

# 8

## NATURAL ENVIRONMENT

Natural resources are positive components of any development and add value where integrated appropriately into development projects. This harmonious coexistence begins with a good understanding of our natural environment.

This chapter will examine topics such as air quality, water resources, energy resources, floodplains, stream bank erosion, local food and urban gardening. It will also identify the potential environmental concerns or threats such as gas pipelines and hydraulic fracturing.



## KEY FINDINGS

Bloomington faces two challenges in managing the public water supply. The short-term need is to mitigate the effects of high nitrate levels in Lake Bloomington. This requires reducing nitrate infiltration from watershed and agricultural runoff, and ongoing improvements to water treatment systems. The long-term challenge is adding public water supply sources to meet the need of a growing community, by preserving current resources and identifying new sources for water.

As calculated by the Ecology Action Center, as of 2008 residents of Bloomington accounted for 31% of greenhouse gas emissions produced by electricity use. 61% of emissions were from commercial users, 5% from industry, and 3% from local government use of electricity. Private sector users produce nearly all emissions caused by transportation.

The McLean County Landfill #2 is scheduled for a 2017 closure upon reaching its capacity of nearly 4 million cubic yards. Annual volume in the landfill has been 90,000 tons, equaling 300 tons per day. Discussion of alternative disposal sites is underway, with locations outside of McLean County under consideration.

The growth of the City of Bloomington has often been achieved by converting farmland into new development. Historically, the City expands in area at a faster rate than it grows in population. Much of the farmland that surrounds the City is highly productive, and development there results in the loss of all the food it might grow in the future.

The natural environment is comprised of vegetation, soils, water, plants, wind, energy and air. Also included as part of the natural environment are all living things that interact within this sphere. In other words, it is the habitat in which all living things exist. It is contrasted with the built environment, which comprises components of materials that are created by human society. This chapter will examine the present local natural environment and what it means to future planning for the City of Bloomington.

This chapter considers the natural resources on which City services depend and which provide the raw materials for those services. Natural resources may also be used by public utilities and private companies to provide services, such as energy. While the natural environment influences how we live in Bloomington, the existence of an urbanized area like the City of Bloomington also produces impacts on the surrounding natural environment.

## GREENWAYS

Greenways are defined as a linear open space, natural corridor (such as a riverfront, stream or valley), or railroad right-of-way converted for recreational use. It can also be a natural or landscaped course for pedestrian or bicycle passage, or a connector for linking parks, nature preserves, cultural features or historic sites with populated areas.

The City, the Town of Normal and McLean County engage in an ongoing planning process to examine the relationship between the natural environment and urban

development. This process produced the *McLean County Regional Greenways Plan*. Updated and approved in September of 2009, the *McLean County Greenways Plan* established a vision for a regional system of greenways which includes the City of Bloomington. The plan urged that all municipalities within the County make conservation and the environment a priority through the use of best management practices when possible. The need to preserve and expand all types of open spaces is important for a community like Bloomington. Conservation techniques were urged on all development of open space as well as increased public education efforts of how the built and natural environment can function together. “Priority” greenway development was insisted that included the development and restoration of waterways, natural areas, and human-made green space that may be developed in various areas determined to be environmentally “threatened.” Priority greenways exhibit at least one or more of the following features: benefits multiple communities, completes an existing greenway, creates new connections, assists wildlife, preserves water quality, prevents flood damage, buffers an existing preserve, is located in a scenic or historic area, provides a trail extension opportunity or has special implementation potential as a greenway (see Figure 8.1).

Some of the goals and objectives of the plan include the adoption of local erosion control ordinances, completion and update of watershed studies for both Evergreen Lake and Lake Bloomington watersheds, continued expansion of local and regional trail

systems and promotion of “green building” techniques and guidelines in new development projects.

Most conservation areas within the urban boundaries are privately developed and owned. There are conservation areas in the Lake Bloomington and Evergreen Lake watersheds but those areas are also privately owned or owned and maintained by McLean County Parks and Recreation. The Park-Lands Foundation owns and maintains two conservation areas in the Lake Bloomington watershed (Merwin Preserve and Lexington Prairie) and three conservation areas in the Evergreen Lake area (Chinquapin Bluffs, Letcher Basin and Ridgetop Hill Prairie Nature Area).

County conservation areas which lie within the reservoir watersheds include Deer Island, Lake View, Mallards Bay, Six-Mile Creek, Southeast Conservation Area, Southwest Conservation Area and White Oak.

## TOPOGRAPHY, SOILS AND LAND COVERAGE

The terrain within the City of Bloomington is highly compatible for most urban development. The topography allows for gravity flow sewers in the majority of the City, although lift stations are necessary in some areas of the City where the terrain is steeper than normal. Development on very flat land can cause “ponding” or flash flooding and on highly-sloped areas can produce erosion hazards during building, street or road construction projects. Most of McLean County and the City is located within the

glacial till plain that is prevalent in central Illinois. Land is nearly level or gently rolling with some instances of steeper slopes being present adjacent to stream valleys and drainage ways as along Sugar Creek at the City’s southwestern edge. Other low-level topography can be found along the streams, creeks and tributaries that flow within the City boundaries. Higher elevations of the City can be found where glacial moraines are present. These areas include Prairie Vista Golf Club (southern section), Downtown Bloomington, and the Central Illinois Regional Airport and the Far East side (see Figure 8.2).

According the Natural Resource Conservation Service (NRCS), the City is dominated by soil types that require special designs, construction or maintenance practices to maintain structural integrity and building safety. Many of the local soil types drain poorly and special care must be taken to ensure the drainage capacity is improved.

However, the City’s subdivision ordinances provide safeguard provisions to overcome any physical limitations of the land. For example, all residential construction must comply with the City’s stormwater utility regulation which stipulates steps to improve urban drainage and prevent flooding. When building, landowners and developers are required to comply with a requirement to present the City with an erosion control plan outlining measures they will take to prevent erosion and sediment runoff on site. The City has the added option to require more stringent measures if lots are found to be even more susceptible to drainage problems.

Figure 8.1 Priority Greenways

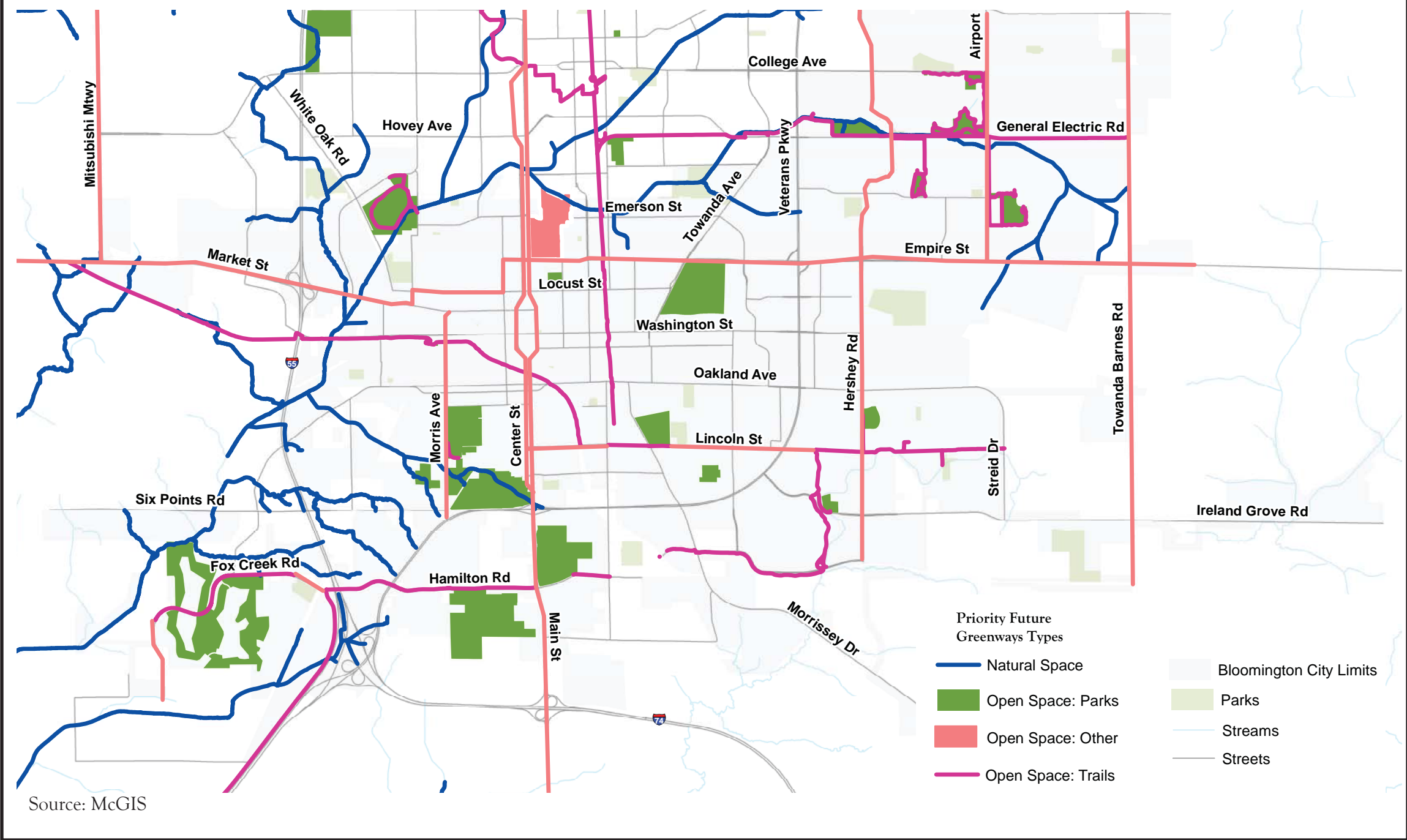




Figure 8.2 Elevation

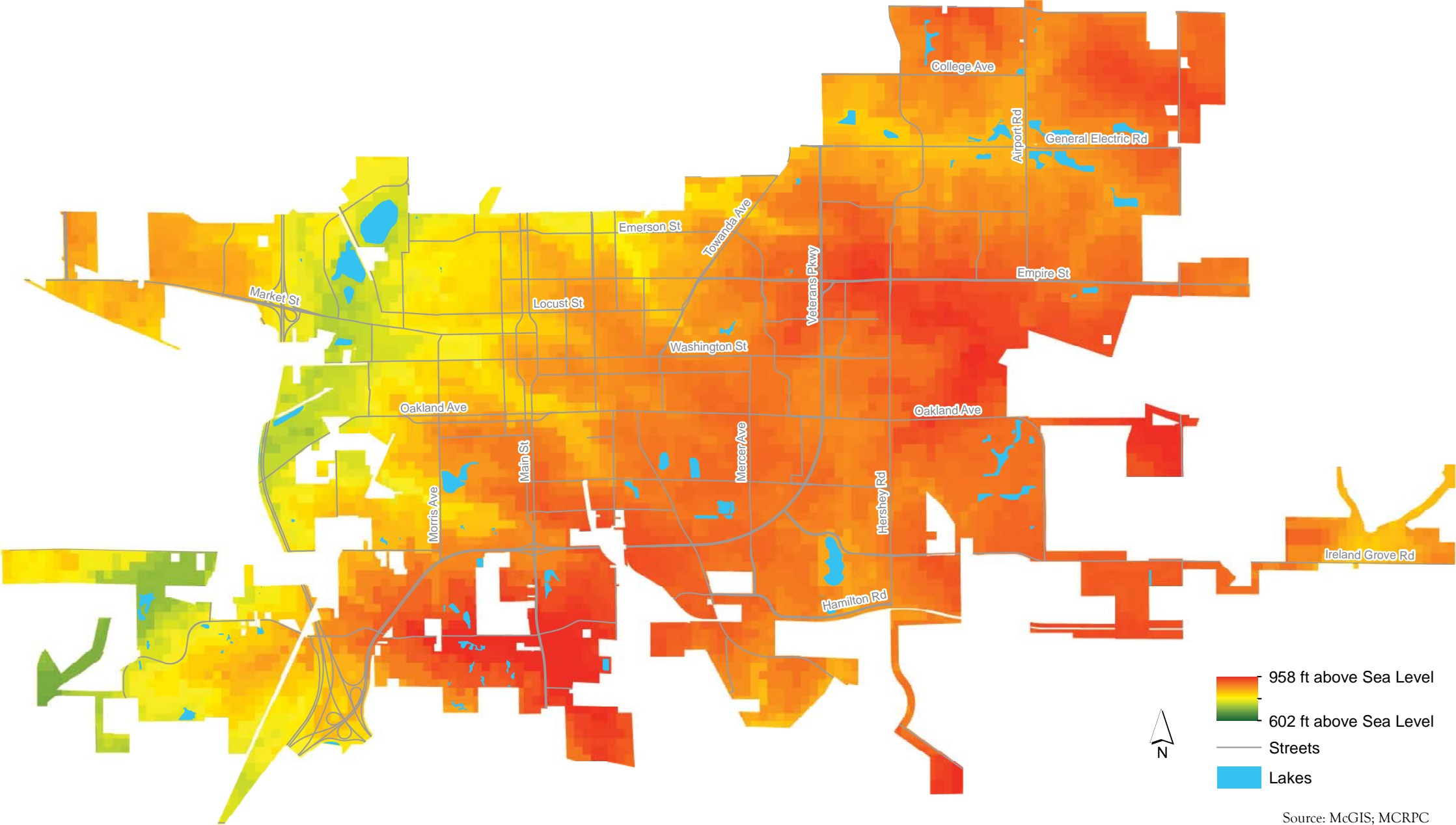
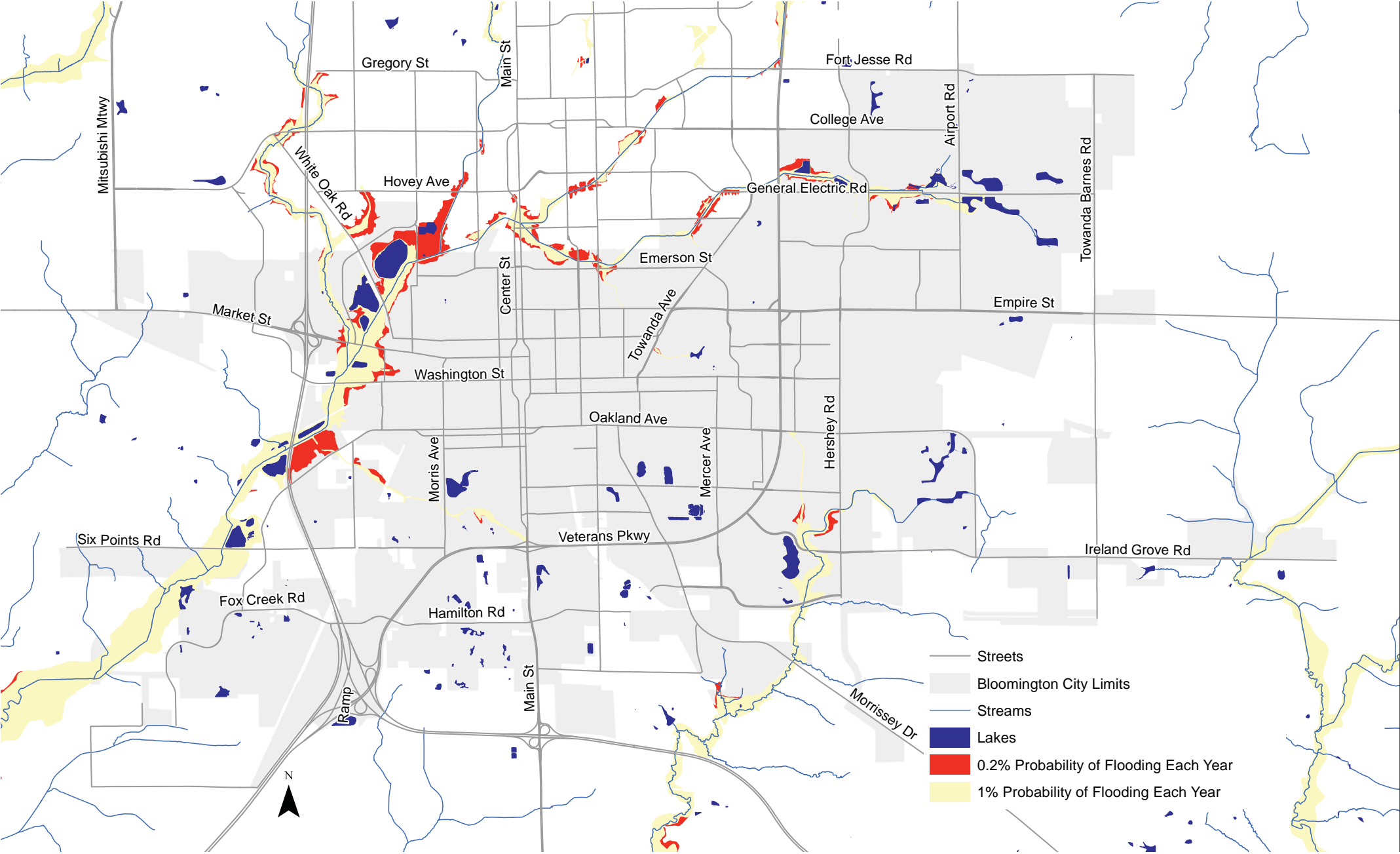


Figure 8.3 Flood Hazard Areas



Source: Federal Emergency Management Agency, McGIS

## FLOODPLAINS

Floodplains provide an important natural area for drainage. When left in a natural state, a floodplain can function as a natural drainage area for stormwater runoff as well as provide an area for wildlife habitat, trails and a scenic area within the urban area. Because of these reasons and the fact that floodplains are not conducive for development, construction of any type should be prohibited in or near a designated floodplain (see Figure 8.3).

If for any reason construction is required in or near a floodplain, the project must be insured under the National Flood Insurance Act. The City has made every effort to conform to these regulations. Bloomington's floodplain is generally located along the north, south and southwest areas of the City. Its floodplain area is the tributaries and small streams of Sugar Creek. The floodplain is inter-dispersed in narrow areas in the north central section of the City. Although it does not sit within the immediate City boundaries, segments of the Kickapoo Creek have been identified as flood hazard areas, particularly just to the southwest of the City (see Figure 8.3).

Communities utilize stream buffer ordinances to protect the flood plains. McLean County adopted a stream buffer ordinance in July of 2010 for the unincorporated areas. The Town of Normal also incorporated a similar ordinance in April of 2008. These ordinances assigned numerical designations to local streams and waterways which are used to identify flow and flood potential of

area waterways along with best management practices for addressing flood and pollutant potential during storm events. Enforcement rules and penalties for owners who fail to address these concerns is also part of the ordinance. The City of Bloomington has not yet adopted a stream buffer ordinance.

## WATER SUPPLY AND MANAGEMENT

Sources of drinking water include rivers, lakes, streams, ponds, reservoirs, springs and wells. The City of Bloomington's primary sources for water are Lake Bloomington and Evergreen Lake. The raw water from the lakes is treated at the Lake Bloomington Water Treatment Plant and delivered to customers in Bloomington, Towanda, Hudson, and Bloomington Township.

Average daily pumpage from Bloomington water sources is approximately 11.5 million gallons per day (MGD). Both lakes have a combined drainage area of 131 square miles and a combined capacity close to 7.5 billion gallons.

The Lake Bloomington reservoir is fed by runoff from 70 square miles of land while the drainage area for Evergreen Lake is 41 square miles. In 1988 and 2005, the area experienced significant droughts. These events alerted the City to two areas of concern, finding new sources for water to support population growth and addressing high nitrate levels in Lake Bloomington. The City initiated a Water Supply Plan that takes into consideration available water supplies, water quality, management and water infrastructure.

Historically, nitrate levels in Lake Bloomington have seasonally exceeded EPA regulatory standards. The majority of the watershed area for both of the city's reservoirs lies in active agricultural areas, which can add nitrates and additional pollutants to the potential water supply. The reservoirs can lose a fraction of their volume to siltation.

As part of the compliance agreement with the Illinois Environmental Protection Agency (IEPA), the City maintains regulatory compliance of nitrate levels by careful reservoir management.

The City water department has partnered with the Nature Conservancy, area landowners and various other institutions and organizations to build "constructed wetlands" to study the causes of nitrates. These wetlands, built in targeted agricultural fields, have been proven to remove over 50 percent of inflowing nitrates from underground tiles that would likely enter the watersheds of Six Mile and Money Creeks.

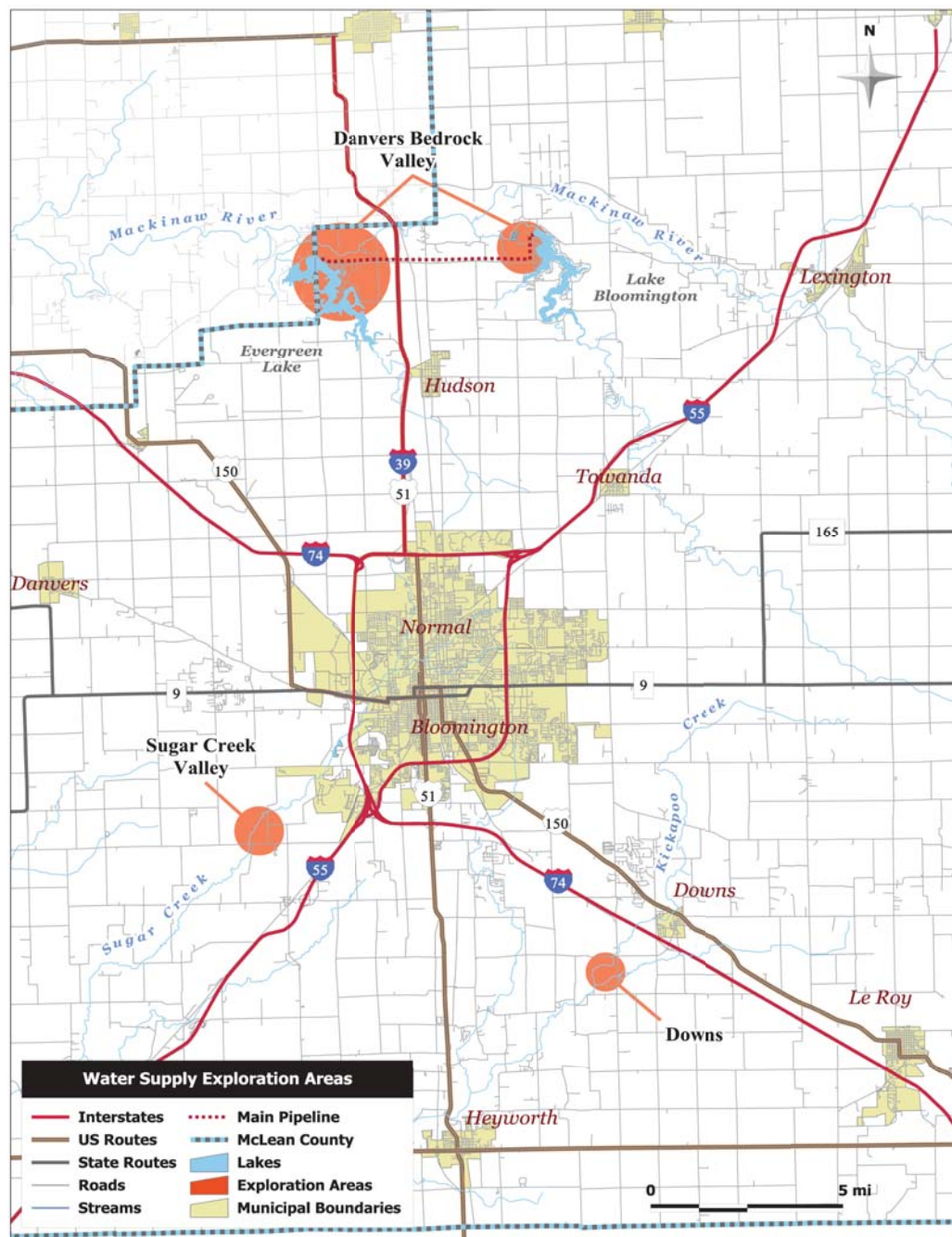
Other potential reservoir pollutants include pollution that originates in a specific location, such as industrial or factory waste/runoff (point source pollution) and pollution that comes from more than one source (non-point source). Examples of non-point source pollution are pollutants that drain into the watersheds such as lawn fertilizers, car oils, trash, agricultural runoff (pesticides, herbicides, animal waste), and urban runoff (rain water that comes from draining from buildings, sidewalks, streets and parking lots). (EAC) Urban runoff is a threat to watersheds because it can change water flow paths. Wa-

tersheds rich in natural filtration from soils, sands and plants need to be preserved or maintained. When this is not possible, every effort should be made to include natural plantings and natural drainage features to the built environment to reduce the effects of urbanization that adversely affect the potential water supply.

In April of 2004, the City approved the Storm Water Utility fee. The fee created a major source of dedicated revenue which supports stormwater management in an equitable manner. Residential properties are assessed the fee based on the gross size of their parcels while commercial, industrial and institutional customers pay based on the estimates of each parcel's impervious areas. The money assessed from this fee is used to support stormwater management.

City of Bloomington staff undertook a strategic water study to address the issue of supply. The study focused on long-term water demand, supply and management and a forecast for future water needs, which includes potential use of the Mahomet Aquifer. The City also adopted as "emergency response ordinance" which addresses steps and actions to be taken in occurrences of future water emergencies. Efforts have also been made requiring all septic systems on Lake Bloomington property to be brought up to current code when a lake lease transfer takes place. Another recommendation of the study was the implementation of a long-term lake management program in partnership with the University of Illinois that addresses nitrogen, phosphorus and other potential pollutants.





**Figure 8.4 Water Supply Exploration Areas**

Source: City of Bloomington, *Interim Water Supply Plan*, January 2010

The study also recommended the development of a water conservation plan that identified water conservation measures such as separate rates to encourage the reduction of water usage. High-level users would be charged a different user rate than average or low-use customers.

To address the need for additional water supply, the City has increased the capacity of Evergreen Lake by one-third (one billion gallons). The City has also developed the Mackinaw River pumping pool which can pump water from the Mackinaw River into Evergreen Lake under certain conditions as outlined by the U.S. Army Corps of Engineers permit. Since 1994, the City has been exploring additional water supplies throughout McLean County. The effort has entailed an aggressive test drilling initiative due to a groundwater research project which identified potential underground water locations (see Figure 8.4). Some observation wells have been in place for close to 20 years.

Test wells have been drilled after intense study of subsurface conditions. During the process, careful attention is paid to the materials extracted from the test “hole” that may indicate acceptable water volumes. This process develops what is known as a “log” for future reference. Depending on the results, some test sites will be developed into monitoring wells for future exploration. The best situation for establishing a well is when an aquifer is discovered below a shallower aquifer that surrounds an operable domestic well.

The Mahomet Aquifer is a groundwater source for water that stretches just beyond

the Illinois River to the west all the way to the eastern border of Illinois (see Figure 8.5). Several cities and counties within the aquifer use it for a primary water source. The supply is used by municipalities and for irrigation purposes. Daily usage estimated by the Illinois State Water Survey stands at approximately 100 MGD. Population projections suggest that by 2020, the aquifer may increase usage by an additional 100,000 gallons a day meaning close to 900,000 people could be pumping water from the aquifer daily. This includes additional demands from Bloomington as well as Springfield, Decatur and Danville.

The Illinois State Water Survey estimates the sustained daily yield for the Mahomet Aquifer could result in over-usage in any localized area if the aquifer is not resupplied during times of high water usage or in instances of drought. The Mahomet Aquifer Consortium is a group of local representatives keeping a line of communication open with the ISWS to monitor the situation closely.

For the foreseeable future, the City plans to utilize its two reservoirs as its primary sources for water. No matter how much high-quality, low nitrate water could be tapped from the Mahomet Aquifer or other sources, the City must still meet its nitrate standard at its water treatment plant. At present, there is no reasonable or economically feasible way to pump water from the Mahomet Aquifer to be blended at the treatment plant. The City has no financially feasible option other than removing the nitrate with



present treatment equipment. The alternative would be to construct a new wastewater or dilution system which is cost prohibitive.

The surface water supply in Bloomington has been designed to provide over one year’s worth of water. If additional water is needed in the near future, a likely first option for a secondary supply will come from the development of a high capacity well-field at the McLean-Tazewell County line area as well

as utilizing already-mentioned back-up water sources (see Figure 8.6).

As previously mentioned, the City’s reservoir system is fed by water from local watersheds. A watershed is defined as a basin-like landform that descends into lower elevations and stream bodies. The “shed” carries rain water into creeks, rivers and ditches. This water can also be channeled into soils and groundwater which makes its way into

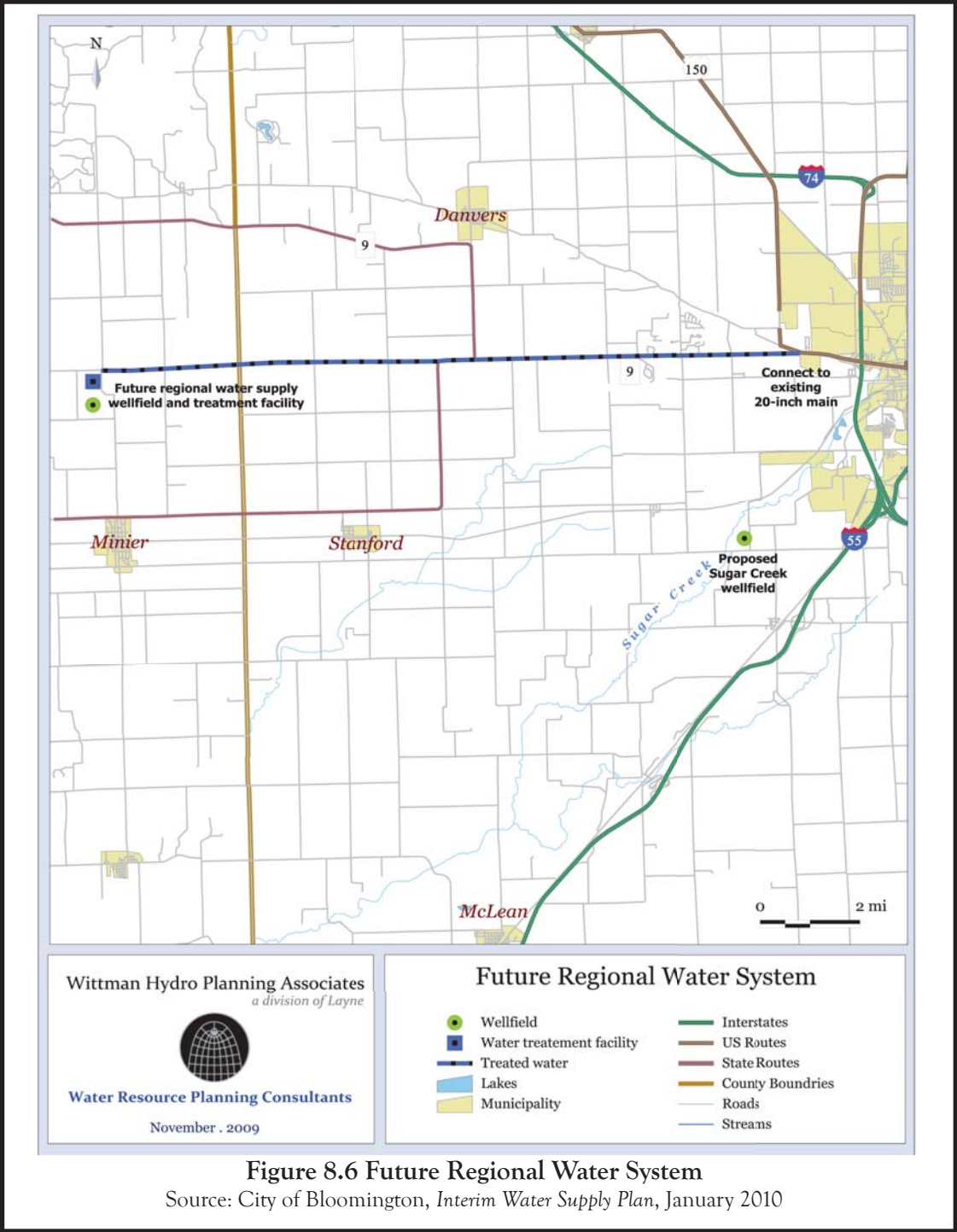
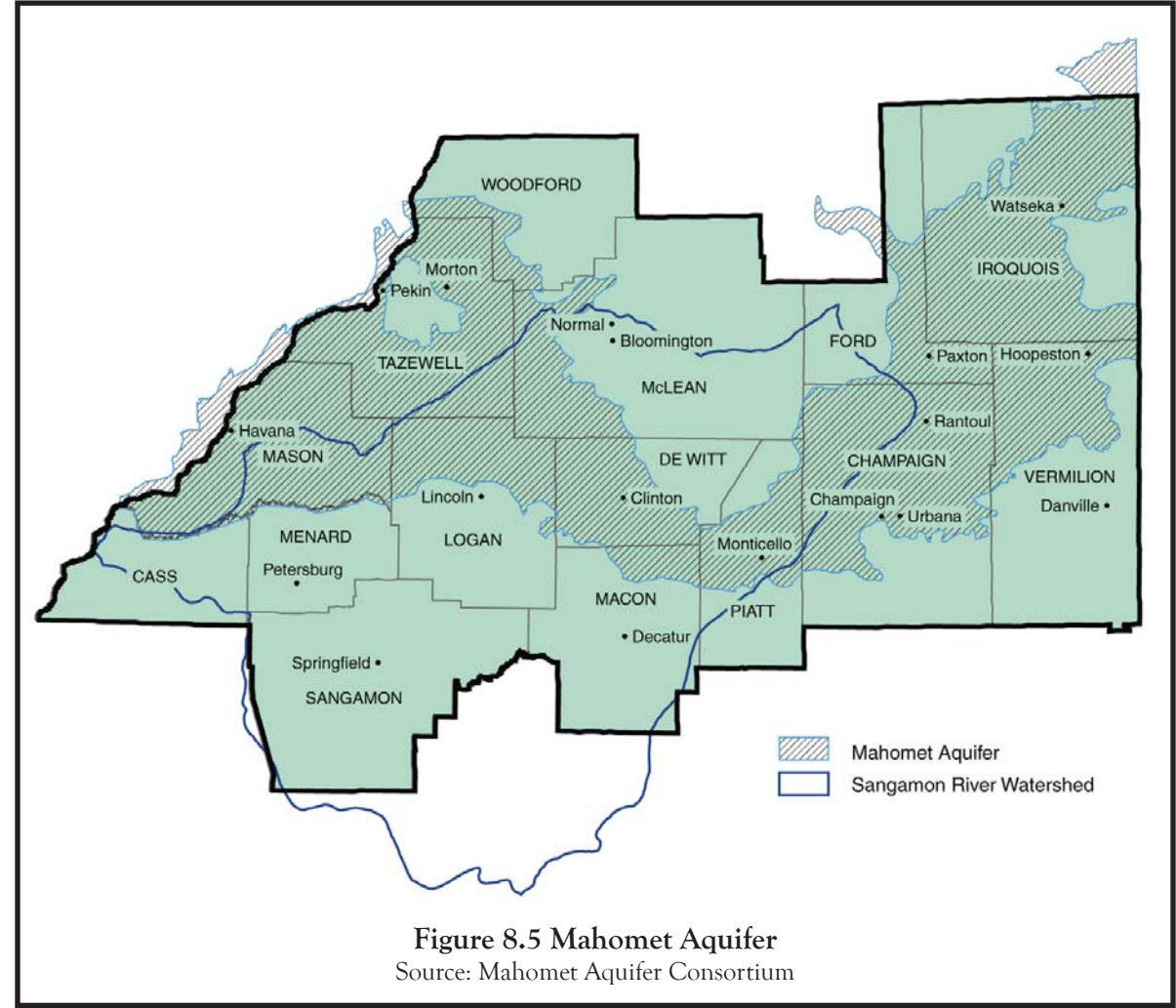
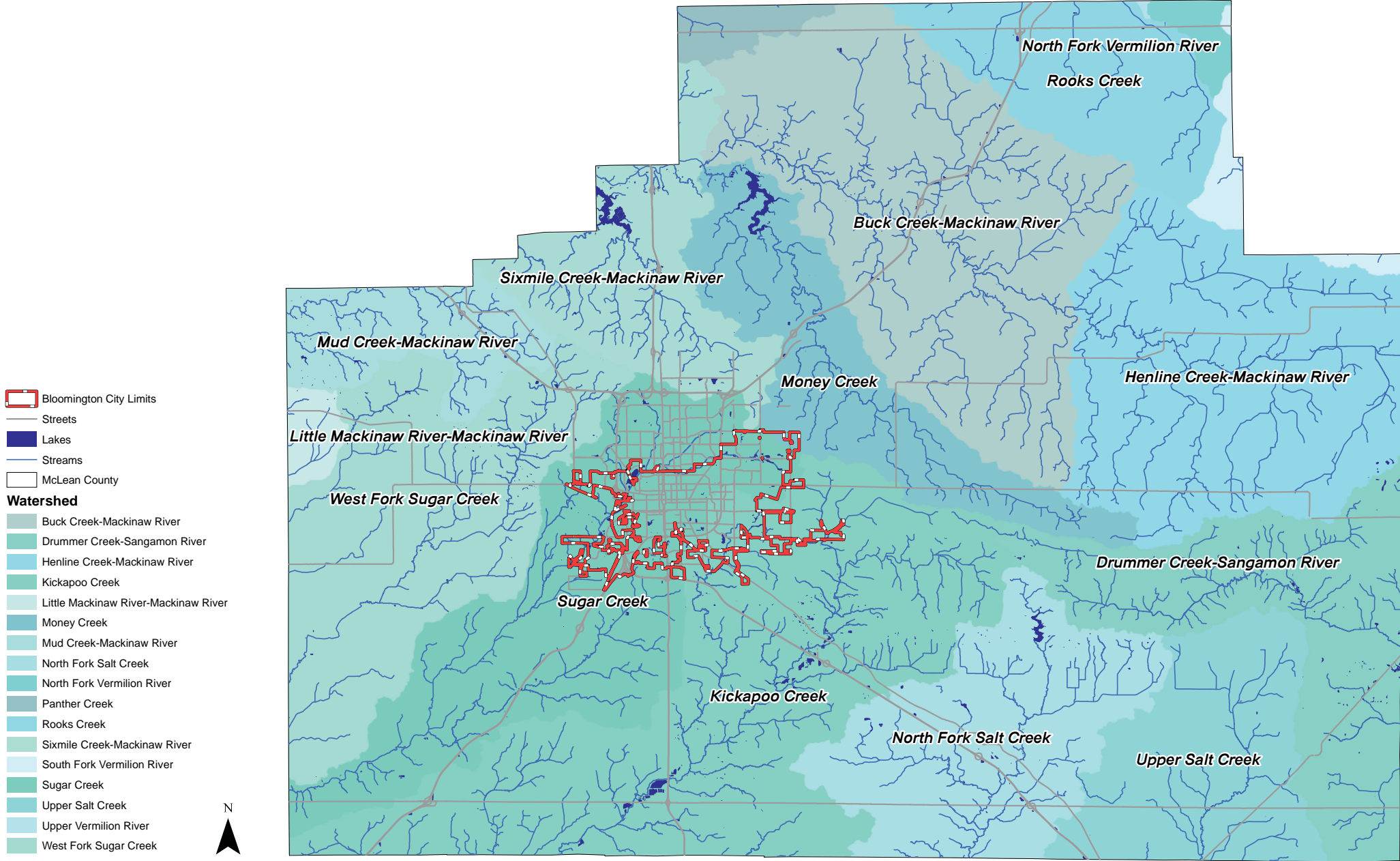


Figure 8.7 Streams and Watersheds



Source: McGIS

larger water bodies.

McLean County contains 17 of these watersheds (see Figure 8.7). The city reservoirs are mainly supplied by water flowing into the Evergreen and Lake Bloomington watersheds by the Six Mile Creek-Mackinaw River, Money Creek and Buck Creek-Mackinaw River watersheds. It is of the utmost importance that these watersheds are continually monitored for supply and pollutants in order that the cleanest water possible is flowing into the reservoirs. The City is making continuous efforts to do so by estab-

lishing watershed restoration projects in the area as well as implementing test projects to improve best management practices. (i.e., Bloomington’s Grove at the Kickapoo Creek Restoration Wetland).

ENERGY

The natural environment of McLean County and the area around Bloomington offers a broad array of local energy sources. Some have been exploited since early in the City’s history, and others have only recently been recognized and used. Each of

these resources comes with its own set of benefits and concerns in terms of the energy provided, the impact of the extraction of the resource, and the impact of the use of the resource to generate energy. Each is also dependent upon the development of the appropriate infrastructure to process, produce and transmit the resulting energy.

Energy production and consumption starkly illustrate the complex relationships among natural resources, environmental capacity and urban growth. In Illinois, nearly half of electricity generation is produced by

nuclear power (see Figure 8.8). Nearly an equivalent amount of electricity is produced from coal-fired generating plants. Both nuclear and coal electricity generation produce environmental impacts and long-term consequences.

A substantial portion of our energy usage is in the form of fossil fuels (see Figure 8.9). This includes petroleum products, natural gas and coal, either used in electricity generation, or as fuel for vehicles and industrial and farm equipment.

In evaluating the planning implica-

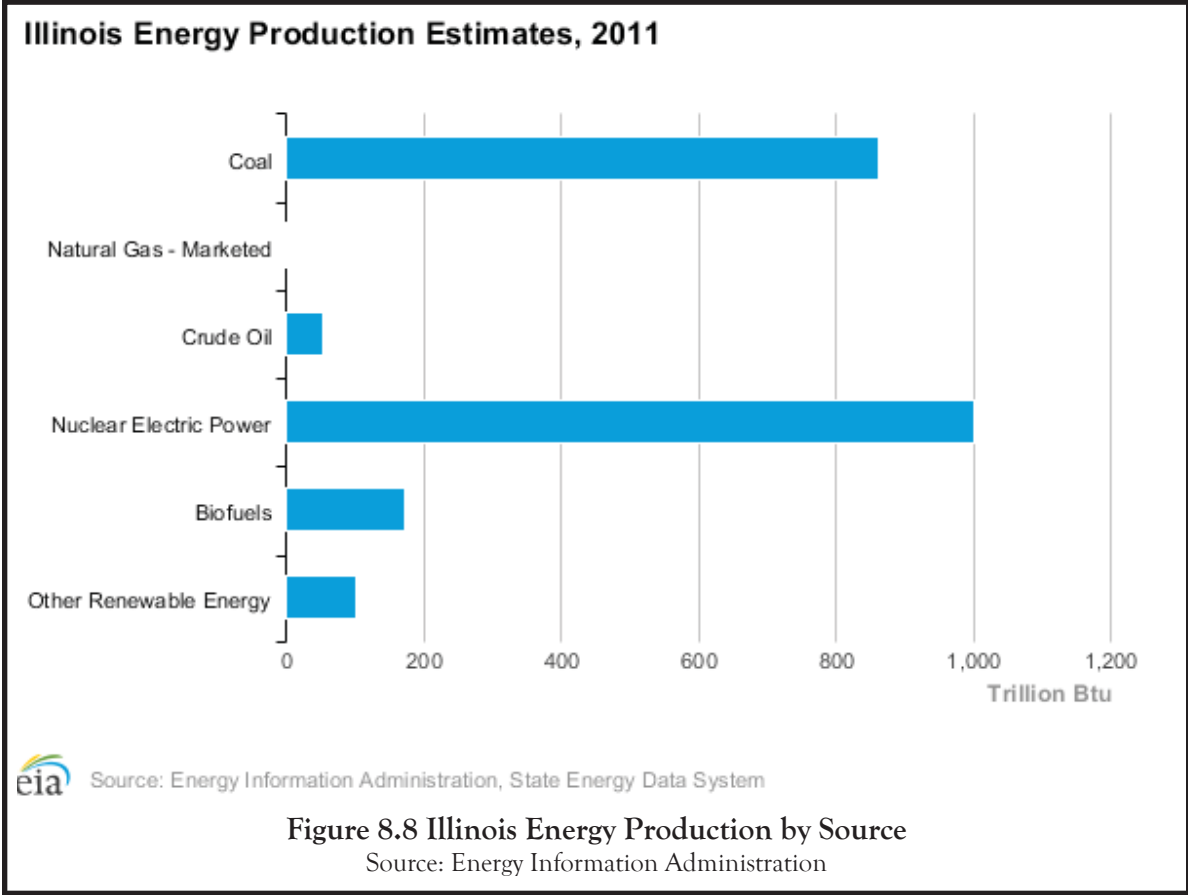


Figure 8.8 Illinois Energy Production by Source  
Source: Energy Information Administration

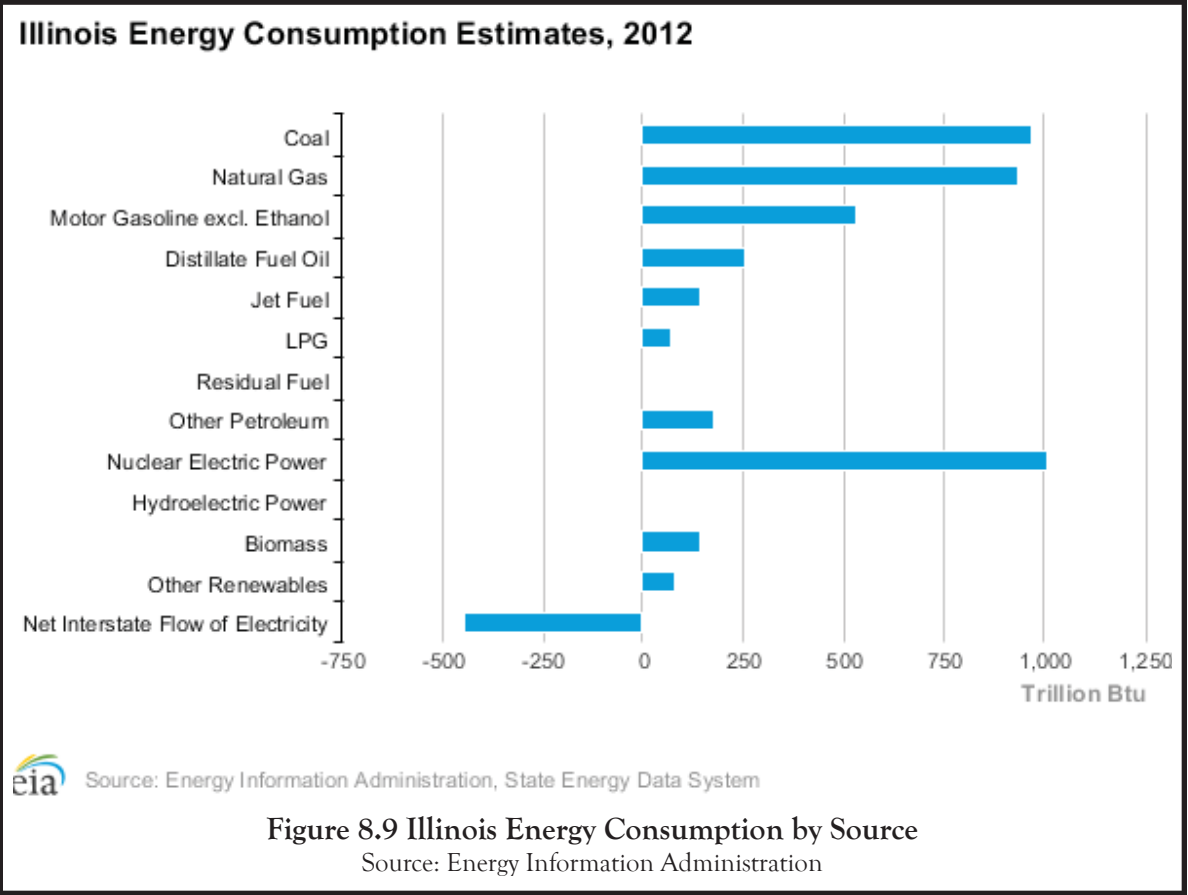


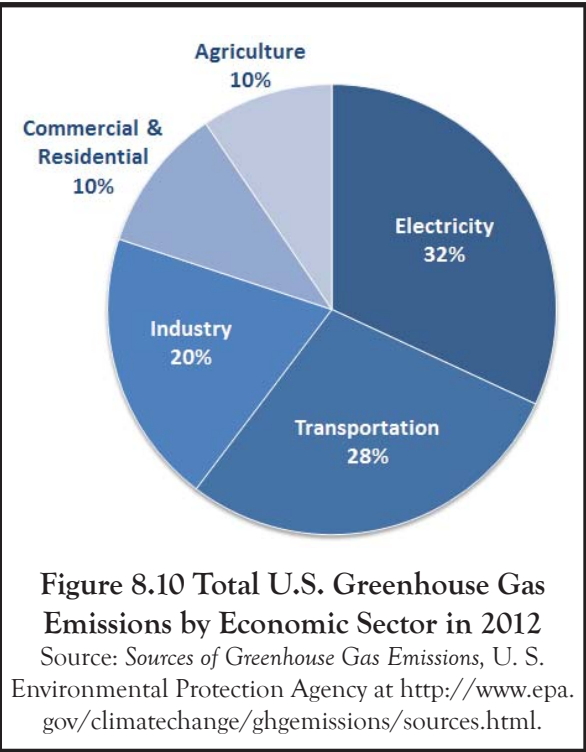
Figure 8.9 Illinois Energy Consumption by Source  
Source: Energy Information Administration



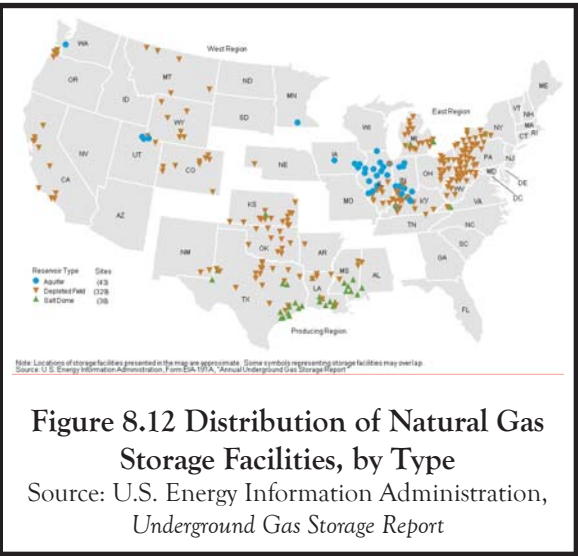
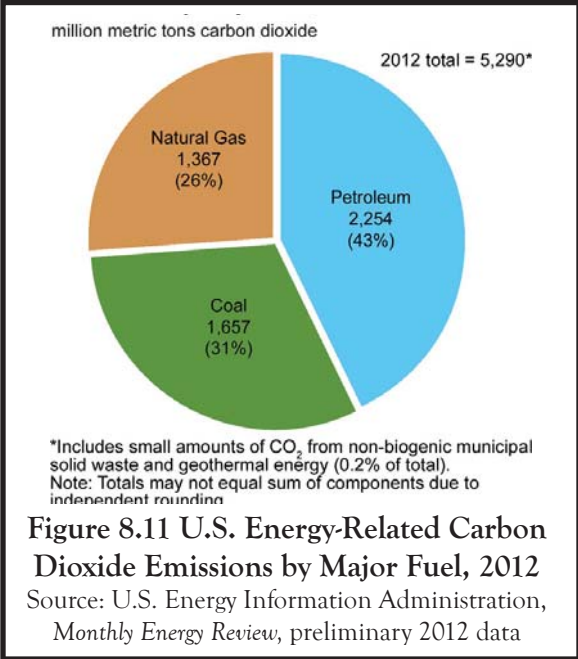
tions of energy production and consumption for the City, it is important to remember that the energy market is large-scale; energy produced locally is transmitted through regional and national systems, and costs are determined at a global scale. Similarly, decisions regarding the equity and safety of energy production are based in state and national policy, on which regional and local interests may have little influence. For Bloomington, a focus on impact mitigation and lower-impact alternative energy sources may best identify energy issues on which the City can exert direct influence.

*Fossil Fuel Use and Environmental Impact*

Among the issues raised regarding



the use of fossil fuels is the connection to greenhouse gas production and impacts on air quality. The use of fossil fuels is a major contributor to greenhouse gas emissions.<sup>1</sup> As shown in Figure 8.10, at the national level



large scale-energy usage such as electricity generation predominantly through the use of fossil fuels, industry and transportation comprise 80% of greenhouse gas emissions. Use by individuals and business outside the industrial sector and agriculture account for the remaining 20%. EPA notes that land use, land use change, and forestry in the United States is a net greenhouse gas sink and offsets approximately 15% of these greenhouse gas emissions. As noted above, the proportion of nuclear electricity generation in Illinois is well above the national average, thus shifting the allocation of greenhouse gas sources for the state. The extensive agricultural land use in the state (less directly tied to fossil fuel use) may produce proportionately higher emissions than are found nationally.

The U.S. Energy Information Administration looks at 2012 emissions for the greenhouse gas carbon dioxide released due to energy production, analyzed by fuel, as shown in Figure 8.11. Petroleum products (crude oil, gasoline, diesel, propane, jet fuel, ethanol, and other liquid fuels) produce more than 40% of the total emissions, followed by coal and natural gas. This further details the contribution of fossil fuels as contributors to greenhouse gases when used for energy production.

To bring the energy picture into local perspective, the Ecology Action Center (EAC) has conducted a study of local conditions, the Bloomington-Normal Greenhouse Gas Inventory, which examines the energy uses of the local governments and other sectors and assess greenhouse gas emissions

for the urban area. The study was prepared for the City of Bloomington and the Town of Normal, and uses 2008 as its baseline data year.

Using an accepted aggregate measurement that includes weighted values for carbon dioxide, methane and nitrous oxide, and excluding other greenhouse gases that contribute a very low percentage of emissions, the EAC analyzed energy uses by local governments, and commercial, residential and industrial users. With respect to electricity use, the analysis correlated to the emission of metric tons (or 2,204.6 pounds) of carbon dioxide equivalent greenhouse gases. The data used is provided by the electric utilities.<sup>2</sup> For Bloomington, the analysis resulted in the following distribution of emissions, where MT CO<sub>2</sub>e denotes the total metric tons of carbon dioxide equivalent emissions due to electricity use in the base year.

Footnotes:  
1) U.S. Energy Information Administration, U.S. Department of Energy, at [http://www.eia.gov/energy-explained/index.cfm?page=environment\\_where\\_ghg\\_come\\_from](http://www.eia.gov/energy-explained/index.cfm?page=environment_where_ghg_come_from)  
2) See Bloomington-Normal Greenhouse Gas Inventory for a detailed discussion of the methodology and data limitations.

Figure 8.13 Emissions Due to Electricity Use		
Use Sector	2008 MT CO2e	% of total emissions
Commercial	496,919	61%
Industrial	40,126	5%
Residential	249,932	31%
Local Government	23,709	3%
Total emissions	810,687	
Source: Ecology Action Center, Bloomington-Normal Greenhouse Gas Inventory, June 2014.		

Commercial and residential users produce 92% of Bloomington’s greenhouse gas emissions resulting from electricity use. Local government use and industry produce the remaining 8%.

The inventory also calculates the source of emissions due to transportation, based on total vehicle miles traveled by specified entities, and by fuel types. Emissions due to transportation are overwhelmingly sourced from the private sector. In considering the emissions produced by the local governments through use for transportation, noted in Figure 8.13, in the baseline year the City was producing triple the greenhouse gas emissions as the Town of Normal due to transportation activity. This level of emissions through City transportation use was disproportionately high compared to use by Normal. (In 2010 Bloomington was nearly 50% larger in land area than Normal, and nearly 1½ times as populous, but in the baseline

Figure 8.14 Emissions Due to Transportation, Private and Public Sector Users			
Sector	Fuel Type	2008 MT CO2e	% of total emis- sions
Mixed residen- tial, com- mercial, industrial (VMT)	not specified	420,453	98%
Amtrak	not specified	594	0.1%
Connect Transit	diesel	3,114	0.7%
City of Bloom- ington	diesel, gasoline	3,334	0.8%
Town of Normal	diesel, gasoline	1,060	0.2%
BNWRD	diesel, gasoline	144	0.0%
Total Emissions		428,699	
Source: Ecology Action Center, Bloomington-Nor- mal Greenhouse Gas Inventory, June 2014.			

The EAC report also examines community scale emission inventory results, and

concludes with a comparison of 2008 per capita greenhouse gas emissions for the urban area, Illinois and the United States. The Bloomington-Normal per capita emission level of 17.3 MT CO2e is slightly below the Illinois level of 18.6 MT CO2e, and appreciably below the U.S. per capita emissions level of 22.2 MT CO2e.

ENERGY SOURCES – IMPACTS & ISSUES

The finding in the Ecology Action Center report that local greenhouse gas production as of 2008 is lower than state and national averages is an encouraging development, although it should be tested against other measurements of energy demand between 2008 and the present day. These measurements may include but need not be limited to construction activity, industrial production levels and economic activity. More recent data on energy demand for comparison to 2008 may also be useful in evaluating policies with respect to energy management. The EAC report notes several initiatives to address greenhouse gas emission reduction, including the development of the City of Bloomington Bicycle Plan.

The various energy sources available to Bloomington also present challenges and issues beyond the direct environmental impact of their use. Current issues arising with respect to specific energy sources are discussed below.

Natural Gas

McLean County does not produce

natural gas locally, but geologic structures here provide for significant natural gas storage capacity. Nicor Gas Company (Nicor) maintains underground natural gas storage reservoirs at several locations in northern McLean County. These storage facilities take advantage of deep aquifer formations of porous rock sequestered under an impermeable rock cap, within which natural gas can be stored under pressure.<sup>3</sup> As shown in Figure 8.12<sup>4</sup>, Illinois is a primary location for gas storage in aquifers.

The storage of natural gas allows Nicor to maintain supply to accommodate seasonal variations in demand, and to regulate the volume of natural gas in the pipeline system.

Use of the underground storage capacity relies upon pipeline systems and an injection facility north of Normal.

One potential impact of underground natural gas storage mirrors the impact of naturally-occurring gas deposits. This can include migration of natural gas into public and private water wells, which can in turn make the wells unusable as a water source. This is of concern to users of private wells, but may also have implications for ongoing water supply planning.

Footnotes:  
3) “The Basics of Underground Natural Gas Storage,” U.S. Energy Information Administration, U.S. Department of Energy, at [http://www.eia.gov/pub/oil\\_gas/natural\\_gas/analysis\\_publications/storagebasics/storagebasics.html](http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/storagebasics/storagebasics.html).  
4) U.S. Energy Information Administration, U.S. Department of Energy at [http://www.eia.gov/cfapps/ngqs/images/storage\\_2011.png](http://www.eia.gov/cfapps/ngqs/images/storage_2011.png).



Although the Nicor gas storage areas are not in proximity to the City, elements of the pipeline network are, and the entire system is an important component of the energy infrastructure that influences the quality of life for City residents. While the geology of McLean County provides a local resource for natural gas management, it also creates some constraints on development. Nicor has expressed concerns regarding urban growth in close proximity to its injection facility and monitoring wells, due to maintenance procedures not compatible with adjacent residential uses. While this is not an immediate concern for the City at the moment, being primarily an issue for the Town of Normal, the Nicor facilities are relatively close to Lake Bloomington, and have regional impacts that all municipalities in McLean County should consider.

As noted above, the transmission and use of natural gas produces greenhouse gas emissions, including methane, as a result of system leakage occurring during transmission and use<sup>5</sup>. No gas system can be completely free of leaks, therefore proper safety and maintenance practices are important not only for Nicor itself, but for the health and safety of the local governments and their residents. Continuing communication between Nicor and City staff is an element in monitoring the components of local natural gas infrastructure, and preserving the environmental integrity of the area it occupies.

Footnote:  
5) See note 1, page 124.

Oil

As is the case with natural gas, McLean County does not produce oil or petroleum products. However, the construction of the Enbridge, Inc. Southern Access Extension Pipeline, expected to be completed in 2015, will carry crude oil through our area, to the east and south of Bloomington (see Figure 8.13). The Enbridge project has been in development for several years, and has been approved by the Illinois Commerce Commission, which also granted Enbridge the power to use eminent domain proceedings to facilitate the acquisition of the needed corridor for the pipeline, which will cross eight counties in central Illinois.

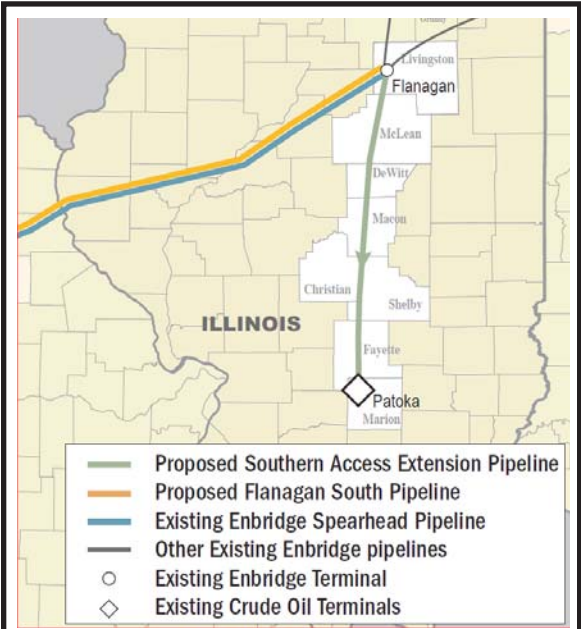
As currently described by Enbridge, the pipeline will cross Money Creek, which flows into Lake Bloomington, and the Mackinaw River and tributaries, a secondary source for the water supply system. As the pipeline begins service, Bloomington’s interest in maintaining the integrity of the City’s water supply merits monitoring of pipeline management, directly and through McLean County and the appropriate state and federal agencies. There are also opportunities for the City to work with area environmental advocacy groups in monitoring and evaluating the operation of the pipeline. The Enbridge pipeline project has garnered significant public interest and concern during the pre-construction period, and a continuation of the that discussion during the planning process is warranted.

As noted above, petroleum product use, particularly in electricity generation,

transportation and agriculture, creates greenhouse gas emissions, which are a continuing issue for the health of the community.

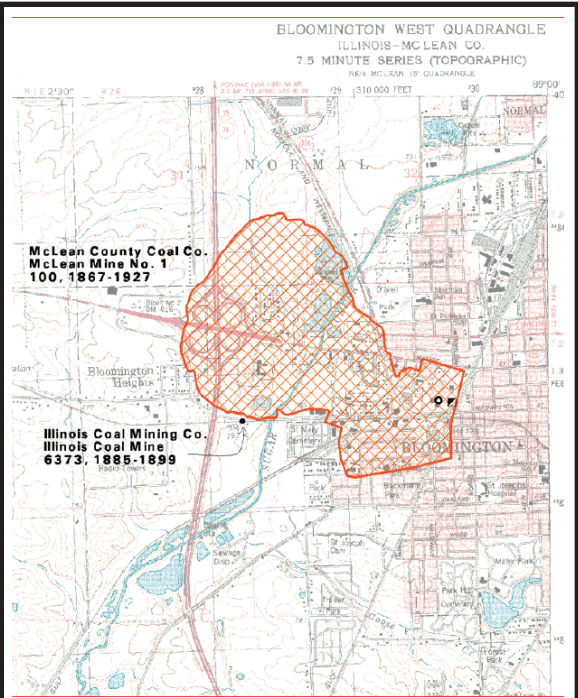
Coal

As noted in the Historic Context chapter, Bloomington was a coal-producing city for some sixty years, beginning just after the Civil War and continuing well into the 20th century. Figure 8.14 illustrates the extent of coal mining on the west side of Bloomington between 1867 and 1927. During this period, coal was the dominant fuel for industry, commerce, residential and transportation use, and local production had a local market as well as export potential. In the 21st century, coal remains an essen-



**Figure 8.15 Enbridge Inc. Project Map, Southern Access Extension Pipeline**  
Source: Enbridge, Inc.

tial national resource, with massive mining operations in the mountain west and Appalachia supplying national and international demand, with additional production across the southern plains and Midwest. As of 2012, Illinois was the fifth largest coal producing state in the nation, producing slightly more than one-tenth the tonnage of Wyoming, the most productive coal state<sup>6</sup>. As discussed above, in Illinois coal produces half of electric power generation. Coal mining continues as a viable industry in central Illinois, notably at the Viper Mine operating at Elkhart and



**Figure 8.16 Detail of 1981 USGS Bloomington West 7.5 Minute Quadrangle Map**  
Source: *Directory of Coal Mines in Illinois*, Chenoweth & Louchios, Illinois Department of Natural Resources, Illinois State Geological Survey, 2004

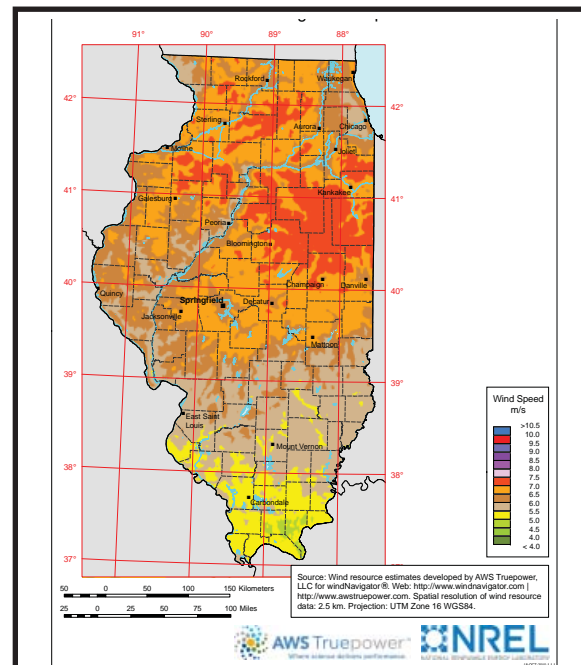


Williamsville, although the bulk of Illinois coal production is in southern Illinois.

It has been nearly ninety years since the benefits and detriments of coal mining have directly affected the City of Bloomington. It is unlikely that this industry will re-emerge in the foreseeable future, but as global demand for energy intensifies, planning for the City's future should evaluate the contingencies.

## RENEWABLE ENERGY

The range of available energy sources will continue to be dominated by fossil fuels, but renewable energy is a growing force in McLean County. Bloomington residents and



**Figure 8.17 Illinois - Annual Average Wind Speed at 80m**  
Source: National Renewable Energy Laboratory

businesses have an increasing array of options available to incorporate the use of renewable energy in their day-to-day lives.

## Biofuels

Bloomington is surrounded by the bounty of McLean County farmland, a source of the City's prosperity and economic stability for more than 150 years. In recent decades, the production of corn and soybeans has found new markets in biofuels, including ethanol and biodiesel. This shift provides new revenue sources to farmers, and has generated new types of processing as companies move into biofuel production. According to the U.S. Energy Information Administration, "Illinois is the third largest producer of ethanol among the states, and biodiesel production capacity in Illinois is second only to Texas."<sup>7</sup>

The use of crops for fuel rather than food is a continuing source of controversy, and combined with questions about the efficiency and environmental cost of biofuel manufacturing processes, is likely to remain a point of contention.<sup>8</sup> While the debate continues, the use of renewable energy such as biofuels is now an accepted component of the energy supply.

The use of farm products to manufacture biofuels is supported by state and federal incentive programs. In 2007 state law was enacted creating the Illinois Power Agency to establish energy procurement plans incorporating required levels of renewable energy sources. This agency also oversees the municipal electric aggregation program.<sup>9</sup> Specifically,

the state renewable portfolio standard: "... requires that investor-owned electric utilities with more than 100,000 Illinois customers obtain 25% of retail sales from renewable resources by May of 2026, with at least 75% of the requirement from wind and 6% from solar photovoltaics (PV)."<sup>10</sup>

There are a number of federal programs supporting the use of renewable energy, including grants, tax credits, loans and research and development assistance.<sup>11</sup> Several programs provide specific incentives for the manufacture and use of biofuels, and for development of additional biomass resources for use in biofuels. Domestic production of biofuels is regarded as a strategy to improve the nation's energy security and advance energy independence for the United States.

The evolving use of agricultural land to produce both food and energy also produces a new calculus of land value, an issue for Bloomington when annexing farmland into the City is proposed. Much of the area identified for the future development of Bloomington is currently in agricultural use. Discussion during the planning process may evaluate the appropriate balance in economic and environmental terms between land converted to urban uses, and land remaining in agricultural production of food and fuel, especially when viewed through the fiscal impact analysis of development in the City.

## Wind Energy

As construction of the Twin Groves wind farm in eastern McLean County began, City residents found themselves sharing

Route 9 with trucks hauling the enormous turbine blades and towers from the rail yards on the west side to their locations five miles east of Towanda-Barnes Road and onward to the County line. Now the turbines are simply part of the scenery, visible from many points on the east side of the City as they track the wind. While not everyone agrees on the aesthetic qualities of the turbines, they have created a new energy industry in our area. If development of Twin Groves and related wind projects continue as originally envisioned, much of the eastern half of our county will be dotted with wind turbines.<sup>12</sup> We have come a long way from the windmills used to power wells and pumps once common across the prairie landscape.

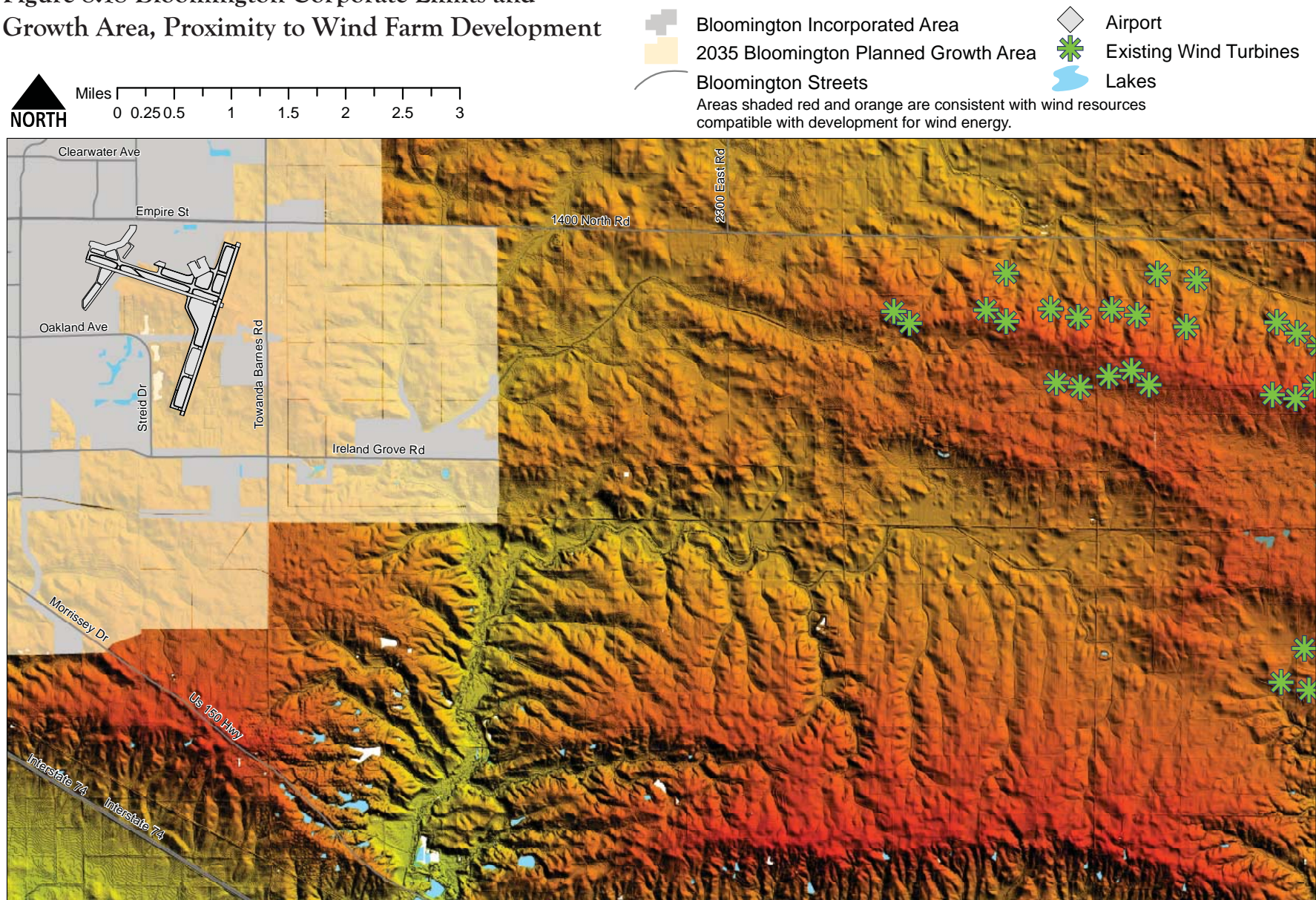
The Twin Groves and White Oak wind farm projects highlight the emergence of Illinois as a wind energy center. As ob-

## Footnotes:

- 6) U.S. Energy Information Administration at [http://www.eia.gov/energyexplained/index.cfm?page=coal\\_where](http://www.eia.gov/energyexplained/index.cfm?page=coal_where).
- 7) U.S. Energy Information Administration, U.S. Department of Energy at <http://www.eia.gov/state/analysis.cfm?sid=IL>
- 8) "The Transportation Nexus: Ethanol Is a 'Food vs. Fuel' Issue," Knowledge@Wharton, University of Pennsylvania, July 10, 2013, at <http://knowledge.wharton.upenn.edu/article/the-transportation-nexus-ethanol-is-a-food-vs-fuel-issue/>
- 9) Illinois Power Agency website at <http://www2.illinois.gov/ipa/Pages/default.aspx>.)
- 10) U.S. Energy Information Administration, U.S. Department of Energy at <http://www.eia.gov/state/analysis.cfm?sid=IL>
- 11) U.S. Energy Information Administration, U.S. Department of Energy at [http://www.eia.gov/energyexplained/index.cfm?page=renewable\\_home#tab3](http://www.eia.gov/energyexplained/index.cfm?page=renewable_home#tab3).)



Figure 8.18 Bloomington Corporate Limits and Growth Area, Proximity to Wind Farm Development



Source: MCRPC

served by the U.S. Energy Information Administration, “Wind generation is the primary renewable resource for electric power generation in Illinois. The state’s wind resource potential is ranked 15th in the nation; however, by the end of 2012, it was one of the top five states in the nation in terms of wind capacity installations with more than 3,500 megawatts of generating capacity online.”<sup>13</sup>

Considerable wind resource remains to be utilized. As illustrated in Figure 8.16, much of McLean County has the same level of wind capacity as the areas where wind farms are now in place. Although the announced plans for the area may not come to fruition in precisely the form suggested, the availability of the resource and advancing technologies, as well as the transmission infrastructure in place, support the anticipation of future development around Bloomington.

In the years following the construction of Twin Grove additional wind energy development has expanded across central Illinois. For Bloomington, the spread of wind energy prompts consideration of two issues, continued eastward growth of the City, and policy regarding small-scale wind power infrastructure within the urban area.

The annexation and development of the Grove subdivision on Ireland Grove Road brought the City limits to within ap-

Footnotes:  
12) “Central Illinois may gain 2,000 turbines in 5 years,” M.K. Guetersloh, Daily Pantagraph, October 6, 2010.  
13) <http://www.eia.gov/state/analysis.cfm?sid=IL>



proximately three miles of the westernmost installed wind turbine at Twin Groves (see Figure 8.18). McLean County has established regulations regarding distance between wind turbines and residential uses, which may be a factor in future annexation decisions by the City, particularly if further wind farm development does occur.

The planning process also offers an opportunity to evaluate the evolving technologies for residential and commercial scale wind energy installations within the city, and consider policy for what is often called “urban wind.” Wind turbine design for small-scale use is a growing field, and rather than replicating large turbines in smaller form, designs now include vertical-axis turbines and noise-reduction features.

## EMERGING ENERGY ISSUES

The rapidly changing energy landscape in Illinois and the nation has triggered several issues for which Bloomington has an opportunity to consider policy preferences. Although some matters will require governmental cooperation at multiple levels to reach solutions, the City has the opportunity through the planning process to consider the best approach to these issues for Bloomington.

### *Hydraulic Fracturing*

The emergence of hydraulic fracturing, better known as fracking, to extract additional oil or gas from a well has garnered considerable attention in recent years. The process requires injection of large quantities

of pressurized fluid to break apart the subterranean rock and allow the oil and gas to flow into the well structure. This process is thought to allow fracking products to migrate outward from well structures. Components in fracking fluid have been detected in aquifers adjacent to wells subjected to the process, and the disposal of the fluids has become a separate environmental concern. Formulas for the fluids used are regarded as proprietary information by drilling companies, which complicates efforts to track the migration of the fluids and assess their impact.

Fracking is also associated with surges in seismic activity in areas not known for earthquakes. A study published in July 2014 by researchers from Cornell University and the University of Colorado<sup>14</sup> links the use of wastewater injection in the fracking process to earthquake swarms in Oklahoma, which has become the second most seismically active state in the country since intensive fracking activities began in 2008.<sup>15</sup>

There has been some interest in using fracking for oil drilling in McLean County, and the issue was brought to the McLean County Zoning Board of Appeals in 2011, only to have the matter withdrawn before a hearing. Although the state enacted oil and gas drilling regulations in 2013, there is concern that the Illinois Department of Natural Resources does not have the staff needed to properly administer the regulations.<sup>16</sup> In view of possible impacts from fracking on potential water supplies of interest to Bloomington for future regional water planning, the City is warranted in giving careful attention to the

implementation of the state law and requests to drill locally.

### *Air Quality*

The recent Bloomington-Normal Greenhouse Gas Inventory prepared by the Ecology Action Center (discussed above) provides a detailed analysis of the challenges to air quality in the urban area created by greenhouse gas emissions resulting from fossil fuel use, in the baseline year 2008. The report provides agencies at several levels with data for future comparison and analysis. As part of its transportation planning program, the McLean County Regional Planning Commission works with the Environmental Protection Agency (EPA), the Federal Highway Administration (FHWA) and the Illinois Department of Transportation (IDOT) to track current air quality performance and formulate plans to maintain or improve local air quality. Through these plans, actions may be taken to manage transportation activity to bring about improvement in overall air quality, in recognition of the substantial portion of air pollution that is produced by the transportation system. EPA also regulates other sectors, such as electric utilities, with respect to air quality requirements.

EPA conducts air monitoring to determine the levels of pollutants identified in the Clean Air Act and the National Ambient Air Quality Standards (NAAQS) in a given area. The NAAQS are applied to six “principal pollutants,” which include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO<sub>2</sub>), Ozone (O<sub>3</sub>) particulate matter (PM) and

sulfur dioxide (SO<sub>2</sub>) Figure 8.15 illustrates 2013 daily aggregated levels of the primary pollutants recorded by the Bloomington-Normal area monitoring station, Ozone and PM 10 particulates. The monitoring station is located on the ISU campus in Normal. The EPA engages in ongoing assessment of the air quality standards, and the FHWA works with regional agencies like MCPRC to manage compliance with programs to maintain or achieve required air quality standards.

The Bloomington-Normal urban area is currently classified under federal law as an “attainment area,” which means that the measured levels of the primary pollutants falls below the levels that violate the air quality standards.<sup>17</sup> This status may change to “non-attainment” should Congress revise the acceptable levels of pollutants defined in federal law. Designation as a non-attainment area would require that MCRPC, local transit agencies and local government initiate a complex planning process to reduce pollutant levels and monitor progress in returning to compliance with air quality standards.

As illustrated in the EAC Bloomington-Normal Greenhouse Gas Inventory,

Footnotes:

14) Keranen et al., “Sharp increase in central Oklahoma seismicity since 2008 induced by massive wastewater injection,” *Science*, July 2014.

15) Hailey Branson-Potts, “Study links Oklahoma earthquake swarm with fracking operations,” *Los Angeles Times*, July 3, 2014.

16) Illinois has hired few workers to oversee fracking, *Daily Pantagraph*, July 9, 2014.



air pollution is released by a wide variety of sources. While many sources are beyond the regulatory control of municipalities like Bloomington, the EAC report notes that the community is already engaging in projects and planning to improve quality of life and lessen impacts on the natural environment.

GROWTH AND ENVIRONMENTAL IMPACT

Although the components of the natural environment are important to the comprehensive plan on their own merits, the core of concern for Bloomington is at the point where the City’s development intersects and impacts environmental resources. This is particularly true for resources critical to the survival of the community, such as water. Although current demographic data suggest a slower rate of growth for Bloomington than was experienced in the 1990s, growth continues today and in the future. To support the City’s long-term interests, the comprehensive

planning process evaluates benefits and impacts.

Bloomington continues to plan for water resources to support future growth of residents and business. As the city grows, demands for water for all uses grow with it, placing increasing pressure on water treatment and supply infrastructure. There are significant costs when adding new infrastructure to support demand, and maintaining the existing water system to leverage the investment it represents. The City recognizes that both environmental and fiscal viability are challenged by these demands, and implementation of actions recommended the 2010 Water Supply Plan is one step towards meeting the challenge. Because water is a regional resource, continued work on coordinated water supply planning, and the implementation of the resulting recommendations is essential to Bloomington’s future. As noted in the 2010 water supply study, planning for water demand and supply must also account for issues arising from the agricultural land uses that surround the City and affect water quality and infrastructure.

Bloomington is also proactive in addressing impacts due to stormwater; the Department of Public Works has given the City Council a clear picture of the needs and associated costs to deal with existing stormwater impacts, and has formulated a master plan to manage the process. As public works staff has noted, action is costly, but failure to act will be even more costly. Another finding from the public orks planning efforts is the ratcheting cost of system maintenance over

time, as discussed in the Infrastructure chapter.

Stormwater impacts on residents and surrounding areas grow with the City. As streets and parking lots are paved, and buildings are roofed, the increase in impervious surfaces accelerates water runoff and intensifies the impact of storms. In addition to its effect within Bloomington, increased stormwater volume has downstream impacts, triggering erosion and introducing increased levels of pollutants into streams and rivers. As with water supply and treatment, stormwater management continues to be a regional issue, with regional solutions needed to avoid negative impacts on the natural environment.

Another critical impact of growth is demand for conversion of land from agricultural to urban use. Bloomington has consistently expanded its incorporated area at a higher rate than that of its increase in population, often annexing substantial tracts that were in active agricultural production. The farm ground that surrounds the City is an irreplaceable natural resource, adapted over the last 150 years of settlement to become a vital economic and commodity engine. Once development displaces agricultural use, all the possible future production from the land is lost. Comprehensive planning can define the balance between expansion and preservation, and establish Bloomington’s land use priorities.

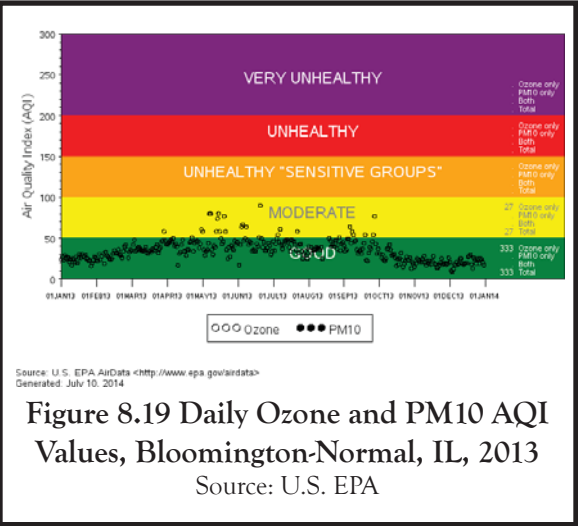
HEAT ISLANDS & IMPERVIOUS SURFACES

Urban centers of all sizes and struc-

ture are susceptible to “heat island” effect. On hot summer days, roof and pavement temperatures can be 50 to 90 degrees warmer than the surrounding air. This phenomenon can affect a community’s environment and quality of life due to introducing unnatural and additional heat into the human environment. This can result in increased energy consumption, elevated emissions and greenhouse gases and impaired water quality.

Higher than normal pavement and rooftop surfaces can be responsible for heating stormwater runoff. Rainwater temperature can increase an average of 25 degrees on impervious surfaces on hot and humid days. This heated stormwater generally becomes runoff, draining into storm sewers and other outlets that eventually finds its way into streams and other waterways. Water temperature affects aquatic life and ecosystems. According to USEPA, these rapid temperature changes can be stressful and even deadly for some aquatic species. Warm weather temperatures combined with impervious surfaces (buildings, pavement and parking lots) and urban heat islands can increase energy demand in urban centers for all types of commercial and residential cooling needs. These factors increase not only normal electrical demand but needs for electricity during peak usage periods. This can contribute to overloading the electrical system contribut-

Footnote:  
17) EPA monitoring measures at various times and seasons, and produces individual and aggregated measurements as defined in the air quality regulations.



ing to brownouts or blackouts. Some energy providers opt for implementing controlled or rolling brownouts during such high demand periods to avoid power outages.

According to the Ecology Action Center, concrete and asphalt structures cannot absorb heat and water as well as a natural landscape. As the natural landscape is replaced by the built environment, steps must be taken to address the problems that can occur from development. According to the Ecology Action Center, the built environment can be a threat to watersheds as it can change the path and speed of water flows from runoff and storm events. If stormwater cannot be absorbed into the ground, it becomes runoff which can lead to erosion of streams and creeks. Stormwater can also be contaminated as it picks up debris as it flows.

## SOLID WASTE

In Bloomington alone, the City services approximately 26,000 solid waste customers every week which includes single-family, apartment complexes and mobile home parks. This includes weekly refuse (trash) collection, bi-weekly single stream recycling, weekly curbside bulk waste collection, drop-off recycling collection, drop-off large item collection and yard waste collection. In December of 2009, the City began limiting the number of bulk loads collected for free due to budget constraints. In 2009, the City also eliminated free collection of sod, dirt, concrete, rock and shingles.

Daily tonnage of garbage has declined

from a high of just over 20,600 in 2007 to a low of under 17,705 in 2013 (see “Total Tons of Daily Garbage-COB Solid waste Program Analysis-2013). Collection of recyclables has increased from 2,173 total tons in 2007 to just over 3,500 tons in 2013 (see Total Tons Recyclable Collection-COB Solid Waste Program Analysis-2013). This has resulted in an overall savings of just over \$160,000 in land-fill fees. In FY 2013, close to \$612,000 has been added to the City solid waste program. Bulk waste collection continues to be the most costly service from the city solid waste program at just over 56 percent while daily garbage collection costs account for another 24 percent.

Through an intergovernmental agreement, the Ecology Action Center (EAC) is designated as the solid waste agency for all local governments within McLean County. Services provided by the EAC, include but are not limited to: public education and outreach, solid waste planning, administration of non-traditional recycling programs, coordination of household hazardous waste collection and technical services such as calculation of community-wide waste generation and recycling rates.

Through the McLean County Solid Waste Program, the EAC seeks to help local residents and businesses reduce waste, increase recycling and promote the proper disposal of hazardous wastes. One measure of progress toward these goals is the annual recycling rate. The current goal is 40 percent of all solid waste generated, which the overall area is making significant progress towards.

A 2014 “waste audit” conducted by EAC of the B-N urban area found that close to 73% of all waste collected was non-recyclable waste. Most materials including aluminum, glass, and plastics are being properly recycled with composition rates of materials remaining similar to previous studies. However, significant volumes of recyclable paper products are still being improperly disposed of which is consistent from findings of previous audits. That stated, Bloomington residents continue to recycle a majority of their waste that can be recycled. The EAC continues to review possible programming that can address non-traditional recycling programs such as textiles and food waste or increased emphasis on “source reduction.”

McLean County Landfill #2 is scheduled for closure in 2017 due to reaching capacity of close to four million cubic yards of waste. This will eliminate a local waste site that has a permitted disposal area of just over 43 acres and a permitted landfill capacity of 55 acres. Total annual disposal throughout the life of the landfill has differed. Annually more than 300,000 cubic yards or over 90,000 tons of waste is dumped in the landfill, translating to over 300 tons of waste being dumped daily. (Landfill Capacity in Illinois-State of Illinois). Community leaders are currently discussing viable options which may include transporting some waste out of county once the landfill is closed.

