CHAPTER 5
Agriculture, Natural and Cultural Resources

Section 5.1 Climate

Bureau County is cold in winter. In summer it generally is hot but has occasional cool spells. Precipitation falls as snow during frequent snowstorms in winter and chiefly as rain showers, which often are heavy, during the warmer periods when warm moist air moves in from the south. The amount of annual rainfall usually is adequate for corn, soybeans, and small grain crops.

In winter, the average temperature is 27 degrees F and the average daily minimum temperature is 18.4 degrees. The lowest temperature on record, which occurred at Ottawa on January 28, 1963, is -21 degrees. In summer, the average temperature is 74 degrees and the average daily maximum temperature is 85.1 degrees. The highest recorded temperature, which occurred at Ottawa on July 1, 1956, is 102 degrees.

Growing degree days are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 34.79 inches. Of this, 22.73 inches, or about 65 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 8.77 inches at Ottawa on July 14, 1958. Tornadoes and severe thunderstorms strike occasionally. They are of local extent and short duration, and they cause only sparse damage in narrow belts. Hailstorms sometimes occur during the warmer periods in scattered small areas.

The average seasonal snowfall is 28 inches. The greatest snow depth at any one time during the period of record was 28 inches. On the average, 44 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

Section 5.2 Land Cover

Land cover is the physical material at the surface of the earth. Land covers include grass, asphalt, trees, bare ground, water, etc. There are two primary methods for capturing information on land cover: field survey and through analysis of remotely sensed imagery. Land cover is distinct from land use despite the two terms often being used interchangeably. Land use is a description of how people *utilize* the land and socio-economic activity - urban and agricultural land uses are two of the most commonly recognized high-level classes of use. Chapter 8 Land Use analyzes the County's land use.

The predominant land cover in Bureau County is crop land. In 2012, approximately 82.7% of the County was in some form of agricultural crop production. The following Table 5.1 details the land cover characteristics of the County. The County's land cover is graphically depicted in the map titled *Map 5.1: Land Cover, Bureau County, Illinois* found in Appendix I Maps.

Table 5.1 Land Cover of Bureau County, Illinois

Land Cover Category	Area (Ac.)	Area (Sq. Mi.)	% of Area
Corn	306,384.9	478.7	54.8
Soybeans	117,522.2	183.6	21.0
Deciduous Forest	51,178.1	80.0	9.2
Pasture/Hay	33,597.8	52.5	6.0
Developed/Open Space	21,705.7	33.9	3.9
Developed/Low Intensity	11,161.1	17.4	2.0
Open Water	4,425.4	6.9	0.8
Woody Wetlands	4,016.9	6.3	0.7
Developed/Medium Intensity	2,650.1	4.1	0.5
Alfalfa	1,575.4	2.5	0.3
Winter Wheat	1,517.8	2.4	0.3
Grassland Herbaceous	947.6	1.5	0.2
Developed/High Intensity	651.2	1.0	0.1
Herbaceous Wetlands	403.9	0.6	0.1
Barren	274.0	0.4	0.0
Double Crop Winter Wheat/Soybeans	225.3	0.4	0.0
Sweet Corn	223.3	0.3	0.0
Peas	135.2	0.2	0.0
Oats	100.5	0.2	0.0
Walnuts	54.7	0.1	0.0
Other Hay/Non-Alfalfa	35.1	0.1	0.0
Double Crop Barley/Soybeans	27.4	0.0	0.0
Potatoes	15.8	0.0	0.0
Fallow/Idle Cropland	12.2	0.0	0.0
Sod/Grass Seed	10.0	0.0	0.0
Other Crops	6.2	0.0	0.0
Rye	3.6	0.0	0.0
Pumpkins	2.9	0.0	0.0
Shrubland	2.2	0.0	0.0

Dry Beans	0.9	0.0	0.0
Evergreen Forest	0.4	0.0	0.0
Vetch	0.4	0.0	0.0
Double Crop Winter Wheat/Corn	0.2	0.0	0.0
Double Crop Soybeans/Oats	0.2	0.0	0.0
Cabbage	0.2	0.0	0.0
Total	**558,868.8**	**873.2**	**100.0**

Source: National Agricultural Statistics Service, 2012 Cropland Data Layer

Section 5.3 Agricultural Resources

The economic activity of agriculture has some very specific land use requirements, depending on the type of farming. The growing of crops for profit necessitates relatively large, contiguous parcels, the slope of which should not be excessive and the soils, fertile and well drained. This is particularly true of grains and soybeans. Other types of agricultural pursuits, such as feed lots, garden farms, and dairies generally demand increased labor and less land to be profitable. Generally, agricultural units are limited to the physical characteristics of the land and are relatively flexible with respect to location. This is in marked contrast to other economic activities where the location of the activity with respect to others is a very important part of their economic framework.

Nearly 83% of the County's land area is in agricultural crop production. Grain farming, hay farming and livestock production are the predominant agricultural activities in Bureau County. Agriculture has always been the major industry in Bureau County. The county has a high percentage of productive soils, good transportation facilities, nearby markets, and a favorable climate.

In 2007, the county had 1,189 farms that made up 478,389 acres; the average farm size was 402 acres (2007 Census of Agriculture). Corn and soybeans are the major crops. In 2010, 306,000 acres of corn were harvested, and 119,600 acres of soybeans were harvested (Illinois Agricultural Statistics Service). Livestock is also an important component of the agricultural industry in Bureau County. As of December 1, 2010, there were 90,000 head of hogs and pigs in Bureau County; as of January 1, 2011 there were 12,400 head of cattle and calves in Bureau County (Illinois Agricultural Statistics Service, 2011).

Bureau County has two designated Agricultural Areas established by the Bureau County Board pursuant to the *Agricultural Areas Conservation and Protection Act* (505 ILCS 5/1). These Agricultural Areas encompass 4,374 acres. No land within and established Agricultural Area can be used for other than agricultural production, although a dwelling may be built on land in an Agricultural Area provided the resident of the dwelling is actively involved with the farming operation (i.e. farm owner, operator, tenant, and seasonal or year-round hired workers).

Bureau County is one of the top agricultural producing counties in the State (102 counties). Following are listed several of the more noteworthy state ranking for Bureau County from 2010 according to the Illinois Department of Agriculture:

- 5th in the State for acres corn production.
- 7th in the State for cash crops receipts.
- 7th in the State for total (crops and livestock) cash receipts.
- 11th in the State for number of head of hogs and pigs.
- 17th in the State for soybean production.
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Other Bureau County agricultural items and trends of note (Source: 1997 and 2002 U.S. Census of Agriculture):

- The number of farms increased 9% between 2002 and 2007 from 1,091 farms to 1,189 farms.
- The amount of land in farms decreased 3% between 2002 and 2007 from 491,180 acres to 478,389 acres.
- The average farm size decreased 11% between 2002 and 2007 from 450 acres to 402 acres.
- The market value of agricultural products sold increased 49% between 2002 and 2007 from $203,923,000 to $303,358,000.
- The market value of agricultural products sold (based on average per farm) increased 36% between 2002 and 2007 from $186,914 to $255,137.
- Government payments increase 6% between 2002 and 2007 from $9,463,000 to $10,029,000.
- Government payments based on average per farm receiving payments decreased 13% between 2002 and 2007 from $11,903 to $10,340.
- The average age of principal farm operators increased 2.9% between 2002 and 2007 from 54.9 years to 56.5 years.
- In 2007, 55.5% of principal farm operators indicated farming as their primary occupation compared to 74.9% in 2002.
- The number of female principal farm operators increased from 52 (4.8%) in 2002 to 114 (9.6%) in 2007.

Section 5.4 Natural Resources

This section will describe the existing conditions of natural resources in Bureau County. Natural resources include: geology and mineral resources, soils, groundwater and water supply, surface water, wetlands and floodplains, natural areas and open space, vegetation and wildlife.

A. Topography and Physiography

The topography of Bureau County is mostly flat to rolling, and is the result of the actions of several glacial advances that crossed the County during the Pleistocene Epoch, erosional processes, and irregularities in the bedrock surface, which have influenced the total drift thickness (see Appendix I Maps, *Map 5.2 Shaded Relief, Bureau County, Illinois*). The lowest elevation in the County is approximately 450 feet above mean sea level (MSL) where the Illinois River exits Bureau County; the highest elevation in the County is approximately 950 feet MSL on an unnamed hilltop on the Providence Moraine in Sections 33 and 34 of Indiantown Township. Total relief in the County is approximately 500 feet, and the average slope is 1.23%.

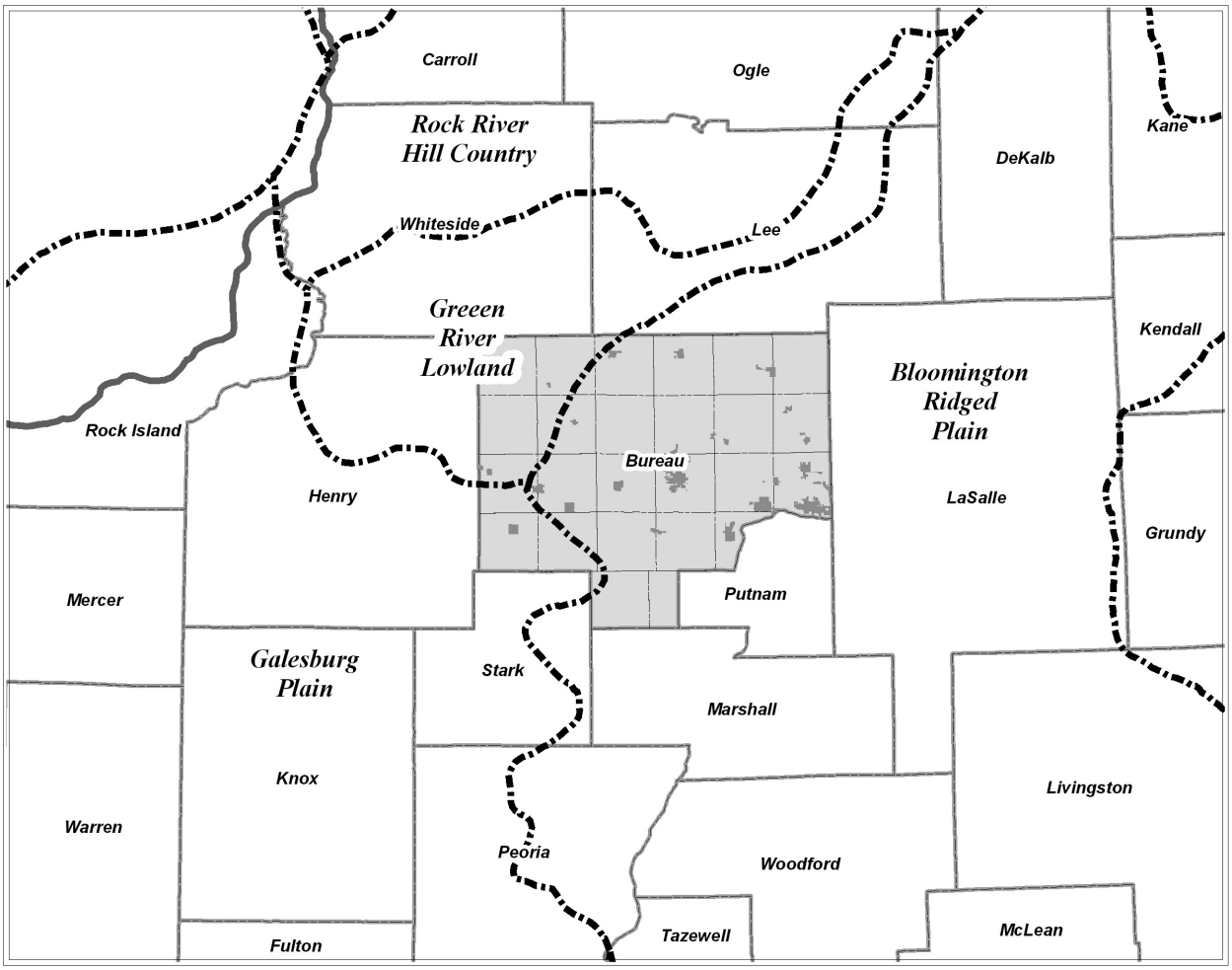
The northwestern part of Bureau County is a nearly level outwash plain with prominent sand dunes. It is drained by the Green River. The eastern part is a till plain with low, broad ridges. The central and southeastern parts are a rolling till plain that is drained by Bureau Creek and the Illinois River. The southwestern part of the county is an older (Illinoian) dissected till plain.

The two glacial ages of particular importance to the physiographic development of Bureau County were the Illinois Episode and the more recent Wisconsin Episode, which ended approximately 10,000 years ago. The most recent Wisconsin Episode and its deposits of sand and gravel materials is characterized by concentric bands of moraines that were deposited during the retreat of glacial ice lobes that formed Lakes Michigan and Erie. These moraines are a dominant landform in the Bureau County. The glacial deposits range from 50- to 500-ft thick and are thickest in buried bedrock valleys. The thick, sand and gravel deposits in the Ancient Mississippi and Rock River Bedrock Valleys are major aquifers for public water supply in central Illinois. See Appendix I Maps, *Map 5.3 Moraines, Bureau County, Illinois*.

Bureau County is divided into three distinct physiographic regions (see Figure 5.1). Much of the County is located in the Bloomington Ridged Plain of the Till Plains Section of the Central Lowlands Province. The Central Lowlands Province is principally the State of Illinois. This area is characterized by its rolling hills, thin glacial drift and narrow valleys. The Bloomington Ridged Plan physiographic region is characterized by its low, broad morainic ridges, flat to gently rolling ground moraine and thick glacial drift. The northwestern portion of the County is located within the Green River Lowland of the Till Plains Section of the Central Lowland Province, which is best

known for its low, poorly drained soils. The southwestern corner of the County is located within the Galesburg Plain of the Till Plains Section of the Central Lowland Province, which was developed by Illinoian glaciers about 250,000 years ago. Since that time, the area has been eroded and covered by windblown silt. Prior to glaciation, an extensive system of valleys had become deeply entrenched into the bedrock surface.

Figure 5.1: Physiographic Divisions



Source: Illinois State Geological Survey

B. Geology and Mineral Resources

1. Bedrock Topography/Drift Thickness

During the long interval between deposition of the bedrock formations (about 440-490 million years ago [mya]) and the advance of continental ice sheets across North America (about 1 mya), streams dissected and removed younger rocks, creating an integrated pre-glacial drainage network on the bedrock surface. By early glacial time this erosion had carved most of the major topographic features of the present bedrock surface. Subsequent scouring by glacial ice and erosion by glacial meltwater and modern streams and rivers further eroded the bedrock surface. The amount of glacial deposition, the amount of subsequent erosion of these deposits, and the many irregularities in the bedrock surface are the important factors controlling the total drift thickness (glacial deposits) in Bureau County.

The most pronounced bedrock topographic features in Bureau County are the Ancient Mississippi and Rock River Bedrock Valleys. The Mississippi bedrock valley generally trends southeast-northwest through the County, and the Rock bedrock valley generally trends southwest-northeast through north central and northeastern portion of the County, intersecting the Mississippi bedrock valley in the central part of the County. The thalweg (lowest point) of the Mississippi and Rock bedrock valley ranges from 400 to 500 feet elevation in the central and northeast portions of the County, and the Mississippi bedrock valley ranges from 300 to 400 feet in the western portions of the County. Drift thickness in upland areas of Bureau County ranges from 100 to 200 feet, and is found at depths of less than 25 feet in the southwestern portions of the County, and the southeastern portions of the County along the Illinois River. See Appendix I Maps, *Map 5.4 Drift Thickness and Bedrock Topography, Bureau County, Illinois*.

2. Bedrock Geology

Beneath the glacial deposits that cover the surface of the County, the upper bedrock formations range in geologic age from Ordovician (oldest) to Pennsylvanian (youngest). The Ordovician geologic units consist largely of dolomite and limestone, but contain sandstone, shale and siltstone formations. The Silurian Unit consists principally of dolomite and limestone. The Pennsylvanian Units consist largely of shale and sandstone with beds of coal, limestone and clay. See Appendix I Maps, *Map 5.5 Geologic Units, Bureau County, Illinois*.

3. Quaternary Geology

Sand and gravel deposits are widespread in northwestern Bureau County along the southern edge of the Green River Lowland and scattered throughout the rest of the county. These deposits are largely the direct or indirect result of glacial processes. There are two basic types of sand and gravel deposits: outwash, which is composed of poorly sorted sand and gravel from 10 to 50 feet thick and up to 200 feet in some locations, and sand dunes formed by the wind. The dune deposits range in thickness from 20 to 60 feet and constitute a smaller aggregate resource than the outwash deposits. Sand dunes are prominent landforms in this county. They were deposited on outwash plains, moraines, and stream terraces.

Outwash deposits provide an abundant source of sand and gravel for the aggregate industry, and dune sand also is highly valued by industry, mostly for use in foundries for making high-quality metal castings. The modal particle size of the dune sand of the Green River Lowland is around 250 μm (sieve 60), which is the perfect size for application as foundry sand. In addition, dune sand is also very well sorted, making it ideal for application in the foundry industry. (Source: Illinois State Geological Survey)

See Appendix I Maps, *Map 5.6 Distribution of Surficial Eolian and Outwash Sand Deposits, Bureau County, Illinois* published by the Illinois State Geological Survey.

C. Soils

Soil is a natural body comprised of solids (minerals and organic matter), liquid, and gases that occurs on the land surface, occupies space, and is characterized by one or both of the following: horizons, or layers, that are distinguishable from the initial material as a result of additions, losses, transfers, and transformations of energy and matter or the ability to support rooted plants in a natural environment. The upper limit of soil is the boundary between soil and air, shallow water, live plants, or plant materials that have not begun to decompose. Areas are not considered to have soil if the surface is permanently covered by water too deep (typically more than 2.5 meters) for the growth of rooted plants. The lower boundary that separates soil from the non-soil underneath is most difficult to define. Soil consists of horizons near the earth's surface that, in contrast to the underlying parent material, have been altered by the interactions of climate, relief, and living organisms over time. Commonly, soil grades at its lower boundary to hard rock or to earthy materials virtually devoid of animals, roots, or other marks of biological activity. For purposes of classification, the lower boundary of soil is arbitrarily set at 200 cm (From *Soil Taxonomy*, second edition).

Soil-forming processes act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the parent material, the plant and animal life on and in the soil, the climate, the relief, and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors in soil formation. They act on the weathering of rocks, slowly changing it into a natural body that has genetically related horizons. The material weathered from rocks may have been relocated by water, glaciers, or the wind. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil. Usually, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the others.

Parent material is the unconsolidated geologic material in which a soil forms. It determines the chemical and mineralogical composition of the soil. Most of the parent material in Bureau County was deposited by wind, glaciers, or glacial meltwater. In some areas the material was reworked and redeposited by the subsequent actions of water and wind. Although all of the parent material in the county is of common glacial origin, its properties vary greatly, sometimes within small areas, depending on how the material was deposited. The soils in the county formed dominantly in loess, glacial till, outwash deposits, dune sand, alluvium, organic material, and bedrock residuum.

Loess is the major kind of parent material in the county. It ranges from about 8 to 20 feet in thickness on the nearly level uplands. The Mississippi River Valley was the main source of the loess, but the valley of the Rock River and the lowlands along the Green River also were important sources.

Glacial till is material that was laid down directly by glaciers with a minimum of water action. It was deposited in Bureau County during the Illinoian and Wisconsinan glacial periods. The most recent glacier, of Wisconsinan age, receded from the survey area about 14, 000 years ago. Wisconsinan glacial drift forms a series of morainic belts that occur as north-south trending ridges in the central and eastern parts of the county. The drift was deposited by glaciers from the north. It was later mantled by loess throughout the county. It includes reddish brown, Tiskilwa drift, which is dominantly west of Bureau Creek and brown Malden drift, which is east of Bureau Creek.

Illinoian glacial drift is deposited on a till plain in the southwestern part of the county. In many places it has a paleosol, or relict buried soil. It includes dark greenish Radnor drift and brown Lee Center drift. The Lee Center drift was previously thought to be Wisconsinan but is now considered to be Illinoian because in some areas it has a paleosol.

Outwash material was deposited by glacial meltwater carrying great loads of sediment. This material generally occurs as strata of differing particle sizes. The size of the particles in individual strata ranges from clay to gravel, depending on the velocity of the stream that carried the material. The coarse particles, such as gravel and sand, were deposited as the water slowed down. The finer particles, such as very fine sand, silt and clay, were deposited in much more slowly moving or standing water.

Sand dunes formed when the wind sorted the finer particles from the coarser particles on outwash plains that dried up as the amount of glacial meltwater diminished. The dunes are most extensive in the northwestern part of the county. Some have migrated onto the morainal hills to the east and some onto terraces along the major streams.

Alluvium is material that was recently deposited by floodwater along streams. It varies in texture, depending on the velocity of the floodwater.

Organic deposits, such as muck and peat, are made up of plant remains that accumulated in wet depressions on outwash plains, flood plains, and till plains after glaciers withdrew. In many areas these deposits have underlying layers of sedimentary peat and marl. In some areas they are interbedded. Marl is mostly mineral material that is low in content of organic matter and high in content of calcium carbonate. It formed during an open-water state of bog development that preceded the period when decaying plant vegetation filled the bog.

Some of the soils in the county formed in material weathered from shale bedrock. The shale residuum is mantled by loess.
Plants have been the principle organisms influencing the formation of soils in the county. Bacteria, actinomycetes, fungi, algae, protozoa, earthworms, insects, and human activities also have been important. The chief contribution of plant and animal life to soil formation is the addition of organic material and nitrogen to the soil. The amount and kind of organic matter on and in the soil depend on the kink of native plants that grew on the soil. The native vegetation in the county was dominantly prairie grasses and hardwood trees. As the grasses died and decomposed, many fine, fibrous roots added large amounts of organic matter to the soils. The soils that formed under grasses have a thick, black or dark brown surface layer. In contrast, soils that formed under deciduous trees have a thinner, lighter colored surface layer because the source of their organic matter is mainly leaf litter on the surface.

Bacteria, fungi, and other micro-organisms help to break down organic matter and thus provide nutrients that can be used by plants and other soil organisms. The stability of sod aggregates, which are structural units made up of sand, silt, and clay, is affected by microbial activity because cellular excretions from these organisms help to bind soil particles together. Stable aggregates help to maintain soil porosity and promote favorable relationships among soil, water, and air. Earthworms, crayfish, insects, and large burrowing animals tend to incorporate organic matter into the soils and help to keep the soils open and porous. Human activities, such as clearing forests, cultivating, and applying fertilizer, also affect soil formation.

Climate is an important factor in the formation of soils. It influences the kind of plant and animal life on and in the soil. Precipitation affects the weathering of minerals and the transporting of soil material. Temperature determines the rate of chemical reaction that occurs in the soil. The general climate has had an important overall influence on the characteristics of the soils, but it does not cause major differences among soils in a relatively small area, such as a county.

Relief has markedly affected the soils in the county through its influence on natural drainage, runoff, erosion, plant cover, and soil temperature. Slopes in the county range from 0 to 60 percent. Natural drainage ranges from excessively drained on sandy ridgtetops to very poorly drained in depressions. Through its affect on aeration of the soil, drainage determines the color of the soil. Runoff is most rapid on the steeper slopes. It is temporarily ponded in low areas. Water and air move freely through well drained soils but slowly through very poorly drained soils. Relief greatly affects the rate of soil erosion. This rate increases as the length and gradient of slopes increase.

Time, usually several thousand years, is necessary for the development of distinct horizons in the soil. Differences in length of time that the parent material has been in place are commonly reflected in the degree of profile development. In a given period of time, however, some soils form rapidly and others form slowly. The length of time necessary for a soil to form is influenced by the other factors of soil formation. In general, soils form more rapidly in the more permeable material containing easily weatherable mineral with a low content of calcium carbonate than in slowly permeable material that has a high content of calcium carbonate. Soil formation is more rapid under forest vegetation than under prairie vegetation because the water entering the soils under forest vegetation is more acid and is more effective in leaching soluble bases. Soil formation is slower in strongly sloping areas because less water infiltrates the soil and the resulting runoff increases the extent of natural erosion of the surface layer. Soils that form in nearly level areas accumulate water from the adjacent slopes. The additional water results in more rapid leaching of soluble compounds and thus more rapid soil formation.

75.6% of the soil types identified in Bureau County (approximately 422,804.7 acres) are classified as being “prime farmland” (including drainage-qualified and flooding-qualified prime farmland); 15.0% (approximately 83,731.5 acres) are classified as “farmland of statewide importance”. The remaining soils are classified as “not prime farmland”, “other land”, “water” or “wetland”. "Prime farmland" is of major importance in meeting the Nation's

short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland. See Appendix I Maps, *Map 5.7 Farmland Classification of Soils, Bureau County, Illinois*.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

For some of the soils identified in the table as prime farmland, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. A recent trend in land use in some areas has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

In some areas, land that does not meet the criteria for prime or unique farmland is considered to be "farmland of statewide importance" for the production of food, feed, fiber, forage, and oilseed crops. The criteria for defining and delineating farmland of statewide importance are determined by the appropriate State agencies. Generally, this land includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some areas may produce as high a yield as prime farmland if conditions are favorable.

The United States Department of Agriculture, Natural Resources Conservation Service (in cooperation with other Federal, State and local agencies), has prepared a soil survey for Bureau County. Soil surveys contain information that affects land use planning in the soil survey areas. They include predictions of soil behavior for selected land uses. The survey highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

Soil surveys are designed for many different users. Farmers, foresters, and agronomists can use the surveys to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the surveys to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations. These and many other soil properties that affect land use are described in the Bureau County Soil Survey. The location of each soil is shown on the detailed soil maps found in the Bureau County Soil Survey. Each soil in the survey area is described, and information on specific uses is given. The published soil survey consists of a manuscript and a set of soil maps.

D. Groundwater and Water Supply

An aquifer is a geologic unit that contains and transmits groundwater to wells and springs in quantities sufficient to warrant economic development. Both yield and quality considerations are important in determining what might be construed as an aquifer. For example, a geologic deposit that is a fine source of water for a rural household may be inadequate for a community or industrial user. The groundwater within some of these aquifers is derived from precipitation that infiltrates the land surface and percolates downward. On its way through the unsaturated zone, much of the infiltration is returned to the surface by natural processes: evaporation and vegetative transpiration. Below a certain depth, however, all the pores between the grains of earth are filled. The level defined by this saturated condition is called the water table. In most cases, its configuration is similar to the land's topography. Usually the water table occurs just a few feet below land surface throughout most of Illinois. When the water table intercepts depressions in the land, it occurs as surface water in ponds and lakes.

Geologists and well drillers studying the subsurface of the upper Midwest frequently think of two types of materials: consolidated and unconsolidated. Consolidated materials are those easily recognizable sedimentary rock types called bedrock. According to geologists, the bedrock of Illinois dates to the Paleozoic Era. These rocks originally were deposited in oceans as unconsolidated sediments. Their once soft clay deposits have hardened and been compacted into shale; the sand grains have been cemented together to form sandstone; and the lime, precipitated in deeper seas, has recrystallized into limestone. Overlying the bedrock are unconsolidated materials of silt, sand, and clay. These materials were often deposited during the Ice Age, and some may predate the Quaternary Period of the Cenozoic Era. Others postdating the Ice Age are currently being deposited as modern alluvium.

Groundwater is generally plentiful and of good quality in Bureau County and the surrounding area. Both the bedrock and the unconsolidated material that lies above the bedrock throughout Bureau County are excellent aquifers and sources of groundwater that serve the needs of agriculture, business, industry and domestic users throughout the County. A report prepared by the Illinois State Water Survey and issued in 2004 titled “Groundwater Conditions of the Principal Aquifers of Lee, Whiteside, Bureau, and Henry Counties, Illinois” found “No significant, regional water quality problems...”.

Groundwater quality is a high priority in Illinois. Water quality degradation or contamination resulting from point and nonpoint sources throughout the state is of primary concern. In many industrialized parts of the state (including the metropolitan areas of Chicago, Rockford, and East St. Louis) groundwater in glacial deposits and bedrock aquifers has been degraded by improperly contained or disposed of chemicals. In some agricultural areas, the quality of groundwater in the underlying shallow aquifers has been degraded by the routine application of agricultural chemicals.

The Illinois Environmental Protection Agency (IL EPA) has designed and implemented a “probabilistic monitoring network” of community water supply wells (CWS) in the State of Illinois. The goal of the network is to represent contamination levels in the population of all active CWS wells. This probabilistic network is designed to provide an overview of the groundwater conditions in the CWS wells; provide an overview of the groundwater conditions in the principle aquifers (e.g., sand and gravel, Silurian, Cambrian-Ordovician, etc.,); establish baselines of water quality within the principle aquifers; identify trends in groundwater quality in the principle aquifers; and evaluate the long-term effectiveness of the Illinois Groundwater Protection Act, Clean Water Act and Safe Drinking Water Act program activities in protecting groundwater in Illinois. Of the 354 wells in the IL EPA’s probabilistic monitoring network, six (6) are located in Bureau County.

Assessment of overall groundwater use support is based upon application of Illinois’ Ground Water Quality Standards (including non-degradation standards) to water quality sample measurements from the probabilistic network of CWS wells. Generally, a detection of an organic contaminant above the laboratory practical quantification limit or the detection of an inorganic constituent above the naturally occurring background level in a CWS well is considered a cause of less than full use support. Class I standards include the non-degradation standards. The attainment of use support is described as Full and Nonsupport, as described below:

Full Support:

Good - indicates that no detections occurred in organic chemical monitoring data and inorganic constituents assessed were at or below background levels for the groundwater source being utilized.

Nonsupport:

Fair - indicates that organic chemicals were detected and therefore exceed the non-degradation standard, but measured levels are less than the numerical Class I Ground Water Quality Standards (GWQS), and inorganic constituents assessed were above background level (non-degradation standard) but less than the numerical Class I GWQS.

Poor - indicates that organic chemical monitoring data detections were greater than the Class I GWQS and inorganic chemicals assessed were greater than both the background concentration and Class I GWQS.

According to the Illinois Integrated Water Quality Report and Section 303(d) List - 2012 (Clean Water Act Sections 303(d), 305(b) and 314; Water Resource Assessment Information and Listing of Impaired Waters; Volume II: Groundwater) dated December 20, 2012, of the six (6) Bureau County wells in the IL EPA's probabilistic monitoring network, one (Bureau Junction) was determined to be Not Supporting ("Poor") due to statistically significant increases in chloride (Cl-) above background. The remaining five wells in the probabilistic monitoring network (DePue, Malden, Ohio, Princeton and Van Orin Water Company) were determined to be Fully Supporting ("Good").

For comparison, of the 354 wells in the IL EPA's state-wide probabilistic monitoring network:

- 28 (8%) were determined to be Not Supporting ("Poor") due to the elevated levels of nitrate and VOCs that include trichloroethylene and tetrachloroethylene. All of these wells draw their water from shallow sand and gravel aquifers, except for one, which is using a deep well from the Cambrian/Ordovician bedrock aquifer in the northern part of the state);
- 91 (25%) were determined to be Not Supporting ("Fair") due to statistically significant increases in chloride (Cl-) above background, detections of VOCs, nitrate (total nitrogen) greater than 3 mg/l, but have not exceeded the health-based Groundwater Quality Standards; and
- 235 (67 %) were determined to be Fully Supporting "Good"), which show no detections of any of the above analytes.

The summary and conclusions of the Illinois Integrated Water Quality Report and Section 303(d) List - 2010 are that, "*Illinois groundwater resources are being degraded. Degradation occurs based on the potential or actual diminishment of the beneficial use of the resource. When contaminant levels are detected (caused or allowed) or predicted (threat) to be above concentrations that cannot be removed via ordinary treatment techniques, applied by the owner of a private drinking water system well, potential or actual diminishment occurs. At a minimum, private well treatment techniques consist of chlorination of the raw source water prior to drinking.* "

According to the Illinois Environmental Protection Agency's "Source Water Assessment Program" Bureau County has thirty-two (32) public water supply systems that are "community water supplies". A "community water supply" is a public water supply that serves or is intended to serve at least 15 service connections used by residents or regularly serves at least 25 residents. All of the public (community) water supplies in the County access ground water via wells.

The community water supplies in the County are: Arlington, Buda, Bureau Junction, Cherry, Dalzell, DePue, Dover, Hillview Mobile Home Park, Hollowayville, Kasbeer, LaMoille, Ladd, Malden, Manlius, Mineral, Neponset, New Bedford, Ohio, Princeton, Seatonville, Sheffield, Spring Valley, Tiskilwa, Van Orin Water Company, Walnut and Wyanet.

Approximately 27,010 people in Bureau County, or 73.8% the total County population, receive their domestic water from a public (community) water supply. The remainder of the population is served by private wells.

The Illinois Environmental Protection Act provides minimum protection zones of 200 feet for community wells, which is regulated by IEPA. However, to further minimize the risk to a community's groundwater supply, IEPA recommends that communities consider three additional actions: 1) Enact a "maximum setback zone" ordinance. These ordinances are authorized by the Illinois Environmental Protection Act and allow county and municipal officials the opportunity to provide additional protection up to a fixed distance, normally 1,000 feet from their well; 2) The water supply staff may wish to revisit their contingency planning documents. Contingency planning documents are a primary means to ensure that, through emergency preparedness, a community will minimize their risk of being without safe and adequate water; and, 3) The water supply staff is encouraged to review their cross connection control program to ensure that it remains current and viable. Cross connections to either the water treatment plant (for example, at bulk water loading stations) or in the distribution system may negate all source water protection initiatives provided by the community.

Community drinking water systems are inspected and monitored under the supervision of the Illinois Environmental Protection Agency (IEPA), while non-community drinking water systems are the responsibility of the Illinois Department of Public Health (IDPH). In addition, IDPH reviews water well installation plans, issues permits for new well construction, and inspects wells. However, private water well owners themselves have the primary responsibility to test well water for potential contaminants.

An estimated 26.2% of the population of Bureau County receives its domestic water supply via a private well. Groundwater (the source of fresh water for households with a well) can become contaminated in many ways: through contact with natural pollutants, such as arsenic and radon, and by human activities, such as chemical spills and failing septic systems. The degree to which a potential health threat may exist depends on the amount and type of the contamination. In some cases, contamination of the water can be detected by sight, taste or smell; however, many of the most serious problems can only be detected through laboratory testing of the water.

E. Surface Water

A watershed is defined as the land area that directly drains water, sediment, and other materials to a common stream, river or lake (often considered synonymous with a drainage basin or catchment). Watershed (drainage basin) boundaries follow topographic highs - land elevation, not political borders, defines watershed boundaries. Watersheds are important as the viability of the watershed directly affects the health of the communities within that watershed. Water for human consumption, wildlife, industry and recreation are all impacted by activities that occur within the watershed. The watershed is one of the earliest concepts to evolve from American policies for planning and managing water resources. The identity of a watershed is directly related to the management problems of concern, from large-scale flooding along a major river, such as the Mississippi or Illinois River, to sediment control issues in small reservoirs.

Watersheds may be broken down into smaller and smaller units based on drainage area. For example, a large stream's watershed, such as the Illinois River watershed, may be broken down into smaller watersheds based on the streams that flow into it. In turn, these streams may be broken down into smaller units and so on. Watersheds are categorized (from largest unit to smallest) as regions, subregions, basins, subbasins, watersheds and subwatersheds.

Bureau County is located within the Upper Mississippi Region and both the Rock River and Lower Illinois River Subregions, and is drained by both the Lower Rock River basin and the Lower Illinois River basin. Subbasins of the Rock River basin that are within Bureau County are the Green River and Lower Rock River subbasins; subbasins of the Lower Illinois River basin that are within Bureau County are the Lower Illinois-Senachwine Lake and Spoon River sub-basins (see Appendix I Maps, *Map 5.8 Watershed Sub-Basins, Bureau County, Illinois*).

The local watersheds that drain Bureau County are: Alfords Creek-Illinois River; Big Bureau Creek; Coon Creek; East Bureau Creek; Fox Creek-Spoon River; Little Vermillion River; Main Union Special Ditch-Green River; Mud Creek; Pike Creek-Big Bureau Creek; Scholes Branch-Crow Creek; Senachwine Lake-Illinois River; Walnut Creek-Green River; and, West Bureau Creek (see Appendix I Maps, *Map 5.9 Local Watersheds, Bureau County, Illinois*). There are 42 watershed subbasins within the County.

Bureau County also contains many lakes and ponds, most of which are man-made. The largest named lakes in Bureau County (and their approximate area) are Senachwine Lake (5,450 acres); Lake DePue (approximately 531 acres); Spring Lake (approximately 226 acres); Lake Rawson (134 acres); Hickory Ridge Lake (62 acres); Lake Arispie (40 acres); Lower Spring Lake (22 acres); Clover Leaf Ranch Lake (20 acres); Beaver Glenn Lake (17 acres); and, Bolton Lakes (15 acres). Most lakes and ponds in the County are private, unnamed, less than 10 acres in area and are used for agricultural, recreational or erosion control/sediment management purposes.

Over the years, the quality of some Illinois lakes, rivers, and streams has been impaired by pollutants from a variety of sources. However, since the signing of the federal Clean Water Act (CWA) in 1972, water quality has improved greatly, primarily through regulation of point source discharges. Although great strides have been made in restoring our state waters, there are still degraded lakes, streams, and rivers that need attention. Restoring their quality is crucial in maintaining a healthy environment and ensuring the sustainability of these waters for all to use and enjoy.

The Clean Water Act and USEPA regulations require states to submit a list of water-quality-limited waters still requiring TMDLs, pollutants causing the impairment, and a priority ranking for TMDL development (including waters targeted for TMDL development within the next two years). TMDL is short for Total Maximum Daily Load. It determines the greatest amount of a given pollutant that a water body can receive without violating water quality standards and designated uses. TMDLs set pollution reduction goals that are necessary to improve the quality of impaired waters. A TMDL takes a watershed approach in determining the pollutant load that can be allowed in a given lake or stream. By taking a watershed approach, a TMDL considers all potential sources of pollutants, both point and non-point sources. It also takes into account a margin of safety, which reflects scientific uncertainty and future growth. The effects of seasonal variation are also included. Section 303(d) of the Clean Water Act does not require the inclusion of an Implementation Plan as part of a TMDL. However, Illinois EPA has taken the initiative to include Implementation Plans for every TMDL that is developed.

All pollutant causes of impairment associated with impaired designated uses require TMDL development. USEPA regulations require establishing a priority ranking of 303(d) listed waters for the development of TMDLs that accounts for the severity of pollution and the designated uses. Table 5.2 indicates streams and/or stream segments located within Bureau County that are included on the State's 303(d) list of impaired streams. Of the Bureau County streams on the 303(d) list, the Little Vermillion River has been targeted for TMDL development in the next two years. All other 303(d) streams will have TMDL development initiated at some time within the next thirteen (13) years.

Table 5.2
Stream Quality Data
IEPA Assessed Streams Within Bureau County

Assessment Unit ID	Stream Segment Name	Segment Length (mi.) or Acres	Designated Use	Potential Causes of Impairment
IL_PBJ-04	Mud Creek	28.34	Aquatic life	Unknown
IL_PBJA-04	Coal Creek	4.56	Aquatic life	Unknown
IL_PBM-11	Fairfield Ditch	7.64	Aquatic life	Aldrin, Oxygen, dissolved
IL_PBO-10	Fairfield Union special Ditch	5.65	Aquatic life	Aldrin, sedimentation/siltation
IL_PBP-01	Walnut Special Ditch	4.39	Aquatic life	Aldrin
IL_D-16	Illinois River	24.75	Fish consumption	Mercury, polychlorinated biphenyls

Assessment Unit ID	Stream Segment Name	Segment Length (mi.) or Acres	Designated Use	Potential Causes of Impairment
IL_D-16	Illinois River	24.75	Primary contact (recreation)	Fecal coliform
IL_RDU	Lake DePue	524.00	Aesthetic quality	Phosphorus (total), total suspended solids (TSS)
IL_RDU	Lake DePue	524.00	Aquatic life	Cadmium, endrin, dissolved oxygen, phosphorus (total), sedimentation/siltation, silver, total suspended solids (TSS), zinc
IL_RDU	Lake DePue	524.00	Fish consumption	Mercury, polychlorinated biphenyls
IL_DQ-02	Big Bureau Creek	16.40	Fish consumption	Mercury, polychlorinated biphenyls
IL_DQ-03	Big Bureau Creek	5.40	Fish consumption	Mercury, polychlorinated biphenyls
IL_DQ-03	Big Bureau Creek	5.40	Primary contact (recreation)	Fecal coliform
IL_DQ-05	Big Bureau Creek	37.67	Fish consumption	Mercury, polychlorinated biphenyls
IL_DJO-01	West Fork Spoon River	22.48	Aquatic life	Chloride, sedimentation/siltation
IL_DQA-01	East Bureau Creek	26.76	Aquatic life	Cause unknown
IL_DR	Little Vermillion River	4.26	Aquatic life	Cause unknown
IL_DR-01	Little Vermillion River	3.79	Aquatic life	Chloride, pH, phosphorus (total), total suspended solids (TSS), zinc
IL_DR-01	Little Vermillion River	3.79	Primary contact (recreation)	Fecal coliform
IL_DQD-01	West Bureau Creek	23.67	Primary contact (recreation)	Fecal coliform
IL_RDZX	Senachwine Lake	3,324.00	Aesthetic quality	Phosphorus (total, total suspended solids
IL_RDZX	Senachwine Lake	3,324.00	Aquatic life	Aldrin, dissolved oxygen, phosphorus (total), sedimentation/siltation, silver, total suspended solids (TSS)

Assessment Unit ID	Stream Segment Name	Segment Length (mi.) or Acres	Designated Use	Potential Causes of Impairment
IL_DQ-01	Big Bureau Creek	9.61	Fish consumption	Mercury, polychlorinated biphenyls
IL_DQ-04	Big Bureau Creek	4.68	Fish consumption	Mercury, polychlorinated biphenyls
IL_DQ-04	Big Bureau Creek	4.68	Primary contact (recreation)	Fecal coliform

Source: Illinois Integrated Water Quality Report and Section 303(d) List - 2012 (IL Environmental Protection Agency)
Note: Some streams/stream segments and/or water bodies are not entirely within Bureau County.

F. Wetlands

In general terms, wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. The single feature that most wetlands share is soil or substrate that is at least periodically saturated with or covered by water. The water creates severe physiological problems for all plants and animals except those that are adapted for life in water or in saturated soil. Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of the year. (*U.S. Fish & Wildlife Service*)

Wetlands found to occur within Bureau County are classified by the U.S. Fish & Wildlife Service as “Lacustrine”, “Palustrine” or “Riverine” wetlands.

The Lacustrine System includes wetlands and deepwater habitats with all of the following characteristics: 1) situated in a topographic depression or a dammed river channel; 2) Lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% areal coverage; and, 3) Total area exceeds 20 acres.

The Palustrine System includes all non-tidal wetlands dominated by trees, shrubs, emergents, and mosses or lichens. The Palustrine System was developed to group the vegetated wetlands traditionally called by such names as marsh, swamp, fen, and prairie, which are found throughout the United States. It also includes the small, shallow, permanent or intermittent water bodies often called ponds. Palustrine wetlands may be situated shoreward of lakes, river channels, or estuaries; on river floodplains; in isolated catchments; or on slopes. They may also occur as islands in lakes or rivers.

The Riverine System includes all wetlands and deepwater habitats contained in natural or artificial channels periodically or continuously containing flowing water or which forms a connecting link between the two bodies of standing water. Upland islands or Palustrine wetlands may occur in the channel, but they are not part of the Riverine System.

The National Wetlands Inventory (U.S. Fish & Wildlife Service) indicates the presence of approximately 15,762 acres of wetlands within Bureau County. Approximately 72.9% of these wetlands are classified as Palustrine; approximately 17.9% are classified as Lacustrine; and, approximately 9.1% are classified as Riverine. The descriptive (Cowardin classification system) types of wetlands found in Bureau County are indicated in Table 5.3.

Table 5.3
Wetland Type and Acreage
Bureau County, IL

Wetland Type	Area (Ac.)
Freshwater Emergent (Palustrine)	2,207.7
Freshwater Forest/ Shrub (Palustrine)	8,290.2
Pond (Palustrine)	997.8
Lake (Lacustrine)	2,822.6
Riverine	1,441.5
Other (Palustrine)	2.7
TOTAL	15,762.5

Source: U.S. Fish & Wildlife Service, National Wetlands Inventory

G. Floodplains

Flood plain lands and adjacent waters combine to form a complex, dynamic physical and biological system found nowhere else. When portions of floodplains are preserved in (or restored to) their natural state, they provide many benefits to both human and natural systems. These benefits range from providing aesthetic pleasure to reducing the number and severity of floods, helping handle stormwater runoff and minimizing non-point water pollution. For example, by allowing floodwater to slow down, sediments settle out, thus maintaining water quality. The natural vegetation filters out impurities and uses excess nutrients. Such natural processes cost far less money than it would take to build facilities to correct flood, stormwater, water quality and other community problems. Natural resources of floodplains fall into three categories: water resources, living resources and societal resources. The following sections describe each category's natural and beneficial functions.

Natural flood and erosion control
Over the centuries, floodplains develop their own ways to handle flooding and erosion with natural features that provide floodwater storage and conveyance, reduce flood velocities and flood peaks, and curb sedimentation. Natural controls on flooding and erosion help to maintain water quality by filtering nutrients and impurities from runoff, processing organic wastes and moderating temperature fluctuations. These natural controls also contribute to recharging groundwater by promoting infiltration and refreshing aquifers, and by reducing the frequency and duration of low surface flows.

Biologic resources and functions
Floodplains enhance biological productivity by supporting a high rate of plant growth. This helps to maintain biodiversity and the integrity of ecosystems. Floodplains provide excellent habitats for fish and wildlife by serving as breeding and feeding grounds. They also create and enhance waterfowl habitats, and help to protect habitats for rare and endangered species.

Societal resources and functions
People benefit from floodplains through the food they provide, recreational opportunities they afford and scientific knowledge gained in studying them. Wild and cultivated products are harvested in floodplains, which are enhanced agricultural land made rich by sediment deposits. They provide open space, which may be used to restore and enhance forest lands, or for recreational opportunities or simple enjoyment of their aesthetic beauty. Floodplains provide areas for scientific study and outdoor education. They contain cultural resources such as historic or archaeological sites, and thus provide opportunities for environmental and other kinds of studies. Floodplains can increase a community's overall quality of life, a role that often has been undervalued. By transforming floodplains from problem areas into value-added assets, the community can improve its quality of life. In Illinois, Chicago's lakefront, Peoria's riverfront, Naperville's Riverwalk, and Lockport's historic canal district are well-known examples. Parks, bike paths, open spaces, wildlife conservation areas and aesthetic features are important to citizens. Assets like these make the community more appealing to potential employers, investors, residents, property owners and tourists.

The Federal Emergency Management Agency (FEMA) has designated and mapped floodplains, or "Special Flood Hazard Areas" within Bureau County (for specific information, the Bureau County Digital Flood Insurance Rate Maps and Flood Insurance Study should be reviewed [available from the Bureau County Zoning Administrator / Floodplain Administrator]). Encroachment on flood plains by development, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. Development can occur in Special Flood Hazard Areas if structures are constructed above the elevation of the 100-year flood plain, but flood plain development should be discouraged.

In order to have common standards, the National Flood Insurance Program (NFIP) and the State of Illinois adopted a baseline flooding probability called the base flood. The base flood is the one percent chance flood. The one percent chance flood is the flood that has a one percent (one out of 100) chance of occurring in any given year. The one percent chance was chosen as a compromise between excessive exposure to flood risk from using a lower standard (such as a 10 percent chance flood) and applying such a high standard (say, a 0.1 percent chance flood) that it would be considered excessive and unreasonable for the intended purposes of requiring the purchase of flood insurance and regulating new development. The one percent chance flood has also been called the 100-year flood. The term 100-year flood is often misconstrued. Commonly, people interpret the 100-year flood definition to mean "once every 100 years." This is wrong. You could have a 100-year flood two times in the same year, two years in a row, or four times over the course of 100 years. You could also not have a 100-year flood over the course of 200 years. To avoid confusion (and because probabilities and statistics can be confusing), the NFIP uses the term base flood. A 100-year flood is defined as having a one-percent chance of being reached or exceeded in any single year. Thus, the 100-year flood also is called the "one-percent annual chance flood." To restate, the 100-year flood, the base flood, refers to a flood that the one percent chance of occurring in any given year. The terms base flood, 100-year flood and one-percent annual chance flood are used interchangeably throughout the NFIP. Another term used is the "500-year flood." This has a 0.2% chance of occurring in any given year. While the odds are more remote, it is the standard used for protecting critical facilities, such as hospitals and power plants.

Development within Special Flood Hazard Areas is regulated to the "Base Flood." The land area covered by the floodwaters of the base flood is the base flood plain. On FEMA maps, the base flood plain is called the Special Flood Hazard Area (SFHA). The SFHA is the area where the NFIP's flood plain management regulations must be enforced by the community and the area where the federal mandatory flood insurance purchase requirement applies. The computed elevation to which floodwater is anticipated to rise during the base flood is the base flood elevation **(**BFE).

The term "100-year flood" has caused much confusion for people not familiar with statistics. Another way of looking at it is to think of the odds that a base flood will happen sometime during the life of a 30-year mortgage (26% chance) as indicated in Table 5.4.

Table 5.4
Chance of Flooding Over a Period of Years

	Flood Size			
Time Period	**10-Year**	**25-Year**	**50-Year**	**100-Year**
1 Year	10%	4%	2%	1%
10 Years	65%	34%	18%	10%
20 Years	88%	56%	33%	18%
30 Years	96%	71%	45%	26%
50 Years	99%	87%	64%	39%

Source: National Flood Insurance Program

Even these numbers do not convey the true flood risk because they focus on the larger, less frequent, floods. If a house is low enough, it may be subject to the 10- or 25-year flood. During the proverbial 30-year mortgage, it may have a 26% chance of being hit by the 100-year flood, but the odds are 96% (nearly guaranteed) that it will be hit by a 10-year flood. Compare those odds to the only 5% chance that the house will catch fire during the same 30-year mortgage. (Source: CFM Study Guide, IL Assoc. of Flood plain and Stormwater Managers).

H. Natural Areas and Open Spaces

With settlement, the nation's natural systems have changed. Like the nation, Illinois has moved from complex natural systems toward simpler ones, from stable natural systems toward unstable ones, from native species toward non-native ones, from integrated natural systems toward fragmented ones, from self-sustaining natural systems toward managed ones. The result is a trend toward a generic Illinois environment populated by "generalist" species able to exploit simplified ecosystems. Complexity lingers mainly in habitats of only marginal use to humans, such as river bottomlands, swamps, hillsides and bogs. To illustrate the change in natural systems, it is helpful to look at current and historical land cover. Currently, nearly 83% of the County's land area is in agricultural crop production, 9.6% of the County's land area is in deciduous forest, and 2.8% is wetland (see Table 5.1 Land Cover of Bureau County, Illinois and Table 5.3 Wetland Type and Acreage, Bureau County, Illinois). According to the Illinois Natural History Survey, in the early 1800s, the dominant land cover in Bureau County was prairie (75.2%), followed by forest (19.6%); approximately 4.6% of the County was wetland swamp, slough, marsh or wet prairie.

Natural areas and open space provide Bureau County with recreational opportunities, resource protection and aesthetic beauty, and are an important part of the County's identity. Bureau County is host to a variety of natural communities and vegetation types. The distribution and extent of these natural communities has been altered significantly since European settlement. Many of the natural communities that remain were spared the conversion to cultivation due to uncompromising topography, unproductive soils, or preservation efforts on the part of the land owner or the public.

1. Nature Preserves

Nature preserves are areas of land or water in public or private ownership that are formally dedicated to receive maximum protection of significant natural features. The central goal of the nature preserve system is to protect and preserve examples of all significant natural features found in Illinois for the purpose of scientific research, education, conserving biodiversity, and aesthetic enjoyment. Nature preserves are administered by the Illinois Nature Preserves Commission (INPC). Preserves usually are the shared responsibility of the INPC, the Illinois Department of Natural Resources, and the land owners. There are four (4) INPC protected areas in Bureau County as follows:

- Hetzler Cemetery Prairie Nature Preserve
- McCune Sand Prairie Land and Water Reserve
- Miller-Anderson Woods Nature Preserve
- Myer Woods Nature Preserve

2. Illinois Natural Area Inventory

The Illinois Natural Areas Inventory (INAI) was conducted by the University of Illinois, the Natural Land Institute and the Illinois Department of Conservation (now Illinois Department of Natural Resources) over a three-year period in the mid-1970's to document remaining examples of the natural communities of Illinois. Results from the Inventory indicated that, statewide, only 0.07% of Illinois' total land and water area remained in what the INAI described as "high quality, relatively undisturbed" condition at the time. The Inventory established seven categories of natural areas based on significant features. The categories are:

I - High quality natural communities and natural community restorations;
II - Specific suitable habitat for state-listed species of state-listed species relocations;
III - State dedicated Nature Preserves, Land and Water Reserves, and Natural Heritage Landmarks;
IV - Outstanding geological features;
V - Category unused at this time;
VI - Unique concentrations of flora or fauna and high quality streams

The INAI established a grading system to designate natural quality. The natural quality of a natural community was graded from A (relatively stable or undisturbed) to D (very early successional or severely disturbed). Grade E was reserved for cropland or other highly developed lands. In general, only A and B communities are designated as significant or exceptional features.

The INAI recognized fourteen (14) sites totaling 1,312.05 acres in Bureau County as indicated in Table 5.5.

Table 5.5
Illinois Natural Areas Inventory (INAI) Sites within Bureau County, Illinois

Natural Area Name	Categories	Acreage
Big Bureau Creek	VI	49.33
Daisy Hill Prairie	I	0.58
Fairfield Ditch	II	132.08
Gold Prairie	II	13.49
Goose Lake Botanical Area	II	2.45
Hennepin Canal-Wyanet Prairie	I	8.23
Hennepin Illinois River Floodplain	II	70.23
Hetzler Cemetery Prairie	I, III	1.92
McCune Sand Prairie	II, III	269.57
Miller-Anderson Woods	I, II, III	490.73
Myers Forest and Game Preserve	I, III	20.33
Spring Lake-Bureau	II, VI	202.21
Spring Valley Geological Area	IV	5.24
Wyanet Geological Area	IV	45.66

Source: Illinois Department of Natural Resources

I. Wildlife

Much of Bureau County is suitable habitat for a variety of species of wildlife including birds, mammals, amphibians, reptiles and fish. Even in the intensive agricultural areas, scattered woodlands and fence rows exist which provide habitat for various wildlife species.

Mammals commonly sighted in Bureau County include white-tailed deer, red fox, coyote, grey and fox squirrel, woodchuck, cotton-tail rabbit, raccoon, opossum, Eastern chipmunk, thirteen-lined ground squirrel, and several species of bats. There have been reports of wolf and mountain lion sightings in Bureau County.

Many species of birds live year-round in Bureau County or are migratory visitors during various times throughout the year. Bald eagles have become more common in Bureau County, particularly in winter months, and large numbers of migratory waterfowl utilize the Illinois River corridor during annual Spring and Fall migrations.

Several species of reptiles and amphibians are known to occur in Bureau County, including salamanders and newts, frogs, turtles and snakes.

The Illinois Natural Heritage Database lists eight (8) species of threatened or endangered animals that have been observed in Bureau County as of September 12, 2011, as follows:

Scientific Name	Common Name	State Status
Dendroica cerulea	Cerulean Warbler	Threatened
Emydoidea blandingii	Blanding's Turtle	Endangered
Fundulus dispar	Starhead topminnow	Threatened
Heterodon nasicus	Plains Hog-nosed Snake	Threatened
Lanius ludovicianus	Loggerhead Shrike	Endangered
Notropis heterolepis	Blacknose Shiner	Endangered
Notropis texanus	Weed shiner	Endangered
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	Endangered

J. Flora.

Prior to settlement, the area of present-day Bureau County consisted of approximately 75.2 percent prairie, 19.6 percent forest, and the remainder were swamps, marshlands, bottomlands, and wet prairie. As people settled the County, wetlands were drained and prairies tilled for agricultural purposes, and timber groves were utilized for building materials and fuel.

In present-day Bureau County, native prairie is all but non-existent, except for a few scattered prairie remnants found mostly along railroad right-of-ways, in old pioneer cemeteries and on sandy ridges and hillsides that have not been tilled. Scattered "islands" of primarily deciduous forest exist scattered throughout the County, particularly along stream corridors and in areas not well suited to cropland.

The Illinois Natural Heritage Database lists seven (7) species of threatened or endangered plant species that have been observed in Bureau County as of September 12, 2011, as follows:

Scientific Name	Common Name	State Status
Boltonia decurrens	Decurrent False Aster	Threatened
Filipendula rubra	Queen-of-the-prairie	Endangered
Helianthus giganteus	Tall Sunflower	Endangered
Orobanche ludociciana	Broomrape	Threatened
Pinus banksiana	Jack Pine	Endangered
Speyeria idalia	Regal Fritillary	Threatened
Tomanthera auriculata	Ear-leafed Foxglove	Threatened

Section 5.5 Cultural Resources

Cultural and historic resources often help link the past with the present and can give a community a sense of place or identity. These resources can include historic buildings and structures along with ancient, historic and archeological sites.

Many of Bureau County's historic structures have been lost to time, accidental fires, and the demolition crew, although there are some fine examples of late-nineteenth century residential architecture, and the commercial downtown areas of the cities and villages have both historical and cultural value. The County cemeteries are an important cultural and genealogical resources, serving as records of past inhabitants of the area.

Early trails were important to the settlement and development of Bureau County. Many trails that later became wagon roads and stage routes were originally Indian trails. As settlers moved to the area, many trails were blazed across the County to make travel and marketing of agricultural products easier and safer.

The timber groves in the area are also important cultural and historic resources. The groves served as important resting places for travelers and sources of raw materials and the necessities of life in the early settlement days, as they provided sources of shelter, lumber, fire wood, water, and game for food. The groves later became recreational areas for community, church and family festivals and picnics.

The potential exists for prehistoric archaeological sites to be found throughout the county (see Appendix I Maps, *Map 5.10 Archaeological Resource Potential, Bureau County, Illinois*). Despite Bureau County's potential historical and cultural resources, no systematic county-wide survey has ever been undertaken to identify and evaluate archaeological and historical sites.

The Illinois Historic Preservation Agency (IHPA) manages the National Register of Historic Places program in Illinois. In general, sites selected for inclusion in the National Register of Historic Places, in addition to being at least fifty years old, must meet one of the following four criteria:

1. It is associated with significant historic events or activities (history).
2. It is associated with important persons (history).
3. It possesses distinctive design or physical characteristics, or high artistic value (architecture).
4. It has the potential through physical investigation to provide important information about prehistory or history (archeology).

Table 5.6 summarizes the sites (and district) in Bureau County that are listed on the National Register of Historic Places. The table column with the heading "Site ID No." corresponds to the site locations as indicated on *Map 5.10 National Register of Historic Places in Bureau County* found in Appendix I Maps.

Table 5.6
Sites Listed on the National Register of Historic Places
Bureau County, Illinois

Site ID No.	Site	Location	Historic Significance (Period)	Architectural Style	Historic Function	Current Function
1	Allen School	301 Main St., LaMoille	Education (1925-1949, 1900-1924, 1875-1899	N/A	Education-School	Education-School
2	First Congregational Church of LaMoille	94 Franklin St., LaMoille	Architecture	Italianate	Religion-Religious Structure	Religion-Religious Structure
3	First State Bank of Manlius	North side of Maple St., Manlius	Architecture (1900-1924)	No style listed.	Commerce/ Trade-Financial Institution	Vacant/Not in use
4	Greenwood Cottage a/k/a Joseph Innskeep Taylor House	543 E. Peru St., Princeton	Architecture, Landscape Architecture (1850-1874)	Gothic Revival	Domestic-Single Dwelling	Domestic-Single Dwelling

5	Hennepin Canal Historic District a/k/a Illinois & Mississippi Canal	Hennepin Canal from Bureau Junction through Bureau County to near Sheffield, continuing west to Moline, with Feeder Canal to Rock Falls	Domestic, Industry/ Processing/ Extraction, Transportation, Economics, Engineering, Politics/ Government, Commerce, Social History, Invention (1900-1924, 1875-1899)	No style listed; Other.	Communi-cations Facility, Rail-Related, Road-Related, Secondary Structure, Single Dwelling, Water-Related	Domestic, Landscape, Vacant/Not In Use, Single Dwelling
6	Lone Tree School	19292-250 North Ave., Tiskilwa	Education (1925-1949, 1900-1924, 1875-1899)	N/A	Education-School	Government-City Hall
7	Owen Lovejoy Homestead a/k/a Underground Station	Peru St. (U.S. Hwy. 6), Princeton	Politics/ Government, Black Social History (1825-1849)	N/A	Domestic-Single Dwelling	Recreation and Culture-Museum
8	Old Danish Church a/k/a St. Peters Evangelical Danish Lutheran Church	SW Corner of Cook and Washington Sts., Sheffield	Education, Architecture (1875-1899)	No style listed.	Religion-Religious Structure	Religion-Religious Structure
9	Princeton Chapter House	1007 N. Main St., Princeton	Education, Politics/ Government, Architecture, Social History (1900-1924)	Mission/ Spanish Revival	Social-Civic	Commercial use
10	Red Covered Bridge	2 miles north of Princeton off IL Route 26 on Old Dad Joe Trail, Princeton	Architecture, Transpor-tation, Engineering (1850-1874)	No style listed.	Transpor-tation-Road Related	Transpor-tation-Road Related
11	Richard M. Skinner House a/k/a The House with the Deer	627 E. Peru St., Princeton	Architecture (1875-1899)	Second Empire, Italianate	Domestic-Single Dwelling	Domestic-Single Dwelling
12	Sheffield Village Hall	239 S. Main St., Sheffield	Architecture (1900-1924)	Classic Revival	Government-Village Hall	Government-Village Hall

13	Stevens House a/k/a Springer's Folly	140 E. Main St., Tiskilwa	Architecture (1900-1924, 1875-1899, 1850-1874, 1825-1849)	Classic Revival, Greek Revival	Domestic-Secondary Structure, Single Dwelling	Domestic-Secondary Structure, Single Dwelling
14	Wood-Tellkamp House	82 Main St., LaMoille	Architecture (1900-1924, 1875-1899, 1850-1874)	Classical Revival, Italianate	Domestic-Secondary Structure, Single Dwelling	Domestic-Secondary Structure, Single Dwelling

Source: National Register of Historic Places

There are also a number of sites within Bureau County that, although not currently listed on the National Register of Historic Places, are eligible for listing:

- Bridge over Masters Creek Branch carrying TR 1 (Base Line Rd.), located approximately 2 miles northwest of Van Orin.
- Bridge over Lime Creek carrying TR 192 (1600 East St.), located approximately 4 miles southeast of Walnut.
- Bridge over Green River carrying New Bedford Road (2500 North Ave.), located approximately 0.6 mile west of IL Route 40.
- Bridge over West Fork Spoon River carrying TR 46 (350 East St.), located approximately 3 miles south of Neponset.
- Bridge over Plow Hollow Creek carrying CH 4 (1900 East St.), located approximately 1 miles south of Tiskilwa.
- Bridge over TR 170B (1500 East St.) carrying BNSF Railroad, located northeast of Wyanet.
- Bridge over Illinois River carrying IL Route 89.

Section 5.6 Issues Identified by the Planning Commission

- Historical and cultural sites in the County need to be identified, preserved and maintained.
- Prime farmland needs to be protected and preserved.
- Unique natural features need to be identified, preserved and protected.
- Development needs to be planned for and located so that it has the least amount of impact on agriculture, natural and cultural resources.
- Aquifers need to be protected from contamination.

Section 5.7 Agricultural Resources Goals, Objectives, Policies

A. Goal

Protect economically productive farmland areas.

B. Objectives

1. Work to preserve farming as a viable occupation and way of life within the County.
2. Protect farm operations from incompatible land uses and activities that may adversely affect the capital investment in agricultural land, improvements, and equipment.
3. Protect, strengthen and maintain the economic base that agricultural pursuits provide the County.
4. Prevent the conversion of agricultural land to scattered non-farm development which, when un-managed, unnecessarily increases the cost of public services to all citizens and results in the premature disinvestment in agriculture.

C. Policies

1. Minimize non-agricultural development in farming areas.
2. Promote the continuation of the "family" farm by supporting the introduction and operation of agriculture-support businesses, and providing families with opportunities for small non-farm businesses to supplement farm income.
3. Ensure that development occurs in such a fashion as to minimize conflict between agricultural and other land uses and the enforcement of any rule, regulation or ordinance is consistent with the "Farm Nuisance Suit Act", *Illinois Compiled Statutes, Chapter 740, par. 70/0.01 et seq*.
4. Prevent scattered, haphazard or premature urbanization by guiding growth in a logical, orderly fashion.
5. Protect lands best suited for agricultural purposes from the encroachment of urban-type development in order to promote more efficient use of the increasingly reduced area of land in agricultural use as the result of expanding urbanization.

Section 5.8 Natural Resources Goals, Objectives, Policies

A. Goal

Preserve and protect the County's natural features, including wetlands, streams, lakes, woodlands, wildlife habitats, open spaces, groundwater and mineral resources, and encourage the wise use and management of natural resources throughout the County in order to preserve the integrity, stability and beauty of the County and the value of land.

B. Objectives

1. Identify and protect the County's natural resources, such as rivers, lakes, floodplains, wetlands, mineral resources, steep slopes, ridgetops, woodlands and productive soils.
2. Areas containing significant natural features such as native vegetation, rivers, streams, wetlands, etc. or areas with significant historical and cultural values should be preserved and protected, with special attention to dedicated nature preserves and habitats containing threatened or endangered natural plant or animal species.
3. Protect and enhance surface water, ground water, and shoreline quality.
4. Encourage the use of soil conservation practices and the management of woodlands.
5. Direct development away from environmentally sensitive areas.
6. Discourage developments which utilize private, on-site sewage disposal systems in areas where soil conditions and/or geology indicate that there is a potential for contamination of ground and/or surface water.
7. Areas containing underground deposits of mineral resources should be given adequate protection so that these natural resources will be preserved for future uses. The appropriate re-use of such areas after the resource(s) have been depleted should be planned in advance.
8. Pursue opportunities that support both natural resource protection and rural economic development.

C. Policies

1. Map and protect "environmental corridors" as a composite of the County's most sensitive natural areas by:
   a. Protecting areas classified as wetlands from development to preserve the significant natural functions that wetlands provide.
   b. Protecting areas within the 100-year floodplain to avoid damage to private and public property and the health, safety and welfare of the County.
   c. Discouraging building or driveway development on slopes in excess of 20 percent.
2. Protect surface water quality (e.g., waterways, drainage channels, lakes, ponds, impoundments, and wetlands) by supporting streambank management, natural shoreline restoration, erosion control, proper agricultural practices, stormwater management, and buffer areas as appropriate practices to protect the County's water quality, depending in part on the quality and sensitivity of the associated water and the relative presence or absence of development.
3. Protect groundwater quality through proper placement of new on-site wastewater systems, appropriate maintenance and replacement of older systems.
4. Work to protect rare species and wildlife habitat areas.

5. Preserve woodlands and wetlands associated with farms which, because of their natural physical features, are useful as water retention and groundwater recharge areas, and as habitat for plant and animal life; and which have an important aesthetic and scenic value which contributes to the unique character of the County.
6. Promote land stewardship through the development of environmentally oriented site planning standards and the preservation of environmentally sensitive areas.
7. Protect and preserve the natural and scenic qualities of the Illinois River corridor and other high-quality riparian corridors throughout the County:
    - Protect and preserve scenic "view sheds" from visual intrusions.
    - Prohibit flood plain development.
    - Protect wetlands near and/or adjacent to streams.
    - Monitor water quality and control point- and non-point source pollution.
    - Promote wise stream-bank management practices.
    - Require developments to dedicate open space along the river.
    - Preserve scenic and historic features.
    - Ensure public access to the Illinois River.
8. Leverage the County's natural resources to promote tourism and local economic development.

Section 5.9 Cultural Resource Goals, Objectives, Policies

Preserve the County's cultural, historic and archeological sites and scenic character.

A. Objectives

1. Identify and promote the preservation of the County's cultural, historic, and archeological resources that celebrate the County's pre-settlement and early settlement periods.
2. Preserve large blocks of woodlands, hunting land, wetlands, and open space that contribute to Bureau County's rural character and way of life.
3. Protect the narrow, winding, lightly-traveled roadways that contribute to the County's scenic quality and, for some, outdoor recreation opportunities.

B. Policies

1. Encourage private landowners to protect and rehabilitate known historic and archeological sites.
2. Preserve and celebrate the scenic landscape and byways in the County.
3. Promote "heritage tourism" (e.g., local festivals, fairs, farm tours, and markets) that celebrates the County's heritage and rural setting.