CHAPTER OUTLINE

I. Chapter Focus

II. Findings

A. Groundwater Resources

B. Drainage, Stormwater Control and Flooding

C. Rivers, Streams and Wetlands

III. Goals and Objectives

IV. Implementation Statement

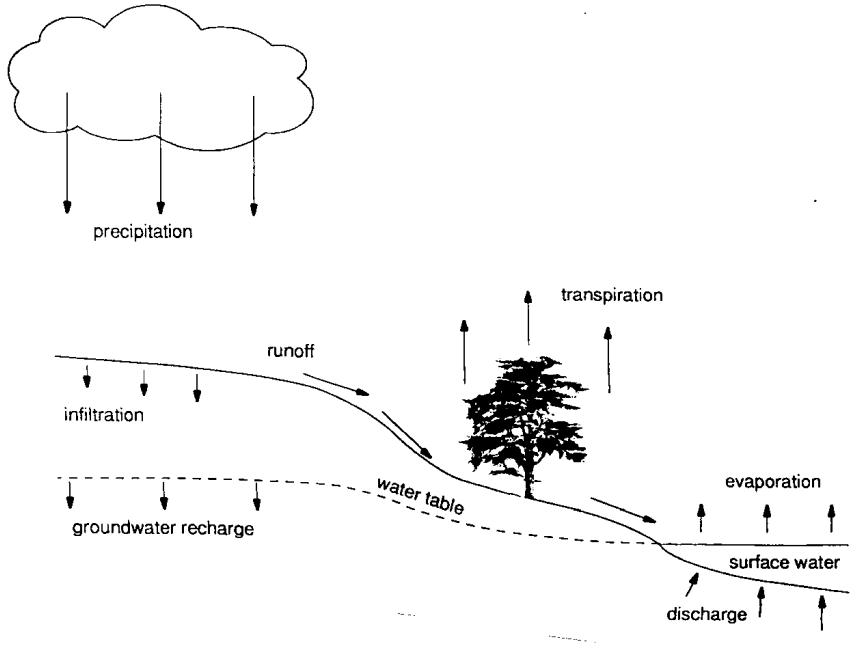
I. CHAPTER FOCUS

Within the limited range of temperature and pressure that occur near the Earth's surface, water changes from solid to liquid to gas and back. Because of its capacity to change state, water can move from the atmosphere to land and back again, using energy from the sun and the force of gravity. This process, known as the hydrologic cycle, is vital to our planet's climate and water distribution system.

Figure 6-1 illustrates the hydrologic cycle. Water travels into the atmosphere through evaporation and transpiration, and returns to the surface through precipitation. It may flow across the land to surface water bodies (streams, rivers and lakes) as runoff. It may infiltrate into the unsaturated zone of porous soil and/or rock. Water that infiltrates may be returned directly to the atmosphere by evaporation and transpiration, or it may flow to a nearby surface water body as subsurface storm flow. It may also seep downward toward the saturated zone as groundwater recharge. Groundwater may then complete the next step of the hydrologic cycle through transpiration to the atmosphere or discharge to a surface water body.

The hydrologic cycle affects the quantity and quality of our groundwater supply, surface water drainage and flooding, and the occurrence and quality of natural features such as streams, rivers and wetlands. This Chapter describes these elements and their interaction with human activity, and suggests ways to preserve them for their own sake and for future generations.

FIGURE 1-6
THE HYDROLOGIC CYCLE



II. FINDINGS

A. Groundwater Resources

All potable water supplies within the community are taken from groundwater. Without the groundwater resource, St. Charles would have greater difficulty providing a quality water supply for its citizens and industries. In the groundwater segment of the hydrologic cycle, water enters the aquifers described in Chapter 5 by recharge, and leaves by discharge to surface water, transpiration from vegetation, and pumping from wells. Aside from locally significant sand and gravel mining, the aquifers themselves do not change. It is possible, however, for man to alter the surface environment so that the groundwater resource is no longer of suitable quality or quantity. The key to preventing this is to protect and maintain the recharge process.

Unfortunately, the conditions that promote groundwater recharge can also promote pollution. Recharge areas are generally the geologic environments least likely to protect groundwater supplies from pollution. Because of this, the strategy to protect the groundwater resource must be twofold: To preserve areas which allow for recharge, and to prevent the introduction of pollutants, particularly where the potential for contamination is high.

The Illinois State Geological Survey has classified various kinds of terrain into four categories according to their recharge potential:

1. Areas with high potential for recharge/high rates:
   a. Generally level or gently sloping uplands with coarse-grained sand and gravel or highly permeable, possibly fractured, bedrock at or near the surface and overlain by coarse-grained soils.
   b. Areas of karst topography.

2. Areas with high potential for recharge/low to moderate rates:
   a. Generally level or gently sloping uplands with fine-grained clay or silty materials at the surface.
   b. Generally level or gently sloping uplands where highly permeable materials are overlain by a thin layer of low permeability, fine grained, or poorly drained soils.
   c. Dissected uplands with generally steep slopes underlain by thick sequences of coarse-grained materials or a thin mantle of soil over permeable bedrock.

3. Areas with moderate potential for recharge:
   a. Slopes with thick, coarse-grained deposits adjacent to lowlands.
   b. Slopes with a thin layer of coarse-grained, highly permeable materials overlying less permeable materials.
   c. Dissected uplands and steeply sloping areas with thick, fine-grained deposits

at the surface.

d. Lowlands, characterized by streams, rivers, and lakes, in areas with coarse-grained materials or highly permeable bedrock at or near the surface.

4. Areas with low potential for recharge:
   a. Lowlands, characterized by rivers, lakes, and marshes, with thick deposits of fine-grained materials.

Pursuant to the Illinois Groundwater Protection Act, the Illinois State Geological Survey has mapped the potential for aquifer recharge for the entire state. This mapping, however, is not accurate enough to be used for site-specific purposes, such as development review. Map 5 in Chapter 5 shows the locations of the most significant aquifers in Kane County. These descriptions can be used in conjunction with soils and geologic mapping data to identify and protect the areas which have the greatest potential for recharge.

At the present time, there is no shortage of water from shallow aquifers. Shallow aquifers, however, are the most vulnerable to pollution from surface sources and so must be protected to ensure long-term supplies. All levels of government in Kane County should manage land use in recharge zones to maximize quantity and quality of the groundwater resource.

In order to maximize quantity and quality, development within recharge zones should be carefully managed and limited where necessary. All open space land uses which do not require impermeable surfaces, compact soils, or generate significant pollution are acceptable. Natural areas, passive recreation, and grazing of farm animals are appropriate uses for recharge areas. Row crop production may be considered, but is not the best use because of pesticide use and because it tends to reduce soil permeability.

To best preserve areas with the highest potential for recharge, they should be acquired by a governmental body or encumbered by restrictive easements wherever possible. If a high priority recharge area cannot be acquired and development is proposed, it should be evaluated by the following guidelines:

1. Maximum of 10 percent coverage by impermeable surfaces.

2. Prohibit uses which involve storage or use of substances that could contaminate groundwater (gasoline, road salt, chemicals, pesticides, landfills, etc...).

3. Locate development on less sensitive parts of site by means of clustering or similar methods.

4. Design storm water transmission and control facilities to maximize filtering of pollutants and to provide for natural habitats and groundwater recharge.

5. Provide public sanitary sewers in lieu of conventional septic systems.

Currently, the State of Illinois imposes a 200 to 400 ft. setback zone around water wells. Certain uses with high potential for contamination, such as storage of volatile organic chemicals, are prohibited within this setback zone. The State has recommended that St. Charles increase the setback zone to 1,000 feet because of local geological conditions, to ensure protection of its wells.

B. Drainage, Stormwater Control and Flooding

A drainage area is that area from which surface runoff from precipitation flows into a particular segment of a river or stream. A drainage area or drainage basin is said to be tributary to the river or stream. The Fox River, Ferson Creek, Mill Creek, Brewster Creek and Norton Creek are the major drainage streams. (See Map 6).

The pre-settlement landscapes of prairies and woodlands absorbed precipitation and slowed runoff very efficiently. They were so effective that the river systems of the region, including the Fox River, were of significantly different character than they are today. Instead of channels with year-round flow and open water, the earliest observers reported that today's rivers included slow-flowing areas nearly obscured by wetland vegetation. With settlement came cultivation, which included draining wet areas and plowing up the prairie to plant row crops. These changes caused the rate of runoff to increase significantly, resulting in more channelized streams and rivers that had to carry a much higher peak flow.

Development of a City brings buildings, roads, and other hard surfaces that further decrease absorption and increase the rate of stormwater runoff. Historically, as development occurred drainage was designed to carry stormwater to the receiving stream as quickly as possible. This meant that streams and rivers received the peak of stormwater runoff even more quickly than under agricultural development. These methods produced flooding in developing areas, which led to a reexamination of drainage design.

In the last three decades, stormwater drainage design has incorporated new goals and techniques that attempt to slow runoff so that it does not exceed the capacity of the receiving stream. Detention basins and ponds are used to temporarily hold water, which is then released at a controlled rate to the receiving pipe or stream.

Drainage systems are designed to handle the 100-year storm or design event, which has a 1 in 100 chance of occurring in a given year, without exceeding the carrying capacity of the receiving stream. Under certain conditions, however, such as rainfall greater than the 100 year event, snow melt, and saturated soils, rivers and streams may overflow their

banks and cause considerable damage. One of the best ways to prevent losses from flood damage is to protect floodplains from development. Locating development in the floodplain exposes buildings, streets and utilities to extensive and expensive flood damage, and exposes the resident population to significant risks to health and safety during floods.

Because floodplains are associated with water features, they can satisfy some outdoor recreation and education needs. Many active and passive recreational uses are compatible with floodplains, particularly for activities not requiring structures or facilities which would be vulnerable to flood damage. Another secondary or supplemental function of floodplains is to provide wildlife habitat. Since floodplains are associated with lakes and streams, they include the land-water edge, which is particularly important in satisfying the food, water and habitat needs of a wide variety of land and water-based wildlife. In addition, floodplains are geographically continuous, and this continuity is extremely important in enhancing the value of open space for wildlife habitat.

Floodplains also provide secondary or supplemental functions by enhancing scenic beauty and shaping urban form. While floodplains themselves are scenic, they also provide buffers between adjacent communities or land uses, and provide logical boundaries for urban growth. (See Map 6).

In addition to attempting to control the quantity of stormwater runoff, careful attention should be paid to improving its quality. "Nonpoint" source surface water runoff is a major source of pollution, and urban stormwater runoff is part of the problem. Detention and retention basins and ponds can be designed to promote settling of stormwater pollutants to improve water quality. Natural plantings also can be used to enhance aesthetics and to further attenuate pollutants.

C. Rivers, Streams and Wetlands

The primary surface water environments of the St. Charles area are rivers, streams and wetlands. St. Charles' landscape is dominated by the Fox River and its valley; several smaller streams feed into it and give different parts of the community different identities. The remaining wetlands in the area are but a fraction of what once was, but still are important.

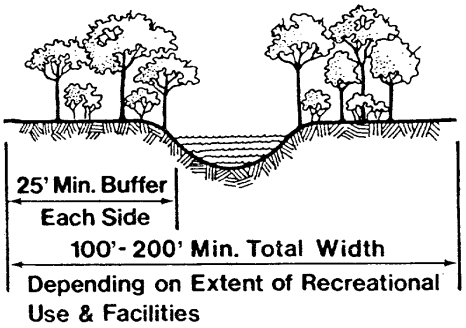
One of the most critical areas of rivers and streams is the shorelands, the strip of land adjoining the waterway. Natural shorelands help to control pollution by allowing vegetation to filter contaminants from surface runoff before it enters the stream, and by stabilizing the streambank. This is particularly important in urban areas, where development has increased pollutant levels in runoff and stream flows. They also provide area for lateral shifting of the streambed or channel over time. Replacing the natural streambed with concrete or metal channels is not compatible with the need to slow runoff

and filter pollutants, and is not aesthetically appropriate in most settings.

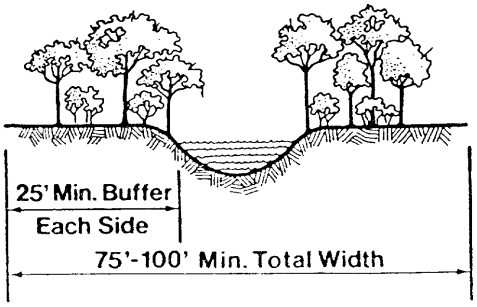
Shorelands along streams and drainageways enhance scenic beauty by preserving views of these water bodies and by providing areas for woodlands or wetlands. Shorelands along small intermittent streams can help to define and separate adjacent land uses, shape urban form and provide boundaries for urban growth. Shorelands along larger streams are partially protected by flood plain regulations, but the shorelands along the smaller streams are not. These fragile areas could be protected by establishing shoreland buffer strips. Figure 6-2 contains recommended buffer strip dimensions for smaller drainageways and intermittent streams.

FIGURE 6-2
SHORELAND BUFFER STRIPS

With Public Access For Recreation:



Without Recreational Access:

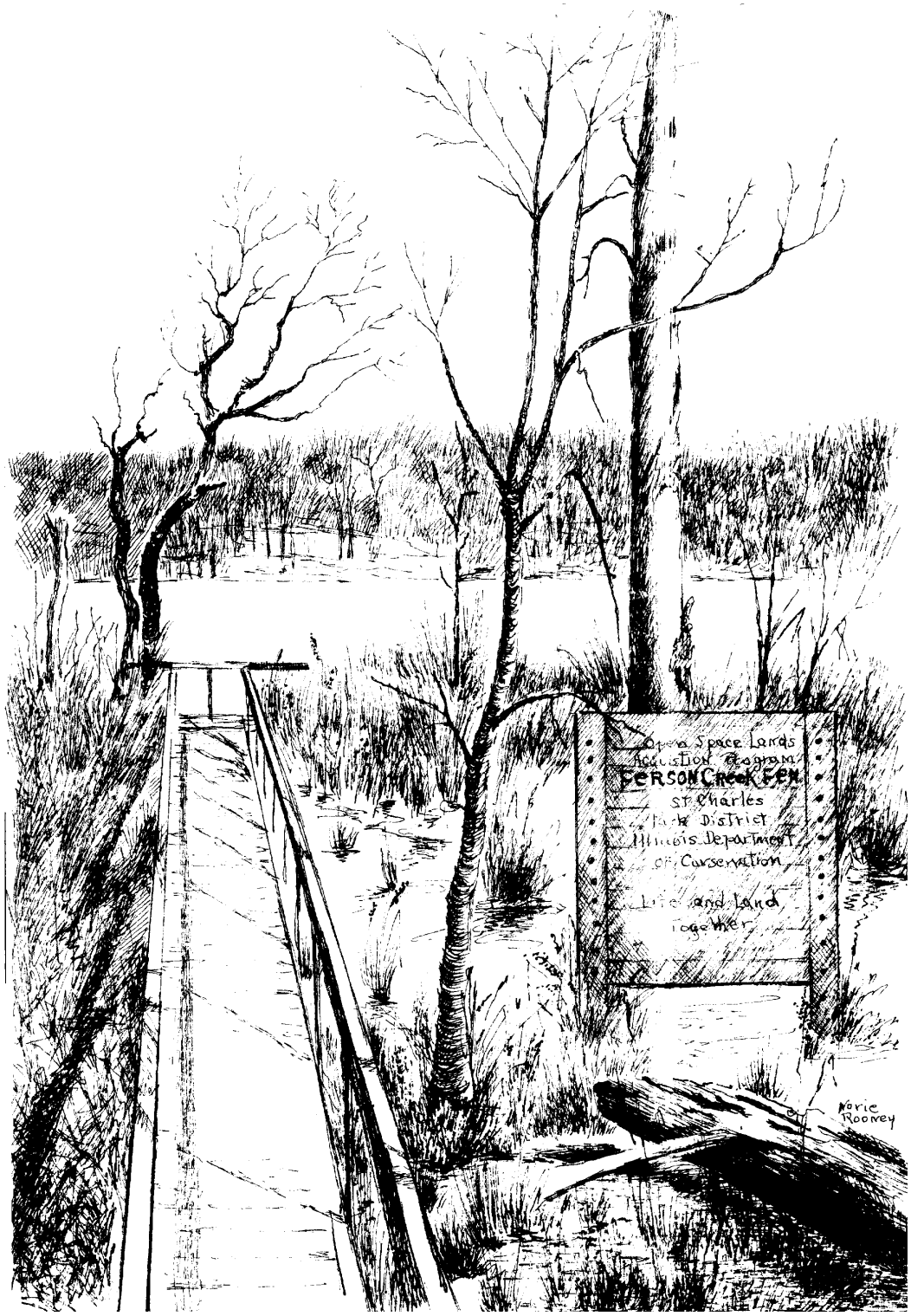


Wetlands are particularly fragile and important natural resources which contribute to the hydrologic cycle and provide open space. Wetlands are defined by the presence of three elements: plants that grow in wet conditions, soils that are formed in wet conditions, and periodic inundation. They can help maintain stream flows during dry weather conditions and, like shorelands, remove pollutants from stormwater runoff. They can provide temporary storage of runoff, which reduces flood damage and maintains hydrologic balance between ground and surface waters.

Wetlands are perhaps the most important resource feature in providing wildlife habitat, since they support a wide variety of living organisms. They are critical to supplying food, water, nesting and breeding habitat for wildlife. A secondary or supplemental function of wetlands is to provide outdoor recreation and educational opportunities such as nature study. They are, however, fragile resources which are generally unsuited to intensive recreational use.

Avoiding construction and development in wetlands protects public health, safety and property, because these areas are often subject to flooding and exhibit unstable and compressible soils.

Map 7 presents wetland areas as identified by the National Wetlands Inventory Map. Although this map can be used as a guide to areas with larger wetlands, site-specific investigations are required to determine the presence and extent of wetlands on a specific site. The Army Corps of Engineers is the wetlands regulatory agency and should be consulted in any matters concerning wetlands. Some communities have enacted their own wetland protection ordinances, to preserve this valuable resource.


Open Space Lands
Acquisition Program
FERSON Creek FEN
St Charles
Park District
Illinois Department
of Conservation
Life and Land
together
Marie
Rooney

III. GOALS AND OBJECTIVES

A. To restore, protect and enhance the groundwaters of the St. Charles region, as a natural and public resource.

1. Adopt 1000 ft. setback zones between wells and potential contamination sources or routes.

2. Regulate and manage development to minimize impact on recharge capacity.

3. Adopt development guidelines for recharge areas.

B. Minimize the social and physical impact of flooding.

1. Continue to enforce the City's flood damage prevention ordinances, which restrict development within flood plain and floodway areas.

C. Manage storm water runoff and maintain natural runoff conveyance networks to minimize the need for storm sewer construction and drainageway modification.

1. Continue the enforcement of the City's storm water management ordinances.

2. Develop and adopt a regional approach to storm water management based on drainage areas.

3. Develop and implement design standards to promote enhanced water quality from stormwater runoff through detention basin design and other methods.

4. Develop and adopt a plan to preserve shoreland buffer strips.

D. Control water pollution and maintain storm and flood water capacity by wetland preservation.

1. Within the bounds of statutory authority, develop and adopt a wetland protection ordinance.

IV. IMPLEMENTATION STATEMENT

It is no longer possible to cling to the traditional view that land and water are abundant raw materials that can be exploited for development without limitations. Comprehensive planning must not focus on land use and physical design alone nor on nature itself, but rather on seeking a harmonious balance between human settlement and the natural environment.

Nowhere is this balance more fragile than the hydrologic cycle and our use of the water resource. Areas that are sensitive or vulnerable to development act as land use planning constraints that must be respected. These constraints can mean restricted or no development in certain areas.

Combining the regulatory requirements applicable to groundwater protection, wetland protection, flood plains, and soils may provide a basic level of protection, but the community will need to coordinate these and move beyond them to achieve harmony between development and nature's water resource.