan review, construction site inspection, etc.)

Comments: Permit fees: 14; General revenue: 6; None: 2; No land left; Under "permit fees," some charge for actual time.

(Additional space for comments or explanations.)

Comments: Stormwater management system based on use of natural buffers and filters rather than expensive infrastructure; Couldn't McHenry County adopt something similar to the Lake County ordinance?; Presently developing stormwater ordinance and using county code as guide in interim; Would like to get grants that other towns get; Countywide ordinance would be great, provided it is similar to NIPC model as a minimum; Two filled out by one municipality (engineer and Public Works Director) and very consistent responses including general public recognition of problems and ranking of critical stormwater elements; Two filled out by another municipality (president and engineer) and not that similar-chose responses that seemed most appropriate (combined the responses) as noted on surveys.

APPENDIX B

WATERSHED PLANNING POLICIES AND PROCEDURES

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WATERSHED PLANNING POLICIES AND PROCEDURES

I. INTRODUCTION

The purpose of this appendix is to supplement Section 5.3 of the Stormwater Plan - "Watershed Planning Methodology and Issues". While Section 5.3 describes the basic methodology and identifies the issues that should be addressed during comprehensive watershed planning, it does not provide the depth or detail of information provided in this appendix. Although this appendix is intended to be able to stand alone, it is recommended that the Stormwater Plan and Section 5.3, in particular, be reviewed along with this appendix.

The purpose of watershed planning is to identify the unique resources and problem areas of a watershed and to develop a plan to prevent potential future problems and remediate existing problems. A comprehensive watershed plan should identify and address in a comprehensive fashion the problems, needs and opportunities in the watershed, including the following:

- **floodplain mapping status and needs**
- **flood damage prevention, remediation, and mitigation needs**
- **regionally significant storage area opportunities**
- **channel and shoreline erosion problems**
- **sedimentation problems**
- **water quality protection and remediation needs**
- **aquatic and riparian habitat protection and restoration needs**
- **recreational use impairment**
- **coordination opportunities with other programs (e.g. open space acquisition and roadway construction)**

A watershed planning methodology utilizing the following basic steps should be used to address the issues above.

A) **Identify watershed stakeholders and create watershed advisory committee**
B) **Establish preliminary goals and objectives**
C) **Inventory watershed resources and conditions**
D) **Analyze watershed characteristics and problems**
E) **Analyze and recommend alternatives for problem remediation and prevention**
F) **Develop an effective action plan**

The methodology presented in this appendix is based on work for the Lake County Stormwater Management Commission by the Northeastern Illinois Planning Commission (Dreher, 1994). The key principles of the methodology are to base recommended actions on identified flooding problems and waterbody impairments and to approach the solution of watershed problems in a holistic, comprehensive fashion.

An interdisciplinary team should be assembled to guide the watershed planning process and develop watershed plans. The team should include the following disciplines: water resources and environmental engineering, environmental planning, biology, and mapping/GIS. The remainder of this document describes each of the above steps in detail including how the problems, needs and opportunities should be considered in the plan.

II. PLANNING METHODOLOGY

A. Create Watershed Advisory Committee

In addition to the Watershed Board, a watershed advisory committee may be formed to provide input during the watershed planning (and implementation) process. While the Watershed Board is composed of the decision makers in the watershed and will ultimately be responsible for implementing the plan, the advisory committee members may be more technical in nature and have greater knowledge of detailed watershed conditions. The advisory committee would likely be composed of staff from various entities as well as citizens. The principal roles of the committee are to assist the planning team and Watershed Board in the establishment of goals and objectives, identification of remedial and preventative needs and to provide input on the practicality and implementability of the watershed plan alternatives and recommendations. The following entities should be considered for membership on the advisory committee (some of these entities are already represented on the Watershed Board):

- local governments
- county stormwater committee
- county health department
- county conservation district
- county soil and water conservation district
- drainage districts
- regional resource agencies
- state resource agencies
- federal resource agencies
- lake management groups
- citizens conservation groups
- land owners/developers

B. Establish Preliminary Goals and Objectives

The goals and objectives of the watershed plan should be related to the unique conditions, problems, and opportunities of the watershed. However, the goals and objectives of the watershed should begin with and be consistent with the goals and objectives of the countywide stormwater plan. The following general goals and objectives are a synthesis from the Stormwater Plan.

- **Identify floodprone areas and manage development in those areas to prevent increases in flood damages**
- **Reduce existing flood damages due to overbank flooding and local drainage problems**
- **Address streambank erosion both through preventative and remedial measures**
- **Protect and enhance surface and subsurface water quality and quantity**
- **Protect and enhance recreational opportunities**
- **Protect and improve lake and wetland quality**
- **Protect and improve fish and wildlife habitat**
- **Protect and improve the aesthetics of the stream corridor**
- **Provide a plan within which each municipality can implement projects and guide new development**
- **Educate citizens on proper stream, lake, and wetland management**
- **Provide guidance on the management of wetlands in the development process, emphasizing regional stormwater storage and wetland banking opportunities**

The objectives identified early in the planning process should be used to guide the direction of the process. However, goals and objectives may evolve over time. That is, objectives may be refined, made more specific, or even radically changed based on findings which emerge from subsequent steps of the watershed planning process. For example, early perceptions of watershed conditions may be based on anecdotal information and visual evidence. As watershed inventories are completed and more detailed information is presented, perceptions of watershed problems and the feasibility of solutions may change. Consequently, goals and objectives may also change.

C. Collect Data and Inventory Watershed Resources and Conditions

Once the goals and objectives of the watershed plan have been established, data can be collected to inventory the watershed resources and conditions. Below is a list of data that may need to be collected and potential sources of information. However, the data actually needed will depend on the goals and objectives and the findings during data collection itself. It should be noted that this data collection step and the next step (analysis) are not completely independent. Cursory assessments should be made as the data is collected to guide collection of the other data.

1) floodplains and floodprone areas
2) hydrologic, hydraulic, and flood damage data
3) water quality data
4) wetlands
5) stream corridor inventory
6) existing and future land use/land cover
7) soils
8) drainage network
9) topographic information
10) transportation network
11)pre-settlement vegetation

Management and analysis of the data above can often be accommodated through the use of a geographic information system (GIS). Use of a GIS allows incorporation of maps at various scales and allows overlaying the information onto aerial photography for later analysis.

1) Floodplains and Floodprone Areas

Floodplain maps are available from FEMA as paper maps. The FEMA maps have been digitized by the Northeastern Illinois Planning Commission (NIPC) for the incorporated areas and by the Illinois State Water Survey for the unincorporated areas. These maps depict the 100-year floodplain, generally for drainage areas greater than one square mile. The digitized FEMA maps should be sufficiently accurate for planning purposes but should not be used for regulatory purposes. In the body of this Plan a map is provided showing those areas where urban land uses lie within the floodplain. Also, MCSC has a large scale color map showing floodplains overlaid on 1990 land use to assist in identification of likely problem areas.

The USGS hydrologic atlases, which depict the flood of record on USGS 7.5 minute quadrangle maps (USGS, various years), are another source of information regarding floodprone areas. Because these maps depict the flood of record which has no frequency associated with it, it is difficult to determine the risk level associated with the floodprone areas shown. In some areas the flood of record may only be a 10-year event while in other areas the flood of record may exceed a 100-year event. These maps are useful in identifying floodprone areas further up in the watershed

than the typical one square mile upstream limit of the FEMA maps. These maps are also useful for identifying isolated depressional storage areas not directly connected to the stream network.

Finally, hydric soils as identified in the county soil survey can be another indicator of floodprone areas. Based on review of these maps as well as inputs from the advisory committee, a determination can be made regarding the need to update the regulatory floodplain maps (also discussed in Section D.) and investigate remedial flood damage reduction projects.

2) Hydrologic, Hydraulic and Flood Damage Data

Collection of hydrologic and hydraulic data is necessary only if a model of the watershed is to be constructed. In addition to the drainage network, topography, soils and land use data discussed in this section, rainfall and runoff data is needed to determine the runoff response of the watershed for calibration of the hydrologic model. This information should be collected well in advance of preparing the watershed plan since at least several years of data is needed to adequately calibrate the model under a variety of conditions. The required detail and rigorousness of this data collection effort will be determined somewhat by the model to be used for watershed analyses.

Hydraulic information includes stream and bridge cross sections, surveys of significant storage areas and hydraulic data on major storm sewers that may be modeled. These data may exist from previous studies or may need to be collected (or existing data may need to be supplemented) by a survey team as part of this task. If cross sections need to be surveyed, locations should be identified during the stream inventory.

If flood control projects are likely to be needed, information should be collected to assess flood damages including ground elevation and low water entry elevations of all structures in and near the floodplain.

3) Water Quality Data

To assess nonpoint source impacts, it is useful to consider the conditions of streams and watershed lakes in the context of Illinois EPA's (IEPA) classification system for waterbody uses. This system categorizes the following:

- **potential uses**
- **use impairments**
- **causes of use impairment**
- **sources of impairments**

The principal potential uses identified for McHenry County streams and lakes include support of aquatic life (including fish consumption), swimming and secondary contact recreation (IEPA, 1994). Public water supply is another potential use but inland waterbodies in McHenry County are not generally utilized for this purpose.

IEPA use impairment information is documented in the *Illinois Water Quality Report, 1992-1993* (IEPA, 1994). This report identifies use impairments for both streams and lakes throughout the state, and provides information on both the causes and sources of impairment. It is notable, however, that these assessments are based on the monitoring of biological organisms at relatively limited locations. Furthermore, the data for some waterbodies were collected in the early to mid-1980s and may not accurately reflect current conditions, particularly if substantial urbanization has occurred or if major discharges have been phased out or added.

Additional sources of data include Lake Water Quality Assessment Reports (IEPA, 1994), Volunteer Lake Monitoring Program Reports (Hudson and Soulliere, 1994), and data that may have been collected by local citizens organizations or school groups. Data collected by citizens organizations and school groups should be used with caution as the level of training and quality control may be highly variable. In many instances current field surveys will be needed to supplement historical and volunteer collected data to accurately assess use impairments.

4) Wetlands

Wetlands information is currently available from the National Wetlands Inventory maps and from the NRCS for agricultural areas. The NRCS data is available in digital form. However, McHenry County is currently in the process of performing an Advanced Identification Study (ADID) which will define wetlands of high functional value and evaluate them in terms of stormwater storage, pollutant filtering and biological/habitat value. During the watershed planning process, the ADID assessment of watershed wetlands should be verified to ensure that conditions have not changed significantly since the ADID study.

5) Stream Corridor Inventory

The principal focus of the stream corridor inventory should be the stream and riparian area, lakes and wetlands. These waterbodies should be walked and photographed and visual observations recorded. Watershed characteristics such as land use within the corridor should also be inventoried. If stream cross section data for use in the hydraulic model is to be collected, their locations should be identified for the survey crew.

The inventory should document geomorphologic, hydrologic and biological conditions of the creek and riparian area within a 100 foot corridor. In particular, it should document problems such as streambank erosion and downcutting, channelization, debris blockages, sedimentation, degraded water quality and suspicious discharges, impoundments (man-made and natural), storm sewer and tile outlets and invasion of non-native streamside vegetation. The inventory team should be composed of a natural scientist familiar with stream, lake, and wetland ecology and a water resources engineer familiar with the hydrology and hydraulics of stream systems.

6) Existing and Future Land Use/Land Cover

Existing and future land use and land cover data combined with soils information is used to determine runoff characteristics of the watershed for use in hydrologic modeling. Land use information can also be used to predict relative pollutant loads to the drainage system. A GIS land use database based on interpretation of 1990 aerial photographs is available from the Northeastern Illinois Planning Commission. Land cover information based on remote sensing of satellite images is available from the USGS.

7) Soils

Soils data are available from the Soil Survey of McHenry County, Illinois (University of Illinois, 1965). These maps are in the process of being updated for McHenry County by NRCS and will be available in digital form. These maps are useful in identifying existing and former wetlands, natural drainageways and runoff characteristics.

8) Drainage Network

Information on the drainage network includes both the stream network and the storm sewer (and agricultural drain tile) network. The stream network may already be available in digital form from the USGS but should be reviewed against recent aerial photography for changes that may have occurred.

Storm sewer information is available from municipalities and is likely to be at a variety of scales. Agricultural drain tile information should be available from the drainage districts, the SWCD, and the recorder of deeds. Although storm sewer and drain tile information should be collected, the extent to which it need be entered into the GIS will depend on if hydrologic and hydraulic modeling is to be performed.

9) Topographic Information

Topographic information is used to delineate the watershed and subwatersheds and to determine drainage patterns. Topographic information at 10 foot contours is readily available from USGS quadrangle maps. However, more detailed maps with 1 or 2 foot contours is very useful when performing hydrologic and hydraulic analyses, particularly if local drainage problems are to be analyzed.

10) Transportation Network

Roads and railroads also often form drainage divides between watersheds and subwatersheds and often form restrictions in the drainage network resulting in storage areas upstream.

11) Presettlement Vegetation

This information is based on the original 1830's land survey information and is available on plat maps from the McHenry County Conservation District. This information along with wetlands and soils information can be used to identify former wetlands and low quality wetlands that may be potential wetland mitigation and banking sites. The pre-settlement vegetation data can also provide information regarding appropriate vegetation types (e.g. prairie, forest, marsh) for stream and wetland restoration projects.

D. Analyze Watershed Characteristics and Opportunities

This step focuses on analyzing causes and sources of water quality and flooding problems based on information collected in the previous step. The assessment may involve development of a watershed hydrologic, hydraulic (H/H) and water quality model(s).

The discussion in this section corresponds to Section 5.3.2 of the body of this Stormwater Plan. Although there is substantial overlap between this section and the body of the Stormwater Plan for completeness, Section 5.3.2 focuses on the nature of the problems and issues and this section focuses on the purpose and methods of analysis.

1) Floodplain Mapping Status and Needs

The floodplain maps throughout most of McHenry County were prepared in the early 1980's. Generally in the more urban areas of the county, the mapping was prepared based on hydrologic and hydraulic modeling. In the more rural areas, the mapping was done by more approximate means such as regression equations and using the historic flood of record as the regulatory flood. Due to land use changes, better rainfall information and greater sophistication in watershed modeling techniques, the accuracy of many of the existing maps is questionable. The current floodplain mapping should be evaluated in terms of:

- **Changes in land use and hydraulic conditions since the time of the mapping** (Changes in Land Use and the installation or removal of significant hydraulic structures since the time of the mapping may have significantly altered the flood risk within and adjacent to the currently mapped floodplain.)

- **Adequacy of the geographic coverage of the mapping** (most regulatory maps do not extend into the headwaters of streams where the drainage area is less than one square mile)

- **Adequacy of the hydrologic and hydraulic analysis supporting the floodplain mapping** (Many of the regulatory floodplains in McHenry County were studied using approximate methods and do not have elevation associated with them.)

- **Recent flooding experience** (Recent experience may help identify inaccuracies in the current regulatory floodplain.)

- **The number and significance of map revisions (LOMRs) and map amendments (LOMAs) that have occurred since the time of the mapping** (LOMRs and LOMAs are not shown on existing floodplain maps and information on them can be difficult to obtain from FEMA. Also LOMRs and LOMAs are often not requested for floodplain modifications permitted by IDNR-OWR (formerly IDOT-DWR)).

If it is determined that floodplain mapping for the watershed is not adequate, the maps should be updated. Using the hydrologic and hydraulic models, flood profiles should be developed for both existing and future land use conditions. Profiles of the regulatory flood should be based on the higher of the existing and future conditions 100-year profiles. Future condition flows may consider the impact of detention for new development in the watershed provided that ordinances are in place and being enforced throughout the watershed.

Floodplain mapping should extend to drainage areas less than one square mile. The necessary upstream extent of the mapping may vary from watershed to watershed and the USGS hydrologic atlases may be used as a guide to make this determination. Mapping should also be extended to significant depressional storage areas.

2) Flood Damage Prevention, Remediation and Mitigation Needs

To quantitatively assess flood flows, elevations, and damages, hydrologic and hydraulic modeling will be necessary. The models are developed using the drainage network, topographic, land use, and soils information as well as rainfall-runoff and hydraulic data collected in the previous step. The models selected for the analyses should be appropriate for the conditions that exist in the watershed. For example, flooding on the Fox River and in large depressional storage areas are largely affected by snowmelt and spring thaw conditions which are not readily represented by event models.

On the remediation/damage reduction side, the models should be used to assess the extent of flooding and for alternative and economic analysis of flood damage remediation projects as well as design of these projects. The models may also be useful in analyzing streambank and shoreline erosion problems.

On the preventative side, the model may be used to update floodplain maps and establish watershed and perhaps subwatershed specific development control ordinance standards. In addition, the models can be used to identify significant storage areas for protection or potential enhancement to prevent increases in flood damages.

3) Identification Regionally Significant Storage Areas

Existing significant storage areas can be identified and the approximate volume quantified using topographic maps. Considering that many depressional storage areas are also wetlands, the National Wetland Inventory and the McHenry County ADID may also be used to identify

potential storage areas. The extent to which these storage areas influence flood levels and damages downstream can be analyzed with the H/H models. Where storage is significant, various means of protecting those areas should be analyzed including regulatory controls, acquisition, and conservation easements. Opportunities for creation of regional storage areas should also be identified. For example, storage areas could be created behind existing or future roadway embankments. Identification of potential sites will be particularly useful if there are significant flooding or streambank erosion problems related to excessive runoff rates or volumes.

4) Channel and Shoreline Erosion

Excessive channel and shoreline erosion will have been identified during the stream corridor inventory. If H/H models are developed, they can be used to determine flow velocities and the frequency and magnitude of water level fluctuations to determine the extent to which hydrology is causing the erosion. The stream inventory data on streambank and shoreline vegetation and presence of debris blockages can be used to determine the extent to which instream conditions are causing the erosion. It is likely, particularly in urban watersheds, that both unstable hydrology and instream conditions are contributing to excessive erosion.

Alternatives to remediate excessive channel and shoreline erosion should consider both watershed measures to address hydrologic destabilization and instream measures. Watershed measures to address hydrologic destabilization could include retrofitting of existing detention basins to improve rate control during 2-year and smaller runoff events and creation and/or utilization of regional storage areas described previously. Potential instream measures include reestablishment of native deep rooted vegetation and bio-technical erosion control measures which use a combination of structural and vegetative measures to control streambank and shoreline erosion.

Alternatives to prevent excessive stream and shoreline erosion should also consider both watershed and instream (and riparian) measures. Watershed measures should include adequate stormwater controls to prevent hydrologic destabilization as the watershed develops. Instream measures should include stream corridor management to prevent and address invasion of non-native and undesirable vegetation, prevent disturbance of natural streams that are currently stable, and restore channelized streams that may be unstable. Finally, buffers should be established along streams and shorelines so that normal erosion does not later threaten structures and property that is developed along the stream or shoreline.

5) Sedimentation

Areas of excessive sedimentation causing loss of conveyance capacity, degradation of habitats, or eutrophication of lakes should be identified during the stream inventory. Based on land use and the extent of upstream streambank erosion, the relative contribution of the various potential sources of sediment can be estimated (e.g. material eroded from streambanks, agricultural runoff, construction site runoff or urban runoff).

6) Water Quality Remediation and Protection

Locations of poor water quality can be determined from observations during the stream inventory, from the IEPA water quality report and from locally collected data. Water quality problems are typically related to high concentrations of suspended sediment, nutrients, pesticides, oil and grease, organic matter and heavy metals. Potential sources of these pollutants include agricultural and urban runoff, streambank erosion, failing septic systems, and point sources. The relative contribution from these sources can be estimated based on land use, the extent of upstream streambank erosion and point source discharge permit data. Less easy to identify sources of pollutants include illicit discharges to storm sewers (e.g. dumping of used motor oil) cross connections to storm sewers (e.g. sanitary sewers, floor drains, etc) and septic system failure. In older urban areas cross connections can be significant and in older small lot rural areas with well and septic, septic system failure can be significant.

Water quality problems can also be the result of conditions within the waterbody itself (particularly for lakes) such as resident carp populations and certain recreational activities which stir up bottom sediments and lead to high turbidity levels and release of nutrients and pollutants from bottom sediments due to low dissolved oxygen levels.

High quality streams, lakes, and wetlands should be identified, particularly those in watersheds that are or will be experiencing urbanization. The impacts of urbanization on the water quality of these waterbodies should be estimated and protection strategies identified.

7) Aquatic and Riparian Habitat Protection and Restoration

Locations of impaired stream, lake, and wetland habitats in need of restoration can be determined from observations during the stream inventory and from the IEPA water quality report. Potential restoration sites can also be identified from the stream inventory. Good candidates for restoration include areas adjacent to unimpaired areas, areas that may also be candidates for regional storage or flood control and areas under development pressure where cooperation with the developer could lead to protection and enhancement in trade for increased densities elsewhere on the site. Wetlands, soils and pre-settlement vegetation data can be used to provide information regarding potential wetland mitigation sites. The potential of candidate restoration sites should consider hydrology and sediment and pollutant loads in determining the viability of the restoration.

As discussed under water quality, high quality streams, lakes and wetlands should be identified and protection strategies developed. Protection strategies should consider both the water quality impacts of development and the physical impacts caused by changes in hydrology and direct modification.

8) Recreational Use Impairment

Impairment of recreational uses of streams, stream corridors, and lakes can be assessed from the stream inventory, local water quality data, and reports from the advisory committee. The potential sources and causes of impairment can be determined from on-site observations, land use, and hydrology.

In addition to restoration of existing recreational areas, opportunities to create or enhance recreational opportunities as part of other projects should be identified. Potential opportunities include trails along stream restoration projects, parks adjacent to flood control projects, and use of floodplain acquisition to reduce floodplain damages while increasing open space.

E. Analyze and Recommend Alternatives for Problem Remediation and Prevention

Detailed recommendations for preventative, remedial, and maintenance/ongoing management measures should be made by the project team.

1) Preventative Measures

Preventative measures should be selected based on the goals and objectives, existing and projected future conditions and the analyses described in the previous steps. Preventative measures will primarily focus on stormwater controls for new development but should also include preservation and/or acquisition of critical resource areas such as significant depressional storage areas and high quality wetlands, lakes and streams.

In terms of stormwater management standards for new development, it may be appropriate to have watershed specific standards (including limits on impervious area), depending on the specific resources of the watershed and the sensitivity of those resources. For example, lake protection may be a critical priority in one watershed, stream channel habitat and stability in another and overbank flooding in another. The three general types of McHenry County watersheds are listed below.

- **headwater stream**
- **large river**
- **inland lake**

The following paragraphs describe the three watershed types listed above and some of the considerations particular to the type of watershed that can guide development of watershed specific development standards.

Headwater Streams: Headwater streams have relatively small watersheds (e.g., up to 30 square miles) and their uses, such as aquatic life, are sensitive to both hydrologic impacts as well as stormwater-induced changes in water quality.

Because of the relatively short runoff response time of headwater streams they are particularly subject to increases in flooding due to increases in peak flow rates associated with urban development. Also, small drainageways often do not have regulatory floodplains associated with them to prevent building in floodprone areas.

In the headwaters of natural streams the drainage pattern is not well defined and many small storm events never produce surface runoff because of the moderating effects of wetlands and depressional storage and because of the lack of impervious surfaces. As the watershed size increases, flow patterns are more defined and flow generally is confined to a pilot channel which resides in a larger floodplain. The capacity of the channel is generally associated with the 2-year runoff event. Moderate flow velocities in the channel result in clean gravelly substrates conducive to fish spawning and proliferation of lower aquatic life forms.

Impervious surfaces associated with urban development lead to substantial increases in surface runoff and corresponding decreases in subsurface runoff, or baseflow. This effect, combined with drainage improvements, stream channelization, the loss of wetlands and depressional storage areas, leads to larger and more frequent flood flows and correspondingly higher channel velocities. This, in turn, causes channel erosion and subsequent sedimentation which leads to broader, shallower stream channels (Schueler, 1987).

Streambank erosion is exacerbated by the replacement of deep-rooted native vegetation with non-native species. Particularly problematic are aggressive woody species (such as buckthorn) which shade out understory vegetation and cause debris blockage as branches are shed. Also problematic are shallow-rooted invasive species such as reed canary grass.

Increased surface runoff volumes due to urbanization can lead to larger water level fluctuations in wetlands and depressional storage areas. Increased water level fluctuations in wetlands can stress less tolerant plant species and lead to degraded wetland conditions. Increased water level fluctuations in depressional storage areas can also lead to flooding of surrounding structures.

Based on the factors cited above, top priority should generally be given to stabilizing the hydrology in headwater streams. In many watersheds, control of 2-year and 100-year flow rates and protection and restoration of wetland and depressional storage areas will be sufficient to protect these streams. However, in watersheds dominated by subsurface runoff, control of stormwater runoff volumes and maintenance of infiltration patterns will also be important to maintain adequate baseflows. Runoff volume control may also be important to minimize increases in water level fluctuations in high quality wetlands and depressional storage areas with adjacent structures.

Also important is stream protection and restoration which can often be accomplished as part of the site development process. This involves remediating streambank erosion problems through the use of native riparian vegetation and removing excessive debris blockages. Developers are generally interested in creating aesthetic features that make their development unique and a restored natural stream can often accomplish that objective.

Control of sediments and toxics should also be a consideration for headwater streams. Stormwater generated sediments are likely to accumulate in wetlands and depressional storage areas, thereby affecting their habitat and reducing their ability to moderate hydrologic effects. Pollutants which accumulate in stream sediments may be taken up by bottom dwelling organisms leading to bioaccumulation in fish. However, because of favorable velocities, headwater streams are less inclined to act as sinks for runoff pollutants.

Large Rivers: Rivers are of sufficient size and have sufficient flows to support important recreational fisheries. They may also support body contact and non-contact recreation such as swimming and canoeing. Larger rivers (i.e. the Fox River) are generally characterized by lower velocities than headwater streams and are more subject to sedimentation. They are also more prone to excessive growth of algae and noxious aquatic plants due to high nutrient loads, particularly during low flow conditions. Larger rivers appear to be less prone to excessive streambank erosion, partly due to the attenuation of flashy flows found in headwater streams.

Because of the longer response time of larger rivers, increases in flooding are generally less a function of increases in runoff rates and more a function of the accumulation of increases in runoff volumes as the watershed urbanizes.

Top priority should be given to 100-year rate control and runoff volume control to reduce increases in overbank flooding. Runoff volume control is also a top priority to increase infiltration and augment baseflows between storm events.

Sediment and nutrient control is a top priority to minimize channel sedimentation and excessive aquatic plant growth. Wetland protection is a top priority to provide sediment and nutrient control as well as to moderate flood volumes.

Although not a top priority, biochemical oxygen demand (BOD) and toxics control is important (second priority). Excessive BOD in stormwater runoff can lead to depressed dissolve oxygen (DO) levels, particularly during extended dry periods or following summer storm events. From a nonpoint source perspective, though, low DO is more of a problem in lakes and impoundments than in free-flowing rivers. Due to the apparent lower susceptibility of large rivers to streambank erosion, control of the 2-year event is less important than for headwater streams.

Inland Lakes: Lakes act as pollutant sinks and are very sensitive to increases in stormwater pollutant loads. Consequently, the control of sediment, nutrients, BOD, and toxic pollutants should be a top priority. Sediment in runoff raises turbidity which impairs recreational uses and reduces the ability to support many fish and plant species. Polluted sediments can also impair lake bottoms by interfering with natural processes like spawning. Excessive loads of nutrients (i.e., nitrogen and phosphorus compounds) lead to eutrophic conditions (i.e., excessive aquatic plant and algae growth). Excessive plant growth reduces the lake's ability to support recreational uses such as swimming and boating. Excessive BOD loads can depress dissolved oxygen levels which can be very stressful to aquatic life and cause fish kills under extreme conditions. Also, low dissolved oxygen or anoxic conditions in the bottom of the lake can lead to release of phosphorous from the bottom sediments. Toxic pollutants found in stormwater, including heavy metals, pesticides, petroleum-based hydrocarbons, are toxic to aquatic organisms at high concentrations and can exert chronic effects via bioaccumulation.

Native littoral zone and shoreline vegetation of lakes protects the shore from wave action and better anchors shoreline vegetation so that the shore can better withstand wave action. To protect against shoreline erosion, protection of native vegetation and shoreline slopes should be given top priority.

Wetland protection is also a top priority due to the ability of wetlands to settle, filter, and convert stormwater pollutants, thereby supplementing the pollutant removing capabilities of onsite development controls.

In most lakes, flooding is not a problem. However, lakes with large watersheds and low discharge rates may experience excessive water level fluctuations due to upstream urbanization. These fluctuations can lead to excessive shoreline erosion and be a source of sediment. Streambank erosion upstream of the lake can also be a significant source of sediment. Thus, the hydrologic related objectives of 2-year and 100-year rate control and runoff volume control may be a top priority for some lakes but less of a priority for other lakes. The priority level of the hydrologic objectives can be expected to vary substantially between lakes based on the ratio of watershed to lake area and the type of outlet control on the lake.

When developing a watershed plan, the priorities of the immediate watershed as well as the downstream watershed should be considered. For example, an area tributary to a headwater stream which discharges to an inland lake should merge the priorities of inland lakes and headwater streams. While the above discussion was presented in the context of guiding preventative measures, the discussion should also be considered when identifying and analyzing problem areas and developing remedial alternatives

2) Remedial Measures

Remedial measures will vary considerably among sub-watersheds depending on the nature and severity of problems documented in the watershed analyses. Remedial measures fall into two basic categories, flood hazard remediation and stream environment remediation. While many measures used to address flood hazards have negative environmental consequences, most stream environment remediation measures are neutral or have positive benefits for flood control. As a result, these two basic categories are discussed separately.

a) **Flood Hazard Remediation:** Alternatives for remediation of flood hazards should consider both traditional site specific and non-traditional watershed wide measures. Site specific measures include structural alternatives such as flood control reservoirs and non-structural alternatives such as acquisition and floodproofing of flood prone structures. Non-traditional watershed measures may include expansion of detention throughout the watershed and restoration of wetlands and depressional storage areas to improve their flood storage capacity. While potentially effective, watershed measures may be more difficult to assess in terms of their ability to reduce flood flows and stages to a specified level.

Several alternatives, including inaction, should be developed for the identified flooding problems. The alternatives will likely include combinations of structural, non-structural and watershed measures. In selecting the most appropriate alternative a comparison of benefits and costs should be made. Benefits should include flood damage reduction as well as open space, water quality and aquatic and wildlife habitat benefits. Costs should include monetary costs as well as potential impairment of water quality and impairment and/or loss of aquatic and wildlife habitat. Potential flood hazard remediation measures are discussed further below

- **Acquisition of Floodprone Properties and Flood Proofing:** These non-structural measures do not change the extent of flooding, Instead, they reduce the damages associated with a given level of flooding. These measures address direct damages to structures but generally do not address more indirect damages such as transportation delays due to flooding of roads. Non-structural measures generally have less environmental consequences than structural measures and because of the potential to add open space and to restore riparian lands to more natural conditions, non-structural measures (particularly acquisition) can have many environmental, open space and recreational benefits.

- **Structural flood control:** Structural flood control measures include reservoirs, levees, and channel improvements. The intent of all of these measures is to reduce the extent of flooding associated with a particular event thereby reducing both direct and indirect flood damages. Because these measures generally involve significant modifications to the stream and riparian corridor, they generally have the greatest negative environmental consequences of the three basic measures outlined here.

- **Watershed controls:** Potential watershed controls such as retrofitting of detention basins and infiltration practices throughout the watershed may be feasible in some circumstances, particularly if some of these controls are being implemented to address water quality problems, as well. Restoration and enhancement of the stormwater storage characteristics of watershed wetlands and depressional storage areas may be another means of reducing flood flows. Watershed controls, like structural measures, may be used to reduce flow rates and thereby reduce the extent of flooding. It should be recognized that due to the more distributed nature of watershed controls, a much more detailed hydrologic and hydraulic analysis may be necessary to evaluate the effectiveness of these controls. While this will increase the cost of analysis, the potential decrease in capital expenditures along with the more environmentally benign or beneficial nature of these practices may offset the increased cost of analysis.

b) **Stream Environment Remediation** There are several categories of remedial measures that may be used to address problems within the stream environment (including streams, lakes, and wetlands). The ones listed below are generally appropriate to observed McHenry County situations. Several of these are nonpoint source controls that either address poor water quality and hydrology associated with urban runoff or address instream conditions directly. However, point source control measures are also included because they are not currently well addressed by local regulatory programs. In addition to poor water quality, use impairments are often the result of degraded physical conditions within the stream, lake or wetland. Although the cause of the degradation is often related to poor water runoff quality or unstable hydrology, other factors such as invasion by non-native species and past direct human modifications may be equally important in many circumstances.

- **retrofit stormwater BMPs:** Retrofits may involve swales, detention basins, and sand filters. This approach is most appropriate for sites which were developed without adequate BMPs and which contribute substantial pollutant loads and/or uncontrolled runoff rates. Examples include auto service stations, industrial parks, and commercial areas. Retrofitting can be used to address both water quality concerns and unstable hydrology which may be contributing to streambank and shoreline erosion in the receiving waterbody.

- **stabilize eroding stream channels and shorelines:** Streambank and shoreline erosion can be a significant source of sediments as well causing direct loss of instream and riparian habitat. Streambanks and shorelines can generally be stabilized through vegetative measures such as willow posts or replacement of undesirable woody vegetation shading the banks with deep rooted herbaceous vegetation. Under more extreme conditions, vegetative measures in combination with non-intrusive structural measures at the toe of the bank may be required.

- **restore habitat and water quality functions in channelized streams:** This is appropriate for channelized or highly degraded streams in which restoration can improve pollutant filtering functions and restore habitat for aquatic organisms. This can be done by installing artificial undercut banks or artificial riffle structures. Under more aggressive restoration programs, meander patterns and oxbow wetlands can be restored.

- **restore degraded wetlands:** Many existing wetlands have been disturbed by drainage, sedimentation and vegetative disturbances. Restoration, potentially involving flow control structures, excavation, and native plantings, can restore lost functions, particularly pollutant filtering, stormwater storage and aquatic habitat.

- **install controls for material and waste storage facilities:** In addition to traditional drainage and detention BMPs, commercial and industrial sites with concentrated pollutant sources may require special measures to minimize runoff contamination. A typical control is to cover material storage sites (e.g., for fertilizer or pesticides) and waste storage facilities (e.g., large refuse bins) to minimize exposure to rainfall, and thereby minimize stormwater runoff.

- **eliminate illicit connections to storm sewers:** Illicit connections include sanitary sewer cross connections and floor drains of industrial facilities or automobile service stations.

- **remedy problematic sanitary sewer overflows and bypasses**

- **remediate or replace problem septic systems**

3) Maintenance/Ongoing Measures

Maintenance measures are necessary to address a number of residual problems. These include an array of measures ranging from infrastructure maintenance to measures implemented by private citizens.

- **maintain detention and flood control facilities:** Common maintenance needs include removing accumulated sediment and stabilizing eroding shorelines in wet basins.

- **maintain the drainage system:** Typical maintenance needs include cleaning catch basins and ensuring that property owners keep debris and obstructions out of drainage easements.

- **remove obstructing debris in stream channels to maintain conveyance and minimize bank erosion**

- **sweep streets and parking lots:** From a nonpoint source control perspective, this is most appropriate in commercial/industrial areas to minimize litter and debris washoff. It may be particularly beneficial around recreational lakes.

- **control disposal/use of household chemicals and wastes:** This practice requires education of watershed residents regarding disposal of materials such as used motor oil, pesticides, and lawn wastes.

In summary, watershed management recommendations include an array of preventative, remedial and maintenance measures which can be applied across a watershed. They may also include site-specific measures to remediate localized problems (e.g., flood control and streambank stabilization) or to capitalize on opportunities to provide downstream benefits (e.g., wetland restoration or detention retrofitting). Preliminary recommendations should be discussed with the watershed advisory committee to verify their appropriateness and to identify additional site-specific controls.

F. Develop an Effective Action Plan

Once recommendations are completed and initially reviewed by the advisory committee, an action plan can be drafted. The action plan identifies from a watershed-wide perspective the means for implementing the recommendations. It includes specific programs and measures for the prevention of future problems, the remediation of existing problems, and maintenance of the drainage system. The recommended action plan should contain the following elements:

- **Specific recommendations for programs and projects.**

- **Descriptions of projects and programs and how they will be implemented.**

- **Cost estimates and identification of funding sources for each program and project.**

- **Identification of responsible parties, or stakeholders, including local governments, the MCSC, private and public property owners, watershed interest groups, and developers.**

- **Recommended implementation schedule.**

An important benefit of going through the process of developing the action plan is the interaction and feedback between the project team, watershed board and the advisory committee. This

feedback is critical both in educating the watershed committees and residents of the findings of the analysis and in ensuring that the action plan is both implementable and effective. Alternative selection, while not a simple matter, primarily considers technical concerns such as problem and watershed type, hydrology and soils. Effective plan implementation, however, must consider several more complicated factors, including institutional, public awareness, financial and regulatory concerns, as well as needs for coordination with other programs. A brief description of these factors follows:

1) Institutional Factors

Most of the entities identified as being responsible for plan implementation, particularly local governments, have little experience with nonpoint source issues and related water quality measures. A watershed planning process is an opportunity to educate staff, elected officials and private citizens about the benefits of plan implementation.

2) Public Awareness

While the citizens of McHenry County appear supportive of strong environmental protection and conservation programs, there is still relatively little awareness of the nonpoint source problem. Consequently, wide support for potentially expensive control programs may be difficult to demonstrate. Public awareness will be enhanced by effective news reporting of watershed planning activities and demonstration projects; publication and wide distribution of brochures, videos, etc.; school environmental programs; and active participation by local interest groups such as the McHenry County Defenders.

3) Financial Factors

Local government budgets often are very tight and typically do not include identified programs or revenue sources for plan implementation. One key way to improve funding for plan implementation is to document the multiple benefits likely to result, including flood control, improved aesthetics and reduced needs for future maintenance and remediation. The watershed board and other implementors should be made aware of grant programs and other assistance available from state and federal agencies which can be invaluable in initiating program implementation.

4) Regulatory Factors

The awareness of a need for regulatory requirements for urban nonpoint BMPs is improving. MCSC will be developing a comprehensive countywide watershed development ordinance which developers and local officials will need to become familiar with. Many in the development community are not familiar with related state/federal NPDES permit requirements for construction activities and other stormwater discharges, and even fewer are familiar with pending requirements for municipal stormwater permits. Nonetheless, it is critical that these and other

relevant regulatory programs be considered in developing and implementing the watershed action plan.

5) Coordination with Other Resource Management Programs

As already alluded to, the success of plan implementation and watershed protection programs can be facilitated by effective coordination with related programs. For example, stream maintenance programs, which have been traditionally focused on improving channel conveyance, can be improved to address water quality and habitat needs. Land acquisition programs can target threatened wetlands and riparian areas. Similarly, trail/greenway development should target stream corridors to improve public access and awareness of a valuable, but often hidden, resource.

6) Action Plan Monitoring Needs

An important element in the implementation of the Action Plan is an effective, ongoing monitoring program to measure the achievement of watershed goals and objectives. The monitoring plan should be coordinated by a central entity such as the MCSC, although participation by agencies currently collecting data, including the Conservation District and watershed volunteers, is also important.

The monitoring plan should include two general components: 1) documentation of watershed plan implementation activities and 2) measurement of changes (i.e., improvements) in waterbody conditions. Documentation of implementation activities is the principal means of measuring plan implementation against the recommended schedule. The measurement of waterbody changes is a more direct measure of the success of the action plan. The monitoring results, ideally, will show that documented problems and impairments are being lessened or eliminated, that higher uses are being attained, and that watershed development is not leading to further degradation. The monitoring program should also be used to determine whether changes are needed in action plan recommendations to better accomplish plan objectives. Monitoring can also have substantial educational and stewardship development benefits that can lead to greater awareness and appreciation of the resource.

Recommended categories of waterbody monitoring data include chemical, physical, and biological. Chemical water quality data can be very expensive to collect and analyze and may be inconclusive until long-term trends can be identified. Physical data (e.g., water column clarity or sediment depths) are typically less expensive to collect but can be very illuminating about waterbody conditions. Biological indicators (e.g., samples of fish or bottom dwelling organisms) may be the most informative type of data because they reveal the cumulative response of a waterbody to multiple corrective and/or preventative actions. Because project funds will typically be constrained, the monitoring program should be designed to collect the least expensive, most informative indicators of waterbody use attainment. Because the nature and complexity of

waterbody impairments can vary greatly, monitoring program design should be tailored to watershed-specific conditions.

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APPENDIX C

STATUS OF MCHENRY COUNTY FLOOD INSURANCE STUDIES

Status of McHenry County Flood Insurance Studies

Community	Watercourse	Methods of Hydrologic Analysis, Year[1]	Floodway Map[2]	Elevations[3]
Algonquin	Fox River	Detailed, 1980	Yes	Yes
	Rat Creek	Approximate, 1980	No	No
	Crystal Creek	Approximate, 1980	No	No
Barnard Mill	Included in Unincorporated McHenry County Study			
Barrington Hills	Spring Creek	Approximate, 1979	No	No
Bull Valley	Boone Creek	Approximate, 1980	No[4]	No
Cary	Fox River	Detailed, 1983	Yes	Yes
	Cary Creek	Detailed, 1983	Yes	Yes
	Unnamed Trib U.S. of Silver Lake Road	Approximate, 1983	No	No
Crystal Lake	Crystal Creek D.S. of Lake Avenue	Approximate, 1981	Yes	Yes
	Crystal Creek U.S. of Lake Avenue	Approximate, 1981	No	Yes
Fox Lake	Fox River	Detailed, 1986	Yes	Yes
	Squaw Creek	Approximate, 1986	Yes	Yes
Fox River Grove	Fox River	Detailed, 1980	Yes	Yes
	Shannon Creek	Approximate, 1980	No	No
Fox River Valley Gardens	Fox River	Detailed, 1979	Yes	Yes
Greenwood	Included in Unincorporated McHenry County Study			
Harvard	Mokeler Creek	Approximate, 1979	Yes	Yes
Hebron	No Flood Insurance Study			
Holiday Hills	Fox River	Detailed	Yes	Yes
Huntley	South Branch Kishwaukee River	Approximate, 1992	Yes	Yes
	Unnamed Trib.	Approximate, 1992	No	No

Community	Watercourse	Methods of Hydrologic Analysis, Year[1]	Floodway Map[2]	Elevations[3]
Island Lake	Cotton Creek	Detailed, 1982	Yes	Yes
	Fox River	Detailed, 1982	Yes	Yes
	Mutton Creek[5]	Approximate, 1982	Yes	Yes
Johnsburg	Included in Unincorporated McHenry County Study			
Lake in the Hills	Crystal Creek	Detailed, 1983	Yes	Yes
	Woods Creek	Detailed, 1983	Yes	Yes
	Tributary to Woods Creek	Detailed, 1983	Yes	Yes
Lakemoor	Lily Lake	Approximate, 1982	No	No
Lakewood	No Flood Insurance Study			
Marengo	Unnamed Trib. to Kishwaukee River	Approximate, 1979	Yes	Yes
	Numerous Tribs. to Kishwaukee River	Approximate, 1979	No	No
McHenry	Boone Creek Fox River to mile 1.8	Detailed, 1983	Yes	Yes
	Boone Creek and Tribs. U.S. of mile 1.8	Approximate, 1983	No	No
	Fox River	Detailed, 1983	Yes	Yes
	Lakeland-Park Drainage Ditch Boone Creek to C&NW R.R.	Detailed, 1983	Yes	Yes
	Lakeland-Park Drainage Ditch U.S. of C&NW R.R.	Approximate, 1983	No	No
	McCullom Lake	Approximate, 1983	No	No
McCullom Lake	Included in City of McHenry Study			
Oakwood Hills	Included in Unincorporated McHenry County Study			
Prairie Grove	Thunderbird Creek	Approximate, 1979	No[4]	No

Community	Watercourse	Methods of Hydrologic Analysis, Year[1]	Floodway Map[2]	Elevations[3]
Richmond	North Branch of Nippersink Creek	Detailed, 1981	Yes	Yes
Ringwood	Included in Unincorporated McHenry County Study			
Spring Grove	Nippersink Creek	Detailed, 1981	Yes	Yes
	Spring Creek	Approximate, 1981	Yes	Yes
	Unnamed Trib. A	Approximate, 1981	No	No
Sunnyside (now part of Johnsburg)	Fox River	Detailed, 1979	Yes	Yes
	2 Unnamed Tribs.	Approximate, 1979	No	No
Union	Railroad Creek	Approximate, 1983	No	No
Wonder Lake	Nippersink Creek	Detailed, 1983	Yes	Yes
Woodstock	Silver Creek	Detailed, 1979	Yes	Yes
Unincorporated McHenry County	Cary Creek	Detailed, 1981	Yes	Yes
	Dutch Creek	Detailed, 1981	Yes	Yes
	Elizabeth Lake Drain	Detailed, 1981	Yes	Yes
	Fox River	Detailed, 1981	Yes	Yes
	Nippersink Creek	Detailed, 1981	Yes	Yes
	North Branch Nippersink Creek	Detailed, 1981	Yes	Yes
	Silver Creek	Detailed, 1981	Yes	Yes
	Slough Creek	Detailed, 1981	Yes	Yes
	South Branch Slough Creek	Detailed, 1981	Yes	Yes
	Apple Creek	Approximate, 1981	No	No
	Boone Creek	Approximate, 1981	No	No
	Coon Creek	Approximate, 1981	No	No
	Crystal Creek	Approximate, 1981	No	No
	DeYoung Creek	Approximate, 1981	No	No
	Franklinville Creek	Approximate, 1981	No	No

Community	Watercourse	Methods of Hydrologic Analysis, Year[1]	Floodway Map[2]	Elevations[3]
Unincorporated McHenry County	Fox River	Detailed, 1982	Yes	Yes
	Geryune Creek	Approximate, 1981	No	No
	Kishwaukee River	Approximate, 1981	No	No
	Lawrence Creek	Approximate, 1981	No	No
	Little Beaver Creek	Approximate, 1981	No	No
	Mokeler Creek	Approximate, 1981	No	No
	Mud Creek	Approximate, 1981	No	No
	Nippersink Creek	Approximate, 1981	No	No
	North Branch Kishwaukee River	Approximate, 1981	No	No
	North Branch Nippersink Creek	Approximate, 1981	No	No
	Oakwood Hills Area	Approximate, 1981	No	No
	Piscasaw Creek	Approximate, 1981	No	No
	Powers Creek	Approximate, 1981	No	No
	Rush Creek	Approximate, 1981	No	No
	Sleepy Hollow Creek	Approximate, 1981	No	No
	South Branch Kishwaukee River	Approximate, 1981	No	No
	Vander Karr Creek	Approximate, 1981	No	No
	Williamson Creek	Approximate, 1981	No	No
	West Branch Piscasaw Creek	Approximate, 1981	No	No
	Woods Creek	Approximate, 1981	No	No

[1] "Year" indicates year that Flood Insurance Study was Published.
[2] "Yes" indicates that a Floodway Map exists, "No" indicates that only a Flood Insurance Rate Map exists.
[3] "Yes" indicates that elevations are available for the floodplains within that community area.
[4] Flood Hazard Boundary Map only
[5] Located in Lake County

APPENDIX D

GLOSSARY OF TERMS

GLOSSARY OF TERMS

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

BEST MANAGEMENT PRACTICES (BMP's): Design, construction, and maintenance practices and criteria for stormwater facilities that minimize the negative impacts of development on stormwater runoff rates, volumes, and quality.

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.

CRITICAL WETLANDS: Wetlands of the highest value by virtue of one or more high ranking characteristics that result in a uniquely valuable environment.

DEPRESSIONAL STORAGE: The existing volume of storage available under the base flood that may be 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 activity, excavation or fill, alteration, subdivision, change in land use, or practice, including without limitation, redevelopment, undertaken by private or public entities, that effects the discharge of stormwater. Development does not include maintenance of stormwater facilities.

DRY DETENTION BASIN: A detention basin designed to drain completely after temporary storage of stormwater flows and to normally be 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 or wave action.

FEMA: The Federal Emergency Management Agency.

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 mitigate or prevent flooding. Remedial and/or preventative actions come in the form of stormwater regulations for development, floodplain management, stormwater detention/retention, diking and non-structural activities such as open space preservation.

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.

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 surfaces.

MAINTENANCE: The selective removal of undesirable woody material and accumulated debris from, or repairs to, a manmade or natural stormwater facility so that it will perform the functions for which it was intended.

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.

NON-POINT SOURCE POLLUTION: Pollution which has no single discharge point or origin. Pollutants are usually comprised of sediment, organic compounds, toxic metals and various pathogens. Sources of non-point pollution include urban and agricultural runoff and effluent from septic systems and landfills.

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

POINT SOURCE POLLUTION: Wastes or pollution which are discharged from a single point or structure. Most often, a point source is a pipe delivering effluent from a wastewater treatment facility or a factory.

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, whether initially in the form of rain or snow. Runoff is that portion of the hydrologic budget which 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.

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 appurtenance features, canals, channels, ditches, streams, culverts, streets, storm sewers, detention basins, swales and pumping stations.

STORMWATER MANAGEMENT: Encompasses both control and developmental activities in which there is physical interaction with stormwater (a broader interpretation includes activities of an institutional nature, such as financing, staffing, etc.).

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

URBAN RUNOFF: Runoff with characteristics reflective of urban land use. This usually includes increased volumes due to imperviousness and to degraded quality representative of non-point pollution associated with domestic activities.

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, this event 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, this event 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.