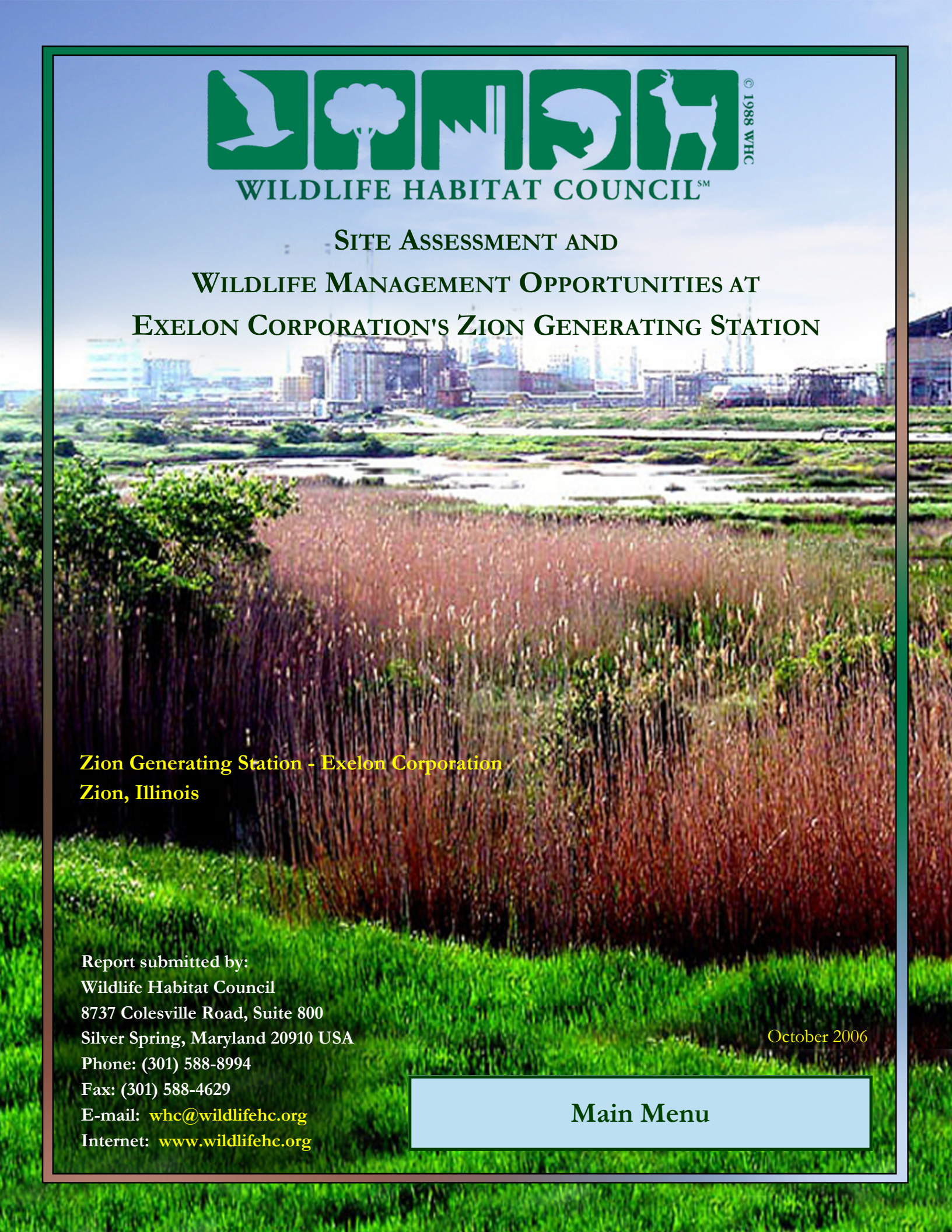

WILDLIFE HABITAT COUNCIL℠

Site Assessment and Wildlife Management Opportunities at Exelon Corporation's Zion Generating Station

Zion Generating Station - Exelon Corporation
Zion, Illinois

Report submitted by:
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October 2006

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This report was prepared by:

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SUE WOLINSKY, CERTIFICATION PROGRAM MANAGER/WILDLIFE BIOLOGIST

With further assistance from the staff of the Wildlife Habitat Council

The Wildlife Habitat Council (WHC) commends EXELON CORPORATION for its commitment to improving habitat for wildlife through the initiation of a wildlife habitat enhancement program at the ZION GENERATING STATION.

We thank Jim Bolte and Kenneth Greenlee for their hospitality during WHC's site visit.

The **WILDLIFE HABITAT COUNCIL (WHC)** is an independent, nonprofit assemblage of corporations, conservation organizations, and individuals dedicated to protecting and enhancing wildlife habitat.

Created in 1988 and based in the greater Washington DC area, WHC strives to promote responsible environmental stewardship within the corporate management culture through the provision of expertise and resources to companies concerned with the protection of wildlife habitat on private landholdings. Over 2 million acres of private land is currently managed for wildlife through WHC-assisted projects in North America and around the world.

WHC also works to broaden understanding of wildlife values through the incorporation of environmental education, volunteer participation, and community outreach programs.

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EXECUTIVE SUMMARY

The Wildlife Habitat Council's (WHC) *Wildlife at Work*[SM] program focuses on involving company employees, community members, conservation organizations, and government agencies in the long-term, active management of company property to improve wildlife habitat and raise environmental awareness. Exelon Corporation and other private landowners play a significant role in species conservation. It has recently been estimated that traditional reserves such as parks, wildlife refuges, and other designated natural areas will, at best, secure roughly five percent of the world's species. Creation of wildlife habitat in and around areas that also feature economic activities can promote biodiversity conservation at local, regional, and even global scales.

Exelon Corporation joined the Wildlife Habitat Council as a one-year member in March 2005, further exemplifying its commitment to investigating and improving wildlife habitat conditions through the enrichment of pre-existing habitat and the establishment of new habitat on the company's landholdings. The following excerpt is taken directly from the Exelon Corporation web site:

> "Exelon understands that being a business leader involves more than being a reliable provider of energy services. It also means being an important part of the communities we serve and working to sustain our environment. We recognize the importance of balancing the need for reliable energy with our responsibility to ensure that the quality of our environment is preserved. We have partnered with many environmental stakeholders to create and support environmental preservation initiatives, we are committed to using technology to more effectively utilize our limited natural resources and to minimize the production of waste, we continuously seek to improve our work practices to further ensure the integrity of the environment, and we are pursuing how we can create value for our shareholders through environmental performance in order to ensure economic growth and environmental sustainability for future generations."

The Zion Generating Station is the 11th site to begin participation in WHC programs. Induction into the *Wildlife at Work* program will enable the Wildlife Habitat Council to assist employees at the Zion Generating Station in their efforts to improve wildlife habitat at the site. Furthermore, partnership with WHC provides Exelon Corporation with an opportunity to demonstrate responsible corporate environmental stewardship by formulating and implementing a balanced and operative wildlife management program.

To assist in the development of a biodiversity assessment and wildlife habitat management plan, representatives from the Zion Generating Station invited a WHC biologist to visit the site on August 16, 2006. This report, *Site Assessment and Wildlife Management Opportunities for*

Exelon Corporation's Zion Generating Station, was created with information compiled from the site visit, discussions with employees, and independent research. It is intended to present and outline historical and current information pertaining to the ecological communities at the Zion Generating Station, focusing on a review of critical habitats and species on site, while outlining opportunities for future enhancement recommendations that are designed to augment food, water, cover, and space resources – the four basic components species require from their habitat. The Wildlife Team may choose to implement some or all of these projects and is furthermore encouraged to explore additional habitat enhancement opportunities. Projects suggested for the Zion Wildlife Team to consider in the future include:

- Improve biodiversity throughout the site by identifying and managing any invasive, exotic species on site;
- Use Best Management Practices of Right-of-Ways that cross the site,
- Enhance & restore wetland habitats for wildlife,
- Maintain grasslands and shrub scrub areas in an early successional state,
- Restore savanna habitat on site by removing shrubby understory and thinning trees,
- Consider a nest box monitoring program for cavity nesting species including songbirds, raptors and bats,
- Manage for snags (dead standing trees) for cavity nesting species,
- Protect shoreline and dune habitats from disturbance during migration and nesting seasons,
- Consider monitoring and managing for threatened and endangered species, such as the piping plover, Blanding's turtle, Franklin's ground squirrel, karner blue butterfly, etc.,
- And initiate enhancement projects, such as creating an amphibian hibernacula, to benefit native amphibian and reptile species.

The Zion Generating Station will be eligible to apply for Habitat Program Certification with WHC when at least one habitat enhancement project has been implemented and monitored for a minimum of one year. WHC's *Corporate Wildlife Habitat Certification/International Accreditation* program is designed to recognize exceptional corporate wildlife habitat programs and supply third-party credibility for environmental stewardship. As WHC certification review procedures are rigorous, the Zion Generating Station Wildlife Team is advised to keep textual and photographic documentation of site habitat enhancement projects and public outreach programs in order to increase its prospects for certification.

Wildlife habitat enhancement, employee participation, and public outreach are the primary objectives of the *Wildlife at Work* program. WHC is confident that employees at the Zion Generating Station can achieve these goals through the development of a wildlife habitat management plan and the implementation of the proposed enhancement projects.

The staff of the Wildlife Habitat Council commends employees at the Zion Generating Station for their demonstrated commitment to protecting biodiversity and improving site wildlife habitat through the implementation of a team-designed wildlife management plan

and anticipates the formation of a sustained association with site participants. Please contact Kathleen A. Koelbl-Crews or WHC staff with inquiries regarding the wildlife management plan, additional habitat enhancement opportunities, and WHC certification procedures.

1. OVERVIEW

WHC requires a site visit by a staff wildlife biologist prior to recommending a wildlife habitat management plan. The purpose of the site visit is to accurately assess the current habitat conditions of the site and to subsequently determine which habitat enhancement projects would be most appropriate for these particular conditions in accordance with management objectives. Therefore, it is standard procedure during the site visit that the visiting WHC biologist meet with company personnel to ascertain the objectives of the site's wildlife program and to present initial habitat enhancement opportunities. This overview contains the proceedings of the site visit, as well as a detailed site description and review of local area history.

1.1 SITE VISIT

On August 16, 2006, WHC Wildlife Biologist Kathleen Koelbl-Crews met with Exelon Corporation representatives Jim Bolte and Kenneth Greenlee, and Commonwealth Edison representataive Brett Richer to discuss site biodiversity and wildlife habitat opportunities at the Zion Generating Station. The group met in the turnaround area that is located just outside of the security checkpoint in front of the Powerhouse building at the Zion Generating Station, at approximately 9:00 a.m. on Wednesday morning. Following introductions, a brief meeting occurred to discuss management opportunities for Commonwealth Edison the right-of-ways (ROWs) at the site. In addition, the group discussed future plans for the powerhouse building, which is currently owned by Commonwealth Edison. Following the meeting, Mr. Richer departed and Mr. Bolte, Mr. Greenlee and Ms. Koelbl-Crews conducted a comprehensive tour of the Zion Generating Station's property. The group walked and drove a majority of the property, discussing habitat opportunities at the site, as well as environmental education opportunities, and possible use of the Powerhouse building as an environmental/nuclear educational center.

The group reviewed Great Lakes dunes habitat, lake-basin marshes, wet & sedge meadows, savannas, and sand and mesic prairie habitats.

1.2 SITE DESCRIPTION

Exelon Corporation's Zion Generating Station is located on approximately 250 acres in Lake County, Illinois. The Zion Generating Station is located in the city of Zion, which is in northeastern Illinois, approximately 47 miles north of Chicago, and four miles south of the Wisconsin state line. The property is adjacent to the shore of Lake Michigan, between the north and south units of Illinois Beach State Park. The site is bordered on the north and south by these park units, to the east by Lake Michigan, and to the west by commercial areas of the city of Zion.

The Zion Generating Station employs 50 permanent employees, but it is currently not in operation as a nuclear generating facility. The facility's reactors were shut down in 1998 after 20 years of operation. The following spring, generators were converted to synchronous condensers to provide stability to the region's electrical distribution during the peak summer months. Current employees maintain these generators and monitor spent fuel cells that are stored on site.

The site contains some rare and unique habitat types due to its position on the western shore of Lake Michigan. Great Lakes dune habitat dominates the shoreline landscape, while surrounding areas consisting of lake-basin wetlands and wet and sand prairie habitats. In addition to providing space for a variety of rare habitat types, the Zion Generating Station is also the home of the Powerhouse, a Commonwealth Edison educational center formerly devoted to educating the public concerning nuclear energy and alternative sources of energy, such as wind generation, solar energy, etc. This building is not currently in use.

1.3 SITE HISTORY AND COMMUNITY BACKGROUND

Exelon Corporation's Zion Generating Station is located in the city of Zion, which is in Lake County. The county seat of Lake County is Waukegan, Illinois. Lake County was officially formed in 1839, during which time is was primarily agricultural and sparsely-settled by Potawatomie Native Americans. Since that time, and as of the 2000 U.S. Census, the population in Lake County has grown to 644,000 individuals (IL, Lake County Govt, 2006). Lake County's population has been increasing steadily since the post-World War II suburban expansion of Chicago that continues today.

Within Zion Township, the City of Zion was incorporated in 1902. The population of Zion County has grown from approximately 8,950 to 22,866 in 2000, according to the U.S. Census. The City of Zion includes numerous community-access park and recreation sites, totaling over 575 acres within and adjacent to the Lake Michigan shoreline. There are 19 individual park sites that range in size from one half acre to well over 100 acres spread throughout the city.

2. BIODIVERSITY ASSESSMENT OF THE ZION GENERATING STATION

Preservation of natural biodiversity has long been a global priority, and WHC supports Exelon Corporation's desire to understand site biodiversity and create an effective wildlife habitat management and biodiversity protection plan. Biodiversity is defined in general as the number and variety of living organisms in any given area, and is often assessed by documenting the species composition and defining characteristics of each individual habitat.

2.1 DESCRIPTION OF THE ECOREGION

Because undertaking habitat enhancement projects adds ecological and functional value to both the immediate area and the entire ecosystem, it is important to understand the site's ecological location and its relation to native flora and fauna prior to implementing a habitat enhancement program.

There are several ecoregion classification models available for study. The United States Department of Agriculture's (USDA) Forest Service adopted its own policy and subsequent classification of ecosystem types in the publication *Ecoregions of the United States*, which was compiled by Robert G. Bailey and revised in March 1995; this publication classifies land based on forest cover types, grasslands, and other data from ongoing research programs.

According to the Bailey's ecoregion classification, Exelon Corporation's Zion Generating Station is located in the Humid Temperate Domain. This middle latitude domain is affected by both tropical and polar air masses, resulting in pronounced seasons and strong annual cycles of temperature and precipitation. Winter frost determines six divisions within this domain. The Zion Generating Station is located within the Hot Continental Division of the Humid Temperate Domain.

The Hot Continental Division is typified by hot summers and cool winters. The Zion Generating Station is located in the northern portion of this division, which experiences a growing season of only three to five months. Vegetation typical of this division is the winter deciduous forest, with a weakly developed understory of small trees and shrubs. Herbaceous groundcover flourishes in the springtime, but diminishes as trees leaf out and block sunlight from the forest floor. Soils in this division are rich in humus, contributing to the heavy demand for its use in agriculture and subsequent conversion.

As rainfall decreases with increasing distance from the ocean, the Hot Continental Division has been further subdivided into two provinces: moist oceanic and dry continental. The Zion Generating Station lies within the Eastern Broadleaf Forest (Continental) Province. The land surface form in this province is predominantly rolling, with the northern portions having been glaciated. The climate in this province is drier than the oceanic broadleaf forest to the east, with rainfall continuing to decrease traveling inwards. Average annual temperatures range from 40°° Fahrenheit to 65° Fahrenheit within the province, with summers being quite hot.

Vegetation within the province is dominated by broadleaf deciduous forest, primarily consisting of oak-hickory associations, which are more drought tolerant than other deciduous species. Maple, beech and basswood become more common in the northern portions of the province, where the soils are predominantly Alfisols, while oak and hickory appear on the poorer sites. The abundance of mast trees (trees providing seeds, nuts, or berries) provide ample food for species such as the eastern gray squirrel (*Sciurus carolinensis*), eastern fox squirrel (*Sciurus niger*), eastern chipmunk (*Tamius striatus*), blue jay (*Cyanocitta cristata*), and wild turkey (*Meleagris gallopavo*).

FIGURE 1. WILD TURKEY

Photo by Gary M. Stolz, U.S. Fish and Wildlife Service

The Eastern Broadleaf Forest (Continental) province is further subdivided into 13 sections, which are based on terrain features. The Zion Generating Station lies within the Southwestern Great Lakes Morainal section, whose topography, as its name implies, has been formed by glaciation. The topography is flat to undulating, and is covered by Pleistocene glacial drift that consists of till, lacustrine sand-silt-clay-peat-muck, and outwash sands and gravels. Current geomorphic processes that are shaping this section are lakeshore erosion and deposition, dune construction, and fluvial erosion, transport, and deposition.

FIGURE 2. ECOREGION MAP

Map by Tanya Lubansky

Pre-settlement vegetation in this section consisted of mainly oak savanna, with some maple-basswood forest, and small areas of prairie. Several large mammals associated with this section, such as white-tailed deer, were historically common, though not as numerous as they are currently. Elk and bison were once numerous here, with the main predator being the wolf. These species were extirpated from the state by the early- to mid-1800's. Other species once common in the region included the now extinct passenger pigeon, the prairie chicken, sharptailed grouse, and long-billed curlew - all of which have been extirpated - and Franklin's ground squirrel, which is currently threatened.

Species common in the region today include the red fox, coyote, raccoon, red squirrel, and gray squirrel. Wild turkey populations are also on the rise due to a recent successful re-introduction program, and ringneck pheasants, an introduced species, are also common. In

addition, waterfowl species that were previously numerous throughout the area have dwindled to just a few species, many of which, such as Canada geese and sandhill cranes, subsist on the waste grains of agricultural operations. Other waterfowl species are also present, although many exhibit greatly reduced numbers. A complete listing of species common to this ecoregion is located in **Appendix II**.

Another classification scheme that warrants consideration when forming a complete understanding of the landscape is the assessment published by Island Press entitled *Terrestrial Ecoregions of North America: A Conservation Assessment.* This assessment corresponds generally with the Bailey sections designations. According to this publication, the Zion Generating Station is located in the Central Forest-Grassland Transition Zone, and within four miles of the Upper Midwest Forest-Savanna Transition Zone. Therefore, traits of both of these ecoregions can be found in this area.

The Central Forest-Grassland Transition Zone encompasses much of Illinois, extending across Missouri into eastern Kansas, Oklahoma, and Texas. The total area of the ecoregion is more than 146,718 square miles, making it one of the largest savannah-dominated areas in North America, although little of the acreage is currently preserved as native habitat. This ecoregion is recognized as significant due to its large size and its unique location between forested and grassland ecoregions. Unique soil and climate conditions allow woodlands to develop, often in conjunction with an understory of tallgrass prairie and savanna species. Throughout the region, oaks and hickories are the most dominant species in the canopy. The diversity of habitat types and conditions in this transition zone supports select species that have adapted to the neighboring Great Plains grasslands and to hardwood forests. This significance of habitat is further demonstrated through the ecoregion's rank among the top ten for diversity of bird, reptile, butterfly, and tree species.

The Central Forest-Grassland Transition Zone separates the forested regions of the east from the tallgrass and mixed prairies of the plains, and therefore exhibits some of the characteristics of each of the ecoregions that surround it. Regional habitats within this transition zone are distinct, however, in that they display a higher density of trees and shrubs than the prairies and savannahs to the west, as well as a more diverse mosaic of savannah

and prairie habitats than the hardwood forested zone to the east. In addition, the ecoregion is unified in soil type and general climate conditions. The mix of native grassland, forestland, and wetland habitats in this ecoregion was historically maintained by regular disturbances from periodic droughts and fires. Precipitation throughout the ecoregion reportedly ranges between approximately 20 to 45 inches annually. Areas that receive greater precipitation naturally support a greater diversity and density of tree and shrub species, while drier areas support a greater diversity of grassland savannah species and fewer woody plants.

Unfortunately, there are few local examples of intact, forest-grassland transitional habitat because a large percentage of the region has been converted for soybean and corn production. In fact, according to *Terrestrial Ecoregions of North America: A Conservation Assessment*, less than one percent of the remaining habitat is considered to be intact, and all of the remaining plots are small. The most important example of intact habitat is reportedly found within the Emiquon floodplain forests of western Illinois, which are considered to be an important wetland and critical migratory stopover. Although many areas of the ecoregion are managed for agricultural purposes, several individual locations have been identified as having a high potential for native habitat restoration efforts and habitat linking projects, including the Goose Lake Prairies and the Midewin National Tallgrass Prairie in northeastern Illinois, Palos Savanna in northeastern Illinois, Kankakee Sands on the Illinois-Indiana border, Osage Plains in Missouri, Cross Timbers in Oklahoma and Kansas, Arbuckle Uplift native grassland in southeastern Oklahoma, Indiana Dunes Lake Shore grassland savanna in northern Indiana, and the Emiquon floodplain forest in western Illinois. The largest barrier to restoration projects in the region is often that the large-scale loss of native habitats has made the development of expansive tracts of habitat nearly impossible, and it is often even more difficult to link small parcels of habitat. Restoration efforts have thus been scattered and largely ineffectual.

The Upper Midwest Forest-Savanna Transition Zone lies to the north of the adjacent Central Forest/Grassland Transition Zone, with its southern border beginning at approximately the Wisconsin state line. The difference between the two ecoregions is marked by the change in dominance of the major tree species. Whereas the Central Forest/Grassland Transition Zone is dominated by oak and hickory, the Upper Midwest

Forest Savanna Transition Zone is dominated by oak, maple, and basswood. Both ecoregions, however, are transition units between the eastern forests and Great Plains grasslands, and therefore both exhibit savanna characteristics. The boundaries of this ecoregion were also heavily influenced by the disturbance regimes of fire and drought. Most of this ecoregion has also been converted and is highly fragmented, with less than five percent remaining intact. The threats to the flora and fauna of this ecoregion include overgrazing and browsing by cattle and deer, loss of habitat to development, fire suppression, the spread of exotic/invasive species, and lack of public awareness to the plight of savanna ecosystems. Recovery of savanna habitat in this ecoregion is very possible through restoration techniques involving thinning, brush removal, and burning. In addition, the identification and protection of remaining fragments is essential.

2.2 WATERSHED DESCRIPTION

The land within Lake County falls within four watersheds: the Chicago River, Fox River, Des Plaines River, and Lake Michigan. Exelon Corporation's Zion Generating Station is situated within the Lake Michigan Watershed in Lake County. The total drainage basin area of the Lake Michigan watershed is 45,600 square miles, with 100 square miles being within the state of Illinois. It is the third largest of the Great Lakes, with a surface area of 22,300 square miles, and the second largest by volume with 1,180 cubic miles of water resources, and is considered to be the sixth largest freshwater lake in the world. In Illinois, the Lake Michigan watershed extends along the shoreline of Lake Michigan, from the Wisconsin state line, where it is the widest, through Chicago, where the watershed exists as a narrow strip of land immediately adjacent to Lake Michigan. The Zion Generating Station is situated within four miles of the Wisconsin state line, and is, therefore, located in the widest portion of the watershed within the state of Illinois.

Lake Michigan is hydrologically connected to Lake Huron through the Straits of Mackinac. As water enters the lake, it is retained for a long time (approximately 99 years), while slowly circulating toward the Straits of Mackinac, where it exits into Lake Huron. Lake Michigan and Lake Huron are, therefore, considered to be one lake, in a hydrological sense. The

average depth of Lake Michigan is 279 feet, with its deepest point being 925 feet. Its length is approximately 307 miles, and breadth approximately 118 miles. The shoreline length, including islands, is 1,638 miles. These shorelines contain the world's largest freshwater dunes, which are visited by millions of people each year.

Lake Michigan has been known by several names throughout history. Originally named Grand Lac by Champlain, it has appeared on maps from the 1600's, indicating names such as Lake of Puants (Puants being a Winnebago Indian tribe), and Lac des Illinois. Native American tribes oftentimes referred to it as "Michi gami". Other known names include Lac St. Joseph, and Lac Dauphin.

Most of the water draining into the Lake Michigan basin comes from Michigan. Drainage on the southwest portion of the lake, however, flows into the Illinois River, then to the Gulf of Mexico, rather than into the lake. The Illinois Waterway also carries some water from the lake, by means of the Chicago River, and carries it into the Mississippi River basin. Major tributaries flowing into the lake include the Fox-Wolf, the Grand, and the Kalamazoo.

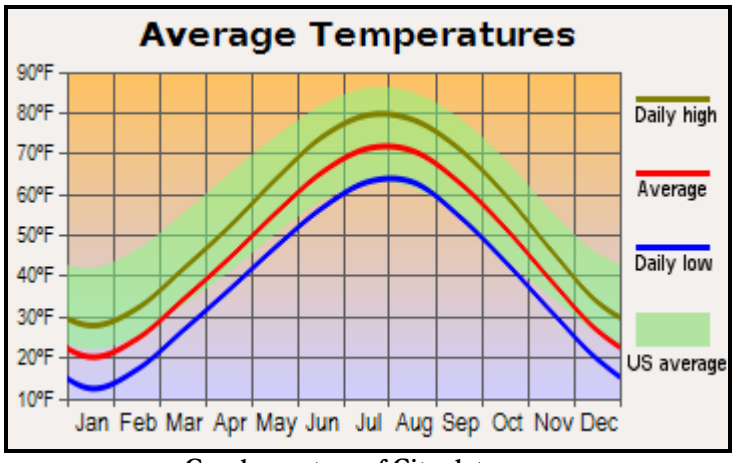
Land cover types within the basin include forests in the sparsely populated northern portions, while southern portions of the basin are heavily populated, with industrial development and agricultural lands hugging the shore.

2.3 CLIMATIC CONDITIONS

The Central Forest-Grasslands Transition Zone lies within what scientists have termed the Hot Continental Division of the Humid Temperate Domain. Climatic conditions in this region are generally classified as having hot summers and cool winters. Variations occur within the Division, with warmer, southern areas experiencing growing seasons of five to six months, and northern areas only experiencing three to five months of frost-free weather. Seasons are the rule in this region, with northern areas experiencing snow cover in the winter. The climate data collected in the City of Zion indicates that temperatures in the

winter months of December and January averaged around 22°Farenheit, with summer months of June through August averaging temperatures of around 71°Farenheit.

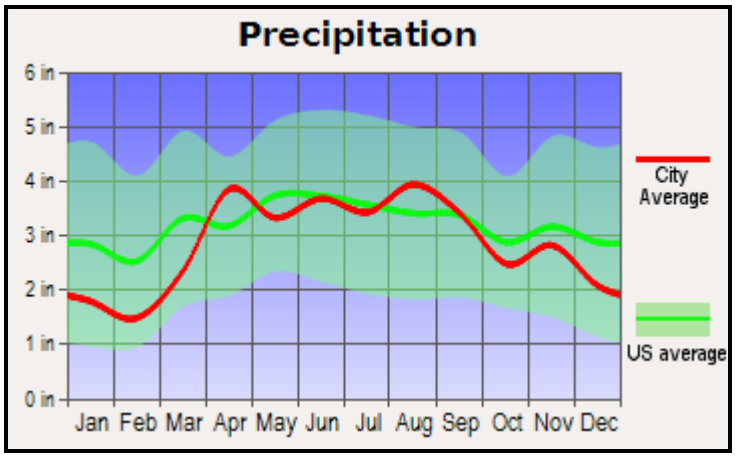
FIGURE 3. CLIMATIC GRAPH OF AVERAGE ANNUAL TEMPERATURES IN ZION



Graph courtesy of City-data.com

Precipitation within the Hot Continental Division decreases with increasing distance from the ocean, and is thus further divided into provinces reflecting this difference. Provinces nearer to the coasts are considered to be moist oceanic, whereas continental provinces are considered to be dry continental. The Zion Generating Station lies within the Eastern Broadleaf Forest (Continental) Province, and is therefore drier than provinces further east. Average annual precipitation within the county is 34.36 inches, 60 percent of which falls during the months between May and October. The average seasonal snowfall is 37.4 inches, with snowfall averages in December and January being 12 and 13 inches. This is not due to lake effect snow, as there is little lake effect snow within this area of southwest Lake Michigan.

FIGURE 4. CLIMATIC GRAPH OF ANNUAL PRECIPITATION IN ZION



Graph courtesy of City-data.com

2.4 SOIL CONDITIONS

There are eleven major soil groups recognized in the world soil classification system that are characterized, described, and mapped based on the presence or absence of distinctive horizons, or layers, commonly present in the soil for any given location. Alfisols are the predominant soil order in the Eastern Broadleaf Forest (Continental) Province ecoregion, and are characterized by the presence of a subsurface horizon in which clays have accumulated (argillic horizon). The type of clay that accumulates is determined by the parent material, and can include clay minerals such as kaolinites, hydrous micas, montmorillonites, and vermiculites. Some of these clay minerals have a high cation exchange capacity, which is a key to it's designation as an Alfisol soil.

Alfisols are well developed, productive soils, typical of the humid continental climate, and are favorable for both silvicultural and agricultural uses. Within the U.S., Alfisols account for approximately 14 percent of the total land area, and are abundant in areas of older glacial deposit. It is estimated that the formation of Alfisol soils takes a minimum of 200 years, and may take 1,000 years or longer, depending on the soil-forming factors of moisture and temperature. Climate and precipitation dictate the conditions of soil formation, as the change between periods of high moisture and temperature to low moisture and temperature facilitate the breakdown, leaching, and accumulation of weathered mineral materials.

Alfisols are formed in temperate regions, predominantly under broadleaf deciduous forests, but may occur in prairie grasslands as well.

Soils are further broken down in their classification into suborders, great groups, subgroups, family, and soil series. Soil series are a grouping of soils within a family that have similar characteristics of composition, color, texture, consistence, structure, and reaction. According to the USDA's Natural Resource and Conservation Service (NRCS) Soil Survey for Lake County, Illinois, the Zion Generating Station site contains soils of four series: Beach sand, Udipsamments complex-undulating, Granby fine sandy loam, and Adrian muck. More information about each of these distinctive soil series' can be found at the following URL: http://soildatamart.nrcs.usda.gov/Manuscripts/IL097/1/maps/map8.pdf.

2.5 ECOLOGICAL COMMUNITIES DESCRIBED ON SITE

The Southwestern Great Lakes Morainal Section of the Eastern Broadleaf Forest (Continental) Province supports diverse oak savanna, forest, and grassland habitats. Furthermore, the USDA places most of Illinois within Plant Hardiness Zone Five. The USDA's Plant Hardiness Zones are determined based on each area's average minimum winter temperature. Zone Five reportedly has average minimum winter temperatures of between -20° Fahrenheit and -10° Fahrenheit. The American Horticultural Society (AHS) has also developed a system to identify plant hardiness and, therefore, planting recommendations based on the determination of heat zones within the nation. Heat zones are calculated based on the average number of days the temperature exceeds 86° Fahrenheit each year. This system places northern and central Illinois in AHS Heat Zone Six, meaning that there are typically an average of between 45 and 60 days each year that exceed 86° Fahrenheit. Knowing both the USDA Plant Hardiness Zone and AHS Heat Zone for a given area can assist planners when determining what type of plant species will most readily adapt and thrive on site.

While it is important to understand and consider area temperatures and soil condition, the diversity of vegetative communities will also depend on precipitation amounts, which vary

regionally. The oak-hickory association is more drought tolerant than many other deciduous tree species, and is therefore, more abundant in this region than elsewhere. Typical oak species include white, red, and black oak, while hickory species include bitternut and shagbark hickory. Understories are well-developed, with shrub layers containing species such as flowering dogwood, sassafras, hophornbeam, evergreens, and many wildflowers. Areas that are wet support species such as American elm, tuliptree and sweetgum. Northern areas within this ecoregion contain more sugar maple, beech, and American basswood, with oak/hickory associations occurring on poor sites. Within Exelon's corporate landholdings at the Zion Generating Station, there are a diversity of habitat types (some rare) including Great Lakes dunes, wet prairies, sand prairies, lake basin wetlands.

2.5.1 Great Lakes Dunes and Shoreline Habitats

The Great Lakes dune system is the largest freshwater coastal dune system in the world. Visible from space, and according to the organization Alliance for the Great Lakes, they are considered to be one of the Seven Wonders of the World. Glaciers were the major source of the sand that formed the Great Lakes dunes. Their slow advance transported weathered bedrock from the northern reaches of North America while meltwaters from their retreat deposited the resulting small glacial particles, known as sand. This sand was rearranged by a combination of wind, water, and vegetation which move, sort, and trap the particles in formations known as the Great Lakes Dunes.

The Zion Generating Station is located on the shoreline of southwestern Lake Michigan. The landform here is best described as the Beach Ridge Complex, consisting of lakeshore dunes with ridges covered by a savanna-like mixture of black oak and grasses, with intervening swales of marshland, wet meadow, and wet prairie communities. The shoreline beach consists of soil of the Beach sand series and consists of sand and well-rounded stones, with no vegetation. This area is frequently disturbed by natural occurrences such as storms, and periods of high water which prevent the establishment of vegetative communities. Avian species known to utilize this habitat are shorebirds, and include species such as the black tern, common tern, and Forster's tern, among others. WHC suggests that the Zion Generating Station consider managing for these species by protecting the shoreline habitat

and associated nesting sites during the migratory and breeding seasons. Human and human-related disturbances, such as predation by pets, and even the flying of kites near the site, will often prevent species from utilizing necessary habitats. WHC also suggests that the Zion Generating Station consider initiation of a monitoring program, for the purpose of inventorying avian species resting or feeding on the shoreline habitat throughout spring and fall migration, as well as throughout the breeding season.

FIGURE 5. DUNES AND SWALES OF THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

The dunes lie adjacent and to the west of this strip of shoreline. Dunes in the Great Lakes region consist of four types – parabolic, perched, linear, and transverse. Dunes in the area of the Zion Generating Station are of the linear type, lying parallel to the shoreline, and were formed when lake levels dropped during the Nipissing period. They are also referred to as dune and swale complexes. As is the case with the Zion Generating Station, there are often two or three additional ridges, also linear, further inland. These dunes and ridges are

separated by linear swales of varying widths, consisting of marshes, wet prairies and sedge meadows. Soils of the dunes are of the Udipsamments complex, undulating series and occur on the summits and backslopes of beach ridges and terraces. They are somewhat excessively drained soils whose parent material is wind-worked beach sand. There is no ponding or flooding that occurs in these soils; however, they have a very high potential for wind erosion.

FIGURE 6. BEACH AND DUNE HABITAT AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

Great Lakes dunes are the most diverse ecosystems in the Great Lakes, due to the number of microenvironments present in a very small area. Historically they supported species such as the now endangered dune thistle (*Cirsium pitcheri*) and lakeside daisy (*Hymenoxys acaulis* var. *glabra*). Many species that depend on the dunes, including the piping plover (*Charadrius melodus*), which nests in dune habitats, are also classified as threatened or endangered. In addition, many migratory avian and insect species rely on Lake Michigan shoreline habitat to rest and feed during migration. These beaches are also sources of minerals much needed by

migratory species, due to the constant evaporation of water and subsequent deposition of essential minerals.

WHC suggests that Exelon's Zion Generating Station protect the existing dune and shoreline habitat on site by limiting the amount of human activity, such as pedestrian traffic and off-road vehicles, during nesting and migratory seasons. Off-road vehicles offer the potential for dune destruction at any time of the year, as they kill dune vegetation which traps and holds sand particles in place. Without this vegetation, wind would severely erode the dune formations. In addition, WHC suggests that the Zion Generating Station consider partnering with neighboring managers at Illinois Beach State Park to manage for the piping plover. Illinois Beach State Park has been designated as critical habitat for the piping plover, and appropriate management actions at the Zion Generating Station could serve as an extension of habitat areas already designated. The piping plover nests on sparsely vegetated dunes, or adjacent to sandy and stony areas above the water level. WHC also suggests that the Zion Generating Station seek the protection of a Safe Harbor Agreement with the US Fish and Wildlife Service before beginning management of any endangered or threatened species. More information about Safe Harbor Agreements can be found in **Section 2.8.2.1**

The inland ridges, which occur to the west of the shoreline dunes, consist of the same soil type as the dunes, the Udipsamments complex, undulating. These areas were also formed as lake levels dropped during the Nipissing period. Vegetation on these inland ridges is more dense than on the dunes, supporting vegetation of the sand prairie and oak savanna type and consisting of species such as black oak, bearberry, Waukegan juniper, sand cress, blue-eyed grass, hoary puccoon, starry false Solomon's seal, and perennial lupine, to name only a few.

2.5.2 Wetland Habitats

Wetlands are defined as areas where the water table is above or near the soil's surface for at least part of the year. Wetland habitats at the Zion Generating Station consist of a mosaic of marshes, lakeplain wet prairies, and sedge meadows, and are found in the swales separating the dune ridges.

FIGURE 7. WETLAND HABITAT AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

2.5.2.1 Marsh Habitats

Non-tidal marshes are areas that are frequently or continually inundated with water, and are dominated by herbaceous (non-woody) vegetative species that have adapted to saturated soil conditions. The vegetation present is characterized by a mixture of emergent, floating, and submergent aquatic species. Freshwater marshes are some of the most diverse ecosystems on earth due to the high level of nutrients present in their highly organic, mineral rich soils. In addition to providing habitat for innumerable species, freshwater marshes also play a vital role in flood control through their ability to store large quantities of water. This stored water serves to recharge streams, keeping them flowing through periods of inadequate rainfall. Marshes also protect shorelines from erosion by acting as a buffer, and filter pollutants from surface runoff, thereby improving water quality. Wetlands, and more specifically marshes, offer many natural amenities that cannot be obtained through artificial means.

Marsh habitat at the Zion Generating Station is abundant, and occurs in the linear swales of the site, which lie between the also linear, sandy dune ridges. Some examples of areas in which they occur are around the meteorological tower, underneath portions of the Commonwealth Edison ROW's, and areas along Shiloh Road west of the Zion Generating Station. Soils in these areas are of the mostly organic, Adrian muck series. These are very poorly drained soils that occur on the toeslopes of beach and lake terraces. They are frequently ponded and considered to be hydric, with ponding depths ranging from zero to two feet in January through December.

FIGURE 8. WETLAND HABITAT AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

The marshes are dominated by a mixture of cattails, various reeds and sedges, as well as grasses, and historically supported species such as bluejoint grass, reed grass, big bluestem, and sedges. Some areas at the Zion Generating Station were also found to contain

phragmites, or common reed, and purple loosestrife, both exotic/invasive species that threaten the diversity of wetlands throughout the state of Illinois and other states in the Midwest.

WHC suggests that the Zion Generating Station consider restoring these wetlands to native plant communities by beginning control of phragmites and purple loosestrife on the site as soon as possible, as control is more easily achieved when measures are undertaken before infestations become expansive. Heavy infestations of phragmites and purple loosestrife become dense, monotypic stands that hold little diversity and little value for wildlife. Currently these species occur in only a few areas on site, while most wetlands here still contain communities of the cattail, reed, sedge, and grass type. These invasive species, having no biological controls, will, however, quickly out-compete these native communities if they are not eradicated from the site. Continual monitoring of wetlands would also be necessary, to prevent the re-infestation of these species, which will continue to encroach on the site from outside areas where control measures are not pursued.

FIGURE 9. WETLAND HABITAT AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

The potential for management of threatened and/or endangered species exists in these marshes, as habitat areas here have historically supported species such as the Blanding's turtle, which is currently classified as endangered in the State of Illinois. Enhancements in marsh areas containing dense stands of cattails can be undertaken to improve habitat conditions for the Blanding's turtle and other reptiles and amphibians that are dependent on shallow, emergent marshes. Cattails are native to the area, but can become invasive when adequate water levels are not maintained. Blanding's turtles will not use wetlands choked with cattails.

FIGURE 10. CATTAIL INFESTATION AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

WHC suggests that the Zion Generating Station consider undertaking enhancements that will restore adequate water levels to those areas choked by cattail. Enhancements to wetlands require permits, however, and WHC suggests that the Zion Generating Station coordinate with the Illinois Department of Natural Resources and the US Army Corps of Engineers to explore these enhancement opportunities. Again, WHC suggests that the Zion Generating Station seek a Safe Harbor Agreement with the U.S. Fish and Wildlife Service before managing for any endangered species. Other threatened or endangered species present in Lake County that would benefit from restoration of emergent marshes on the site could include wading birds such as the American bittern, black-crowned night heron, least bittern, yellow-crowned night heron, and sandhill crane. Shorebirds, such as the piping plover, would also benefit, as emergent marshes and wet meadows are often used as feeding areas for young broods, as well as shorebird migrants. Many species of amphibians and reptiles may benefit as well.

2.5.2.2 Wet Prairie and Sedge Meadows

Wet prairies and sedge meadows also occur in the swales that alternate between the sandy ridges of the Zion Generating Station site adjacent to the marsh habitats. These habitat types are found in areas where the water table is near or above the soil's surface for only a short time throughout the year. They are the transition zone between the emergent wetlands and sand prairies or oak forests. Soils here are of the Granby fine sandy loam series, and being drier than the marsh habitats, they support species such as grasses, sedges, and wildflowers. Historically species such as prairie cordgrass, big bluestem, blue jointgrass, and reed grass, eastern prairie fringed orchid, nodding ladies tress and slender ladies tress.

FIGURE 11. SHRUBBY CINQUEFOIL AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

FIGURE 12. BUG BLUESTEM AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

This soil is, however, also considered to be hydric, and is poorly drained, with ponding occurring at a depth of zero to ½-foot January through May. It is typically found on the toeslopes of outwash plains and lake terraces.

Invasive species present in the marsh habitats are also present in the wet prairie and sedge meadow habitats on site. Purple loosestrife and phragmites endanger the welfare of native communities, some of which may contain rare flora, in these habitats as well. WHC suggests that the Zion Generating Station consider undertaking control measures for these species, to protect these natural communities, and to restore native species on sites where monotypic stands of phragmites and purple loosestrife have become established. Once eradicated from these habitats, monitoring would also be essential to prevent re-infestation from occurring.

WHC also suggests that the Zion Generating Station consider managing for grassland species such as the American kestrel, the eastern bluebird, and tree swallow by installing nest boxes. These are cavity nesting species that nest in the natural cavities of snags (dead, standing trees). While few snags were observed while touring the Zion Generating Station site, an American kestrel was observed hunting over a wet meadow on the site. Therefore, it is suspected that the boxes would be utilized by the birds if installed. In addition, WHC suggests that the Zion Generating Station consider managing for bats by installing bat roosts in wetland areas on the site. Bats also utilize the underside of loose bark and cavities of snags to roost during the daytime. In the absence of snags, bats would benefit by the addition of bat roosts.

The potential to manage for threatened and/or endangered species also exists in wet prairie and sedge meadows on the Zion Generating Station site, as the Blanding's turtle and many wading birds also utilize a complex of wetland habitats, including not only emergent marshes, but wet and sedge meadows as well. Adjacent sand habitats on the site could also be utilized by female turtles for egg-laying. The control of invasive species on the site protects the natural communities that the turtle and other species depend, upon for food, and cover, as they travel between emergent marshes, and/or deeper wintering ponds. Although permanent ponds were not seen while touring the Zion Generating Station site, aerial photographs indicate that they are within close proximity to the various wetlands on site.

2.5.3 Grassland and Shrub-Scrub Habitats

2.5.3.1 Sand & Mesic Prairies (Lakeplain Prairies)

Prairie habitat exists at the Zion Generating Station site on the sandy ridges that lie inland from the main dunes. They consist of the same soils as the dunes nearest to the shore, the Udipsamments complex, undulating. This habitat supports native vegetation of grasses and wildflowers, and was historically maintained in an early successional grassland state by fire and periodic high water conditions. Species historically supported here include big bluestem, leafy prairie clover, lakeside daisy, Mead's milkweed, prairie bush clover, perennial lupine, nodding wild onion, rough blazing star, coreopsis, and black-eyed Susans, among many others. Sand prairies typically border the oak forests, which are savanna-like in nature, and were probably maintained in an open state by the same forces.

FIGURE 13. ROUGH BLAZING STAR AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

WHC suggests that the Zion Generating Station consider maintaining these grasslands in an early successional state by means of either prescribed fire or mowing. Although fire is the most conducive to improving the floristic diversity of prairie habitats, it may be impractical to perform in some areas of the site, such as where grassland occurs under powerline rights-of-way (ROWs). Whichever method is chosen, a rotational schedule should be maintained to avoid removing all of the prairie cover from the site in a single season. Rotational mowing or burning will leave unaltered areas of habitat available for various species of wildlife throughout the year.

Grasslands occurring under transmission and distribution line ROWs are managed in an early successional state to prevent power outages frequently caused by tall vegetation, such

as trees. To ensure a continuous flow of energy distribution in response to power demand, special considerations may be employed to manage these areas for wildlife interests as well. One way to encourage wildlife usage of ROWs on site is to employ Integrated Vegetation Management (IVM) strategies within the ROW.

The goal of IVM is to use site-specific, ecosystem-sensitive, economically sensible, and socially responsible treatments whose consequences lead to attainment of management objectives. The objective of this vegetation management approach is the same as that of traditional management, the goal of which is to reduce the threat that trees pose to the safe and effective transmission of electricity. IVM techniques combine that goal with another one - to increase the quality and extent of wildlife habitat.

In order to manage ROWs for grassland habitat, the following best management practices are recommended:

- Use only species native to the ecoregion in which the ROW is located when restoring grassland habitats.
- Control invasive and non-native species where possible.
- Maintain early successional vegetation.
- If isolated portions of the ROW are smaller than 25 acres, allow them to revert to shrub-shrub and manage sections accordingly.
- Avoid fragmenting grasslands with the addition of roads, buildings, tree corridors, or row crops.
- Where grasslands are bordered by forested tracts, develop a feathered edge between the forest and the grassland. This will provide cover for animals and reduce nest predation.
- If mowing is necessary to maintain the grassland stage, it should only be done during late fall. Use a cutting height of at least 10 inches.
- Woody cover should be kept to a maximum of 5% in grassland habitat.
- Establish a cover of warm-season grass as the dominant grass type. Such grasses will grow during the summer, rather than in the cooler spring and fall months, forming clumps surrounded by more open spaces that provide habitat heterogeneity.
- Use a mix of warm-season grasses. Avoid monotypic stands. Native wildflowers can also be incorporated to increase vegetative diversify.

Maintenance of grasslands in an early successional state will benefit species such as the endangered Franklin's ground squirrel, as well as several other species of grassland birds and insects. This species has been known to be present in Lake County, Illinois, and prefers

prairies of medium to tall grasses with no shrubby growth. The conversion of the historic tallgrass prairie has resulted in its greatly reduced numbers. In addition, species such as the Karner blue butterfly, also endangered, could benefit from grassland maintenance. A small population of perennial lupine is present in a forested area on the site, but the patch remains small due to lack of sunlight in the understory. There may be small populations of the plant elsewhere on the site as well. Historically the plant would have been common in the sand prairies and oak savannas of the region. Larvae of the Karner blue butterfly feed only on the leaves of perennial lupine, and it is, therefore, essential for survival of the species. Fire historically maintained prairies in an early successional state and kept open the understory of the savannas. Fire removes the dead, matted material from the soil's surface, allowing sunlight to reach new seedlings that are striving to survive. Prescribed burning may provide other remnant populations with the conditions necessary to thrive, thereby enhancing habitat for the Karner blue butterfly.

Other species that would benefit from grassland maintenance include grassland raptors such as the American kestrel and northern harrier; ground-nesting grassland birds such as bobwhite quail; many small mammal species; and a suite of various pollinators. Again, WHC recommends that the Zion Generating Station consider seeking a Safe Harbor Agreement with the U.S. Fish and Wildlife Service before managing for any endangered species.

2.5.3.2 Shrub-Scrub Habitats

Shrub scrub habitats are scattered throughout the Zion Generating Station site and are present in the site's wetlands, as well as on the drier, sandy ridges, where they occur as a transition between the prairie and oak forests. Areas adjacent to the wetlands surrounding the meteorological tower are maintained in shrub-scrub habitat, with all trees removed within 400 feet of the tower. Trees within this distance will interfere with proper functioning of the tower. In addition, powerline rights-of-way that pass through the Zion Generating Station site are also maintained in an early successional state to prevent electrical outages from occurring. Prairie areas occurring under the wire zone contain small islands of shrubs scattered throughout. Wetlands also contain scattered islands of shrubs. These islands provide important resting and feeding areas for migratory birds, and, when occurring

in wetlands, can provide habitat for the endangered Massasauga rattlesnake, known to be present in Lake County, as well as other wetland species.

FIGURE 14. SHRUB-SCRUB HABITATS AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

In order to manage ROWs for scrub-shrub habitats, the following best management practices are recommended:

- Selectively use herbicides to control tall-growing species in order to maintain a shrub community of 12 feet or less in height. Selective basal application or low-volume basal application is indicated in this situation.
- After herbicide application, pruning must be done. Desirable species must be topped if grown more than 10 to 12 feet in height. The whole plant should be cut down if more than one-third of it is to be removed.
- When corridors are first cleared, avoid a clearing and grubbing operation in which all vegetation is cut down and soil and roots are disturbed. Leave shrubs and preferred low-growing trees.

- Along the ROW edges, tall trees need only to be topped enough so they do not represent a danger of hitting the power lines. Trunks should be girdled to kill the trees.
- Trees cut down during clearing or maintenance activities should be placed along the corridor edge to form brush piles. Canopy branches are ideal for this operation. Log piles are also of wildlife value.
- If chipping occurs, it can be left on site but at a rate no thicker than 2 to 3 inches in any area.
- It is important to establish forested wildlife corridors, or areas where woody vegetation is allowed to grow, wherever topography allows. They should be wide as possible.

The area surrounding the meteorological tower must be kept free of trees to maintain proper operation of the tower. Traditionally trees have been felled if they grew within 400 feet of the tower. WHC recommends that the Zion Generating Station consider the possibility of girdling these trees to create snags (dead, standing trees), which are highly valuable to cavity-nesting birds, bats, and other wildlife. It is suspected that trees without leaves may not interfere with the functioning of the tower, and may be a highly productive alternative to felling the trees.

FIGURE 15. SHRUB-SCRUB HABITAT AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

2.5.4 Forested Ridges

Forested ridges consisting primarily of oak savanna are present on the inland sandy ridges. These ridges are interspersed with patches of sand and mesic prairie habitats. The soil type here is the Udipsamment complex series and is therefore well-drained. The understories of these savannas were historically vegetated with a variety of species common to the prairies surrounding it, and were kept rather free of brushy undergrowth by fire and periodic high water conditions. Suppression of fire has caused savannas today to become choked with shrubby undergrowth, which oftentimes contains a variety of exotic/invasive species such as buckthorn, multiflora rose, and Japanese honeysuckle. As a result, native species of the savanna understory are suppressed, and oftentimes disappear.

FIGURE 16. FOREST AND SAVANNAH HABITAT AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

WHC suggests that the Zion Generating Station consider restoring overgrown savannas by manually clearing the brushy understory, thus allowing native grasses and forbs that may be present in the dormant seedbank to become re-established. An inventory of species present in the understory should be undertaken first to determine the presence of any rare or endangered species, and discretion should be taken to leave some areas of brushy undergrowth, provided that they do not contain any exotic or invasive species.

FIGURE 17. FOREST EDGE HABITAT AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

Shrubby areas are important for many species of birds, as they often provide food and resting areas for migrants. Some thinning of the trees may also be necessary to restore a fairly open canopy. In areas where trees require thinning, girdling is recommended, as it will provide snags necessary for cavity-nesting species while opening the understory to sunlight, which is required for grass and forb seedling growth. Once grasses are established in the

understory, adequate fuel is present so that prescribed fire can periodically then be used to maintain its open, park-like characteristics. Care should be taken, however, to leave some pockets of brushy growth in areas such as at the interface between savanna and prairie, as a shrubby edge along forested areas, and along wooded corridors, such as roadways.

FIGURE 18. FOREST AND SAVANNA HABITAT ADJACENT TO A ROADWAY AT THE ZION STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

2.6 SPECIES TO CONSIDER BEFORE FORMULATING MANAGEMENT PLANS

2.6.1 Identify and Manage Non-Native, Exotic, Invasive, and Nuisance Species

Invasive plant species are among greatest threats to the world's biodiversity, and the issue of controlling them has become a priority for the scientific community. Several federal acts, such as the Federal Noxious Weed Act of 1974 and the Alien Species Prevention and Enforcement Act of 1992, have been passed to direct the control of invasives. In 1999, President Clinton signed Executive Order 13112 to address the challenge that invasive species present to the nation's environment and economy, and to create a National Invasive Species Council.

While native species are those that have naturally and historically been found in a particular locale, Executive Order 13112 defines invasive species as those species not native, or exotic, to a particular ecosystem that, upon introduction, are "likely to cause economic or environmental harm or harm to human health". Species are introduced in a variety of ways to areas in which they do not historically occur. Some have been introduced intentionally for ornamental or commercial use; others have been accidentally brought from foreign countries because they were mistaken for native plants that are similar in appearance. The vast majority of plant species introduced from other regions of the world do not become established outside their native ecosystem simply because the conditions they require and find in their native environments are not found in their new locations. The few species that do manage to survive, however, can aggressively invade and threaten native ecosystems.

Exotic invasive species can spread quickly due to a combination of two major factors. First, they possess a suite of life history traits that allow them to spread rapidly. Invasive plants can be prolific seed producers, and they may develop extensive underground seed banks and root systems so that they can spread vegetatively. They are often successful in areas with poor soil quality, and are thus able to outcompete native species that are more "selective". The second factor is that exotic species are, by definition, colonizers from elsewhere. Often, these plants spread to new areas of the world, but their primary competitors, predators, and

diseases from their native ecosystems do not follow them, making their establishment and success all the more likely.

As their populations grow out of control, they can have devastating ecological and economic impacts. The natural and economic damage caused by encroachment of invasive species can be matched only by that resultant from floods, hurricanes, earthquakes, mudslides and wildfires. Invasive species often come to dominate local ecosystems, reducing diversity and crowding out native species. When a plant community is dominated by one species, the diversity of food sources decreases and thus native birds, mammals, and other animals can suffer. Furthermore, less diverse communities are more susceptible to environmental stresses and are less resilient to disturbance than healthy, native ecosystems that contain a wide variety of vegetation.

According to the Illinois native Plant Society, "there are approximately 100 million acres of land in the United States that are dominated by invasive, non-native plants species and the current yearly increase is estimated at 14 percent. Invasive plant species become the dominant vegetation on approximately 4,600 acres of public land each day in the United States; this accumulates to nearly three million acres each year, or a land area that is the approximate size of Connecticut."

Two techniques can be employed to mitigate the problems associated with exotic invasive plants: prevention and eradication. Unfortunately, preventing spread is often difficult. The seeds of invasive plants frequently migrate to new areas via roadways, in seed mixtures, or are carried by the birds and mammals that consume them. Eradication often requires repeated action and monitoring to achieve success, but can be accomplished if the problem is addressed while populations are still manageable. **Table 1** provides a list of common invasive species in Illinois according to the Illinois Department of Natural Resources.

TABLE 1. INVASIVE PLANT SPECIES IN ILLINOIS

COMMON NAME	SCIENTIFIC NAME
Amur maple	*Acer ginnala*
Tree-of-heaven	*Ailanthus altissima*
Garlic mustard	*Alliaria petiolata*
Blackberry lily	*Belamcanda chinensis*
Japanese barberry	*Berberis thunbergii*
Paper mulberry	*Broussonetia papyrifera*
Pineapple bush	*Calycanthus floridus*
Nodding thistle	*Carduus nutans*
Oriental bittersweet	*Celastrus orbiculatus*
Chicory	*Chichorium intybus*
Canada thistle	*Cirsium arvense*
Crown vetch	*Coronilla varia*
Orchard grass	*Dactylis glomerata*
Queen Anne's-lace	*Daucus carota*
Cinnamon vine	*Dioscorea batatas*
Cut-leaved teasel	*Dipsacus laciniatus*
Common teasel	*Dipsacus sylvestris*
Autumn olive	*Elaeagnus umbellate*
Burning bush	*Euonymus alata*
Purple winter creeper	*Eunonymus fortunei*
English ivy	*Hedera helix*
Dames rocket	*Hesperis matronalis*
Common privet	*Ligustrum vulgare*
Japanese honeysuckle	*Lonicera japonica*
Amur honeysuckle	*Lonicera maackii*
Purple loosestrife	*Eunonymus fortunei*
Osage orange	*Maclura pomifera*
Water clover	*Marsilea quadrifolia*
White sweet clover	*Melilotus alba*
Yellow sweet clover	*Melilotus officinalis*
Catnip	*Nepeta cataria*
Wild parsnip	*Pastinaca sativa*
Princess tree	*Paulownia tomentosa*
Amur cork tree	*Phellodendron amurense*
Timothy	*Phleum pratense*
Japanese knotweed	*Polygonum cuspidatum*
Kudzu vine	*Pueraria lobata*
Common buckthorn	*Rhamnus catharctica*
Smooth buckthorn	*Rhamnus frangula*
Jetbead	*Rhodotypos scandens*
Multiflora rose	*Rosa multiflora*
Curly dock	*Rumex crispus*
Dandelion	*Taraxacum officinale*
Salsify	*Tragopogon porrifolius*

COMMON NAME	SCIENTIFIC NAME
Red clover	*Trifolium pratense*
Siberian elm	*Ulmus pumilia*
Common mullein	*Verbascum Thapsus*
Cow vetch	*Vicia cracca*
Periwinkle	*Vinca minor*

2.6.1.1 General Management Options for Controlling Invasive Species

When designing an invasive species management plan, it is important to consider options that will both fit with current landscape management practices as well as minimize the impact of invasive plants. Any attempts to control vegetation must be based on the major factors that control vegetative forces in the area, such as available light, water, inorganic nutrients, and growing space. Therefore, a successful management plan will include a strategy for increasing the amount of available space and resources for desirable, native plants while limiting the space in which invasives can take over. There are several different types of management strategies to consider when formulating an invasive species management plan; these methods include physical controls and manual removal, chemical controls, biological controls, and integrated methods that combine various control methods. Those integrated programs that utilize a coordinated effort to control and eradicate invasives are typically more effective than using one method in an attempt to achieve total control.

2.6.1.1.1 Physical Control Methods

Physical methods of control and removal include manual pulling and digging of individual invasive plants, using heavy equipment to destroy or remove individuals, mowing, cutting, and clipping. The manual removal of individual invasive species can be effective, but it is generally only realistic to employ when dealing with small, isolated areas of infestation. Furthermore, there are few cases in which removing individual plants by pulling and digging will ultimately control the growth of an invasive. In addition to hand pulling, other physical removal methods, such as pulling with a tractor, can be effective in removing individual trees and mature shrubs. The most important objective when employing physical removal methods to remove individual invasives species is to remove as much of the root structure as possible, as remaining material may allow the individual invasive to re-establish. Therefore,

the degree of measurable success in invasives control when using the pulling or digging method will depend on the thoroughness of individual plant removal.

Other physical control methods, such as cutting and mowing, can be effective in limiting the growing space and resources available to invasive plants. These methods impose limited success in controlling invasives because the act of cutting and/or mowing will effectively remove the food-producing portion of individual plants, thereby limiting their ability to take over an area. However, because root and stem portions of the plant remain, invasives will likely resprout and continue to spread with time. Therefore, cutting and mowing are most effective as control techniques when coupled with selectively applied chemical controls.

Cutting may be more effective because managers can selectively target invasive plants, while mowing will reduce the growing ability of all plants in an area. Cutting is reportedly most effective when attempting to control invasives in moderately to heavily wooded areas. This is because the surrounding woodland vegetation will assist control efforts by reducing the amount of resources available to the cut invasive. The cut plant must, therefore, rely on resources stored in the roots for repair and refoliation efforts, significantly weakening the plant's ability to effectively spread for a period of time. Cutting is reportedly less effective in controlling invasives in open areas and edge habitats, where repeated cutting would be required to obtain minimal controls. Cutting is most effective when performed in late fall and winter months. When including cutting as part of an invasive species management plan, managers are advised to plan on re-evaluating cut areas annually to assess the need for repeated control efforts.

Mowing is less selective and will effectively put all plants in an area on an equal basis to compete for sunlight, water, and other essential resources. The effectiveness of mowing is difficult to assess because individual plant species have differing growth rates and responses to disturbance. Therefore, mowing will favor those species that are most prolific in refoliating and spreading quickly, which includes many invasive plants. Mowing can be an effective control, particularly when coupled with chemical controls, in open areas where manual plant removal is not an option. Initial treatment with mowing may require the individual, manual removal of those species that are too large to mow. Mowing should be

conducted on a regular basis, and the growth rates and spread of invasives should be closely monitored.

Fire can also be used in conjunction with other physical and biological controls of invasives. Whenever possible, prescribed fire should be considered as a component of an invasive species management plan. Throughout the evolution of the Illinois native landscape, fire has played an important role in the establishment and distribution of native vegetation. Therefore, one of the benefits of using fire as a control technique is that it gives a distinct advantage to the native grasses, trees, and shrubs that have evolved in the region. Drawbacks of using prescribed fires to manage invasive species include a perceived lack of acceptance among citizens and local governments; however, many local fire departments and county and state extension services are prepared and willing to assist with such control options. In addition, public education regarding the importance of fire as a natural management tool and concerning the planned burn strategy can help in alleviating opposition. In order to be effective, prescribed burns must be executed only when specific weather and plant fuel conditions are met, and should only be carried out by trained professionals.

2.6.1.1.2 Chemical Controls

Chemical controls of invasive plants include the selective use of herbicides that are designed to effectively kill weed species. However, it is important to note that most herbicides will also negatively impact desirable, non-target vegetation, and should be used and applied in a responsible and selective manner. The long-term, exclusive use of herbicides is not generally considered to be an effective control technique for most invasive plants for several important reasons. First, coupled with the exclusive use of herbicides is a short-term, "once and over" attitude that simply does not fit with a long-term management plan, which is essential for successful invasive species removal and control. In addition, the inherent, toxic nature of herbicides can impair an individual's ability to successfully deliver a required amount of chemical to the correct area of a plant during the appropriate time in its growing cycle, without posing a potential risk to neighboring vegetation and wildlife resources. However, when safely administered and monitored, and used in conjunction with other

physical or biological control methods, herbicides can be an essential component to an invasive species management plan.

To safely administer herbicides in an infested area, it is recommended that personnel first remove as much of the above ground plant material as possible before applying chemicals, unless the targeted species dictates a foliar application. To control small invasive trees, shrubs, and vines, first cut stems and after about two weeks, apply an herbicide with glyphosate directly to the re-sprouting stems and/or stumps and monitor plants in the weeks to come. To eradicate individual, mature trees, cut the tree in the fall or winter and apply herbicide, such as RoundUp® or Garlon®, directly to the fresh cut stump. For control of invasive vegetation in larger, open areas, moderate infestations may be controlled through use of a broadleaf herbicide, such as Banvel® or 2-4-D®. Severe large-scale infestations may require mowing coupled with herbicide application, followed with plowing, discing, and an additional herbicide application. If this intensive method is required to remove invasive plants, it will be important to quickly establish desirable, native plants following the last discing of the site in order to reduce the likelihood that invasives will successfully reestablish.

2.6.1.1.3 Biological Controls

Biological controls involve the use of other living organisms to control invasive species, such as planting and interseeding native plants, or introducing biological control agents, such as insect pests, in an effort to control and manage invasive species for the long term. For example, the planting of trees and shrubs to further vegetate wooded areas may help to effectively limit the availability of resources to invasive species in the area. In addition, the interseeding of meadows and fields with native grasses and wildflowers can help minimize the establishment and further spread of invasive vegetation. It is likely that this method, coupled with long-term monitoring, cutting and mowing, can severely limit the impact of a moderate invasive species infestation over the period of a few years.

Furthermore, the establishment of native plants immediately after physical or chemical removal methods will significantly reduce the ability of an invasive species to resprout. Evergreen trees are especially effective in producing fast shade to reduce the ability of invasive plants to reestablish, particularly when planted along south and westward facing

forest edges where invasive species are often most prolific. Planting additional evergreen tree and shrub species will also serve to diversify wildlife habitats on site. Following the addition of trees and shrubs to the landscape, managers should continue to mow invasive undergrowth regularly for several years, until the new plants are well established. Other biological control measures include the use of pest populations to control invasive species. These methods often rely on other invasive or genetically engineered pest species that are known to selectively target the non-desirable invasive. Much of the technology surrounding this method is used for the control of invasive and nuisance species that plague large-scale agricultural production.

2.6.1.2 Common Reed Management Options

Common reed (*Phragmites australis*) is a wetland grass common throughout North America. Although it prefers freshwater habitat that is neither particularly acidic nor basic, its ability to grow and spread under less than ideal conditions allows it to dominate compromised habitats, such as those with brackish (between salt and fresh), alkaline, and acidic waters. Areas with high nutrient concentrations, particularly nitrates, as well as areas near roads that receive salt runoff, are commonly invaded. Common reed is also tolerant of anoxic conditions (conditions in which oxygen is absent).

Common reed is identified by its characteristic stalks, which can grow up to 15 feet tall, and by its feathery inflorescence. It spreads rapidly by rhizomes, which form a thick mat under the soil surface, crowding out other plants. These rhizomes can reach a depth of nearly seven feet, and the plant is therefore able to use moisture stored deep in the soil. A build-up of litter underneath the plant also prevents other species from colonizing the area.

Common reed has been found in North America for thousands of years, but it is believed that the more invasive, exotic strains have colonized only recently. Although it does have some value to wildlife and not all stands of common reed are unmanageable and invasive, it is nonetheless viewed as problematic because it spreads quickly and usually forms a dense monoculture, displacing other native vegetation that has greater wildlife value. A stand of common reed can probably be deemed invasive if it has invaded an area characterized by habitat alteration and/or pollution, or if the stand continues to expand at the expense of

other wetland vegetation. As is the case with any invasive plant or animal, managing smaller infestations is easier, so control programs should be designed with provisions for both initial control and management over the long term once problem populations have been identified.

Common reed sets seed between July and September, and the seeds are dispersed between November and January. After the seeds are set, nutrients are translocated down to the rhizomes and the above-ground portion of the plant dies back for the winter. Seeds are an important mechanism of dispersal to new sites, but at a site that has already been invaded, spread occurs primarily by vegetative means. Therefore, common reed control must combine methods that destroy both the above- and below-ground portions of the plant.

Methods including biological control and prescribed burning are generally not effective for eliminating or reducing common reed stands, so chemical control should be used. One of the best control methods for common reed is the application of a non-persistent glyphosate herbicide that is safe for use in and around wetlands, such as Rodeo®. Rodeo and other glyphosate herbicides must be mixed with a surfactant and with clean, preferably distilled, water. Clean water is important because the isopropylamine salt in the herbicide will bind to any soil particles in the water and be rendered ineffective if the water contains sediment.

Herbicide should not be used if rain is anticipated within 12 hours of application, as it will be washed off the leaves before damaging the plants. Herbicide should also not be applied during windy conditions to prevent the spray from drifting to areas where application is not desired. Rodeo is not selective, so plants other than common reed will also be killed if exposed. Since common reed typically occurs in nearly monotypic stands, however, the benefits of common reed eradication often outweigh the risks of eradicating desirable species.

Apply herbicides directly onto the plants when they are allocating nutrients to their root systems (called the tasseling stage) in August or September. Applying the herbicide at this time will ensure that the chemicals are translocated to the rhizomes, killing the plant. Herbicide can be applied with a backpack sprayer, by truck, or aerially, depending on the size of the area and how selective you need to be in order to avoid desirable plants. Because not

all plants will be in the tasseling stage at exactly the same time, and because subdominant plants are protected by canopy plants in dense stands, it will probably be necessary to repeat the herbicide application 15 to 30 days later to ensure complete control. Following spraying, the standing stalks should be mowed and removed, which is often done in late winter or early spring of the following year. Mowing the plants will enable sunlight to penetrate to the soil and allow dormant seeds of other plants to germinate. In most instances, a flush of plant growth is realized following removal of common reed. However, if after 4 to 6 weeks no growth has been recorded; it may be necessary to seed or plant the area using small plants or "plugs" of native species. Establishing a ground cover is important in order to ensure that common reed does not immediately re-invade the area. Keep in mind that this is a difficult species to eradicate and it may take more than one season to control. Following initial eradication, it is important to continually monitor for common reed because seeds can remain viable for up to five years in the soil. Wind and wildlife can bring in new seeds as well.

2.6.1.3 Purple Loosestrife Management Options

Purple loosestrife (*Lythrum salicaria*) is an herbaceous, perennial wetland plant that grows in a variety of habitats. It is easily identified by its purple to magenta, six-petaled flowers, which are arranged on a spike which can reach a few feet in length. It is a native of Europe and Asia that was introduced to North America in the early 19th century through ship ballast and cultivation by early settlers as an ornamental. Purple loosestrife is very hardy, tolerant of many nutrient and moisture conditions, and free of natural insect pests and diseases, all of which make it an extremely invasive species. These same attributes also made it a popular plant for gardeners, further contributing to its spread. Mature plants can reach heights of ten feet, with 30 to 50 stems arising from a common rootstock. The rootstock stores energy resources that are used during spring growth, or to regenerate aboveground shoots that have been damaged. **Figure 19** provides an example photo of purple loosestrife, which has been identified at the Zion Generating Station.

Purple loosestrife forms dense monocultures that displace native wetland plant communities and jeopardize threatened and endangered plant and wildlife species. The plant is a prolific seed producer, with a single mature plant capable of producing over two million seeds. The

small, lightweight seeds are easily dispersed by wind, moving water, or by clinging to fur and feathers of wildlife. With optimal conditions, a small patch of purple loosestrife can take over an entire aquatic site in a single growing season. Monotypic stands of the plant are usually too dense to provide cover for nesting waterfowl, and most waterfowl avoid wetlands that have been overrun by purple loosestrife. Muskrats prefer cattails to purple loosestrife for food and to create their homes with, and songbirds do not eat the small, hard seeds.

FIGURE 19. PURPLE LOOSESTRIFE AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

Because there are only small pockets growing at the Zion Generating Station site, WHC recommends removing purple loosestrife by hand to control its spread. The purple loosestrife identified on site is an invasive plant that will eventually spread and take over vast areas of the wetlands. Since there are only smaller pockets, hand pulling should be implemented as soon as possible.

When purple loosestrife occurs in small, localized stands, such as those present at the Zion Generating Station site, manually removing all roots, underground stems, and aboveground shoots can prove to be an effective control method. Removing all plant parts in a single pass can be difficult, so the area should be monitored for several years to guarantee that no regeneration occurs after the initial removal. To dispose of the roots and aboveground vegetation, either burn the material after it has dried, or compost the material in an enclosed composting structure.

Uprooting the plant by hand and ensuring the removal of all vegetative parts can eliminate *L. salicaria*. Other control techniques include water-level manipulation, mowing or cutting, burning, herbicide application, and biological control (introduced insects). These control methods are costly, require continued long-term maintenance and, in the case of herbicides, are non-selective and environmentally degrading. Biological control using insects that feed on purple loosestrife began in the early 1990's. Initial results, from various regions of the country, show that this may be a viable option for controlling heavy infestations in some areas.

2.6.2 Migratory, Forestland, Grassland, and Wetland Avian Species Management

Throughout the nation, many historically common avian species have experienced significant declines. According to research compiled by the USGS Northern Prairie Wildlife Research Center, most of the declines of avian species within Illinois can be attributed to specific land use practices such as the removal of forestlands, land clearing for agriculture, mining, urban development, reservoirs, highway construction, and the placement of power lines which have all contributed to severe fragmentation of local avian habitats.

Exelon Corporation's Zion Generating Station lies within the Mississippi Flyway, which is one of four major North American flyways. This flyway includes migration routes that extend eastward through the peninsula of southern Ontario to western Lake Erie and southwest across Ohio and Indiana to the Mississippi where routes clearly follow the river to its mouth. The western boundaries are less clearly defined and mix into the Central Flyway in eastern Nebraska and western Missouri and Arkansas. The longest known migration route reportedly passes through this flyway; passing from the north on the Arctic shore of Alaska south to the southern tip of Patagonia. Besides being located within an important migratory route, the Zion Generating Station Station may provide habitat for a number of resident songbirds and important grassland and forestland species.

Research has shown that habitat size, shape, and the amount of edge present in forestland and grassland habitats all greatly affect the success of breeding birds in this region. For this reason, the USGS Northern Prairie Wildlife Research Center has compiled a list of area requirements for forestland and grassland nesting birds based on their ability to successfully adapt to surrounding fragmentation. A partial version of this list is provided in **Table 2** and **Table 3**, and includes those species that have moderate and low sensitivities to fragmentation, as these species would be most likely to utilize habitat available within and around the Zion Generating Station property.

TABLE 2. FORESTLAND BIRDS OF ILLINOIS AND THEIR TOLERANCE OF FRAGMENTATION

SENSITIVITY	COMMON NAME	SCIENTIFIC NAME
Moderately sensitive	Tufted titmouse	*Baeolophus bicolor*
Low sensitivity	Northern cardinal	*Cardinalis cardinalis*
Moderately sensitive	Yellow-billed cuckoo	*Coccyzus americanus*
Moderately sensitive	Black-billed cuckoo	*Coccyzus erythropthalmus*
Low sensitivity	Eastern wood pewee	*Contopus virens*
Low sensitivity	Blue jay	*Cyanocitta cristata*
Moderately sensitive	Yellow-throated warbler	*Dendroica dominica*
Moderately sensitive	Acadian flycatcher	*Empidonax virescens*
Moderately sensitive	Wood thrush	*Hylocichla mustelina*
Low sensitivity	Northern oriole	*Icterus galbula*
Low sensitivity	Red-bellied woodpecker	*Melanerpes carolinus*
Low sensitivity	Red-headed woodpecker	*Melanerpes erythrocephalus*
Low sensitivity	Great crested flycatcher	*Myiarchus crinitus*
Moderately sensitive	Kentucky warbler	*Oporornis formosus*
Moderately sensitive	Northern parula	*Parula Americana*
Low sensitivity	Indigo bunting	*Passerina cyanea*
Low sensitivity	Rose-breasted grosbeak	*Pheucticus ludovicianus*
Low sensitivity	Downy woodpecker	*Picoides pubescens*
Moderately sensitive	Hairy woodpecker	*Picoides villosus*
Low sensitivity	Rufous sided towhee	*Pipilo erythrophthalmus*
Moderately sensitive	Scarlet tanager	*Piranga olivacea*
Moderately sensitive	Summer tanager	*Piranga rubra*
Low sensitivity	Black capped chickadee	*Poecile atricapilla*
Moderately sensitive	Blue-gray gnatcatcher	*Polioptila caerulea*
Low sensitivity	Common grackle	*Quiscalus quiscula*
Moderately sensitive	Louisiana waterthrush	*Seiurus motacilla*
Moderately sensitive	White-breasted nuthatch	*Sitta carolinensis*
Low sensitivity	Carolina wren	*Thryothorus ludovicianus*
Low sensitivity	House wren	*Troglodytes aedon*
Low sensitivity	American robin	*Turdus migratorius*
Moderately sensitive	Red-eyed vireo	*Vireo olivaceus*

There are also several avian species that are characteristic in Illinois grassland and prairie ecosystems, although populations that rely on these types of habitat have suffered dramatic declines following the conversion of grasslands and native tallgrass prairie to agricultural row crops. In recent years, population declines have intensified due to changes from mixed agricultural lands to production of one crop, expanding hay fields and livestock management activities.

TABLE 3. GRASSLAND BIRDS OF ILLINOIS AND THEIR TOLERANCE OF FRAGMENTATION

SENSITIVITY	COMMON NAME	SCIENTIFIC NAME
Low sensitivity	Red-winged blackbird	*Agelaius phoeniceus*
Moderate sensitivity	Grasshopper sparrow	*Ammodramus savannarum*
Low sensitivity	American goldfinch	*Carduelis tristis*
Moderate sensitivity	Sedge wren	*Cistothorus platensis*
Low sensitivity	Northern bobwhite	*Colinus virginianus*
Low sensitivity	Common yellowthroat	*Geothlypis trichas*
Low sensitivity	Song sparrow	*Melospiza melodia*
Low sensitivity	Vesper sparrow	*Pooecetes gramineus.*
Low sensitivity	Dicksissel	*Spiza Americana*
Low sensitivity	Field sparrow	*Spizella pusilla*
Moderate sensitivity	Eastern meadowlark	*Sturnella magna*
Moderate sensitivity	Western meadowlark	*Sturnella neglecta*

Many of the grassland nesting birds that were considered common and had stable populations at the turn of the century are now critically imperiled and increasingly rare. One such progression is evident when studying greater prairie chickens, whose population peaked at an estimated ten million individuals. Current population estimates include fewer than 80 birds in Illinois. A partial list of grassland breeding birds of Illinois, provided by the USGS Northern Prairie Wildlife Research Center, can be found in **Table 4**.

TABLE 4. GRASSLAND BREEDING BIRDS OF ILLINOIS

COMMON NAME	SCIENTIFIC NAME
Red winged blackbird	*Agelaius phoeniceus*
Henslow's sparrow	*Ammodramus henslowii*
Grasshopper sparrow	*Ammodramus savannarum*
Blue winged teal	*Anas discors*
Mallard	*Anas platyrhynchos*
**Short-eared owl	*Asio flammeus*
**Upland sandpiper	*Bartramia longicauda*
American goldfinch	*Carduelis tristis*
Killdeer	*Charadrius vociferous*
Lark sparrow	*Chondestes grammacus*
Common nighthawk	*Chordeiles minor*
**Northern harrier	*Circus cyaneus*
Sedge wren	*Cistothorus platensis*
Northern bobwhite	*Colinus virginianus*
Bobolink	*Dolichonyx oryzivorus*
Horned lark	*Eremophila alpestris*
Common yellowthroat	*Geothlypis trichas*
*Loggerhead shrike	*Lanius ludovicianus*

COMMON NAME	SCIENTIFIC NAME
Swamp sparrow	*Melospiza georgiana*
Song sparrow	*Melospiza melodia*
Savannah sparrow	*Passerculus sandwichensis*
Ring necked pheasant	*Phasianus colchicus*
Vesper sparrow	*Pooecetes gramineus*
Dicksissel	*Spiza americana*
Field sparrow	*Spizella pusilla*
Eastern meadowlark	*Sturnella magna*
Western meadowlark	*Sturnella neglecta*
** Greater prairie chicken	*Tympanuchus cupido*

**Indicates the species is endangered in Illinois.
*Indicates the species is threatened in Illinois.

Native prairie, marsh, and savanna habitats on the Zion Generating Station property can potentially provide excellent habitat for grassland birds. However, many grassland birds are declining in numbers due to conversion of grasslands to agriculture, habitat fragmentation, and suburban development. According to results from the North American Breeding Bird Survey, grassland birds exhibited the most consistent, widespread, and steepest declines of any bird habitat group. Of the 28 grassland bird species in the US, only ten percent have shown positive population trends. In comparison, more than 50 percent of forest bird species have shown an increase since the survey first began in 1966. The plight of grassland birds has been described as America's most neglected conservation problem. Since 1966, the bobolink has declined by 37 percent, the eastern meadowlark by 53 percent, and the grasshopper sparrow by 66 percent. In general, management strategies aimed at preserving grassland bird populations focus on protecting and establishing large contiguous habitat blocks, providing structurally diverse habitat, eliminating mid-season mowing, reducing edge, and controlling the encroachment of woody vegetation. There are three primary management techniques available for managing grassland habitat: prescribed burning, grazing, and mowing.

In addition to preserving and enhancing grassland habitats on site, managers can also increase habitat suitability for native cavity-nesting birds by constructing, placing, and monitoring nest boxes. Cavity-nesting bird populations have also been declining in recent decades due to habitat loss and the concomitant decrease in availability of suitable nesting cavities. Most natural nest cavities are located in standing dead trees, known as snags. The

combination of current forest treatment practices and loss of woodlands has contributed to a decrease in naturally occurring snags. Providing and maintaining nesting structures through a nest box program can help increase native bird populations. Attracting several native bird populations will increase the biodiversity on the site and the surrounding area. WHC recommends placing nest structures for mallards, tree swallows, purple martins, woodpeckers, owls, and American kestrels, which will readily colonize artificial boxes. Beyond initial nest box placement, maintenance and monitoring of the nest boxes is very important for a successful program. A list of cavity-nesting species common in Illinois is provided in **Table 5**. Information concerning cavity-nesting raptor and owl species is outlined in the following sections. For additional information on constructing and placing nest boxes, please refer to the **Artificial Nesting Structures** document located in the "Technical Reference Documents" menu of the Report CD, or contact the Wildlife Habitat Council.

TABLE 5. EXAMPLES OF CAVITY NESTING BIRDS OF ILLINOIS

COMMON NAME	SCIENTIFIC NAME
Northern saw-whet owl	*Aegolius acadicus*
Wood duck	*Aix sponsa*
Northern flicker	*Colaptes auratus*
American kestrel	*Falco sparverius*
Red headed woodpecker	*Melanerpes erythrocephalus*
Eastern screech owl	*Otus asio*
Prothonotary warbler	*Protonotaria citrea*
Eastern bluebird	*Sialis sialia*
White-breasted nuthatch	*Sitta carolinensis*
Yellow-bellied sapsucker	*Sphyrapicus varius*
Bewick's wren	*Thryomanes bewickii*
Carolina wren	*Thryothorus ludovicianus*
Barn owl	*Tyto alba*

In addition to grassland and forestland avian species, habitats available at the Zion Generating Station provide habitat for a diversity of wetland-dependent birds. Wetland species common to the southern region of Lake Michigan are listed in **Table 6**.

TABLE 6. COMMON WETLAND BIRDS THAT MAY INHABIT THE ZION STATION

Type	Common Name	Species Name
Diving Birds	Arctic Loon	*Gavia arctica*
	Belted Kingfisher	*Megaceryle alcyon*
	Common loon	*Gavia immer*
	Double-crested cormorant	*Phalacrocorax auritus*
	Horned grebe	*Podicep sauritus*
	Pied-billed grebe	*Podilymbus podiceps*
	Red-necked grebe	*Podiceps grisegena*
	Western grebe	*Aechmophorus occidentalis*
Gulls and Terns	Black tern	*Chilidonias niger*
	Bonaparte's gull	*Larus Philadelphia*
	Caspian tern	*Sterna caspia*
	Common tern	*Sterna hirundo*
	Forster's tern	*Sterna fosteri*
	Franklin's gull	*Laurus pipixcan*
	Glaucous gull	*Larus hyperboreus*
	Great black-backed gull	*Larus marinus*
	Herring gull	*Larus sargentatus*
	Laughing gull	*Larus atricilla*
	Ring-billed gull	*Larus delawarensis*
	Thayer's (herring) gull	*Larus thayeri*
Pelagic birds	Black-legged kittiwake	*Rissa tridactyla*
Raptors	American kestrel	*Falco sparverius*
	Bald eagle	*Haliaeetus leucocephalus*
	Osprey	*Pandion haliaetus*
	Peregrine falcon	*Falco peregrinus*
Shorebirds	Baird's sandpiper	*Calidris bairdii*
	Black-bellied plover	*Pluvialiss quatarola*
	Dunlin	*Calidris alpine*
	Greater yellowlegs	*Tringa melanaleuca*
	Killdeer	*Charadrius vociferous*
	Least sandpiper	*Calidris minutilla*
	Lesser yellowlegs	*Tringa flavipes*
	Pectoral sandpiper	*Calidris melanotos*
	Piping plover	*Charadrius melodus*
	Purple sandpiper	*Calidris maritime*
	Red knot	*Calidris canutus*
	Ruddy turnstone	*Arenaria interpres*
	Sanderling	*Calidris alba*
	Semipalmated plover	*Charadrius semipalmatus*
	Short-billed dowitcher	*Limnodromus griseus*
	Solitary sandpiper	*Tringa solitaria*
	Spotted sandpiper	*Actitis macularia*

Type	**Common Name**	***Species Name***
Shorebirds	Upland sandpiper	*Bartramia longicauda*
	White-rumped sandpiper	*Calidris fusciollis*
	Willet	*Catoptrophorus semipalmatus*
Wading Birds	American bittern	*Botaurus lentiginosus*
	American woodcock	*Philohela minor*
	Black-crowned night heron	*Nycticorax nycticorax*
	Cattle egret	*Bubulcus ibis*
	Great blue heron	*Ardeo herodias*
	Great egret	*Casmerodius albus*
	Green heron	*Butorides striatus*
	King rail	*Rallus elegans*
	Least bittern	*Ixobrychus exilis*
	Sandhill crane	*Grus Canadensis*
	Sora rail	*Porzana Carolina*
	Virginia rail	*Rallus limicola*
Waterfowl	American coot	*Fulica Americana*
	American wigeon	*Anas Americana*
	Black brant	*Branta bernicla*
	Black duck	*Anas rubripes*
	Black scoter (common)	*Melanitta nigra*
	Blue-winged teal	*Anas discors*
	Bufflehead	*Bucephala albeola*
	Canada goose	*Branta Canadensis*
	Canvasback	*Aythya valisineria*
	Common goldeneye	*Bucephala clangula*
	Common merganser	*Mergus merganser*
	Gadwall	*Anas strepera*
	Greater scaup	*Aythya marila*
	Green-winged teal	*Anas crecca*
	Harlequin duck	*Histrionicus histrionicus*
	Hooded merganser	*Lophodytes cucullatus*
	Lesser scaup	*Aythya affinis*
	Mallard	*Anas platyrhynchos*
	Mute swan	*Lygnus olor*
	Northern shoveler	*Anas clypeata*
	Oldsquaw	*Clangula hyemalis*
	Pintail	*Anas acuta*
	Red-breasted merganser	*Mergus serrator*
	Redhead	*Aythya americana*
	Ring-necked duck	*Aythya collaris*
	Ruddyduck	*Oxyura jamaicensis*
	Surf scoter	*Melanitta perspicillata*
	White-winged scoter	*Melanitta deglandi*
	Woodduck	*Aix sponsa*

For wetland-dependent species, a diversity of vegetation, and a variety of water depths are the most important management considerations. Species dependant on emergent marshes, such as the American bittern, would benefit from the restoration of adequate water levels to areas currently choked with cattails. Shorebirds also benefit from enhancements such as this, as they depend on the shorelines and shallow waters of emergent wetland to provide them with a rich source of insects and other aquatic foods. Shallow, emergent wetlands are also excellent brood-rearing areas for waterfowl, such as mallards and teals, as they again provide a rich food source, as well as dense emergent vegetation as cover to hide the broods. Native vegetation is again stressed, as it provides the most diversity and value to wildlife. Stands of exotic/invasive species, such as purple loosestrife and common reed, should be eradicated in an effort to restore native vegetation to the wetlands on the Zion Generating Station site.

2.6.2.1 Raptor Habitat Management Options

"Raptor" is a general term that refers to birds of prey. In general, raptors are fairly large, possess strong beaks and talons, and have sharp hearing and eyesight. These birds are often at the top of the food chain in ecological systems, and because of their value state and federal laws protect raptors. Raptors include hawks, eagles, falcons, harriers, kites, accipiters, and buteos. Many raptor species have experienced declines in population, in large part due to their tendency to accumulate biotoxins that cause egg thinning and severe reductions in reproductive success. However, efforts to conserve viable raptor habitat and the banning of certain chemicals have helped some raptor species to begin to recover.

Illinois has several species of hawks, which, like eagles, are diurnal, hunting during daylight hours. They feed primarily on small mammals, birds, fish, amphibians, reptiles, and insects, although some also feed on road kill and other carrion. Most hawks can be observed in woodland habitats, in agricultural fields and edge habitats, wetlands, prairies and grasslands, and sometimes even in residential areas. The red-shouldered hawk, which was taken off the state's threatened species list in 2003, prefers forested wetland habitats adjacent to rivers and streams. The red-tailed hawk is one raptor commonly seen in Illinois, often spotted on utility poles, dead standing trees, or available perches. Accipiters, including Cooper's and

sharp shinned hawks, are birds of the woodlands and are able to navigate through the canopy chasing smaller birds.

TABLE 7. COMMON BIRDS OF PREY IN ILLINOIS

COMMON NAME	SCIENTIFIC NAME
Cooper's hawk	*Accipiter cooperii*
Northern saw whet owl	*Aegolius acadicus*
Golden eagle	*Aquila chrysaetos*
Short eared owl	*Asio flammeus*
Long eared owl	*Asio otus*
Great horned owl	*Bubo virginianus*
Red tailed hawk	*Buteo jamaicensis*
Rough legged hawk	*Buteo lagopus*
Red shouldered hawk	*Buteo lineatus*
Broad winged hawk	*Buteo platypterus*
Turkey vulture	*Cathartes aura*
Northern harrier	*Circus cyaneus*
Peregrine falcon	*Falco peregrinus*
American kestrel	*Falco sparverius*
Bald eagle	*Haliaeetus leucocephalus*
Mississippi kite	*Ictinia mississippiensis*
Snowy owl	*Nyctea scandiaca*
Eastern screech owl	*Otus asio*
Osprey	*Pandion haliaetus*
Barred owl	*Strix varia*
Barn owl	*Tyto alba*

Falcons, which include the commonly-observed American kestrel, are generally considered to be small- to medium-sized birds of prey that rely on fast, strong flight abilities for hunting. Kestrels are often spotted perching on or around utility poles and standing dead trees, scanning grasslands below for rodent and insect prey. The northern harrier, another hawk found in Illinois, prefers grassland and marsh habitat for hunting prey. Ospreys are another common Illinois raptor; these birds occupy wetland and upland areas along rivers, lakes, and coastal areas. The Mississippi kite is the only member of its family that is found in Illinois, and it usually inhabits the extreme southern portion of the state, although they sometimes appear in northern regions during the periodic return of certain cicadas. Turkey vultures, which are commonly viewed soaring and circling in groups, are considered to be the most common raptors found in Illinois.

The common owl species of Illinois are found most often in their preferred nesting habitats, which include woodlands, open meadows and field habitats, and edge areas. Owls can be most easily identified during the nesting season, when they are more actively hunting and subsequently more vocal.

2.6.3 Bat Habitat Management Options

Despite the many misconceptions people have about them, bats are actually a unique group of mammals that play a vital role in natural ecosystems. There are more than 1,100 different kinds of bats throughout the world, amounting to approximately ¼ of all mammal species. Many people have the mistaken idea that contact with a bat will result in rabies contraction. In fact, research indicates that the incidence of rabies is only about 0.5 percent in bat populations. Bats will not usually bite unless threatened, and since most of those bats that do contract rabies exhibit the paralytic form of the virus, a rabid bat is unlikely to attack humans.

Bats are important in seed dispersal and pollination of both wild and agricultural plants, and are a major predator of night-flying insects, including mosquitoes; approximately 70 percent of all bats are considered to be insectivorous. A single bat can eat up to 1,000 or more insects in an hour, potentially reducing the need for pesticides and lowering the risk of insect-borne diseases such as West Nile Virus.

Of the more than 1,000 bat species throughout the world, only twelve species live in Illinois all or part of the year. All of them are insect eaters and feed on mosquitoes, as well as many crop damaging corn border and cutworm moths. Therefore, Illinois bats generally hibernate or migrate when insect populations begin to dwindle. Bats common in the region are generally small, only two to four inches in length with average wingspans of up to twelve inches and often weigh less than one ounce.

In spite of their beneficial and relatively innocuous nature, more than half of the bat species in America are considered to be endangered or in rapid decline. Pesticide use, habitat

destruction, and disturbance of colonies during hibernation and breeding are among the biggest threats to these populations. Placing and monitoring artificial roosting structures are steps that the Zion Generating Station can take to support bat populations and to help slow or even reverse, their downward population trend. **Table 8** provides a list of the bats species that are commonly observed in Illinois.

TABLE 8. BATS COMMON IN ILLINOIS

COMMON NAME	SCIENTIFIC NAME	STATUS
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	State Endangered
Big brown bat	*Eptesicus fuscus*	Common, hibernate in winter
Silver-haired bat	*Lasionycteris noctivagans*	Migratory, only in summer
Red bat	*Lasiurus borealis*	Migratory, only in summer
Hoary bat	*Lasiurus cinereus*	Migratory, only in summer
Keen's bat	*Myoits keenii*	Uncommon
Southeastern bat	*Myotis austroriparius*	State Endangered
Gray bat	*Myotis grisescens*	Federal Endangered
Little brown bat	*Myotis lucifugus*	Common, hibernate in winter
Indiana bat	*Myotis sodalist*	Federal Endangered
Evening bat	*Nycticeius humeralis*	Migratory, only in summer
Eastern pipistrelle	*Pipistrellus subflavus*	Common, hibernate in winter

Bat boxes may be used for establishment of nursery colonies during the summer months, for roosting, or for hibernating. Once a location is established, bat populations will generally return to the same bat box every year. The bats can be monitored by looking up into the box during the day with a flashlight to count the number of occupants, and by counting the number of bats that emerge in the evening. To count pups, wait until the adults have emerged in the evening, and then use a flashlight to attempt to count the pups remaining. Each breeding female usually has one pup per year. The pups are born hairless and unable to fly, and are dependent on the mother for protection and milk. The mother will leave the pup alone in the colony at night to feed, but will return to nurse. The young will begin to leave the colony for short flights when six to eight weeks old, usually in late July.

Although bats are not usually aggressive, they should never be handled. Occasionally young may fall from the roost, or adults may be injured when hit by cars. While less than half of one percent of the population carries the rabies virus, as noted above, any downed bat should be treated as a potential carrier. To capture an injured bat, wear gloves, place a coffee can over the bat, and then slide a piece of cardboard under the can. An obvious

juvenile can then be placed back in the box as long as the person does not come into direct contact with the bat. For injured or ill bats, contact the health department or a local wildlife rehabilitator. If there are any issues with this, WHC and the other partners can be contacted for help.

2.6.4 Pollinator Habitat Management Options

The steady decrease in native pollinators is of great concern within the scientific community because of their important role in propagating both agricultural and wild plant species; while some plants are pollinated by the wind or self-pollinated, most flowering plants require a pollinator in order to set fruit and seed. Butterflies and hummingbirds are both important groups of pollinators, but bees are the group responsible for pollinating the greatest number and diversity of native plants. On a typical foraging trip, a bee may visit hundreds of flowers, pollinating each of them inadvertently while drinking nectar. Native bees are fundamentally responsible for maintaining the vigor of natural plant communities and the wildlife that depend on them.

Loss of nesting habitat and nectar sources, combined with widespread pesticide use, has led to a decline in bees and other pollinators that has caused alarm amongst the scientific community. The drastic decline in domestic honeybees in the last few years due to mite parasitism has led to further cause for concern in protecting native bee populations. There are more than 3,500 species of bees native to North America.

TABLE 9. BUTTERFLIES OF LAKE COUNTY

COMMON NAME	SCIENTIFIC NAME
Delaware skipper	*Anatrytone logan*
Least skipper	*Ancyloxypha numitor*
Hackberry butterfly	*Asterocampa celtis*
Tawny emperor	*Asterocampa clyton*
Sachem	*Atalopedes campestris*
Pipevine swallowtail	*Battus philenor*
Silver-bordered fritillary	*Boloria selene*
Spring azure	*Celastrina ladon*
Summer azure	*Celastrina neglecta*
Common wood nymph	*Cercyonis pegala*
Gorgone checkerspot	*Chlosyne gorgone*
Silvery checkerspot	*Chlosyne nycteis*

COMMON NAME	SCIENTIFIC NAME
Orange sulphur	*Colias eurytheme*
Clouded sulphur	*Colias philodice*
Hoary elfin butterfly	*Callophrys polios*
Monarch	*Danaus plexippus*
Northern pearly eye	*Enodia anthedon*
Silver spotted skipper	*Epargyreus clarus*
Wild indigo duskywing	*Erynnis baptisiae*
Olympia butterfly	*Euchloe olympia*
Baltimore	*Euphydryas phaeton*
Two spotted skipper	*Euphyes bimacula*
Black dash	*Euphyes conspicua*
Dion skipper	*Euphyes dion*
Dun skipper	*Euphyes vestries*
Variegated fritillary	*Euptoieta Claudia*
Zebra swallowtail	*Eurytides marcellus*
Little yellow	*Eurema lisa*
Sleepy orange	*Eurema nicippe*
Eastern tailed blue	*Everes comyntas*
Fiery skipper	*Hylephila phyleus*
Common buckeye	*Junonia coenia*
American snout	*Libytheana carinenta*
Viceroy	*Limenitis archippus*
Red spotted purple	*Limenitis arthemis*
*Karner blue	*Lycaeides Melissa samuelis*
Gray copper	*Lycaena dione*
Bronze copper	*Lycaena hyllus*
American copper	*Lycaena phlaeas*
Little wood satyr	*Megisto cymela*
Mourning cloak	*Nymphalis antiopa*
Milbert's tortoiseshell	*Nymphalis milbertii*
Giant swallowtail	*Papilio cresphontes*
Pale crescent	*Phyciodes tharos*
Cabbage white (exotic)	*Pieris rapae*
Long dash	*Polites mystic*
Crossline skipper	*Polites origenes*
Little glassywing	*Pompeius verna*
Eastern tiger swallowtail	*Papilio glaucus*
Black swallowtail	*Papilio polyxenes*
Spicebush swallowtail	*Papilio Troilus*
Common sootywing	*Pholisora Catullus*
Pearl crescent	*Phyciodes tharos*
Cabbage white	*Pieris rapae*
Hobomok skipper	*Poanes hobomonk*
Peck's skipper	*Polites peckius*
Tawny edged skipper	*Polites Themistocles*
Question mark	*Polygonia interrogationis*

COMMON NAME	SCIENTIFIC NAME
Checkered white	*Pontia protodice*
Buckeye	*Precis coenia*
Common checkered skipper	*Pyrgus communis*
Coral hairstreak	*Satyrium titus*
Acadian hairstreak	*Satyrium acadia*
Banded hairstreak	*Satyrium colanus*
Striped hairstreak	*Satyrium liparops*
Gray hairstreak	*Strymon melinus*
Eyed brown	*Satyrodes Eurydice*
Aphrodite fritillary	*Speyeria Aphrodite*
Great spangled fritillary	*Speyeria Cybele*
Regal fritillary	*Speyeria idalia*
Southern cloudywing	*Thorybes bathyllus*
Northern cloudywing	*Thorybes pylades*
European skipper	*Thymelicus lineola*
Red admiral	*Vanessa atalanta*
Painted lady	*Vanessa carduii*
American painted lady	*Vanessa virginiensis*
Southern dogface	*Zerene cesonia*

The majority of North American bees is solitary and should not to be confused with honeybees, which nest in colonies and were introduced into the U.S. The distinction between native solitary bees and introduced social bees is important for public awareness of bee conservation because only social bees swarm to protect their hive. Native bees, on the other hand, rarely ever sting, and when they do the sting tends to be mild. Native bees can generally be categorized as either soil dwellers or wood dwellers. Among the soil-dwelling bees are the bumble, sweat, digger, squash, alkali, and polyester bees. Wood-dwelling bees include orchard mason, horn-faced, leafcutter, and carpenter bees. In their natural habitat, wood-dwelling bees will excavate their nests in the soft central pith of stems and twigs, abandoned beetle borrows, or in dead standing trees. Soil-dwelling bees dig their nests in bare soil or construct domed nests out of mud. For more information about pollinators, please refer to the **Bats** and **Native Pollinators** documents located in the "Technical Reference Documents" menu of the Report CD.

2.6.5 Herptile Habitat Management Options

"Herptile" is jargon typically used to collectively refer to amphibians and reptiles. These two groups are often lumped together when discussing habitat because it is largely accepted that

reptiles evolved from amphibians. Both reptiles and amphibians are cold-blooded animals that lay eggs; however, there are also several important differences between the two groups, and among individual species of each group. Amphibians generally inhabit damp or wet environments such as marches, swamps, bogs, ponds, and larger water bodies. This is because two of the stages of amphibian metamorphosis, the egg stage and the tadpole stage, require aqueous environments. The major groupings of amphibian species include frogs and toads, and salamanders. Frogs and toads are commonly confused with one and other; however, toads generally have shorter legs than frogs, and their movements are described as hopping rather than the leaping common among frogs. In addition, toads generally do not live in as close proximity to water resources as frogs typically do, although both require aquatic environments for successful reproduction. Salamanders, the other common type of amphibian, are generally recognizable by their long, slender bodies and presence of four legs, making them easily distinguishable from toads and frogs.

Frogs and toads can be most readily identified through their calls, taking into consideration overall size, color, and markings. Some amphibian species common in Illinois include the spring peeper, which is less than one inch in size; chorus frog, which is dark olive or black and similar in size to the peeper; cricket frog, which is common in central and southern Illinois; eastern wood frog, which is gray to green in color and inhabits wooded areas; green frog, which is a medium-sized frog; and the deep-toned bullfrog, American toad, and Fowler's toad.

FIGURE 20. NORTHERN LEOPARD FROG AT THE ZION GENERATING STATION

Photo by Kathleen Koelbl-Crews, WHC Wildlife Biologist

Reptiles, the other component of the term "herptile," are often separated into four main categories for study: crocodiles, lizards, snakes, and turtles. Reptile development and overall lifecycles are very different than those common among amphibians. Reptiles generally spend their lives in terrestrial environments and young do not go through an extended metamorphosis; rather they are born as miniature versions of adults. The crocodile category of reptiles includes the American alligator, while the "lizard" classification includes iguanas, geckos, skinks, and chameleons. Snakes, which are legless reptiles that live in the ground, trees, or water, include earth snakes, common garter snakes, and copperheads. Turtles, which are the only reptiles with an external shell, include bog turtles, painted turtles, map turtles, and stinkpots. Now only a remnant of a formerly large group, reptiles today number about 6,000 species worldwide, a much smaller number than the era when reptiles dominated life on this planet.

The lack of vernal pools and other appropriate terrestrial and aquatic reptile and amphibian habitat resources across the country, which is due to the encroachment of developments and the conversion of acreage to agricultural and residential lands, is partly responsible for the alarming decrease of reptiles and amphibians worldwide. Herptiles have been declining in increasing numbers throughout the last century. An ongoing monitoring project can help

the Zion Wildlife Team to determine the status of herptile populations at the site and the quality of habitat resources available for these sensitive species, while also contributing to important regional and national monitoring efforts, such as the compilation of research through the National Wildlife Federation and USGS-sponsored Frogwatch USA program. Frogwatch USA relies on volunteers to collect information regarding amphibian populations in neighborhoods across the nation. Monitoring activities such as this will not only benefit amphibians and reptiles, but they can present an opportunity for community outreach as well. Frogs and toads can be most readily identified through their calls, taking into consideration overall size, color, and markings. Reptiles are often easier to identify based on habitat types and other identifiable characteristics. **Table 10** provides a list of the reptile and amphibian species that are native to Illinois.

TABLE 10. ILLINOIS NATIVE REPTILE AND AMPHIBIAN SPECIES

TYPE	COMMON NAME	SCIENTIFIC NAME
Amphibian	Northern cricket frog	*Acris crepitans*
	Jefferson salamander	*Ambystoma jeffersonianum*
	Spotted salamander	*Ambystoma maculatum*
	Marbled salamander	*Ambystoma opacum*
	Tiger salamander	*Ambystoma tigrinum*
	Green salamander	*Aneides aeneus*
	American toad	*Bufo americanus*
	Fowler's toad	*Bufo fowleri*
	Dusky salamander	*Desmognathus fuscus*
	Mountain dusky salamander	*Desmognathus ochrophaeus*
	Two lined salamander	*Eurycea bislineata*
	Longtail salamander	*Eurycea longicauda*
	Spring salamander	*Gyrinophilus porphyriticus*
	Four-toed salamander	*Hemidactylium scutatum*
	Spring peeper	*Hyla crucifer*
	Eastern newt	*Notophthalmus viridescens*
	Redback salamander	*Plethodon cinereus*
	Northern ravine salamander	*Plethodon electromorphus*
	Slimy salamander	*Plethodon glutinosus*
	Striped chorus frog	*Pseudacris triseriata*
	New Jersey chorus frog	*Pseudacris triseriata kalmi*
	Mud salamander	*Pseudotriton montanus*
	Red salamander	*Pseudotriton ruber*
	Bullfrog	*Rana catesbeiana*
	Green frog	*Rana clamitans*
	Pickerel frog	*Rana palustris*
	Northern leopard frog	*Rana pipens*

TYPE	COMMON NAME	SCIENTIFIC NAME
Amphibian	Coastal plain leopard frog	*Rana sphenocephala*
	Wood frog	*Rana sylvatica*
	Eastern spadefoot	*Scaphiopus holbrookii*
Reptile	Copperhead	*Agkistrodon contortrix*
	Smooth softshell	*Apalone mutica*
	Spiny softshell	*Apalone spinifera*
	Worm snake	*Carphophis amoenus*
	Snapping turtle	*Chelydra serpentina*
	Northern painted turtle	*Chrysemys picta*
	Spotted turtle	*Clemmys guttata*
	Kirtland's snake	*Clonophis kirtlandii*
	Black racer	*Coluber constrictor*
	Timber rattlesnake	*Crotalus horridus*
	Ringneck snake	*Diadophis punctatus*
	Rat snake	*Elaphe obsolete*
	Blanding's turtle	*Emys blandingii*
	Coal skink	*Eumeces anthracinus*
	Five-lined skink	*Eumeces fasciatus*
	Broadhead skink	*Eumeces laticeps*
	Wood turtle	*Glyptemys insculpta*
	Bog turtle	*Glyptemys muhlenbergii*
	Map turtle	*Graptemys geographica*
	Eastern hognose	*Heterodon platirhinos*
	Eastern mud turtle	*Kinosternon subrubrum*
	Common kingsnake	*Lampropeltis getula*
	Milk snake	*Lampropeltis triangulum*
	Smooth green snake	*Liochlorophis vernalis*
	Northern water snake	*Nerodia sipedon*
	Rough green snake	*Opheodrys aestivus*
	Redbelly turtle	*Pseudemys rubriventris*
	Queen snake	*Regina septemvittata*
	Eastern fence lizard	*Sceloporus undulates*
	Eastern massasauga	*Sistrurus catenatus catenatus*
	Stinkpot	*Sternotherus odoratus*
	Brown snake	*Storeria dekayi*
	Redbelly snake	*Storeris occipitomaculata*
	Eastern box turtle	*Terrapene carolina*
	Shorthead garter snake	*Thamnophis brachystoms*
	Eastern ribbon snake	*Thamnophis sauritus*
	Common garter snake	*Thamnophis sirtalis*
	Smooth earth snake	*Virginia valeriae*
	Mountain earth snake	*Virginia valeriae pulchra*

2.6.5.1 Eastern Massasauga, or Swamp Rattlesnake

The eastern massasauga rattlesnake (*Sistrurus catenatus*) is a Federal candidate species, which means that information regarding its biological status and threats is sufficient to propose it for listing as endangered or threatened under the Endangered Species Act (ESA), but for which a proposed listing has not yet been developed due to higher priority activities. As such, continued population decline could lead to a future listing under the ESA, but it currently receives no legal protection. However, the eastern massasauga is listed as an endangered species in the state of Illinois.

Massasaugas are small snakes, gray or light brown with brown blotches on their backs and sides, marbled dark gray or black bellies, and heads marked by a narrow white stripe. These snakes utilize both wetlands and adjacent uplands; however, because they do not travel long distances, developments such as roads, farms, and towns prevent them from moving between these two areas. Urban development and the draining of wetlands have greatly reduced their habitat and affected their numbers. It should be noted that these snakes are venomous, although they generally bite only when cornered or threatened. Many people fear snakes, though, and the very knowledge that massasaugas are poisonous has led some to actively seek them out and kill them, regardless of the snake's true behavior.

In Illinois, massasaugas can be found wintering in low woods, bogs, and marshes. Summer habitat is often characterized by drier, grassy ground with low shrubs. Woody vegetation control is one management option that can be used to protect the snake's habitat. The Zion Wildlife Team should further investigate working with the Fish and Wildlife Service (FWS) to develop a Candidate Conservation Agreement, described in the following section for eastern massasaugas.

2.6.5.2 Blanding's Turtle

The Blanding's turtle is a medium-sized turtle that, as an adult, measures approximately eight to ten inches long and weighs up to approximately three pounds. Easily identified by its bright yellow neck and chin, this turtle is often referred to as a semi-box turtle because of its ability to partially close its shell when alarmed. The carapace, or upper shell, of this turtle is black with yellow spots and streaks, whereas the plastron, or bottom shell, is yellow with

brown or black patches. Juveniles are not as colorful as adults, and do not sport the yellow chins or necks, but instead are camoflauged for protection.

Being semi-aquatic, the Blanding's turtle periodically leaves the water and travels for a variety of reasons, including food. The Blanding's turtle is one of the only turtles that can swallow above water. Therefore, it is not unusual for this turtle to feed on terrestrial plants, berries, insects, worms, and grubs. Aquatic foods include crayfish, fish, frogs, and snails. The Blanding's turtle will also leave the water to bask, lay eggs in adjacent dry, sandy areas, and to migrate to permanent wintering ponds, where turtles hibernate under the mud at the bottom.

Restoration of emergent wetlands on the Zion Generating Station site would benefit the Blanding's turtle. Emergent wetlands that are choked with cattails will not be used by this turtle. Therefore, restoration and enhancement activities implemented to improved habitat for wetland avian species, addressed in **Section 2.6.2** would also benefit the Blanding's turtle.

Sandy areas adjacent to wetlands are used by the Blandings turtle for egg-laying. Ideal habitat for egg-laying at the Zion Generating Station exists in the sandy dune ridges of the site. The site's wetlands are sandwhiched between these linear ridges, so nesting habitat is quite abundant.

The Blanding's turtle is currently listed as endangered in the State of Illinois. It is recommended that the Zion Generating Station seek the protection of a Safe Harbor Agreement with the US Fish & Wildlife Service before beginning management of any endangered or threatened species. A monitoring program would be the next step in beginning management. Should the species be found to nest on the site, additional steps to prevent nest predation may be necessary to ensure nesting success of the turtle. Predators can include species such as raccoons, opposums, skunks, and even pets, such as dogs and cats.

2.7 PLANTS AND WILDLIFE IDENTIFIED AT THE ZION GENERATING STATION

Table 11 lists some of the wildlife species that have been observed at the Zion Generating Station. Comprised of species directly observed by the visiting WHC biologist as well as those identified previously by site and contract employees, the list is intended to be used as a foundation for the development of a comprehensive inventory of plants and animals at the site. To facilitate the development of a species inventory, a sample list of species characteristic of the ecoregion in which the Zion Generating Station is situated is provided alphabetically by scientific name in **Appendix II** of this report.

TABLE 11. PLANTS AND ANIMALS IDENTIFIED AT THE ZION GENERATING STATION

TYPE	COMMON NAME	SCIENTIFIC NAME
Plant	Perrenial lupine	*Lupinis perennis*
	Cattail	*Tyha spp.*
	Wild grape	*Vitis spp.*
	Common reed	*Phragmites australis*
	Black oak	*Quercus velutina*
	Common blackberry	*Rubus allegheniensis*
	Goldenrod	*Solidago spp.*
	Common mullein	Verbascum thapsus
	Chicory	*Cichorium intybus*
	Purple loosestrife	*Lythrum salicaria*
	Willow	*Salix spp.*
	Black-eyed Susan	Rudbeckia serotina
	Field horsetail	*Equisetum arvense*
	Switchgrass	*Panicum virgatum*
	Curled dock	*Rumex crispus*
	Nodding wild onion	*Allium cernuum*
	Big bluestem	*Andropogon gerardii*
	Shrubby cinquefoil	*Potentilla fruticosa*
	Rough blazing star	*Liatris aspera*
	Blazing star	*Liatris spicata*
	Blue phlox	*Phlox divaricata*
Birds	Peregrine falcon	*Falco peregrinus*
	American crow	*Corvus brachyrhynchos*
	American kestrel	Falco sparverius
	American goldfinch	*Carduelis tristis*
Mammals	White-tailed deer	*Odocoileus virginianus*
Amphibians	Northern leopard frog	*Rana pipiens*

2.8 THREATENED AND ENDANGERED SPECIES

There are 478 species that have been listed as endangered or threatened within the state of Illinois, and 24 of these have also been given such designations by the federal government. Examples of animals that were once common in Illinois but have since been extirpated include bison, elk, black bear, passenger pigeon, Carolina parakeet, and Sampson's pearly mussel. Of the total number of endangered and threatened species designated in the state, 367 are plants and 111 are animals. The two most common causes of the species decline that ultimately leads to state and federally listing species are habitat degradation and loss. According to research compiled by Illinois DNR, the state has lost "more than 90 percent of natural wetlands, 80 percent of forests and 99 percent of the original prairie. This habitat loss has had a substantial effect on wildlife populations and has been the primary factor in the endangerment of 478 species of Illinois plants and animals." An Illinois DNR pamphlet describing the history and status of the protection of endangered species goes on to state that "more than 20 percent of the freshwater mussel species ever recorded in Illinois are no longer found in the state, and another 26 percent are considered to be endangered or threatened."

Table 12 provides a summary of the types of species that are considered to be threatened and endangered in Illinois while **Table 13** lists Illinois State and Federal listed threatened and/or endangered species, not all of these species are found within Lake County. More information is available about these species, and the federal and state programs designed to protect them, on the Illinois DNR web site: http://dnr.state.il.us/espb.

TABLE 12. SUMMARY OF THREATENED AND ENDANGERED SPECIES IN ILLINOIS

TYPE	ENDANGERED	THREATENED	TOTAL NUMBER
Fish	21	10	31
Reptile	8	7	15
Amphibian	3	4	7
Bird	26	8	34
Mammal	5	3	8
Invertebrate	39	13	52
Plants	265	66	331
Total	**367**	**111**	**478**

The Illinois Endangered Species Protection Board is the governing agency within the state charged with the power to designate endangered and threatened species, and subsequently with providing advisement to Illinois DNR regarding the management, protection, and conservation of these species. The list of threatened and endangered species is reviewed internally at a minimum of once every five years; the following table was last updated in 2004.

TABLE 13. THREATENED AND ENDANGERED SPECIES IN ILLINOIS

TYPE	COMMON NAME	SCIENTIFIC NAME	STATUS
Fish	Lake sturgeon	*Acipenser fulvescens*	State Endangered
	Western sand darter	*Ammocrypta clarum*	State Endangered
	Eastern sand darter	*Ammocrypta pellucidum*	State Threatened
	Longnose sucker	*Catostomus catostomus*	State Threatened
	Cisco	*Coregonus artedi*	State Threatened
	Gravel chub	*Erimystax x-punctatus*	State Threatened
	Bluebreast darter	*Etheostoma camurum*	State Endangered
	Iowa darter	*Etheostoma exile*	State Threatened
	Harlequin darter	*Etheostoma histrio*	State Endangered
	Banded killifish	*Fundulus diaphanous*	State Threatened
	Starhead topminnow	*Fundulus dispar*	State Threatened
	Cypress minnow	*Hybognathus hayi*	State Endangered
	Bigeye chub	*Hybopsis amblops*	State Endangered
	Pallid shiner	*Hybopsis amnis*	State Endangered
	Northern brook lamprey	*Ichthyomyzon fossor*	State Endangered
	Least brook lamprey	*Lampetra aepyptera*	State Threatened
	Redspotted sunfish	*Lepomis miniatus*	State Threatened
	Bantam sunfish	*Lepomis symmetricus*	State Threatened
	Sturgeon chub	*Macrhybopsis gelida*	State Endangered
	River redhorse	*Moxostoma carinatum*	State Threatened
	Greater redhorse	*Moxostoma valenciennesi*	State Endangered
	River chub	*Nocomis micropogon*	State Endangered
	Pugnose shiner	*Notropis anogenus*	State Endangered
	Bigeye shiner	*Notropis boops*	State Endangered
	Ironcolor shiner	*Notropis chalybaeus*	State Threatened
	Blackchin shiner	*Notropis heterodon*	State Threatened
	Blacknose shiner	*Notropis heterolepis*	State Endangered
	Taillight shiner	*Notropis maculates*	State Endangered
	Weed shiner	*Notropis texanus*	State Endangered
	Northern madtom	*Noturus stigmosus*	State Endangered
	Pallid sturgeon	*Scaphirhynchus albus*	State, Federal Endangered

TYPE	COMMON NAME	SCIENTIFIC NAME	STATUS
Amphibian	Jefferson salamander	*Ambystoma jeffersonianum*	State Threatened
	Silvery salamander	*Ambystoma platineum*	State Endangered
	Hellbender	*Cryptobranchus all eganiensis*	State Endangered
	Spotted dusky salamander	*Desmognathus conanti*	State Endangered
	Eastern narrowmouth toad	*Gastrophryne carolinesnsis*	State Threatened
	Four toed salamander	*Hemidactylium scutatum*	State Threatened
	Bird voiced treefrog	*Hyla avivoca*	State Threatened
	Illinois chorus frog	*Pseudacris streckeri*	State Threatened
Reptile	Spotted turtle	*Clemmys guttata*	State Endangered
	Great Plains ratsnake	*Elaphe emoryi*	State Endangered
	Illinois mud turtle	*Kinosternon flavescens*	State Endangered
	Alligator snapping turtle	*Macrochelys temminckii*	State Endangered
	Coachwhip	*Masticophis flagellum*	State Endangered
	Broad banded watersnake	*Nerodia fasciata*	State Endangered
	River cooter	*Pseudemys concinna*	State Endangered
	Eastern massasauga	*Sistrurus catenatus*	State Endangered
	Kirtland's snake	*Clonophis kirtlandi*	State Threatened
	Timber rattlesnake	*Crotalus horridus*	State Threatened
	Blanding's turtle	*Emydoidea blandingii*	State Threatened
	Western hognose snake	*Heterodon nasicus*	State Threatened
	Mississippi green watersnake	*Nerodia cyclopion*	State Threatened
	Flathead snake	*Tantilla gracilis*	State Threatened
	Eastern ribbon snake	*Thamnophis sauritus*	State Threatened
	Lined snake	*Tropidoclonion lineatum*	State Threatened
Bird	Short eared owl	*Asio flammeus*	State Endangered
	Upland sandpiper	*Bartramia longicauda*	State Endangered
	American bittern	*Botaurus lentiginosus*	State Endangered
	Swainson's hawk	*Buteo swainsoni*	State Endangered
	Piping plover	*Charadrius melodus*	State, Federal Endangered
	Black tern	*Chlidonias niger*	State Endangered
	Northern harrier	*Circus cyaneus*	State Endangered
	Little blue heron	*Egretta caerulea*	State Endangered
	Snowy egret	*Egretta thula*	State Endangered
	Mississippi kite	*Ictinia mississippiensis*	State Endangered
	Black rail	*Katerallus jamaicensis*	State Endangered
	Swainson's warbler	*Limnothlypis swainsonii*	State Endangered
	Yellow-crowned night heron	*Nyctanassa violacea*	State Endangered
	Black-crowned night heron	*Nyctanassa nycticorax*	State Endangered
	Osprey	*Pandion haliaetus*	State Endangered
	Wilson's phalarope	*Phalaropus tricolor*	State Endangered
	King rail	*Rallus elegans*	State Endangered
	Least tern	*Sterna antillarum*	State, Federal Endangered
	Forester's tern	*Sterna forsteri*	State Endangered
	Common tern	*Sterna hirundo*	State Endangered

TYPE	COMMON NAME	SCIENTIFIC NAME	STATUS
Bird	Bewick's wren	*Thryomanes bewickii*	State Endangered
	Greater prairie chicken	*Tympanuchus cupido*	State Endangered
	Barn owl	*Tyto alba*	State Endangered
	Tallow headed blackbird	*Xanthocephalus xanthocephalus*	State Endangered
	Henslow's sparrow	*Ammodramus henslowii*	State Threatened
	Cerulean warbler	*Dendroica cerulea*	State Threatened
	Peregrine falcon	*Falco peregrinus*	State Threatened
	Common moorhen	*Gallinula chloropus*	State Threatened
	Sandhill crane	*Grus canadensis*	State Threatened
	Bald eagle	*Haliaeetus leucocephalus*	State, Federal Threatened
	Least bittern	*Ixobrychus exilis*	State Threatened
	Loggerhead shrike	*Lanius ludovicianus*	State Threatened
Mammal	Gray/timber wolf	*Canis lupus*	State, Federal Threatened
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	State Endangered
	Southeastern myotis	*Myotis austroriparius*	State Endangered
	Gray bat	*Myotis grisescens*	State, Federal Endangered
	Indiana bat	*Myotis sodalis*	State, Federal Endangered
	Eastern woodrat	*Neotoma floridana*	State Endangered
	Golden mouse	*Ochrotomys nuttallii*	State Threatened
	Rice rat	*Oryzomys palustris*	State Threatened
	Franklin's ground squirrel	*Spermophilus franklinii*	State Threatened
Snail	Iowa Pleistocene snail	*Discus macclintocki*	State, Federal Endangered
	Hydrobiid cave snail	*Fontigens antroecetes*	State Endangered
Mussel	Slippershell	*Alasmidonta viridis*	State Threatened
	Spectacle case	*Cumberlandia monodonta*	State Endangered
	Purple wartyback	*Cyclonaias tuberculata*	State Threatened
	Fanshell	*Cyprogenia stegaria*	State, Federal Endangered
	Butterfly	*Ellipsaria lineolata*	State Threatened
	Elephant ear	*Elliptio crassidens*	State Threatened
	Spike	*Elliptio dilatata*	State Threatened
	Snuffbox	*Epioblasma triquetra*	State Endangered
	Ebonyshell	*Fusconaia ebena*	State Threatened
	Pink muckett	*Lampsilis abrupta*	State, Federal Endangered
	Wavy rayed lampmussel	*Lampsilis fasciola*	State Endangered
	Higgins eye	*Lampsilis higginsii*	State, Federal Endangered
	Black sandshell	*Ligumia recta*	State Threatened
	Orangefoot pimpleback	*Plethobasus cooperianus*	State, Federal Endangered
	Sheepnose	*Plethobasus cyphyus*	State Endangered
	Clubshell	*Pleurobema clava*	State, Federal Endangered
	Ohio pigtoe	*Pleurobema cordatum*	State Endangered
	Fat pocketbook	*Potamilus capax*	State, Federal Endangered
	Kidneyshell	*Ptychobranchus fasciolaris*	State Endangered
	Rabbitsfoot	*Quadrula cylindrical*	State Endangered

TYPE	COMMON NAME	SCIENTIFIC NAME	STATUS
Mussel	Salamander mussel	*Simpsonaias ambigua*	State Endangered
	Purple lillput	*Toxolasma lividus*	State Endangered
	Rainbow	*Villosa iris*	State Endangered
	Little spectacle case	*Villosa lienosa*	State Threatened
Dragonfly	Elfin skimmer	*Nannothemis bella*	State Threatened
	Hine's emerald dragonfly	*Somatochlora hineana*	State, Federal Endangered
Leafhopper	Leafhopper	*Paraphlepsius lupalus*	State Endangered
Butterfly/Moth	Arogos skipper	*Atrytone arogos*	State Endangered
	Swamp metalmark	*Calephelis muticum*	State Endangered
	Cobweb spider	*Hesperia metea*	State Threatened
	Ottoe skipper	*Hesperia ottoe*	State Threatened
	Hoary elfin	*Incisalia polios*	State Threatened
	Karner blue butterfly	*Lycaeides melissa samuelis*	State, Federal Endangered
	Eryngium stem border	*Papipema eryngii*	State Endangered
Crustacean	Isopod	*Caecidotes lesliei*	State Endangered
	Isopod	*Caecidotes spatulata*	State Endangered
	Anomalous spring amphipod	*Crangonyx anomalus*	State Endangered
	Packard's cave amphipod	*Crangonyx packardi*	State Endangered
	Illinois cave amphipod	*Gammarus acherondytes*	State, Federal Endangered
	Indiana crayfish	*Orconectes indianensis*	State Endangered
	Kentucky crayfish	*Orconectes kentuckiensis*	State Endangered
	Shrimp crayfish	*Orconectes lancifer*	State Endangered
	Bigclaw crawfish	*Orconectes placidus*	State Endangered
	Iowa amphipod	*Stygobromus iowae*	State Endangered

2.8.1 Identify Endangered, Threatened, and Candidate Species

Corporations play a fundamental role in determining the fate of America's endangered species. One study, conducted by the Association for Biodiversity Information (now NatureServe) and The Nature Conservancy in 1993, found that half of the species listed under the Endangered Species Act (ESA) have 80 percent or more of their habitat on private lands. Exelon Corporation's Zion Generating Station facility may provide habitat that supports state and/or federal listed species, although none have been documented.

Table 14 is a partial listing of the state listed threatened and endangered species, and their habitat requirements, that may occur in Lake County. In addition, there are threatened and/or endangered species that occur in neighboring counties and may find suitable habitat in proximity to the Zion Generating Station location, these species are also included in the following table.

TABLE 14. LAKE COUNTY KNOWN OCCURRENCES OF STATE LISTED THREATENED AND ENDANGERED SPECIES

SCIENTIFIC NAME	COMMON NAME	HABITAT
BIRDS		
American bittern	*Botaurus lentiginosus*	Emergent marshes, wetland edge, and wet meadows
Piping plover	*Charadrius melodus*	Shoreline beaches, dunes & emergent marshes
Black tern	*Childonias niger*	Shoreline beaches
Northern harrier	*Circus cyaneus*	Grasslands & wet meadows
Cerulean warbler	*Dendroica cerulean*	Woodlands
Sandhill crane	*Grus Canadensis*	Emergent marshes and wet meadows
Bald eagle	*Haliaeetus leucocephalus*	Open water & water's edge
Least bittern	*Ixobrychus exilis*	Emergent marshes & wet meadows
Black-crowned night heron	*Mycticorax nycticorax*	Emergent marshes, wetland edge, wet meadows
Yellow-crowned night heron	*Nyctanassa violacea*	Emergent marshes, wetland edge, wet meadows
Osprey	*Pandion haliaetus*	Open water, and water's edge
Forsters tern	*Sterna forsteri*	Shoreline beaches
Common tern	*Sterna hirundo*	Shoreline beaches
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	Emergent marshes, wet meadows, shrubby wetlands
Mammals		
Franklin's ground squirrel	*Spermophilus franklinii*	Prairies
Reptiles & Amphibians		
Blanding's turtle	*Emydoidea blandingii*	Emergent wetlands, wet meadows, ponds, sand prairies and dunes
Massasauga rattlesnake	*Sistrurus catenatus catenatus*	Shrubby wetlands
Insects		
Karner blue butterfly	*Lycaeides melissa samuelis*	Prairie and savanna
Plants		
Dune (Pitcher's) thistle	*Cirsium pitcheri*	Dunes and sandy ridges
Prairie bush clover	*Lespedeza leptostachya*	Prairies, savannas & wet meadows

2.8.2 Develop Agreements for Listed or Candidate Species if Identified On Site

Many private landowners are concerned that identifying endangered or threatened species on their property will result in heavy land use restrictions being imposed upon them, and therefore avoid managing their property in ways that would enhance habitat and benefit these species. Protecting species is not, in fact, a punishment. Several programs, such as Safe Harbor and Candidate Conservation Agreements, have been specifically developed to address landowner concerns.

2.8.2.1 Safe Harbor Agreements

Safe Harbor Agreements are voluntary agreements between the U.S. Fish and Wildlife Service (U.S. FWS) and private landowners specifying management actions that will result in a "net conservation benefit" for the covered endangered or threatened species. Such benefits may include reducing habitat fragmentation, increasing population numbers, or establishing buffers for protected areas. Prior to entering into a Safe Harbor Agreement, U.S. FWS will determine a baseline for population levels or habitat, which conditions must not fall below. Any non-federal landowner can request the development of a Safe Harbor Agreement, and agreements do not impose significant restrictions in land use or future activity.

As an incentive for complying with Safe Harbor Agreements, U.S. FWS will issue an "enhancement of survival" permit that allows the landowner, at the end of the agreement's term, to use the land in any otherwise legal way as long as baseline conditions are maintained. Under section 10(a)(1)(A) of the Endangered Species Act (ESA), U.S. FWS will also authorize landowners to "take" (incidentally harm) individuals or modify habitat in order to return the land to the baseline conditions at the end of the agreement. Before entering into a Safe Harbor Agreement, the U.S. FWS must be assured that the endangered or threatened wildlife species covered by the agreement will receive a measurable benefit from management practices imposed. For example, the U.S. FWS looks for projects that demonstrate some of the following benefits; reductions in habitat fragmentation; maintenance, restoration or enhancement of existing habitat areas; increases in habitat connectivity; reductions in the effects of catastrophic events, such as floods; the creation or

enhancement of buffers that border protected areas; and areas dedicated to the development of new wildlife management techniques.

2.8.2.2 Candidate Conservation Agreements with Assurances

These formal agreements essentially serve as an effort to prevent species from actually becoming endangered or threatened, thereby eliminating the need for future ESA protection as well as the costs and restrictions to landowners resulting from that status. Candidate Conservation Agreements for the Zion Generating Station would be made between the U.S. FWS and Exelon Corporation. The U.S. FWS would provide technical assistance in developing the agreements, which would outline specific actions that Exelon Corporation is voluntarily willing to commit to that which will eliminate or reduce the threats to candidate and proposed species. These actions must, however, contribute significantly to removing the need to list the species.

As with Safe Harbor Agreements, landowners that commit to Candidate Conservation Agreements are provided assurances that no additional restrictions will be imposed above those outlined in the agreement. Section 10(a)(1)(A) of the ESA allows landowners complying with Candidate Conservation Agreements to incidentally take individuals or alter habitat in order to return the land to the conditions outlined in the agreement, provided that the overall goal of precluding the need to list species is adhered to. The U.S. FWS can provide further information on these programs. Contact information is provided in **Appendix III**.

3. DEVELOP A COMPREHENSIVE HABITAT ENHANCEMENT PROGRAM

The Zion Generating Station may wish to purchase a WHC Team Kit to assist with the development of a comprehensive, employee-based habitat enhancement program. Information regarding volunteer recruitment tools, outreach ideas, guidance on writing a wildlife management plan, and WHC programs such as the *Corporate Wildlife Habitat Certification/International Accreditation Program* are included with the WHC Team Kit.

3.1 BUILD A WILDLIFE TEAM

Creating a Wildlife Team is an important part of a successful habitat enhancement program. Employee participation increases interest and enthusiasm among workers and strengthens extended commitment to the enhancement program through the expansion of a sense of involvement, connection, and proprietary pride. The development of a site Wildlife Team is also an effective tool for promoting environmental awareness through active contribution.

WHC recommends that the Wildlife Team be structured with one team leader and several subcommittees for specific projects. Subcommittees can be created based on the individual interests of Wildlife Team members. A team structure in which subcommittee leaders communicate with the team leader facilitates information transfer between team members, team leaders, and site management. The *Wildlife at Work* Team Kit provides Zion Generating Station employees with information and materials that can be used to establish a Wildlife Team.

3.2 CONDUCT A WILDLIFE INVENTORY

Conducting a thorough inventory of the plants and animals present at the site should be a priority of the emerging Wildlife Team, as an initial inventory will help the Zion Wildlife

Team members to become familiar with some of the plants, animals, and various habitats found at the site. A fundamental understanding of the natural characteristics of the site will, in turn, facilitate decision-making regarding the implementation process of projects described in this report and increase the confidence of participant employees. Furthermore, conducting a preliminary inventory will provide baseline data useful for comparison with ensuing data, thereby providing the Wildlife Team with a benchmark from which project success can be evaluated. Such information is also invaluable in shaping the future track of the site habitat enhancement program as a whole, and is essential for the development of environmental outreach and education programs.

The wildlife inventory should be a methodical and ongoing process. Essentially, the goal of the inventory is to identify as many plants and animals as possible, using seasonal inventories conducted in the spring (April), summer (July), and fall (September) to provide a relatively comprehensive list of resident and transitory (including migratory) species. As mentioned, **Appendix II** provides a list of characteristic species associated with the predominant ecoregion of the site locale. This list is not intended to be definitive, but rather it should be used as an indicator of the types of species that participants in the site inventory may encounter.

Resources the Zion Wildlife Team may find useful in conducting a site inventory include knowledgeable employees, local natural resource professionals, and conservation organizations. The Wildlife Team or WHC can contact outside organizations, such as the Natural Resources Conservation Service (NRCS), for possible assistance with inventories. Contact information for organizations that may provide assistance is included in **Appendix III** of this report. Ensure that external experts assisting in species inventories understand the importance of providing educational experiences for employees new to wildlife identification concepts.

3.3 WRITE THE SITE WILDLIFE HABITAT MANAGEMENT AND BIODIVERSITY PROTECTION PLAN

The probability of success for any habitat enhancement program is largely dependent on the formation of a comprehensive strategy; as such, the development of a wildlife habitat management and biodiversity protection plan (in conjunction with the site inventory) should be the most fundamental task of the Zion Wildlife Team. The wildlife habitat management plan outlines the goals of the wildlife habitat program, describes projects to achieve these goals, makes provisions for monitoring projects, and presents implementation and review schedules. WHC recommends that the wildlife management and biodiversity protection plan be holistic in scope by encompassing the entirety of the site. Although the primary goal of the wildlife habitat program is to enhance wildlife habitat, WHC further recommends that additional goals, such as the implementation of an education component or achieving WHC certification, as well as all projects associated with each goal, be included in the wildlife management and biodiversity protection plan.

WHC recommends that the Wildlife Team begin by identifying site habitat and biodiversity program objectives and setting target dates for achievements. In addition, the team should outline how program success will be measured and how performance will be assessed. Habitat projects should be prioritized and clearly defined before beginning projects. In addition, Zion Generating Station employees should work to involve community volunteers and knowledgeable professionals in the management and biodiversity plan development and implementation phases.

3.4 IMPLEMENT THE FIRST TEAM PROJECT

Implementing the first team project is especially important for building a solid volunteer program. Simple projects with high visibility, such as establishing artificial nesting structures and a monitoring schedule, are ideal first projects for the Zion Generating Station Wildlife Team. The first year of the program at the Zion Generating Station should be geared toward projects that provide learning experiences for Wildlife Team members, generate additional enthusiasm and volunteerism, and demonstrate to the community and non-

participant employees that Exelon Corporation is committed to enhancing wildlife habitat at its facility. WHC recommends undertaking more complex and intensive habitat management projects after the team gains experience and greater support from the site management and community.

4. RECOMMENDED WILDLIFE HABITAT ENHANCEMENT PROJECTS

The individual habitat enhancement projects recommended in this section are provided as a resource for developing the wildlife management plan and were chosen based upon ease of implementation, high visibility, and relative likelihood of success. The Wildlife Team may choose to implement some or all of these projects and is furthermore encouraged to explore additional habitat enhancement opportunities. Projects suggested for the Zion Wildlife Team members to consider in the future include:

- Improve biodiversity throughout the site by identifying and managing any invasive, exotic species on site;
- Use Best Management Practices of Right-of-Ways that cross the site,
- Enhance & restore wetland habitats for wildlife;
- Maintain grasslands and shrub scrub areas in early successional state;
- Restore savanna habitat on site by removing shrubby understory and thinning trees;
- Consider a nest box monitoring program for cavity nesting species including songbirds, raptors and bats;
- Manage for snags (dead standing trees) for cavity nesting species;
- Protect shoreline and dune habitats from disturbance during migration and nesting seasons;
- Consider monitoring and managing for threatened and endangered species, such as the piping plover, blanding's turtle, franklin's ground squirrel, karner blue butterfly, etc.; and
- Initiate enhancement projects to benefit native amphibian and reptile species.

As the wildlife program develops and interest among employees – participant and non-participant alike - increases, WHC recommends that the Zion Generating Station pursue additional projects to maintain momentum and continue expanding the program, thereby producing additional opportunities for wildlife habitat enhancement on the site facility, which in turn will further generate exposure and attention to the program. WHC encourages employee and managers associated with the Zion Generating Station to give these initiatives careful consideration as they arise.

In addition to unforeseen opportunities for employees to contribute positively to wildlife conservation within wildlife management areas, WHC recommends exploring additional areas of the site that can be restored or enhanced to provide habitat. Please contact WHC for additional information concerning project recommendations.

5. RAISING ENVIRONMENTAL AWARENESS AMONG EMPLOYEES AND MEMBERS OF THE LOCAL COMMUNITY

An important aspect of a wildlife program is the benefit it provides, through active participation and environmental education, to employees, their families, and to members of the local community. As such, a wildlife program initially based on employee participation that is expanded to engage community organizations for assistance in program implementation holds great potential for the inclusion of public outreach and environmental education components. WHC recommends the following activities for consideration when developing and fostering relationships with the local community and using site enhancement projects as a tool for furthering environmental and conservation education, awareness, and outreach efforts.

- Create a nature trail to highlight habitat areas and wildlife viewing places.
- Establish a *Corporate Lands for Learning* program.
- Establish an environmental learning center at The Powerhouse, an on-site building that is owned by Commonwealth Edison. The building could serve as an Environmental Education Center, protecting and monitoring the rare habitats on site, as well as working to educate the public not only about energy production, but also concerning company habitat enhancement and protection initiatives. This location could also feature exhibits displaying projects of the various habitat restoration and enhancement programs that Exelon Corporation is implementing throughout the nation.
- Hold an employee and program volunteer wildlife photography contest.
- Create a Wildlife Team newsletter to inform employee and the community about the program.
- Work with local scouting and school groups as much as possible when planning, designing and implementing enhancement projects.

6. WHC'S CORPORATE HABITAT CERTIFICATION/INTERNATIONAL ACCREDITATION PROGRAM

WHC's *Corporate Wildlife Habitat Certification/International Accreditation Program* is designed to provide recognition to corporate entities for the successful implementation of substantial wildlife habitat management programs. Sites that demonstrate a long-term commitment to managing habitat for wildlife are bestowed with WHC certification in recognition of such efforts. Awardees are also distinguished through the publication of habitat enhancement program descriptions on WHC's web site, and through the dissemination of site-approved press releases to local and national news sources. Sites certified by WHC also receive an award plaque and are honored at WHC's annual symposium.

The Zion Generating Station could be eligible to apply for WHC certification in 2008 if at least one site habitat enhancement project is implemented prior to July 31, 2007. Habitat enhancement projects must be implemented, documented, monitored, and maintained for a minimum of one year prior to eligibility. Furthermore, WHC requires the submission of appropriate documentation relating to habitat enhancement projects conducted on-site in order for the site to be considered for certification. Additional factors, such as employee participation in the program and community outreach activities, are also reviewed and greatly reinforce the application. Overall, the Zion Generating Station wildlife management program is judged for WHC certification on the basis of a demonstrated commitment to responsible corporate environmental stewardship. A panel of independent wildlife biologists will review submitted documentation to determine if the program meets the criteria of WHC certification.

As outlined on the certification application form included on the Report CD, the following items should be included for submission:

- An inventory of the animal and plant species found on the site;
- The Wildlife Team's wildlife habitat management plan;
- The Wildlife Team's activities log, showing when meetings were held, when projects were implemented, and what management techniques were used; and
- Documentation of maintenance and monitoring activities to demonstrate that the program is ongoing. (Documentation should include before-and-after photographs, number and species of any plants used, success of nest boxes, dates of projects, and records of those involved.)

WHC requires certified sites to apply for re-certification two years after initial certification, and every two or three years thereafter. The re-certification process allows WHC to ensure that the site is committed to the responsible management of its natural features indefinitely, as well as to review the site's efforts, provide recommendations for continued habitat enhancement, and for the recognition of new projects.

For further information about the certification process and associated awards, contact WHC's Certification Coordinator, Emily Powell, by phone at (301) 588-8994 or by e-mail at epowell@wildlifehc.org.

7. ADDITIONAL OPPORTUNITIES FOR PROGRAM DEVELOPMENT

The success of the Zion Generating Station *Wildlife at Work* program depends in large part upon the levels of expertise, labor, and funding available for projects. Thus the potential for success of the site's *Wildlife at Work* program will be significantly increased through the formation of partnerships with an assortment of specialized organizations that may assist in the provision of such factors. Collaborations with local, regional, and national organizations, including non-profits, community groups, schools, youth groups, private landowners, and government agencies, may prove beneficial for the realization of program implementation.

Effective programs for the Wildlife Team to meet conservation and environmental education objectives through partnerships include:

- The **Corporate Campaign for Migratory Bird Conservation**
- The **North American Bird Conservation Initiative (NABCI)**
- The **North American Pollinator Protection Campaign**
- WHC's ***Corporate Lands for Learning* (*CLL*) Program**
- The U.S. Fish and Wildlife Service's **Joint Ventures Program**
- The **Five-Star Restoration Program**

7.1 PARTNERSHIP DEVELOPMENT

The survival of many species, in particular those with extended ranges or that exhibit migratory behavior, depends on coordinated conservation efforts among a number of stakeholder entities. As a result, functional collaboration among various groups is becoming increasingly common as a way of dealing with environmental issues. Such stakeholder affiliations address pressing conservation issues on a landscape scale while allowing individual partner groups to continue working at the local level. As such, individual site programs such as that instituted at the Zion Generating Station are generally more effective when partnered with organizations working for conservation at broader scales.

7.2 THE CORPORATE CAMPAIGN FOR MIGRATORY BIRD CONSERVATION

The Corporate Campaign for Migratory Bird Conservation is a new program developed by the Wildlife Habitat Council. The fundamental goal of this program is to increase migratory bird populations through habitat expansion by means of engaging corporations and other private landowners in conservation activities. Four major bird plans - North American Waterfowl Management Plan, Partners in Flight, Waterbird Conservation Plan, and the U.S. Shorebird Conservation Plan - will serve as guides for habitat management activities in order to combine local efforts and maximize international effects.

7.2.1 Why Focus on Birds?

Birds perform a variety of functions vital to maintaining ecosystem vitality, including roles in seed dispersal, pest control, pollination, and furthermore are an important link in the trophic (food) chain. Moreover, bird populations serve as highly visible indicators of habitat quality; the presence or absence of an assemblage of bird species can be used to gauge overall ecosystem health. When management activities create, restore, or maintain indigenous habitat types for birds, many other species benefit as well.

7.2.2 Why Should Corporations Participate?

Corporations are in a unique position to greatly impact bird conservation due to the nature, size, and location of their facilities. Involvement with the Corporate Campaign for Migratory Bird Conservation gives corporations an opportunity to demonstrate concern for their communities and the environment. The program will also provide participating sites with scientific guidance from WHC as well as state and federal agencies, including Joint Ventures. Expert advice will reduce the number of economic pitfalls that can accompany new environmental projects and facilitate consultation and cooperation with stakeholders. Corporations are given the opportunity to build and strengthen community relations by creating wildlife habitat and providing environmental education at their sites. Moreover, they will be able to expand efforts at their sites across the region, country, continent, and eventually the Western Hemisphere by working with local Joint Venture initiatives (see below).

7.3 THE NORTH AMERICAN BIRD CONSERVATION INITIATIVE

Many migratory bird species of North America must cross international political boundaries during their bi-annual journey. As such, countries with incongruent environmental, biological, and conservation legislation and practices must therefore formulate a standard medium with which to facilitate cooperation for attaining the common goal of bird conservation in order to overcome such disparities in national conservation regulations and programs.

The North American Bird Conservation Initiative (NABCI) was formed to facilitate coordination and cooperation among Canada, the United States, and Mexico in order to address the conservation of migratory bird species that span the continent. Formally,

> "…NABCI is a statement of principles and approaches shared by individuals, organizations, agencies, and programs working for the conservation of birds and their habitats in Canada, the United States, and Mexico."
>
> - NABCI website.

NABCI is not a regulatory instrument, but rather acts as a forum designed to facilitate the flow of ideas and information among concerned organizations and to provide a mechanism for the dissemination of information to a non-specialized audience.

7.4 NORTH AMERICAN POLLINATOR PROTECTION CAMPAIGN

According to the eighty partners working together in the North American Pollinator Protection Campaign (NAPPC), pollinating species such as native and managed bees, beetles, butterflies, moths, bats, and birds ensure productive harvests and seed set for many important food, oil, and fiber crops throughout the world. In the U.S alone, the USDA estimates that pollinators are responsible for providing reproduction services to $40 billion worth of agricultural products each year.

Pollinators are also essential for maintaining healthy, natural ecosystems by pollinating native plants important to many species of insects, wildlife, and fish. For example, approximately 25 percent of all songbirds include fruit or seeds as a major part of their diet, while other

animals eat the leaves, roots, nuts, pollen, and/or nectar of pollinated plants. Additionally, many species of birds, mammals, and fish rely on the adult or larval forms of pollinators as an important source of protein.

Unfortunately, pollinator populations are rapidly declining worldwide. The USDA Council on Sustainable Development and other agencies recognize that the continuing decline of pollinator populations is becoming "…a significant conservation and sustainability issue", and the National Academy of Sciences has recently begun a study, spearheaded by NAPPC, to determine the status of pollinators in North America.

According to NAPPC, the major threat to most pollinators is the destruction and fragmentation of habitat, in addition to the misuse of pesticides and introduced diseases. Pollinator habitat has been, in many areas, degraded to small, isolated patches that oftentimes are dominated by invasive plants and grass that serves little ecological purpose. This has led to a loss of wildflowers required for nectar and pollen, in addition to a lack of nesting sites and host plants so important for ensuring the reproduction of pollinating species. The extensive use and misuse of pesticides also severely impacts both pollinators and their habitats, decimating many beneficial insects and contaminating soil and water for wildlife, fish, and humans. With so much at stake, WHC calls its corporate partners to action to help conserve this diverse and valuable group of species known as pollinators.

The Pollinator Friendly Practices (PFP) guidelines were developed in 2002 by WHC and NAPPC partners, The Xerces Society for Invertebrate Conservation and the Coevolution Institute. Adopted by NAPPC, PFPs are used in support of existing land management practices in schools, private industries, public spaces, agricultural plots, forests, and home landscapes. The guidelines augment existing land use incentives and are to be used by organizations in promoting pollinator-friendly land use practices. WHC is the first organization to promote the PFPs, offering an opportunity for formal recognition, through the "NAPPC WHC Pollinator Protection Award," for institutions implementing pollinator-friendly activities. The award is granted annually to the one certified WHC site that best implements PFP guidelines through specific land management practices that both promote

pollinator populations and habitats, and provide outreach education to surrounding communities.

The NAPPC Pollinator Friendly Practices guidelines consider six different areas of land use management: Foraging Habitat, Reproduction, Shelter, Invasive/Exotic Species, Chemical Use, and Monitoring. For each topic, there is a central question to be addressed, followed by a detailed approach to the subject. The complete guidelines, as well as a program registration form, are included on the Report CD.

7.5 CORPORATE LANDS FOR LEARNING (CLL)

The Wildlife Habitat Council and the National Environmental Education and Training Foundation (NEETF) co-developed the *Corporate Lands for Learning* (*CLL*) program to facilitate the coordination of corporate resources with local schools to form functional partnerships based on the foundation of environmental education and outreach. The goal of the program is to maximize the use of human and natural resources of the corporate site to benefit the educational needs of the local schools. An environmental education program would allow students from the local community to use the Zion Generating Station as an outdoor classroom for practical and applied experience in environmental issues. *CLL* offers the opportunity to create a nationally recognized environmental education partnership between corporations and the communities in which they exist.

The first steps in initiating an environmental education program are to evaluate the needs of the local community and the resources available at the site. Site representatives then meet with representative individuals from local schools and environmental education groups in the community to identify constraints and opportunities. Following these two steps, WHC will provide the site with a report that outlines the types of activities possible, recommendations for implementation, an overview of state mandates, and a suggested curriculum that can be accomplished on the site to meet these mandates. WHC will then develop and deliver a two-day training workshop designed to teach and train employees,

educators, and others how to build partnerships and use the provided educational programs and curriculum.

The Zion Generating Station can apply for WHC *Corporate Lands for Learning* Certification in addition to *Corporate Habitat Certification* following the addition of an environmental education component to the wildlife management program. To be eligible for *CLL* certification, the site must provide:

- A detailed education program description and curriculum.
- Evidence demonstrating that the site hosted a minimum of 8 program days per year.
- Three letters of reference from teachers or community members.

For more information regarding WHC's *Corporate Lands for Learning* program and *CLL* certification, contact Thelma Redick, WHC Education and Outreach Program Manager, at (724) 695-8844 (thelma.redick@verizon.net) or refer to the additional materials provided on the Report CD.

7.6 U.S. FISH AND WILDLIFE SERVICE'S JOINT VENTURES

U.S. Fish and Wildlife Service's Joint Ventures are non-regulatory, voluntary public/private partnerships "…composed of individuals; corporations; conservation organizations; and local, state, and provincial agencies drawn together by common conservation objectives." (U.S. Fish and Wildlife Service). The U.S. Fish and Wildlife Service is involved with NABCI and is incorporating international conservation ideas into their Joint Ventures programs. These regional partnerships are part of a larger Bird Conservation Initiative, components of which include the North American Waterfowl Management Plan, Partners in Flight, the Western Hemispheric Shorebird Reserve Network, and others. Joint Ventures implement the goals of the North American Waterfowl Plan by developing and funding hands-on conservation projects for the benefit of obligate and facultative wetland species.

Many regional Joint Ventures have broadened their efforts to include more than just wetland creation, restoration, and conservation and waterfowl that breed in or migrate through wetland habitats. Joint Venture projects may consider maintaining or enhancing the quality

of wetland vegetation, other wetland wildlife (including invertebrates, migratory songbirds, amphibians, and mammals), and associated upland habitats and wildlife species. These projects not only improve wildlife habitat but also enhance natural resource quality, such as reducing soil erosion and flood potential and filtering pollutants in ground water.

7.6.1 Additional Information and Assistance

More information about the Corporate Campaign for Migratory Birds, regional Joint Ventures, Management Boards, projects, goals, and corporate benefits can be found on-line at www.wildlifehc.org/managementtools/waterfowl.cfm.

7.7 FIVE-STAR RESTORATION PROGRAM

The Zion Generating Station can further demonstrate its commitment to watershed protection by participating in the Five-Star Restoration Program. The Five-Star challenge grant program – a partnership between WHC, the U.S. Environmental Protection Agency, the National Fish and Wildlife Federation, the National Association of Counties, and the National Oceanic and Atmospheric Administration – focuses on community-based watershed restoration projects. Each year, approximately $500,000 is given in grant awards to 70 projects, which are typically matched five-fold by the partners in each project. Since the program's inception in 1998, 70 miles of stream buffers have been planted, 7,000 acres of wetlands have been restored and over 10,000 volunteers have participated. Five-Star is a unique opportunity that allows corporations to reach out to their communities and involve local governments, non-profit organizations, small businesses and a wide range of citizen groups. Each organization contributes cash or services and becomes a "partner" who makes a permanent commitment to maintain the restored or enhanced waterway.

WHC is pleased to promote corporate participation in Five-Star, and we spotlight their work on the WHC web site, in our quarterly newsletters, and at our annual Symposium. So far, 19 WHC members have been involved with Five-Star by organizing their own projects on corporate land or making in-kind and cash donations to support projects in their

neighborhoods. Further information about the Five-Star Restoration Program can be found on-line at http://www.wildlifehc.org/fivestar.

8. SUMMARY AND CONCLUSIONS

WHC has developed the information and recommendations in this report to best describe and supplement existing habitat types in correlation with Exelon Corporation goals: habitat enhancement, employee and community involvement, and public recognition of environmental commitment.

There are several important factors to keep in mind during the development of the wildlife program. First, employee involvement is crucial and can lead to increased morale, productivity, and improved environmental performance. Positive changes to the natural setting where employees work often leads to an improvement in worker morale. Most importantly, by implementing productive habitat enhancement projects at the facility, the Zion Generating Station will help protect biodiversity: Increasing site biodiversity should be the overall goal of the wildlife programs initiated at the Generating Station. With this in mind, WHC has recommended several enhancement projects for various areas of the site, including:

- Identifying and managing any invasive, exotic species on site;
- Use Best Management Practices of Right-of-Ways that cross the site,
- Enhance creek side and riparian habitats for wildlife,
- Partner with neighboring land managers to enhance early successional, grassland habitats for local wildlife species including birds and pollinators,
- Enhance island habitats in cooling lake for nesting waterfowl,
- Consider a nest box monitoring program for cavity nesting species including songbirds, raptors and bats,
- Plan and initiate enhancement projects to benefit native amphibian and reptile species.

WHC can provide technical assistance regarding project implementation, maintenance, and recommendations for future projects throughout the formulation and development stages of the Zion Generating Station wildlife habitat enhancement programs. WHC staff is also

available to participate in team meetings, species inventories, special events, and strategic planning of the program.

WHC is pleased to have been given the opportunity to assist employees at the Zion Generating Station in the development and implementation of a long-term wildlife habitat management program and encourages Exelon Corporation to continue its leadership in this pursuit.

APPENDIX I
INFORMATION SOURCES

These resources provide additional information about the habitat enhancement projects discussed in this report. Information can also be obtained from the Natural Resources Conservation Service (NRCS), your state Department of Environmental Quality (DEQ). General resources are listed first, followed by a selection of recommended field guides.

Internet Resources

USDA, NRCS. 2004. The PLANTS Database, Version 3.5 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, Louisiana.

NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life. Version 6.0 (http://www.natureserve.org/explorer). NatureServe, Arlington, Virginia.

General Habitat Enhancement Resources

Adams, George. 1994. *Birdscaping Your Garden*: *A Practical Guide to Backyard Birds and the Plants That Attract Them.* Rodale Press, Emmaus, Pennsylvania. 208pp.

Bailey, Robert G. 1995. Description of the ecoregions of the United States. 2d. ed. Rev. and expanded (1st ed. 1980). Misc. Publ. No. 1391 (rev.), Washington D.C. USDA Forest Service. 108 p.

Benyus, Janine, M. 1989. *The Field Guide to Wildlife Habitats of the Western United States.* Simon & Schuster Inc. New York, New York. 336 pp.

Biebighauser, Thomas R. 2003. *A Guide to Creating Vernal Ponds*. USDA Forest Service. 33pp.

Bookhout, Theodore A., ed. 1994. *Research and Management Techniques for Wildlife and Habitat.* 5th ed. Wildlife Society, Bethesda, Maryland. 740pp.

Cowardin, Lewis M., Virginia Carter, Francis Golet and Edward LaRoe. 1979. *Classification of Wetland and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service FWS-OBS-79/31. 103pp.

Decker, Daniel J. and John W. Kelly. 1988. *Enhancement of Wildlife Habitat on Private Lands.*

Dennis, John V. 1988. *The Wildlife Gardener.* Alfred A. Knopf, New York, New York. 293pp.

Ehrlich, Paul R., David S. Dobkin and Darryl Wheye. 1988. *The Birder's Handbook: A Field Guide to the Natural History of North American Birds*. Simon & Schuster Inc. New York, New York. 784pp.

Ellefson, Connie, Tom Stephens and Doug Welsh. 1992. *Xeriscape Gardening: Water Conservation for the American Landscape*. Macmillan Publishing Company, New York, New York. 323pp.

Ellis, Barbara W. and Fern Marshall Bradley, eds. 1992. *The Organic Gardener's Handbook of Natural Insect and Disease Control*. Rodale Press, Emmaus, Pennsylvania. 534pp.

Flink, Charles A., Peter Lagerwey, Diana Balmori and Robert M. Searns. 1993. *Trails for the Twenty-First Century: Planning, Design, and Management Manual for Multi-use Trails*. Edited by Karen-Lee Ryan. Island Press, Washington, D.C. 213pp.

Grimm, William Carey. 1993. *The Illustrated Book of Wildflowers and Shrubs*. Stackpole Books, Harrisburg, Pennsylvania. 637pp.

Hammer, Donald A. 1992. *Creating Freshwater Wetlands*. Lewis Publishers, Inc., Chelsea, Michigan. 298pp.

Harker, Donald, Gary Libby, Kay Harker, Sherri Evans and Marc Evans. 1999. *Landscape Restoration Handbook*. 2nd ed. Lewis Publishers, Ann Arbor, Michigan. 145pp.

Henderson, Carrol L. 1987. *Landscaping for Wildlife*. Minnesota Dept. of Natural Resources, St. Paul, Minnesota. 110pp.

Henderson, Carrol L. 1992. *Woodworking for Wildlife: Homes for Birds and Mammals*. 2nd ed. Minnesota Department of Natural Resources, St. Paul, Minnesota. 111pp.

Henry, Peggy. 1995. *Gardening to Attract Birds and Butterflies*. Avon Books, New York, New York. 79pp.

Hotchkiss, Neil. 1972. *Common Marsh, Underwater and Floating-leaved Plants of the United States and Canada*. General Publishing Co., Ltd. Toronto, Ontario. 124pp.

Hygnstrom, Scott, Robert Timm and Gary Larson. 1994. *Prevention and Control of Wildlife Damage*. Vol. 1-2, Texas.

Jones, Samuel B. and Leonard E. Foote. 1990. *Gardening with Native Wildflowers*. Timber Press, Portland, Oregon. 195pp.

Kusler, Jon A. and Mary E. Kentula, eds. 1990. *Wetland Creation and Restoration*. Island Press, Washington D.C. 594pp.

Lee, David S., Carter S. Gilbert, Charles H. Hocutt, Robert E. Jenkins, Don E. McAllister and Jay R. Stauffer, Jr. 1980. *Atlas of North American Freshwater Fishes*. North Carolina State Museum of Natural History., North Carolina. 867pp.

Lincoln, Roger, Geoff Boxshall and Paul Clark. 1998. *A Dictionary of Ecology, Evolution and Systematics, 2nd ed*. Cambridge University Press, Cambridge, UK. 361pp.

Magee, Dennis W. 1981. *Freshwater Wetlands: A Guide to Common Indicator Plants of the Northeast.* The University of Massachusetts Press, Amherst, Massachusetts. 245 pp.

Martin, Laura C. 1986. *The Wildflower Meadow Book: A Gardener's Guide.* East Woods Press, Charlotte, North Carolina. 303 pp.

McComas, Steve. 1993. *Lake Smarts: The First Lake Maintenance Handbook.* Edited by Rachel Reeder. Terrene Institute, Alexandria, Virginia. 215pp.

Robert H. Mohlenbrock @ USDA-NRCS PLANTS Database / USDA NRCS. 1995. *Northeast wetland flora: Field office guide to plant species.* Northeast National Technical Center, Chester, PA.

Packard, Stephen and Cornella F. Mutel. 1997. *The Tallgrass Restoration Handbook for Prairies, Savannas, and Woodlands.* Island Press, Washington, D.C. 463pp.

Parrow, Martin R. and Anthony J. Davy, eds. 2002. *Handbook of Ecological Restoration, Volume 1: Principles of Restoration.* Cambridge University Press, Cambridge, UK. 444pp.

Parrow, Martin R. and Anthony J. Davy, eds. 2002. *Handbook of Ecological Restoration, Volume 2: Restoration in Practice.* Cambridge University Press, Cambridge, UK. 599pp.

Payne, Neil F. 1992. *Techniques for Wildlife Habitat Management of Wetlands.* Mcgraw-Hill, Inc., New York, New York. 549pp.

Payne, Neil F. and Fred C. Bryant. 1994. *Techniques for Wildlife Habitat Management of Uplands.* McGraw-Hill, Inc., New York, New York. 840pp.

Proudman, Robert D. and Reuben Rajala. 1981. *Trail Building and Maintenance.* 2nd ed. Appalachian Mountain Club. 300pp.

Randall, John M. and Janet Marinelli, eds. 1996. *Invasive Plants: Weeds of the Global Garden.* Brooklyn Botanic Garden, Inc., Brooklyn, New York. 111pp.

Rodiek, Jon E. and E.G. Bolen., eds. 1991. *Wildlife and Habitats in Managed Landscapes.* Island Press, Washington, DC. 201pp.

Russo, Monica and Robert Dewire. 1976. *The Complete Book of Birdhouses and Feeders.* Drake Publishers, New York, New York.

Schenk, Marcus. 1990. *Butterflies, How to Identify and Attract Them to Your Garden.* Rodale Press, Inc., U.S.A. 160pp.

Sibley, David Allen. 2001. *The Sibley Guide to Bird Life and Behavior.* Alfred A. Knopf, New York, New York. 607pp.

Sibley, David Allen. 2000. *The Sibley Guide to Birds.* Alfred A. Knopf, New York, New York. 544pp.

Stokes, Donald and Lilian. 1990. *The Complete Birdhouse Book: The Easy Guide to Attracting Nesting Birds*. Little, Brown and Company, New York, New York. 95pp.

Stokes, Donald and Lilian. 1989. *The Hummingbird Book: The Complete Guide to Attracting, Identifying, and Enjoying Hummingbirds*. Little, Brown and Company, Boston, Massachusetts. 87pp.

Tacha, Thomas C. and Clait E. Braun, eds. 1994. *Migratory Shore and Upland Game Bird Management in North America*. Allen Press, Lawrence, Kansas. 223pp.

Terres, John K. 1956. *The Audubon Society Encyclopedia of North American Birds*. Wings Books, Avenel, New Jersey. 1109pp.

Treepeople, Andy and Katie Lipkis. 1990. *The Simple Act of Planting a Tree*. Jeremy P. Tarcher, Inc., Los Angeles, California. 236pp.

U.S.D.A. Forest Service. 1984. *Standard Specification for Construction of Trails*. EM-7720-102. U.S.D.A., Forest Service, Washington, DC. 105pp.

USDA, NRCS. 2005. *The PLANTS Database*, Version 3.5 (http://plants.usda.gov). Data compiled from various sources by Mark W. Skinner. National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Whitson, Tom D., ed., Larry C. Burrill, Steven A. Dewey. David W. Cudney, B.E. Nelson, Richard D. Lee and Robert Parker. 1996. *Weeds of the West*. 5th ed. Pioneer of Jackson Hole, Jackson, Wyoming. 630pp.

Xerces Society, The. 1990. *Butterfly Gardening: Creating Summer Magic in your Garden*. Sierra Club Books, San Francisco, California. 192pp.

Recommended Field Guides

Boyd, Howard P. 1991. *A Field Guide to the Pine Barrens of New Jersey*. Plexus Publishing, Inc., Bedford, New Jersey. 423pp.

Bull, John. 2000. *The Audubon Society Field Guide to North American Birds: Eastern Region*. Revised ed. Alfred A. Knopf, New York, New York. 800pp.

Burr, Brooks M., Lawrence M. Page, and Tory Peterson. 1998. *A Field Guide to Freshwater Fishes: North America North of Mexico* (Peterson Field Guides). Houghton Mifflin Company, Boston, Massachusetts. 541pp.

Burt, William H. 1998. *A Peterson Field Guide to the Mammals of North America North of Mexico*. Houghton Mifflin Company, Boston, Massachusetts. 367pp.

Capula, Massimo. 1989. *Simon & Schuster's Guide to Reptiles and Amphibians of the World.* Edited by John L. Behler. Simon & Schuster Inc., New York, New York. 256pp.

Clark, William S. and Brian K. Wheeler. 2001. *A Peterson Field Guide to Hawks of North America.* 2nd ed. Houghton Mifflin Company, Boston, Massachusetts. 328pp.

Conant, Roger and Joseph Collins. 1998. *A Field Guide to Reptiles and Amphibians of Eastern and Central North America.* 4th ed. Houghton Mifflin Company, Boston, Massachusetts. 634pp.

Covell, Charles V., Jr. 1984. *A Peterson Field Guide to Moths of Eastern North America.* Edited by Roger Tory Peterson. Houghton Mifflin Company, Boston, Massachusetts. 496pp.

Harrison, Hal H. 1998. *A Peterson Field Guide to the Birds' Nests: The United States East of the Mississippi River.* Houghton Mifflin Company, Boston, Massachusetts. 288pp.

Kricher, John C. 1998. *A Peterson Field Guide to Eastern Forests.* Houghton Mifflin Company, Boston, Massachusetts. 506pp.

Little, Elbert L. Jr. 1980. *The Audubon Society Field Guide to North American Trees: Eastern Region.* Chanticleer Press, New York, New York. 716pp.

McKenney, Margaret, and Roger Tory Peterson. 1998. *A Peterson Field Guide to Wildflowers: Northeastern and Northcentral North America.* Houghton Mifflin Company, Boston, Massachusetts. 448pp.

Murie, Olaus J. 1998. *A Peterson Field Guide to Animal Tracks.* Houghton Mifflin Company, Boston, Massachusetts. 400pp.

Newcomb, Lawrence. 1989. *Newcomb's Wildflower Guide.* Little, Brown and Company, Boston, Massachusetts. 490 pp.

Opler, Paul A. and Vichai Malikul. 1998. *A Peterson Field Guide to Eastern Butterflies.* Houghton Mifflin Company, Boston, Massachusetts. 503pp.

Peterson, Roger Tory. 2002. *A Peterson Field Guide to the Birds of Eastern and Central North America.* 5th ed. Houghton Mifflin Company, Boston, Massachusetts. 450pp.

Petrides, George A. 1998. *A Field Guide to Eastern Trees.* 2nd ed. Houghton Mifflin Company, New York, New York. 441pp.

Redington, Charles B. 1994. *Redington Field Guides: Plants in Wetlands.* Kendall/Hunt Publishing Co., Dubuque, Iowa. 394pp.

Silberhorn, Gene M. 1999. *Common Plants of the Mid-Atlantic Coast: A Field Guide.* Revised ed. The Johns Hopkins University Press, Baltimore, Maryland. 295pp.

Theiret, John W., William A. Neiring, and Nancy C. Olmstead. 2001. *National Audubon Society Field Guide to North American Wildflowers: Eastern Region*. Alfred A Knopf, Inc., New York, New York. 896pp.

White, Richard E., and Donald J. Borror. 1998. *A Peterson Field Guide to Insects: America North of Mexico*. Houghton Mifflin Company, Boston, Massachusetts. 448pp.

Williamson, Sheri L. 2002. *A Peterson Field Guide to the Hummingbirds of North American*. Houghton Mifflin Company, Boston, Massachusetts. 275pp.

APPENDIX II

The list of species contained in this table is offered to provide the site Wildlife Team with a representation of plant and animal species indicative of the ecoregion that is prevalent for the site location, and therefore to provide a sampling of species that may be encountered when compiling the site species inventory. Please note that this list is not meant to be definitive.

TYPE	COMMON NAME	SCIENTIFIC NAME
Mammals	Coyote	*Canis latrans*
	American beaver	*Castor canadensis*
	Red-backed vole	*Clethrionomys* sp.
	Star-nosed mole	*Condylura cristata*
	Rafinesque's big-eared bat	*Corynorhinus rafinesquii*
	Big brown bat	*Eptesicus fuscus*
	Big brown bat	*Eptesicus fuscus*
	Shrew	Family Soricidae
	Northern flying squirrel	*Glaucomys sabrinus*
	Silver-haired bat	*Lasionycteris noctivagans*
	Red bat	*Lasiurus borealis*
	Hoary bat	*Lasiurus cinereus*
	Snowshoe hare	*Lepus americanus*
	Northern river otter	*Lutra canadensis*
	Bobcat	*Lynx rufus*
	Striped skunk	*Mephitis mephitis*
	Keen's bat	*Myoits keenii*
	Southeastern bat	*Myotis austroriparius*
	Gray bat	*Myotis grisescens*
	Little brown bat	*Myotis lucifugus*
	Indiana bat	*Myotis sodalist*
	Evening bat	*Nycticeius humeralis*
	White-tailed deer	*Odocoileus virginianus*
	Cotton mouse	*Peromyscus gossypinus*
	White-footed mouse	*Peromyscus leucopus*
	Deer mouse	*Peromyscus maniculatus*
	Eastern pipistrelle	*Pipistrellus subflavus*
	Chipmunk	*Tamias* sp.
	Grey fox	*Urocyon cinereoargenteus*
	Red fox	*Vulpes vulpes*
Birds	Cooper's hawk	*Accipiter cooperii*
	Sharp-shinned hawk	*Accipiter striatus*
	Spotted sandpiper	*Actitis macularia*
	Northern saw-whet owl	*Aegolius acadicus*
	Red-winged blackbird	*Agelaius phoeniceus*
Birds	Wood duck	*Aix sponsa*
	Henslow's sparrow	*Ammodramus henslowii*

TYPE	COMMON NAME	SCIENTIFIC NAME
	Grasshopper sparrow	*Ammodramus savannarum*
	Northern pintail	*Anas acuta*
	Blue winged teal	*Anas discors*
	Mallard	*Anas platyrhynchos*
	Golden eagle	*Aquila chrysaetos*
	Ruby-throated hummingbird	*Archilochus colubris*
	Great egret	*Ardea alba*
	Great blue heron	*Ardea herodias*
	Short-eared owl	*Asio flammeus*
	Long eared owl	*Asio otus*
	Canvasback	*Aythya valisineria*
	Tufted titmouse	*Baeolophus bicolor*
	Upland sandpiper	*Bartramia longicauda*
	Canada goose	*Branta canadensis*
	Great horned owl	*Bubo virginianus*
	Red-tailed hawk	*Buteo jamaicensis*
	Rough legged hawk	*Buteo lagopus*
	Red shouldered hawk	*Buteo lineatus*
	Broad winged hawk	*Buteo platypterus*
	Sanderling	*Calidris alba*
	Northern cardinal	*Cardinalis cardinalis*
	American goldfinch	*Carduelis tristis*
	Turkey vulture	*Cathartes aura*
	Belted kingfisher	*Ceryle alcyon*
	Killdeer	*Charadrius vociferous*
	Black tern	*Chlidonias niger*
	Lark sparrow	*Chondestes grammacus*
	Common nighthawk	*Chordeiles minor*
	Northern harrier	*Circus cyaneus*
	Sedge wren	*Cistothorus platensis*
	Yellow-billed cuckoo	*Coccyzus americanus*
	Black-billed cuckoo	*Coccyzus erythropthalmus*
	Common flicker	*Colaptes auratus*
	Northern bobwhite	*Colinus virginianus*
	Rock pigeon	*Columba livia*
	Eastern wood pewee	*Contopus virens*
	Blue jay	*Cyanocitta cristata*
	Tundra swan	*Cygnus columbianus*
	Yellow-throated warbler	*Dendroica dominica*
	Bobolink	*Dolichonyx oryzivorus*
	Pileated woodpecker	*Dryocopus pileatus*
	Acadian flycatcher	*Empidonax virescens*
	Horned lark	*Eremophila alpestris*
	Peregrine falcon	*Falco peregrinus*
Birds	American kestrel	*Falco sparverius*
	Wilson's snipe	*Gallinago delicate*

TYPE	COMMON NAME	SCIENTIFIC NAME
	Common loon	*Gavia immer*
	Common yellowthroat	*Geothlypis trichas*
	Bald eagle	*Haliaeetus leucocephalus*
	Wood thrush	*Hylocichla mustelina*
	Northern oriole	*Icterus galbula*
	Mississippi kite	*Ictinia mississippiensis*
	Loggerhead shrike	*Lanius ludovicianus*
	Herring gull	*Larus argentatus*
	Hooded merganser	*Lophodytes cucullatus*
	Red-bellied woodpecker	*Melanerpes carolinus*
	Red-headed woodpecker	*Melanerpes erythrocephalus*
	Wild turkey	*Meleagris gallopavo*
	Swamp sparrow	*Melospiza Georgiana*
	Song sparrow	*Melospiza melodia*
	Great crested flycatcher	*Myiarchus crinitus*
	Snowy owl	*Nyctea scandiaca*
	Kentucky warbler	*Oporornis formosus*
	Eastern screech owl	*Otus asio*
	Osprey	*Pandion haliaetus*
	Northern parula	*Parula Americana*
	Savannah sparrow	*Passerculus sandwichensis*
	Indigo bunting	*Passerina cyanea*
	Double-crested cormorant	*Phalacrocorax auritus*
	Ringed-necked pheasant	*Phasianus colchicus*
	Rose-breasted grosbeak	*Pheucticus ludovicianus*
	Downy woodpecker	*Picoides pubescens*
	Hairy woodpecker	*Picoides villosus*
	Rufous sided towhee	*Pipilo erythrophthalmus*
	Scarlet tanager	*Piranga olivacea*
	Summer tanager	*Piranga rubra*
	American golden-plover	*Pluvialis dominica*
	Black-capped chickadee	*Poecile atricapilla*
	Carolina chickadee	*Poecile carolinensis*
	Blue-gray gnatcatcher	*Polioptila caerulea*
	Vesper sparrow	*Pooecetes gramineus*
	Prothonotary warbler	*Protonotaria citrea*
	Common grackle	*Quiscalus quiscula*
	Louisiana waterthrush	*Seiurus motacilla*
	Eastern bluebird	*Sialia sialis*
	White-breasted nuthatch	*Sitta carolinensis*
	Dicksissel	*Spiza Americana*
	Field sparrow	*Spizella pusilla*
	Barred owl	*Strix varia*
Birds	Eastern meadowlark	*Sturnella magna*
	Western meadowlark	*Sturnella neglecta*
	Tree swallow	*Tachycineta bicolor*

TYPE	COMMON NAME	SCIENTIFIC NAME
	Carolina wren	*Thryothorus ludovicianus*
	House wren	*Troglodytes aedon*
	American robin	*Turdus migratorius*
	Greater prairie chicken	*Tympanuchus cupido*
	Barn owl	*Tyto alba*
	Red-eyed vireo	*Vireo olivaceus*
	Canada warbler	*Wilsonia canadensis*
	Mourning dove	*Zenaida m*acroura
Amphibians & Reptiles	Northern cricket frog	*Acris crepitans*
	Copperhead	*Agkistrodon contortrix*
	Jefferson salamander	*Ambystoma jeffersonianum*
	Spotted salamander	*Ambystoma maculatum*
	Marbled salamander	*Ambystoma opacum*
	Tiger salamander	*Ambystoma tigrinum*
	Green salamander	*Aneides aeneus*
	Smooth softshell	*Apalone mutica*
	Spiny softshell	*Apalone spinifera*
	American toad	*Bufo americanus*
	Fowler's toad	*Bufo fowleri*
	Worm snake	*Carphophis amoenus*
	Snapping turtle	*Chelydra serpentine*
	Painted turtle	*Chrysemys picta*
	Northern painted turtle	*Chrysemys picta*
	Spotted turtle	*Clemmys guttata*
	Kirtland's snake	*Clonophis kirtlandii*
	Black racer	*Coluber constrictor*
	Timber rattlesnake	*Crotalus horridus*
	Dusky salamander	*Desmognathus fuscus*
	Mountain dusky salamander	*Desmognathus ochrophaeus*
	Ringneck snake	*Diadophis punctatus*
	Eastern rat snake	*Elaphe obsolete*
	Rat snake	*Elaphe obsolete*
	Blanding's turtle	*Emys blandingii*
	Coal skink	*Eumeces anthracinus*
	Five-lined skink	*Eumeces fasciatus*
	Broadhead skink	*Eumeces laticeps*
	Two lined salamander	*Eurycea bislineata*
	Longtail salamander	*Eurycea longicauda*
	Wood turtle	*Glyptemys insculpta*
	Bog turtle	*Glyptemys muhlenbergii*
Amphibians & Reptiles	Map turtle	*Graptemys geographica*
	Spring salamander	*Gyrinophilus porphyriticus*
	Four-toed salamander	*Hemidactylium scutatum*

TYPE	COMMON NAME	SCIENTIFIC NAME
	Eastern hognose	*Heterodon platirhinos*
	Spring peeper	*Hyla crucifer*
	Gray treefrog	*Hyla versicolor*
	Eastern mud turtle	*Kinosternon subrubrum*
	Common kingsnake	*Lampropeltis getula*
	Milk snake	*Lampropeltis triangulum*
	Smooth green snake	*Liochlorophis vernalis*
	Mudpuppy	*Necturus maculosus*
	Northern water snake	*Nerodia sipedon*
	Common water snake	*Nerodia sipedon sipedon*
	Eastern newt	*Notophthalmus viridescens*
	Rough green snake	*Opheodrys aestivus*
	Redback salamander	*Plethodon cinereus*
	Northern ravine salamander	*Plethodon electromorphus*
	Slimy salamander	*Plethodon glutinosus*
	Striped chorus frog	*Pseudacris triseriata*
	New Jersey chorus frog	*Pseudacris triseriata kalmi*
	Redbelly turtle	*Pseudemys rubriventris*
	Mud salamander	*Pseudotriton montanus*
	Red salamander	*Pseudotriton rubber*
	Bullfrog	*Rana catesbeiana*
	Green frog	*Rana clamitans*
	Pickerel frog	*Rana palustris*
	Northern leopard frog	*Rana pipens*
	Coastal plain leopard frog	*Rana sphenocephala*
	Wood frog	*Rana sylvatica*
	Queen snake	*Regina septemvittata*
	Eastern spadefoot	*Scaphiopus holbrookii*
	Eastern fence lizard	*Sceloporus undulates*
	Lesser siren	*Siren intermedia*
	Eastern massasauga	*Sistrurus catenatus catenatus*
	Stinkpot	*Sternotherus odoratus*
	Brown snake	*Storeria dekayi*
	Redbelly snake	*Storeris occipitomaculata*
	Eastern box turtle	*Terrapene Carolina*
	Shorthead garter snake	*Thamnophis brachystoms*
	Eastern ribbon snake	*Thamnophis sauritus*
	Common garter snake	*Thamnophis sirtalis*
	Smooth earth snake	*Virginia valeriae*
	Mountain earth snake	*Virginia valeriae pulchra*
Butterflies	Common roadside skipper	*Amblyscirtes vialis*
	Least skipper	*Ancyloxypha numitor*
	Tawny emperor	*Asterocampa clyton*

TYPE	COMMON NAME	SCIENTIFIC NAME
	Sachem	*Atalopedes campestris*
	Io moth	*Automeris io*
	Pipevine swallowtail	*Battus philenor*
	Meadow fritillary	*Boloria bellona*
	Brown elfin	*Callophrys augustinus*
	Juniper hairstreak	*Callophrys gryneus*
	Henry's elfin	*Callophrys henrici*
	Hoary elfin	*Callophrys polios*
	Red-banded hairstreak	*Calycopis cecrops*
	Common wood nymph	*Cercyonis pegala*
	Silvery checkerspot	*Chlosyne nycteis*
	Orange sulphur	*Colias eurytheme*
	Clouded sulphur	*Colias philodice*
	Monarch	*Danaus plexippus*
	Northern pearly eye	*Enodia anthedon*
	Silver-spotted skipper	*Epargyreus clarus*
	Wild indigo duskywing	*Erynnis baptisiae*
	Variegated fritillary	*Euptoieta Claudia*
	Little yellow	*Eurema lisa*
	Sleepy orange	*Eurema nicippe*
	Zebra swallowtail	*Eurytides Marcellus*
	Eastern tailed-blue	*Everes comyntas*
	Leonard's skipper	*Hesperia leonardes*
	Fiery skipper	*Hylephila phyleus*
	American snout	*Libytheana carinenta*
	Viceroy	*Limenitis archippus*
	Red spotted purple	*Limenitis arthemis*
	American copper	*Lycaena phlaeas*
	Mourning cloak	*Nymphalis antiopa*
	Giant swallowtail	*Papilio cresphontes*
	Eastern tiger swallowtail	*Papilio glaucus*
	Black swallowtail	*Papilio polyxenes*
	Spicebush swallowtail	*Papilio Troilus*
	White hairstreak	*Parrhasius m-album*
	Common sootywing	*Pholisora catullus*
	Pearl crescent	*Phyciodes tharos*
	Cabbage white	*Pieris rapae*
	Hobomok skipper	*Poanes hobomonk*
	Zabulon skipper	*Poanes zabulon*
	Peck's skipper	*Polites peckius*
Butterflies	Tawny edged skipper	*Polites themistocles*
	Eastern comma	*Polygonia comma*
	Question mark	*Polygonia interrogationis*

TYPE	COMMON NAME	SCIENTIFIC NAME
	Grizzled skipper	*Pyrgus centaureae*
	Common checkered skipper	*Pyrgus communis*
	Striped hairstreak	*Satyrium liparops*
	Aphrodite fritillary	*Speyeria Aphrodite*
	Great spangled fritillary	*Speyeria cybele*
	Regal fritillary	*Speyeria idalia*
	Gray hairstreak	*Strymon melinus*
	Northern cloudywing	*Thorybes pylades*
	Painted lady	*Vanessa carduii*
	American lady	*Vanessa virginiensis*
	Southern dogface	*Zerene cesonia*
Wildflowers	Yarrow	*Achillea millefolium*
	Sweetflag	*Acorus calamus*
	Bishop's goutweed	*Aegopodium podagraria*
	Pale mountain dandelion	*Agoseris glauca*
	Corncockle	*Agrostemma githago*
	Pigweed	*Amaranthus retroflexus*
	Common ragweed	*Ambrosia artemisiifolia*
	Pearly everlasting	*Anaphalis margaritacea*
	Indian-hemp	*Apocynum cannabinum*
	American spikenard	*Aralia racemosa*
	Common burdock	*Arctium minus*
	Dutchman's pipe	*Aristolochia macrophylla*
	Heartleaf arnica	*Arnica cordifolia*
	Dusty miller	*Artemisia stelleriana*
	Mugwort	*Artemisia vulgaris*
	Common milkweed	*Asclepias syriaca*
	Blue wild indigo	*Baptisia australis*
	Tickseed sunflower	*Bidens aristosa*
	Noding bur marigold	*Bidens cernua*
	Field mustard	*Brassica rapa*
	Hummock sedge	*Carex stricta*
	Indian paintbrush	*Castilleja coccinea*
	Blue cohosh	*Caulophyllum thalictroides*
	American bittersweet	*Celastrus scandens*
	Spotted knapweed	*Centaurea biebersteinii*
	Yellow star thistle	*Centaurea solstitialis*
	Chicory	*Cichorium intybus*
	Poison hemlock	*Conium maculatum*
Wildflowers	Horseweed	*Conyza canadensis*
	Garden coreopsis	*Coreopsis tinctoria*
	Flixweed	*Descurainia Sophia*

TYPE	COMMON NAME	SCIENTIFIC NAME
	Flat-topped white aster	*Doellingeria umbellata*
	Pale purple coneflower	*Echinacea pallida*
	Storksbill	*Erodium cicutarium*
	Rattlesnake master	*Eryngium yuccifolium*
	Trumpetweed	*Eupatorium fistulosum*
	Late boneset	*Eupatorium serotinum*
	Sweet fennel	*Foeniculum vulgare*
	Wild strawberry	*Fragaria virginiana*
	Sneezeweed	*Helenium autumnale*
	Cow parsnip	*Heracleum maximum*
	Water pennywort	*Hydrocotyle americana*
	Orange jewelweed	*Impatiens capensis*
	American water-willow	*Justicia Americana*
	Oxeye daisy	*Leucanthemum vulgare*
	Honesty	*Lunaria annua*
	Whorled loosestrife	*Lysimachia quadrifolia*
	Common moonseed	*Menispermum canadense*
	Tall bluebells	*Mertensia paniculata*
	Wall lettuce	*Mycelis muralis*
	True forget-me-not	*Myosotis scorpioides*
	Common evening-primrose	*Oenothera biennis*
	Devil's tongue	*Opuntia humifusa*
	Sweet Cicely	*Osmorhiza claytonia*
	Wild ginseng	*Panax quinquefolius*
	Downy phlox	*Phlox pilosa*
	Common plantain	*Plantago major*
	Saltmarsh fleabane	*Pluchea odorata*
	May-apple	*Podophyllum peltatum*
	Swamp smartweed	*Polygonum hydropiperoides*
	Common buttercup	*Ranunculus acris*
	Black-eyed Susan	*Rudbeckia triloba*
	Fringe-leaf wild petunia	*Ruellia humilis*
	Slender glasswort	*Salicornia maritime*
	Northern pitcher plant	*Sarracenia purpurea*
	Starry Campion	*Silene stellata*
	Canada goldenrod	*Solidago canadensis*
	Wood poppy	*Stylophorum diphyllum*
	Skunk cabbage	*Symplocarpus foetidus*
	Yellow goatsbeard	*Tragopogon dubius*
	Red clover	*Trifolium pretense*
Wildflowers	Coltsfoot	*Tussilago farfara*
	Stinging nettle	*Urtica dioica*
	Blue vervain	*Verbena hastate*

TYPE	COMMON NAME	SCIENTIFIC NAME
	Tall ironweed	*Vernonia gigantean*
	Periwinkle	*Vinca minor*
	Sand violet	*Viola affinis*
	White mule's-ear	*Xanthium strumarium*
	Adam's needle	*Yucca filamentosa*
	Meadow zizia	*Zizia aptera*
Trees	Balsam fir	*Abies balsamea*
	Black maple	*Acer nigrum*
	Horse-chestnut	*Aesculus hippocastanum*
	Bog rosemary	*Andromeda polifolia*
	Wormwood	*Artemisia ludoviciana*
	Common pawpaw	*Asimina triloba*
	Common barberry	*Berberis vulgaris*
	Paper birch	*Betula papyrifera*
	American chestnut	*Castanea dentate*
	Gray dogwood	*Cornus racemosa*
	American hazelnut	*Corylus Americana*
	Pear hawthorn	*Crataegus calpodendron*
	Northern bush honeysuckle	*Diervilla lonicera*
	Autumn olive	*Elaeagnus umbellata*
	Glossy buckthorn	*Frangula alnus*
	White ash	*Fraxinus Americana*
	Common juniper	*Juniperus communis*
	Eastern red cedar	*Juniperus virginiana*
	Tamarack	*Larix laricina*
	Sweet crabapple	*Malus coronaria*
	Black chokeberry	*Photinia melanocarpa*
	Atlantic ninebark	*Physocarpus opulifolius*
	White spruce	*Picea glauca*
	Jack pine	*Pinus banksiana*
	American sycamore	*Platanus occidentalis*
	Eastern cottonwood	*Populus deltoids*
	American plum	*Prunus Americana*
	Sweet cherry	*Prunus avium*
	Northern pin oak	*Quercus ellipsoidalis*
	Smooth sumac	*Rhus glabra*
	Prickly rose	*Rosa acicularis*
	Highbush blackberry	*Rubus allegheniensis*
	Wild red raspberry	*Rubus idaeus*
Trees	Pussy willow	*Salix discolor*
	Sassafras	*Sassafras albidum*
	Meadowsweet	*Spiraea alba*

TYPE	COMMON NAME	SCIENTIFIC NAME
	Common snowberry	*Symphoricarpos albus*
	Canada yew	*Taxus canadensis*
	Eastern hemlock	*Tsuga canadensis*
	Slippery elm	*Ulmus rubra*
	Moosewood viburnum	*Viburnum edule*

APPENDIX III
CONTACT INFORMATION

Association of Illinois Soil and Water Conservation District
2520 Main Street
Illinois State Fairgrounds
Springfield, IL 62702
Phone: 217-744-3414
Fax: 217-744-3420

Illinois USDA Natural Resources Conservation Service
1691 N 31st Road
Ottawa, IL 61350
Phone: 815-433-0551 Ext. 3
Fax: 815-433-0665

Illinois Department of Natural Resources
Office of Resource Conservation
600 N. Grand Ave. West
Springfield, IL 62706

Office of Land Management and Education
Illinois Department of Natural Resources
524 South Second Street
Springfield, IL 62701-1787,
Phone: 217-782-6752

Office of Mines and Minerals
Illinois Department of Natural Resources
524 South Second Street
Springfield, Illinois 62701-1787

Wetlands Program
Contact: Lisa McCauley
Phone: 217-557-0658

Division of Fisheries
Contact: Mike Conlin
Phone: 217-782-6424

Division of Forest Resources
Phone: 217-782-2361

State Forester
Division of Forest Resources
2005 Round Barn Road
Champagne, IL 61821
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1902 Fox Dr.
Champaign, IL 61820-7335
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Fax: 217-373-6675
Email: bill.gradle@il.nrcs.usda.gov

Department of Agriculture
Contact: Ken Towles
Phone: 630-584-7961 ext. 105
Contact: Tom Ryterski
Phone: ext. 104

Illinois Department of Natural Resources
Contact: Ray Eisbrener
Phone: 815-675-2385

Department of Energy
Fermilab, Chicago
Contact: Bob Lootens
630-840-3303

US Fish & Wildlife Service
St. Charles
Contact: John Rogner
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Division of Wildlife Resources
524 South Second Street
Springfield, IL 62701
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Division of Natural Heritage
Contact: Glen Kruse
Phone: 217-785-8774

Illinois Department of Conservation
100 W. Randolph
Suite 4-300
Chicago, IL 60601
Phone: 312-814-2070

Endangered Species Protection Board
Illinois Department of Conservation
524 South Second Street
Springfield, IL 62701
Contact: Sue Lauzon, Coordinator for Endangered Species and Wildlife Diversity Program
Phone: 217-785-8277
Fax: 217-785-8277

Illinois Environmental Protection Agency
1021 N. Grand Ave. East
P.O. Box 19276
Springfield, IL 62794

City of Chicago Department of Environment
North Park Village Nature Center
5801 North Pulaski Road
Chicago, Illinois 60646
Phone: 312-744-5472

U.S. Fish & Wildlife Service
Chicago Illinois Field Office
1000 Hart Road, Suite 180
Barrington IL 600010

Northeastern Illinois Planning Commission (NIPC)
222 South Riverside Plaza, Suite 1800
Chicago, IL 60606
Phone: 312-454-0400

Illinois Department of Natural Resources Northwest Region
2660 East 2350th Road
Marseilles, IL 61341
Phone: 815-357-1608
Web site: http://dnr.state.il.us

Illinois Natural History Survey
607 East Peabody Drive Champaign, Illinois 61820
Phone: 217/333-6880 (general information)
Fax: 217/333-4949

ORGANIZATIONS

Grand Prairie Friends
P. O. Box 36
Urbana, IL 61803-0036
Web site: www: www.prairienet.org/gpf
Email: gpf@prairienet.org

Chicago Botanic Garden
Chicago Botanic Garden
1000 Lake Cook Road
Glencoe, IL 60022
Email: cbglib@nslsilus.org
Phone: (847) 835-5440
Fax: (847) 835-4484
Web Page URL: http://www.chicagobotanic.org

Plant Conservation Alliance
Bureau of Land Management
1849 C Street NW, LSB-204
Washington, DC 20240
Phone: (202) 452-0392
Email: plant@plantconservation.org

Nature Preserves Commission
524 South Second Street
Springfield, IL 62701
Phone: 217-785-8774

Illinois Historic Preservation Society
500 E Madison
Springfield, IL 62701

Chicago Audubon Society
5801-C North Pulaski Road,
Chicago, IL 60646-6057
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Calumet Ecological Park Association
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Chicago IL 60633
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Illinois Natural History Survey
607 East Peabody Drive
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Chicago Herpetological Society
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Chicago, Illinois 60614

Chicagoland Environmental Network
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North Park Village Nature Center
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Association of Illinois Soil and Water Conservation Districts
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Illinois Chapters of The Nature Conservancy
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Grand Prairie Field Office of The Nature Conservancy
1201 S. Main Street
Eureka, Illinois 61530
Phone: 309-467-4662
Fax: 309-467-4664

Northern Illinois Field Office of The Nature Conservancy
4 Crystal Street, 1st floor
Cary, Illinois 60013
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Fax: 847-462-9819

University of Illinois
Office of Extension and Outreach
214 Mumford Hall, MC-710
1301 W. Gregory Dr.
Urbana, IL 61801
Phone: 217-333-5900

Pheasants Forever
2880 Thunder Road
Hopkinton, IA 52237
Contact: Matthew O'Connor
Phone: 319-926-2357
Email: niapfmatt@n-connect.net

Izaak Walton League, Illinois Division
P.O. Box 22, RR #1
Mason City, IL 62664
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Chicago Botanic Garden
1000 Lake Cook Road
Glencoe, Illinois 60022
Phone: 847-835-5440

Prairie Rivers Network
809 S. Fifth St.
Champaign, IL 61820
Phone: 217-344-2371

Prairie Grove Volunteers
P.O. Box 2577
Champaign, IL 61825
Email: pgv@prairienet.org

Midewin National Tallgrass Prairie
Nature Preserve
30071 South State Highway 53
Wilmington, Illinois 60481
Phone: 815-423-6370
Fax: 815-423-6376

Illinois Audubon Society
P.O. Box 2418
Danville, IL 61834
Phone: 217- 446-5085

Sierra Club Foundation
200 N. Michigan Av.
Suite 505
Chicago, IL 60601
Phone: 312- 251-1680
Web Site: http://www.sierraclub.org

Sierra Club's Northern Plains Office
23 N. Scott, Room 25
Sheridan, WY 82801
Phone: 307-672-0425
Email: nt-wy.field@sierraclub.org

Trout Unlimited, Illinois Council
P.O. Box 1280
Oak Brook, IL 60522
Phone: 312- 409-3800
Web Site: http://www.tu.org

Illinois Environmental Council
Education Fund
319W. Cook St.
Springfield, IL 62704
Phone: 217- 544-5954

Illinois Association of Park Districts
211 E. Monroe St.
Springfield, IL 62701
Phone: 217- 523-4554

Illinois Conservation Foundation
100 W. Randolph, Suite 4-300
Chicago, IL 60601
Phone: 312- 814-7237
Web Site: http://dnr.state.il.us/icf

Nature of Illinois Foundation
701 Devonshire Dr., #209
Champaign, IL 61820
Phone: 217- 355-6437
Web Site: http://natureillinois.org

Natural Land Institute
320 S. 3rd St
Rockford, IL 61104
Phone: 815- 964-6666

Chicago Area Council
1218 West Adams St.
Chicago, IL 60607-2802
Phone: 312-421-8800
http://www.chicagobsa.org

Save the Prairie Society
10327 Elizabeth
Westchester, IL 60154
Phone: 708-865-8736
Web Site: http://savetheprairiesociety.org

Madison Arboretum
University of Wisconsin
1207 Seminole Highway
Madison, WI 53711
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Illinois Native Plant Society
Forest Glen Preserve
20301 E. 900 North Road
Westville, IL 61883

American Society of Landscape Architects
Illinois Chapter
1N141 County Farm Road
Winfield, IL 60190
Phone: 630-752-0197

NURSERIES AND SEED SOURCES

Mason State Nursery
17855 N. Co. Rd. 2400 E.
Topeka, IL 61567
Phone: 309-535-2185

Union State Nursery
3240 State Forest Rd.
Jonesboro, IL 62952
Phone: 618-438-6781

Possibility Place Nursery
7548 W. Monee-Manhattan Road
Monee, Illinois 60449
Phone: 708-534-3988
Fax: 708-534-6272
Web Site: www.possibilityplace.com

Berthold Nursery
434 E. Devon
Elk Grove Village, IL 60007
Phone: 847-439-2600

Genesis Nursery
Rural Route 1, Box 32
Walnut, IL 61376
Phone: 815-438-2220

Chicago Botanic Garden
A Bloomin Sale
1000 Lake cook Road
Glencoe, IL 60022-0440
Phone: 847-835-5440

Aquatic Nursery
38 West 135 McDonald Road
Elgin, IL 60123
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Bluestem Prairie Nursery
Route 2, Box 106A
Hillsboro, IL 62049
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Midwest Flowers
PO Box 64
Rockton, IL 61072

Prairie Patch
Rr1, Box 41
Niantic, IL 62551
Phone: 217-668-2409

Purple Prairie Farm
Route 2, Box 176
Wyoming, IL 61491
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2010 East Main Street
St. Charles, IL

Tom Huddleson
Huddleson/McBride Drainage
drain tile installation and removal
St. Charles Phone: 630-513-0757
Rochelle Phone: 815-562-6007