Volume 3

Living Resources

CHICAGO RIVER/LAKE SHORE AREA ASSESSMENT

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

CHICAGO RIVER/LAKE SHORE AREA ASSESSMENT

VOLUME 3: LIVING RESOURCES

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About This Report

The *Chicago River/Lake Shore Area Assessment*, part of a series of statewide regional assessments, examines approximately 348 square miles in northeastern Illinois. The report provides information on the natural and human resources of the area as a basis for managing and improving its ecosystems. The development of ecosystem-based information and management programs in Illinois are the result of three processes — the Critical Trends Assessment Program, Conservation Congress, and Water Resources and Land Use Priorities Task Force.

Background

The Critical Trends Assessment Program (CTAP) documents changes in ecological conditions. In 1994, using existing information, the program provided a baseline of ecological conditions.[1] Three conclusions were drawn from the baseline investigation:

1. the emission and discharge of regulated pollutants over the past 20 years has declined, in some cases dramatically,
2. existing data suggest that the condition of natural ecosystems in Illinois is rapidly declining as a result of fragmentation and continued stress, and
3. data designed to monitor compliance with environmental regulations or the status of individual species are not sufficient to assess ecosystem health statewide.

Based on these findings, CTAP has begun to develop methods to systematically monitor ecological conditions and provide information for ecosystem-based management. Five components make up this effort:

1. identify resource rich areas,
2. conduct regional assessments,
3. publish an atlas and inventory of Illinois landcover,
4. train volunteers to collect ecological indicator data, and
5. develop an educational science curriculum which incorporates data collection

At the same time that CTAP was publishing its baseline findings, the Illinois Conservation Congress and the Water Resources and Land Use Priorities Task Force were presenting their respective findings. These groups agreed with the CTAP conclusion that the state's ecosystems were declining. Better stewardship was needed, and they determined that a voluntary, incentive-based, grassroots approach would be the most appropriate, one that recognized the inter-relatedness of economic development and natural resource protection and enhancement.

[1] See *The Changing Illinois Environment: Critical Trends*, summary report and volumes 1-7.

From the three initiatives was born Conservation 2000, a program designed to reverse ecosystem degradation, primarily through the Ecosystems Program, a cooperative process of public-private partnerships that merge natural resource stewardship with economic and recreational development. To achieve this goal, the program provides financial incentives and technical assistance to private landowners.

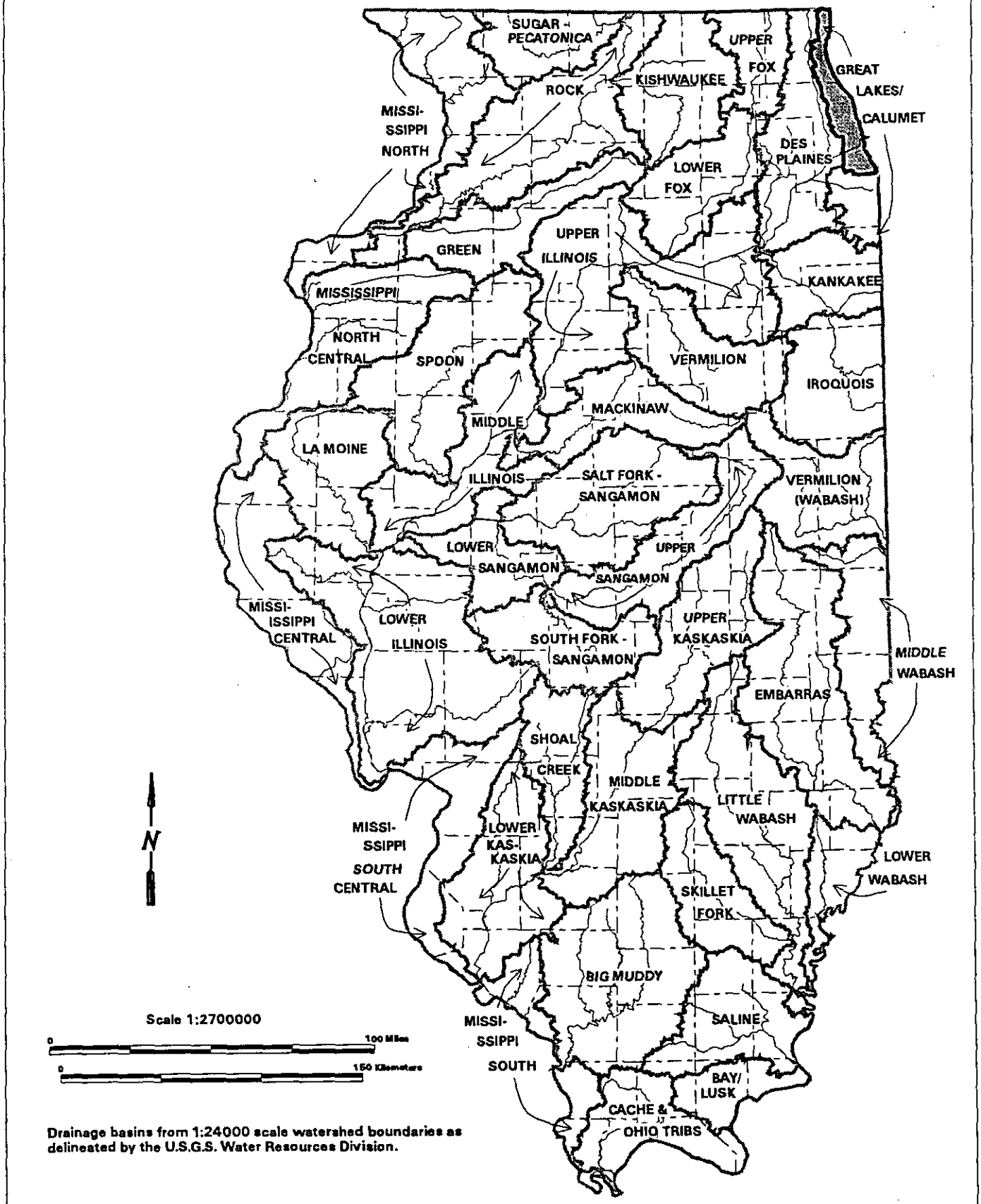
At the same time, CTAP identified 30 Resource Rich Areas (RRAs) throughout the state. In RRAs and other areas where Ecosystem Partnerships have been formed, CTAP is providing an assessment of the area, drawing from ecological and socio-economic databases to give an overview of the region's resources — geologic, edaphic, hydrologic, biotic, and socio-economic. Although several of the analyses are somewhat restricted by spatial and/or temporal limitations of the data, they help to identify information gaps and additional opportunities and constraints to establishing long-term monitoring programs in the partnership areas.

Chicago River/Lake Shore Assessment Area

The Chicago River/Lake Shore assessment area covers approximately 348 square miles in northeastern Illinois and falls within portions of two counties — Cook and Lake. The area is defined by the watershed of the Chicago River and the areas of Cook and Lake counties that drain to Lake Michigan, excluding the area in southern Cook County that drains to the Calumet River.

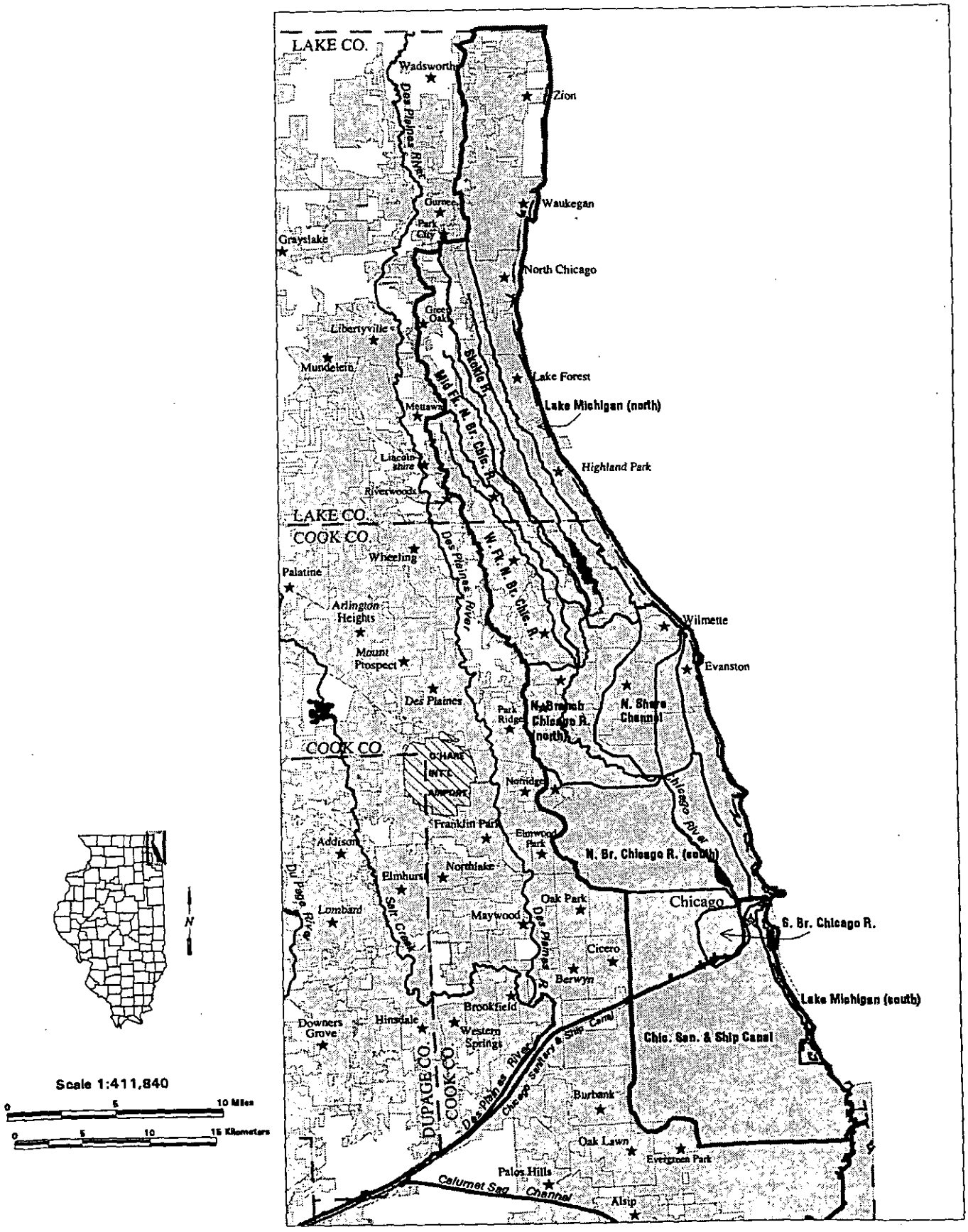
The area lies mostly within the physiographic division of the Chicago Lake Plain. The northern portion in Lake County, the only part of the area that has any concentration of undeveloped land, falls within the Wheaton Morainal Country, a physiographic division characterized by a varied, gently-rolling to hilly topography.

This assessment is comprised of four volumes. In Volume 1, *Geology* discusses the geology, soils, and minerals in the assessment area. Volume 2, *Water Resources*, discusses the surface and groundwater resources and Volume 3, *Living Resources*, describes the natural vegetation communities and the fauna of the region. Volume 4 contains three parts: Part I, *Socio-Economic Profile*, discusses the demographics, infrastructure, and economy of the area; Part II, *Environmental Quality*, discusses air and water quality, and hazardous and toxic waste generation and management in the area; and Part III, *Archaeological Resources*, identifies and assesses the archaeological sites known in the area.



Drainage basins from 1:24000 scale watershed boundaries as delineated by the U.S.G.S. Water Resources Division.

Major drainage basins of Illinois and location of the Chicago River /Lake Shore Assessment Area



Subbasins in the Chicago River/Lake Shore Assessment Area. Subbasin boundaries depicted are those determined by the Illinois Environmental Protection Agency.

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Introduction

Physiographic Characteristics and Natural Divisions

The Chicago River/Lake Shore Assessment Area (CR/LSAA) is an approximately 348.4-mile^2 (223,003.7 acre) contiguous area located in eastern Lake and Cook counties along the shore of Lake Michigan (Figure 1). This Assessment Area includes the drainage basins of the Skokie River, Chicago River, North Branch of the Chicago River (including the West and Middle Forks), and the Dead River (Figure 2). Historically most of these basins were in the Great Lakes drainage (Willman 1971). However, due to the development of the Chicago Sanitary and Ship Canal, the majority of the Assessment Area now is in the Mississippi River drainage. The Dead River still remains in the Great Lakes drainage with its water entering Lake Michigan. Although the Assessment Area straddles the natural divide between the Mississippi and Great Lakes' drainage basins, the development of the Chicago Sanitary and Ship Canal drains the majority of the Assessment Area into the Mississippi River basin.

The majority of Illinois occurs within the Central Lowland Province of the Interior Plains Physiographic Division (Leighton et al. 1948). The CR/LSAA occupies part of the Great Lakes Section of the Central Lowland Province and includes two physiographic (sub) divisions, the Chicago Lake Plain and the Wheaton Morainal Country. Physiographic divisions (subdivisions) are defined by the topography of the bedrock surface and various glaciation characteristics such as extent of glaciation, glacial morphology, etc. (Leighton et al. 1948). Elevation within the CR/LSAA ranges from a minimum of about 545 ft. above sea level in Chicago near the Chicago Sanitary and Ship Canal (at the southern part of the Assessment Area) to about 768 ft. above sea level at the northwestern part of the CR/LSAA, near Waukegan. The Chicago Lake Plain occupies what was once the floor of glacial Lake Chicago. Between 14,000 and 12,500 years ago, Lake Chicago stood in this area at approximately 640 feet above mean sea level, about 60 feet higher than today's Lake Michigan (Willman 1971, Wiggers 1997). This portion of the Assessment Area is mainly underlain by till and is characterized by a very flat surface that slopes gently toward the lake, interrupted by low beach ridges, morainic headlands and islands (Leighton et al. 1948). The Wheaton Morainal Country is physiographically more complex than the Lake Plain and is characterized by physiographic features including moraines and ground moraines that were formed during the Woodfordian substage of Wisconsinan glaciation (Willman and Lineback 1970). It includes a series of broad parallel morainic ridges that encircle the Illinois area of Lake Michigan (Leighton et al. 1948). The bedrock of the CR/LSAA is of the Silurian system, and consists of rock that is almost entirely dolomite. Few, if any, areas of it are exposed naturally in the CR/LSAA, but can be seen in deep quarries in the Chicago region south of the Assessment Area, and along the bluffs of the DesPlaines River (Willman 1971, Willman et al. 1975)

The Natural Divisions of Illinois follow closely the physiographic divisions of Illinois. Delineation of the Natural Divisions are based on physiographical factors such as topography, soils, bedrock, glacial history, as well as the distribution of Illinois flora and fauna (Schwegman et al. 1973). CR/LSAA lies within the Northeastern Morainal Natural Division of Illinois (Figure 3, Table 1) and includes three of its sections: the Lake Michigan Dunes Section, the Morainal Section, and the Chicago Lake Plain Section. The Lake Michigan Dunes Section occupies 10.05% (22,414.86 acres) of the Assessment Area and occurs at the northeastern edge of Lake County along the Michigan Lake shoreline. It is recognized for its dunes and beach habitat and the unique associated flora. The southern half (55.01%, 122,666.97 acres) of the CR/LSAA occurs in the Chicago Lake Plain Section, which is characterized by its flat topography and physiographic history. About 34.6% (77,264.39 acres) of the CR/LSAA is included in the Morainal Section, which contains a variety of glacial landforms. A small fraction of the Assessment Area (0.29%; 657.48 acres) is included in the Lake Michigan Section of the Major Water Bodies Division (Illinois Geographic Information System).

Table 1. Natural divisions occurring in the Chicago River/Lake Shore Assessment Area.

Division & Section	Acres[1]	% of CR/LSAA
Northeastern Morainal/Morainal Section	77,264.39	34.65
Northeastern Morainal/Lake Michigan Dunes Section	22,414.87	10.05
Northeastern Morainal/Chicago Lake Plain Section	122,666.97	55.01
Major Water Bodies/Lake Michigan Section	657.48	0.29
Total:	**223,003.71**	**100.00**

[1] Data from the GIS Natural Division Coverage Database (Illinois Geographic Information System).

The soils of this Natural Division are considered geologically young and differ from most other Illinois soils in that they are derived primarily from a parent material of glacial drift (clay, silt, sand, and gravel deposited by glacial ice), rather than from loess (silty, fine-grained material transported and deposited by wind). They range from very poorly drained in the Chicago Lake Plain section to very well drained on the uplands (Schwegman et al. 1973). Soils in the CR/LSAA occur within three major soil orders. Alfisols are generally light-colored (low in organic matter) soils that develop under forest vegetation. These soils are confined mainly to the drier morainal areas or the rolling, better-drained areas bordering stream valleys. Entisols are light-colored soils that are more recent alluvial deposits (from moving water or streams). These tend to be younger soils that have not been in place long enough to develop recognizable horizons. They occur in very sandy areas, such as the Michigan Lake shores, or along streams that receive sediments from flooding (Fehrenbacher et al. 1984). Mollisols are the dark-colored, high-in-organic-matter soils that develop under grassland vegetation.

Five soil associations cover the majority of the CR/LSAA area: Martin-Milford, St. Charles-Camden-Drury, Morely-Blount-Beecher, St. Clair-Nappanee-Frankfort, and Oakville-Lamont-Alvin soils (Fehrenbacher et al. 1984). The Oakville-Lamont-Alvis soils are Entisols and found mainly along the Michigan Lake shore. The soils of this association are very sandy and were formed on deposits from wind (aeolian), alluvium, or glacial outwash. They generally have only a moderate to low capacity to hold available water. The St. Charles-Camden-Drury, Morely-Blount-Beecher, and St. Clair-Nappanee-Frankfort soils are all light-colored Alfisols, developed under native forests. They occupy the upland and sloping landscapes of the CR/LSAA. The St. Charles-Camden-Drury soils developed in sandy glacial outwash or sandy loam till. Most of these soils tend to be well to moderately well drained. The largest area of this soil association abuts the Oakville-Lamont-Alvin association that runs along the northeastern shores of Lake County. St. Clair-Nappanee-Frankfort soils developed in less than 20 inches of loess on silty clay or clay till or lacustrine (lake) materials. These soils range from poorly drained to moderately to well drained. They occupy the western edge of the Assessment Area. The Morley-Blount-Beecher soils developed in 0 to 20 inches of loess over silty clay loam glacial till. This association occupies the majority of the northern half of the Assessment Area. The Martinson-Milford soils are mainly located in old glacial lakebeds formed by glacial moraines. They are dark-colored Mollisols that generally developed under grassland vegetation. These poorly drained soils occupy a large part of the southern half of the CR/LSAA occurring in nearly level areas (Fehrenbacher et al. 1984).

Climate Patterns[1]

The climate in the Chicago River/Lake Shore Assessment Area (CR/LSAA) is typical of many continental locations, in that there are rather wide temperature fluctuations. The average high temperatures (°F) in the summer are in the 70s and 80s with average lows in the 50s. Winter highs are generally in the 20s and 30s with lows in the teens and 20s. Record temperature extremes range from -27° F to a high of 108° F. There is an average of five and a half months without frost each year.

Precipitation is highest during April through September (averages of 3.31 to 3.97 inches per month) and lowest in January (1.71 inches) and February (1.24 inches), with a yearly average of 34.20 inches.

[1] Information in this section has been taken from the Chicago River/Lake Shore Area Assessment, Volume 2 (Illinois Department of Natural Resources 2000). See that volume for a more detailed discussion of climate patterns and long-term trends in the CR/LSAA.

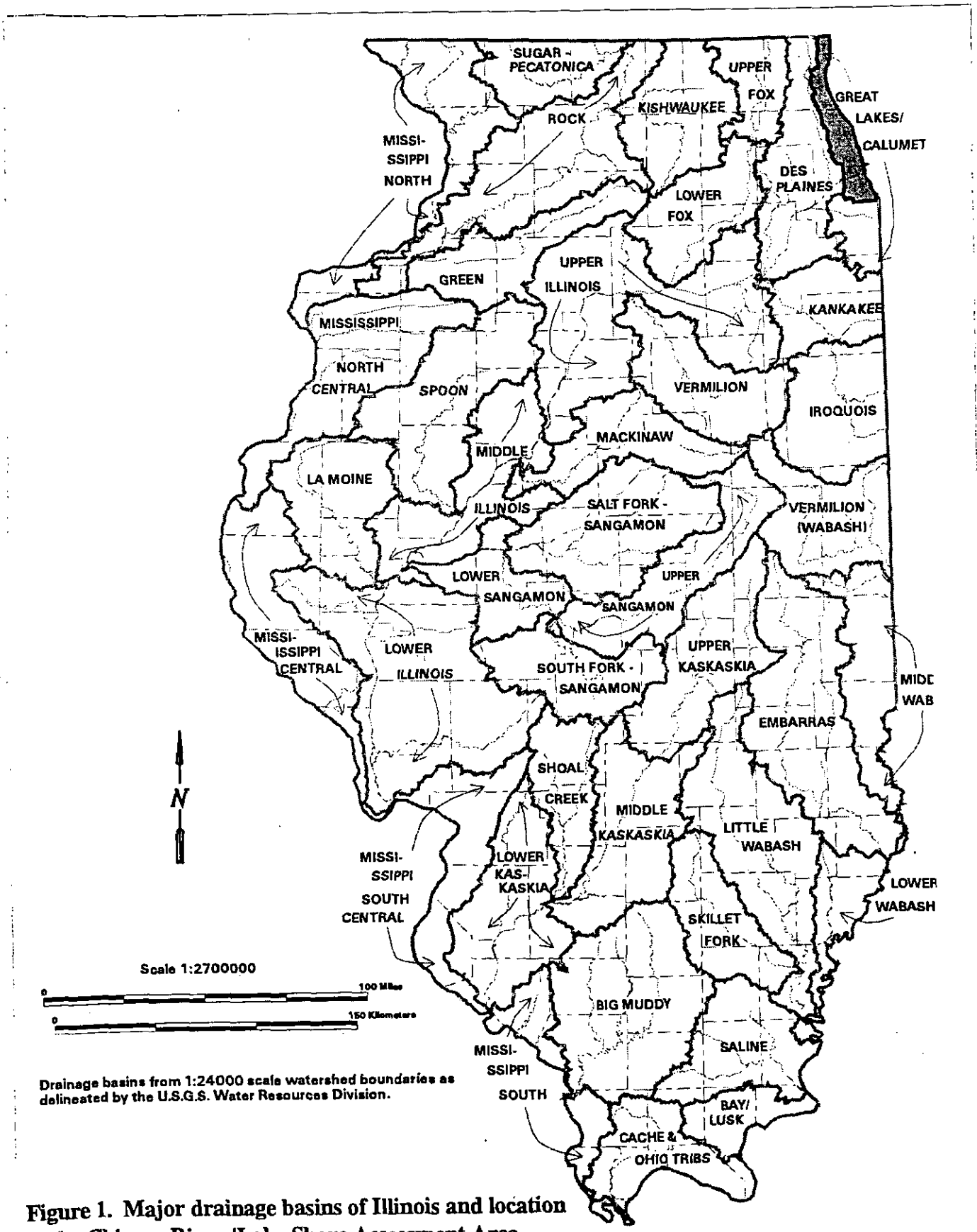


Figure 1. Major drainage basins of Illinois and location of the Chicago River /Lake Shore Assessment Area

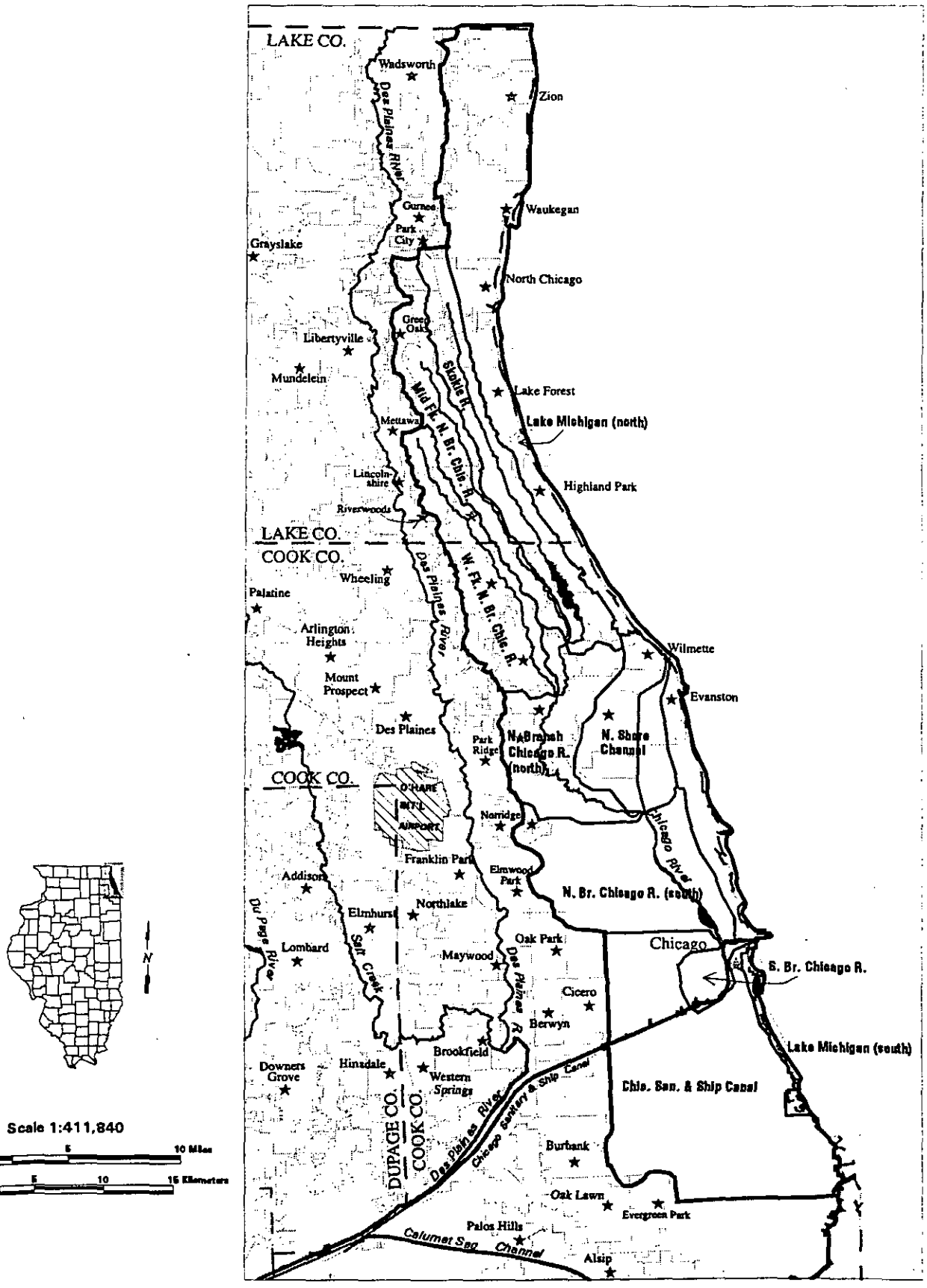


Figure 2. Subbasins in the Chicago River/Lake Shore Assessment Area. Subbasin boundaries depicted are those determined by the Illinois Environmental Protection Agency.

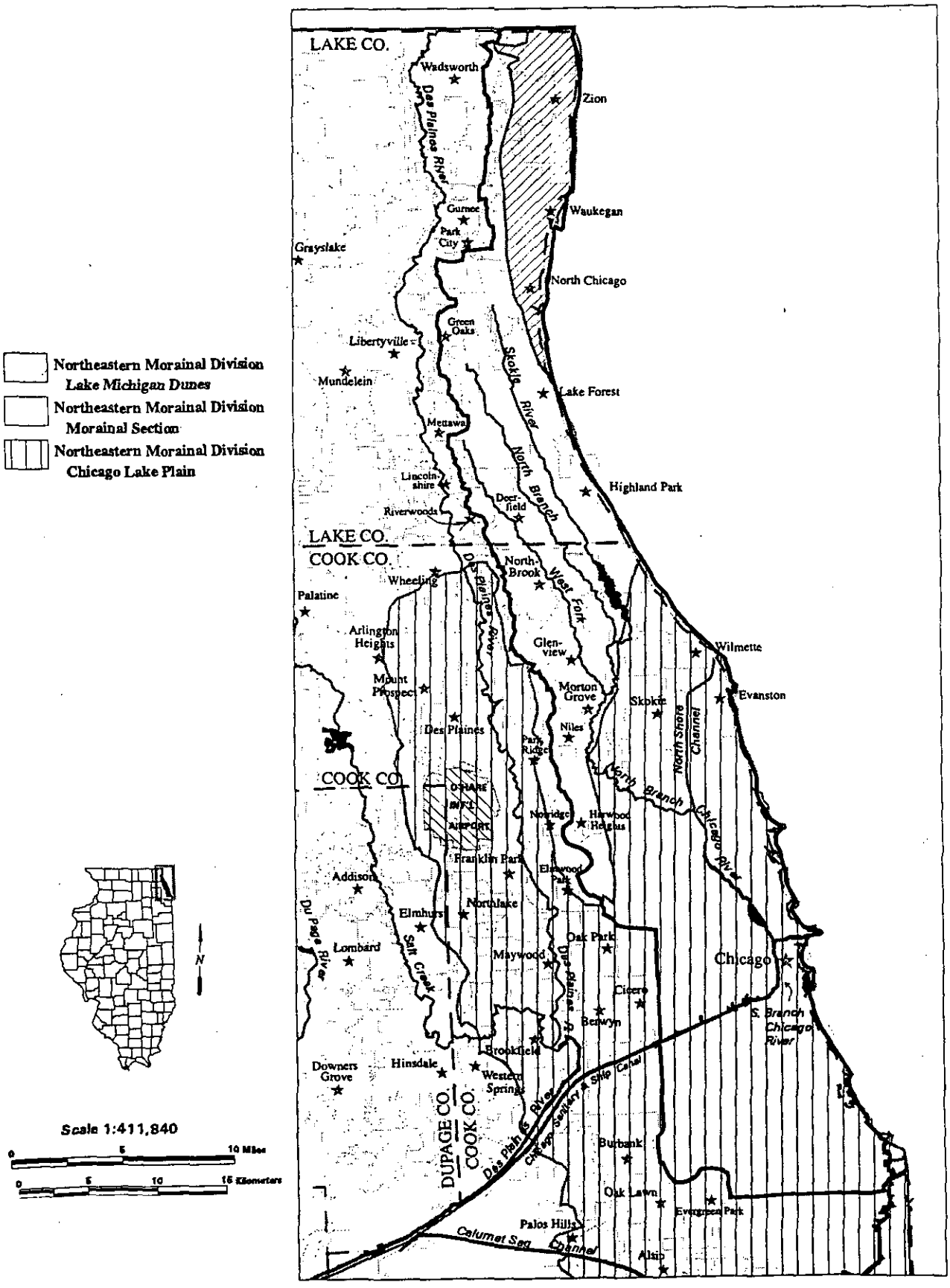


Figure 3. Natural Divisions in the Chicago River/Lake Shore Assessment Area based on the classification developed by Schwegman et al. (1973).

Vegetation History

The presettlement vegetation in Illinois generally can be described as prairie and forest. Interpretations of the original distribution of prairie and forest (Vestal 1931, Anderson 1970, and Iverson et al. 1989) consistently indicate a predominance of prairie occupying about 60% of the State's total land area. Determining the ratio of prairie to forest in presettlement vegetation can be estimated using Government Land Office (GLO) land survey data recorded about 1830 (e.g., Moran 1978). Analysis of GLO vegetation data for the Assessment Area, using Geographic Information System (GIS), indicates the CR/LSAA was approximately 75.9% prairie and 23.8% forest, woodland, and savanna (Anderson 1970, IL Geographic Information System). This is based on estimates of 169,361 acres of prairie and 52,983 acres of "forest" in the Assessment Area. The remaining land (0.03%) was considered habitat classified as open-water or major water bodies. Information on the amount of the 52,983 acres of presettlement forest that was once savanna is unavailable. Boundary zones between natural communities have often been integrated and difficult to distinguish. It has been especially so concerning "boundaries" between communities such as open woodlands, savannas, and prairies. The boundary areas delineating these communities tended to be very dynamic. Savannas, especially, were spatially dynamic and their total area and distribution varied on the presettlement landscape depending on several factors including local climate conditions, and the frequency and intensity of fire.

Savanna and prairie communities appear to have occupied substantial areas of the CR/LSAA prior to white settlement (Moran 1978, Hanson 1981). Prairie dominated the larger part of the landscape at the southern region of the Assessment Area in the former glacial lake plain of Lake Chicago (Hanson 1981). Savannas occupied large areas of the uplands and moraines in the Lake County portion of the CR/LSAA. Oak-hickory woodlands occupied areas near the eastern edge of the Assessment Area, along the bluffs of Lake Michigan. Marshes and wet prairies could be found in lower wet areas and especially the lowlands between the moraines (Moran 1978). Fire is generally considered to have been a major ecological factor in the maintenance of tallgrass prairie, savanna, and open woodland vegetation in the Midwest (Anderson 1970, 1983, 1990; Axelrod 1985; Taft et al. 1995, Taft 1997a).

Data concerning the total amount of presettlement wetlands in the Assessment Area is available only at a county-wide scale and may not accurately represent conditions in the CR/LSAA portion of the two counties. The CR/LSAA accounts for 22.9% of the Lake County land area and 25.5% of the Cook County land area. Considering the combined areas for Lake and Cook counties, the CR/LSAA includes 24.6% of the total two-county land area. Based on estimated presettlement acreage for hydric soils, Cook County was about 15.5% (93,800 acres) wetland and Lake County was about 26.1% (78,000 acres) wetland. Assuming the CR/LSAA had similar proportions of presettlement wetland compared with the estimated totals for Cook and Lake counties, there were approximately 41,816 acres (18.75%) of wetland in the Assessment Area, although this is probably an underestimate. Predominant wetland types probably included wet sand prairie, marsh, sedge meadow, panne, and possibly local areas of peatlands.

Current Land Cover

The landscape of the CR/LSAA has undergone many changes in the past several decades. Urban land uses now dominate the CR/LSAA landscape, comprising about 81% of the Assessment Area (Figure 4, Table 2).

Table 2. Current Land Cover for the Chicgao River/Lake Shore Assessment Area[1].

Land Cover	Acres	Percent
Urban/Built-up	175,700	81.0
Upland forest	28,022	12.9
Grassland	3,898	1.8
Nonforested wetlands	3,476	1.6
Cropland	2,630	1.2
Bottomland forest	1,623	0.7
Water	1,602	0.7
Total:	**216,955**	**100.0**

[1] From the Land Cover of Illinois database (Illinois Geographic Information Service).

Forests cover approximately 13.7% of the CR/LSAA with upland (12.9%) and bottomland (0.7%) forest. The heaviest concentrations of forests occur in the centrally located uplands with scattered patches in the northern half and very widely scattered patches in the Chicago region (Figure 5). Only 292 acres (0.98%) of this forested area remains in nearly undegraded (high-quality) condition, 195 acres in dry-mesic forest and 97 in mesic forest, within 5 woodland sites. A rare, although somewhat degraded, 51-acre stand of sand flatwoods occurs along the North Branch of the Chicago River in Cook County.

Grasslands are scattered mainly through the northern half of the CR/SLAA and are about 1.8% (3,476 acres) of the landcover (Figure 6). Exotic species, mostly cool-season grasses, compose the majority (85.5%) of the grasslands. A total of 506 acres of high-quality prairie remain, harbored within 7 Illinois nature preserves, constituting about 0.3% of the original prairie acreage once found in the CR/LSAA. The undegraded prairie communities consist primarily of dry sand prairie, dry-mesic sand prairie, and mesic prairie.

Based on the Land Cover of Illinois Database (IL Geographic Information System), which was derived from Landsat Thematic satellite imagery acquired between 1991 and 1995, and the Illinois Wetlands Inventory (IWI), a current estimate of wetland for the CR/LSAA (bottomland forest and non-forested wetland such as marshes, wet meadows, and open water wetlands) is about 5,401 acres, or 2.4% of the Assessment Area (Figure 7, Table 3). IWI data for the CR/LSAA was derived from high-altitude photography taken in 1980 and 1981. IWI data is the most recent comprehensive wetlands data available for the state.

Wetlands occupy 2.4% of the CR/LSAA area compared to 3.5% of the total area of the state (Suloway and Hubbell 1994). In the CR/LSAA, wetlands occupy about 5,401 acres (Table 3). Twenty-three percent of the wetland area is bottomland forest, compared to the statewide percentage of 60.5%. Approximately 35% of the wetland acreage is deep marsh

and 13.6% is shallow marsh/wet meadow wetlands. Open water wetlands account for 17.0% of the wetland acreage in the Assessment Area (compared to 11.4% for the state) followed by scrub-shrub (6.2%), lake shore (5.1%), shallow lake (0.1%), swamp (0.1%), and intermittent riverine (0.0%).

The mean size of contiguous forested wetlands is 7.0 acres (range <0.1 to 80 acres); there are 178 separate forested wetlands in the Chicago River/Lake Shore Assessment Area. Emergent wetlands range in size from less than 0.1 acre to 600 acres, with a mean size of 6.8 acres. There are 380 separate emergent wetlands in the CR/LSAA.

Thanks to the protection provided by the Illinois Beach and Illinois Dunes North natural areas, a high percentage (21.3%, 1152.7 acres) of these wetland acres remain as high-quality, essentially undegraded, wetland habitat. These two areas contain 99.8% (1150.1 acres) of the high-quality wetlands remaining in the CR/LSAA supported within several wetland communities (wet-mesic prairie, wet prairie, marsh, graminoid fen, sedge meadow, panne, seep, pond, and 163 acres of great lake).

Isolated patches of cropland and small bodies of open water occur most commonly in the northwestern quarter of the CR/LSAA. Cropland covers about 1.2% of the CR/LSAA (Figure 8) and open water only about 0.7% (Figure 9).

Table 3. Wetlands habitat of the Chicago River/Lake Shore Assessment Area[1].

Category	Acreage	% of Wetland Area	% of Assessment Area
Palustrine Wetlands			
Shrub-Scrub Wetlands	336.99	6.2	0.2
Forested Wetlands			
Bottomland Forest	1,254.45	23.2	0.6
Swamp	3.41	0.1	0.0
Emergent Wetlands			
Shallow Marsh/Wet Meadow	732.52	13.6	0.3
Deep Marsh	1,874.47	34.7	0.8
Open Water Wetlands	916.40	17.0	0.4
Subtotal Palustrine	**5,118.24**	**94.8**	**2.3**
Lacustrine Wetlands			
Shallow Lake	7.34	0.1	0.0
Lake Shore	274.57	5.1	0.1
Emergent Lake	0.00	0.0	0.0
Subtotal Lacustrine	**281.91**	**5.2**	**0.1**
Riverine Wetlands			
Perennial Riverine	0.00	0.0	0.0
Intermittent Riverine	0.54	0.0	0.0
Subtotal Riverine	**0.54**	**0.0**	**0.0**
Total Wetlands:	**5,400.69**	**100.0**	**2.4**

[1] Adapted from Suloway and Hubbell (1994).

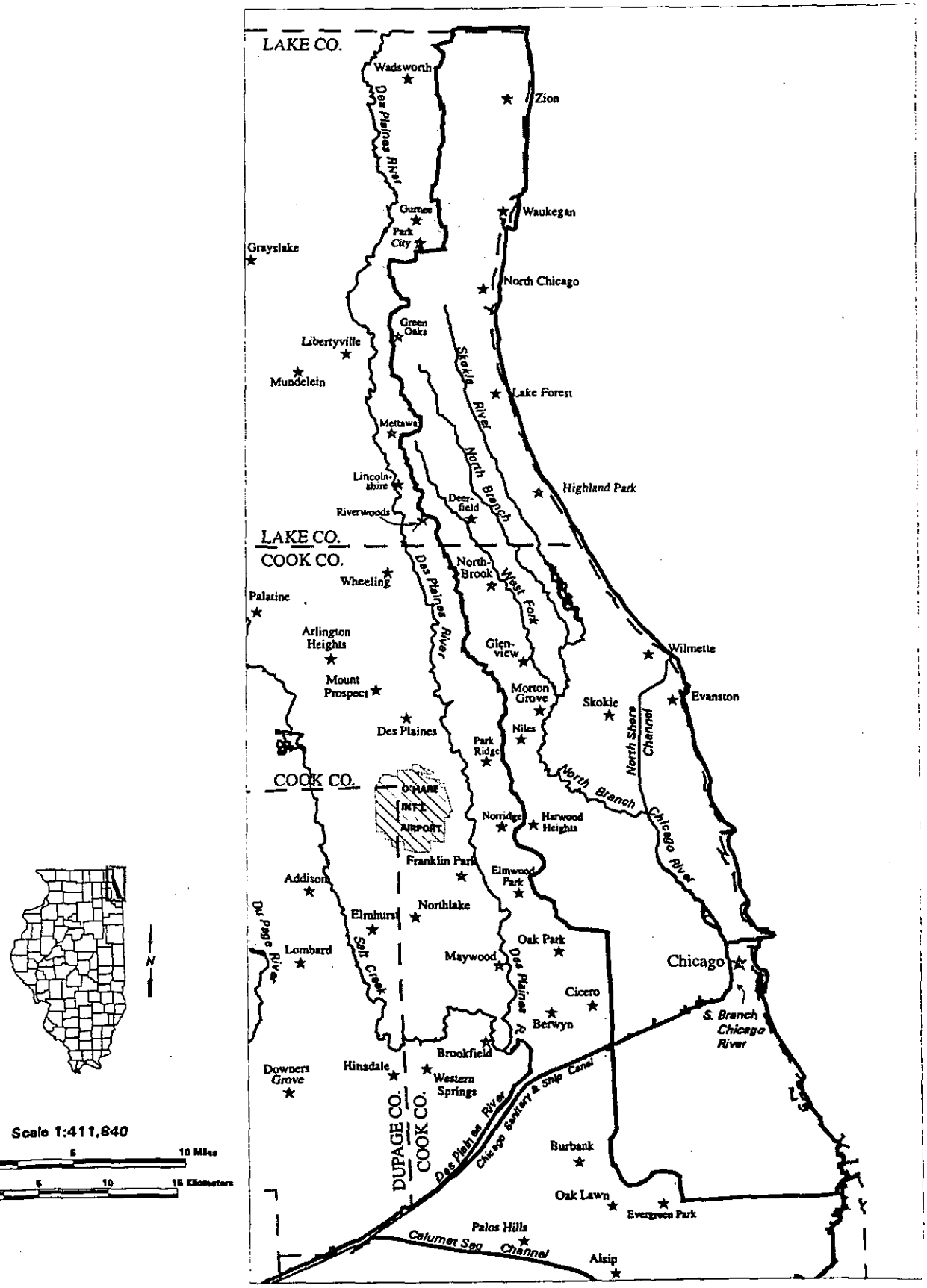


Figure 4. Urban land in the Chicago River/Lake Shore Assessment Area. Urban land depicted on this map includes urban/built-up land and urban grassland from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

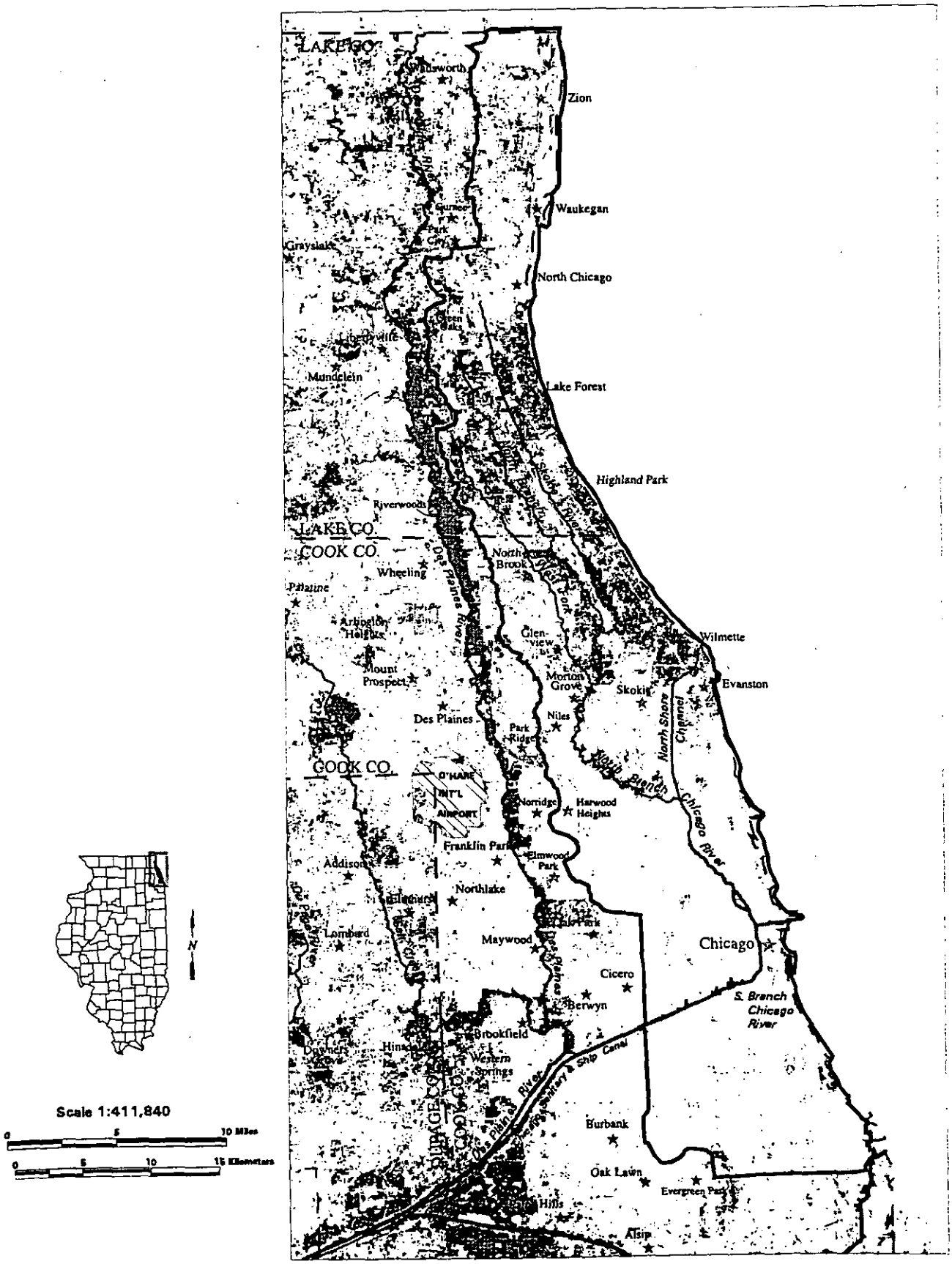


Figure 5. Forest in the Chicago River/Lake Shore Assessment Area. Forest depicted on this map includes upland and bottomland forest from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

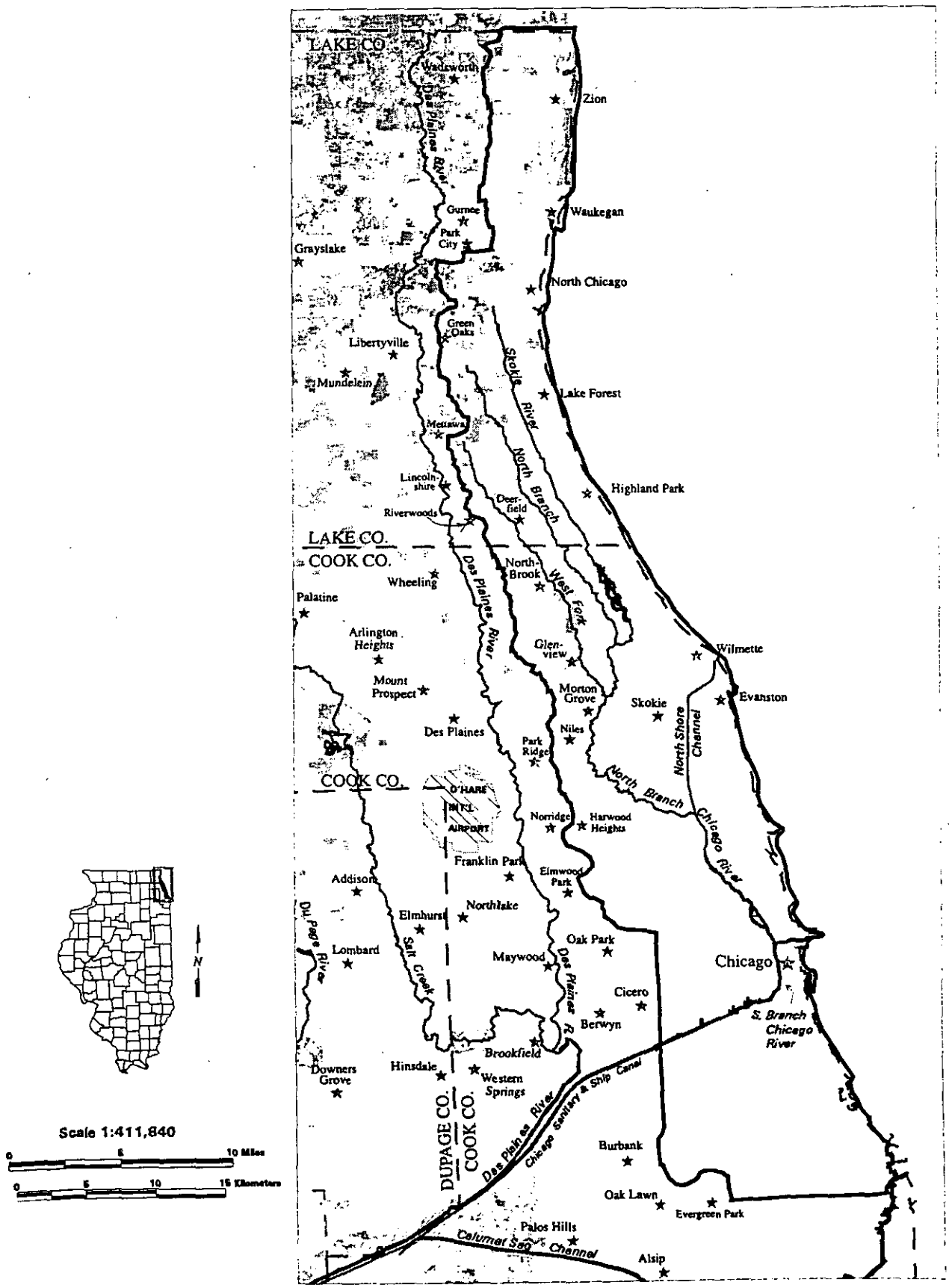


Figure 6. Grasslands in the Chicago River/Lake Shore Assessment Area. Grasslands depicted on this map are nonurban grasslands from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

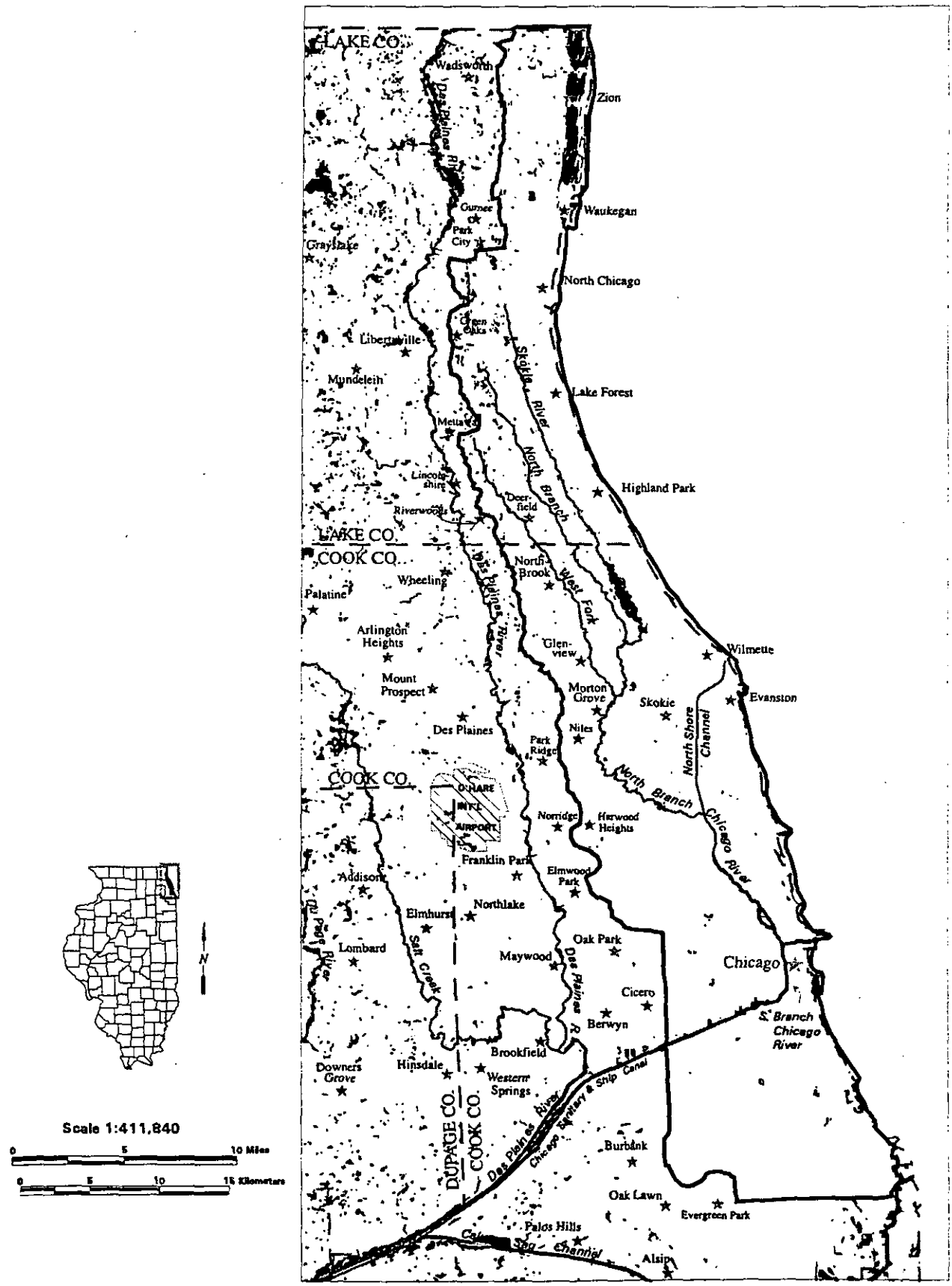


Figure 7. Wetlands in the Chicago River/Lake Shore Assessment Area. Wetlands depicted on this map include nonforested wetlands and bottomland forest from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

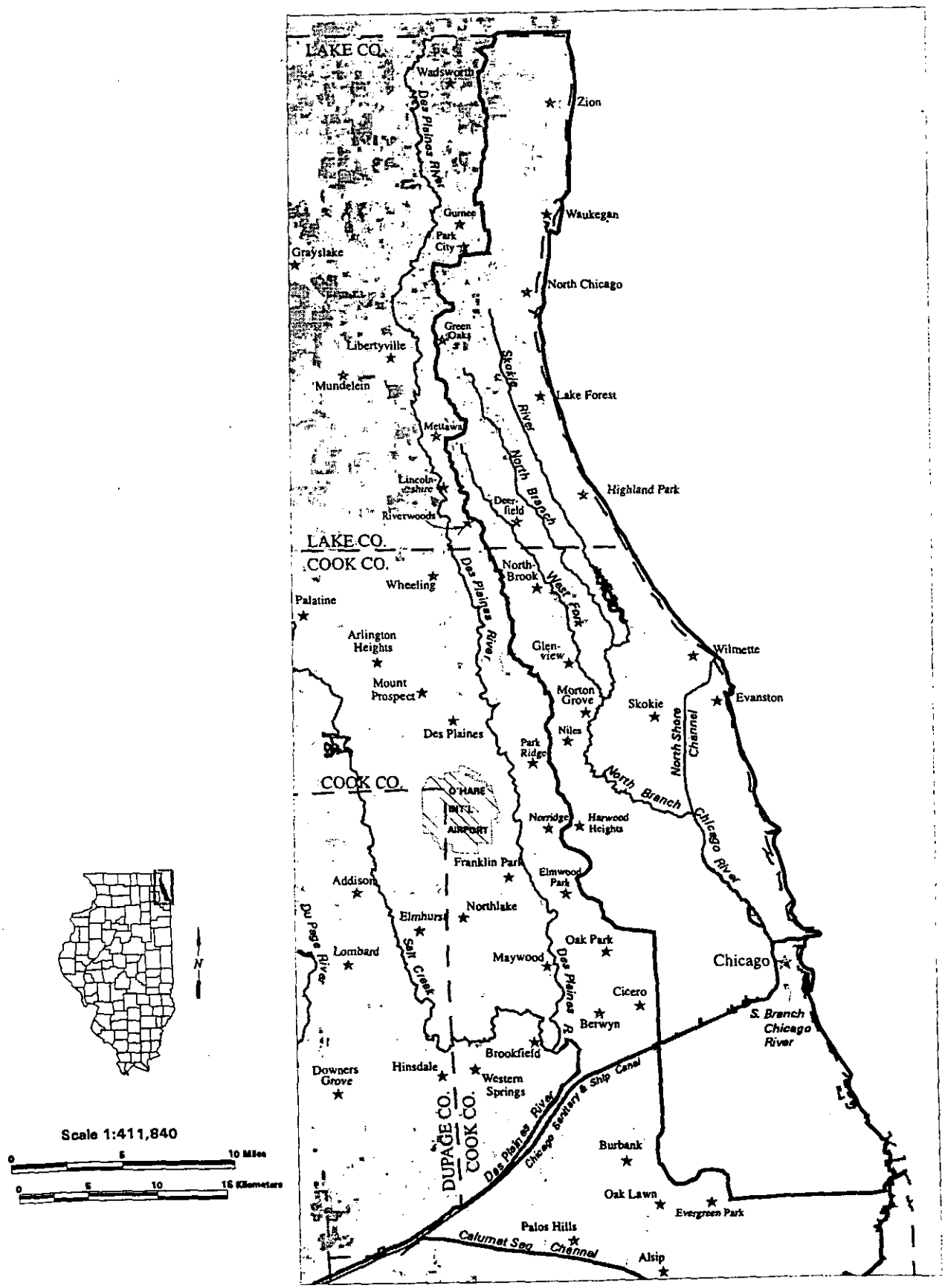


Figure 8. Cropland in the Chicago River/Lake Shore Assessment Area. Cropland depicted on this map includes row crops and small grains from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

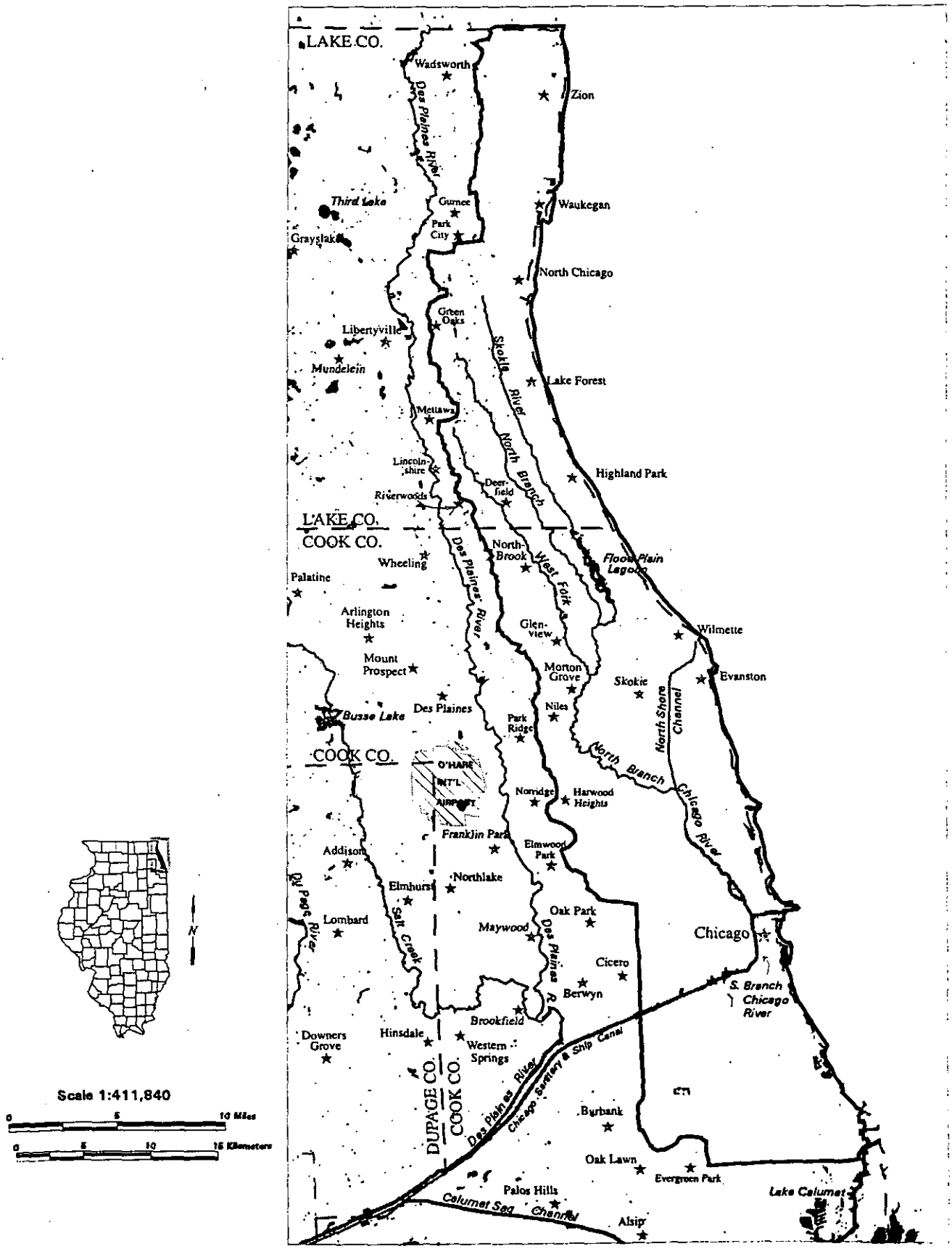


Figure 10. Open water in the Chicago River/Lake Shore Assessment Area from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

Biologically Significant Features of Natural Communities

Public Land

The Chicago River/Lake Shore Assessment Area is part of the metropolitan region of Chicago and is heavily urbanized. Although 81% of the land in the CR/LSAA is urban/ built-up, 12,284 acres have been set aside as federal, state, or county conservation areas, forest preserves, state parks, etc (Figure 10, Table 4). Many of these areas have been designated to provide some level of protection to the natural communities in the area. In some cases they provide the only refuge for certain endangered species or natural communities within Illinois. However, some are not always situated in the most biologically important areas. Others often represent only small vestiges of the former expanse and complexity of the natural communities and cannot always offer adequate protection for many species.

Table 4. Public land in the Chicago River/Lake Shore Assessment Area.

Name	Acres
State Land[1]	
Illinois Beach State Park	3,072
Total state land:	**3,072**
Federal Land	
Fort Sheridan area	720
Total federal land:	**720**
County Land[2]	
Bannockburn Forest Preserve	65
Berkeley Prairie Forest Preserve	37
Calumet Preserve	254
Daniel Wright Woods Forest Preserve	67
Fort Sheridan Golf Course/Forest Preserve	197
Greenbelt Forest Preserve	720
Lake Bluff Forest Preserve	108
Lyons Woods Forest Preserve	311
Middle Fork Savanna Forest Preserve	399
North Branch Preserve	1,073
Old School Forest Preserve	289
Prairie Wolf Slough Forest Preserve	421
Site 15/Floodwater Detention Site	108
Skokie Preserve	3,972
Spring Bluff Forest Preserve	276
Zion Forest Preserve/Beach Park	195
Total county land:	**8,492**

[1] Does not include any natural areas or nature preserves that may be state owned.

[2] County land is limited to forest preserves and similar land

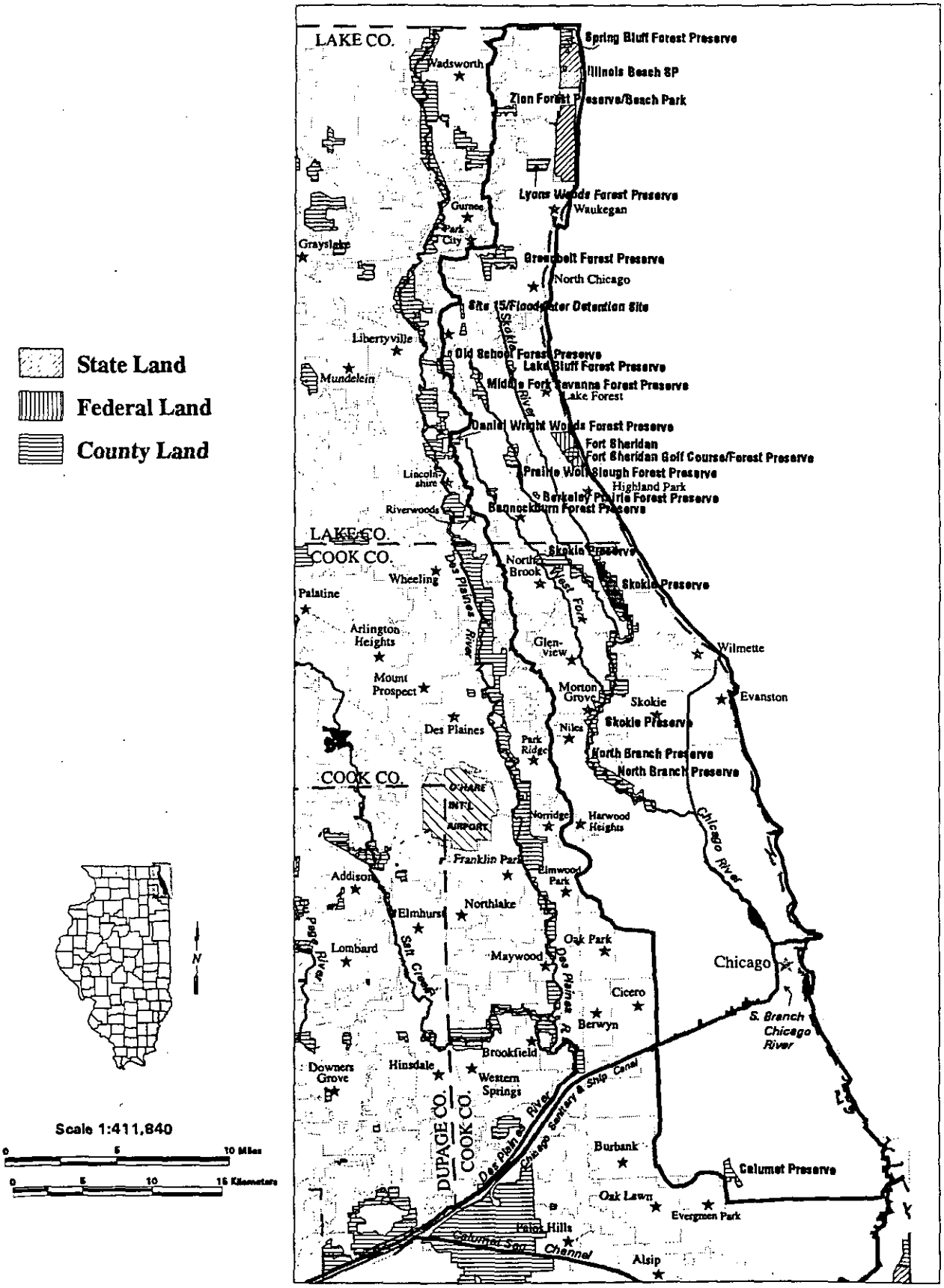


Figure 10. State, federal, and county land in the Chicago River/Lake Shore Assessment Area. State land is limited to parks (SP), conservation areas (SCA), forests (SF), and fish and wildlife areas (SFWA) and county land to forest preserves and similar land.

Natural Areas and Nature Preserves

The Illinois Natural Areas Inventory (INAI) was conducted over a three-year period during the mid 1970s to document remaining significant and exceptional examples of the natural communities and other features in Illinois (White 1978). The INAI established seven categories of natural areas based on significant features. The categories are: I - High Quality Natural Communities; II - Habitat for Endangered Species; III - Habitat for Relict Species; IV - Outstanding Geological Areas; V - Approved Natural Areas and Restoration Sites; VI - Unique Natural Areas; and VII - Outstanding Aquatic Areas. The INAI established a grading system to rank natural quality (White 1978). The natural quality of a community or area was graded as "A" (relatively stable or undisturbed), "B" (late successional or lightly disturbed), or "C" (mid-successional or moderately to heavily disturbed). Grades "D" (early successional or severely disturbed) and "E" (very early successional or severely disturbed) were used for land within a natural area that is used as a buffer for protection of the significant or exceptional feature. In general, only grade "A" or "B" communities are designated as significant or exceptional features, although many natural areas include some Grade C-quality habitats. The estimates and comparisons of natural areas within the CR/LSAA and statewide are based on the best available data. In some cases, comparisons are made using recent data for natural communities within the Assessment Area and comparing to statewide data that are from White (1978) and thus over 20 years old. Consequently, if discoveries of natural areas do not equal area of recently degraded or destroyed natural areas, some data for trends among natural areas may be slightly over or under estimated.

The CR/LSAA harbors an abundance of high quality natural areas and natural communities. According to the Illinois Natural Areas Inventory (White, 1978), Lake and Cook counties contain by far the greatest number of natural areas and significant features of all counties in Illinois. Pope County, in southern Illinois, is the only other county of close comparison. Thirty-four natural areas (11 of which include Illinois Nature Preserves) occur within the CR/LSAA boundaries (Table 5, Figure 11). Sixteen of these are Category I (high-quality, essentially undegraded) sites and ten of these include populations of species listed by the IESPB as threatened or endangered. An additional 17 sites are Category II natural areas (contain threatened and endangered species but no high-quality natural communities). Four more Category I sites (2 of which include T&E species) and four Category II sites occur within a 1-mile buffer area just outside the boundaries of the CR/LSAA.

Table 5. Natural areas in the Chicago River/Lake Shore Assessment Area and surrounding region[1].

NA#[2]	County	Acres[3,4]	Name
70	Lake	65.41	St. Francis Boys Camp
251	Cook	77.95	Wolf Road Prairie Nature Preserve
253	Cook	7.62	Santa Fe Prairie
254	**Cook**	**77.16**	**Somme Prairie**
255	Cook	74.48	Black Partridge Woods

Table 5. Continued.

NA#[2]	County	Acres[3, 4]	Name
256	Cook	12.16	Sagawau Canyon
267	Cook	334.55	Little Red Schoolhouse Nature Center
393	**Cook**	**2.27**	**Glenbrook North High School Prairie Nature Preserve**
395	*Cook*	*5.19*	*James Woodworth Prairie Preserve*
396	**Cook**	**1.42**	**Morton Grove Prairie**
397	**Cook**	**64.13**	**Sidney R. Yates Flatwoods**
398	Cook	33.31	Chicago Ridge Prairie Nature Preserve
399	Cook	144.65	Paw Paw Woods
420	Cook	258.16	Salt Creek Woods Nature Preserve
421	Cook	45.04	Palos Fen Nature Preserve
422	Cook	1,539.33	Cap Sauers Holdings Nature Preserve
423	Cook	375.21	Cranberry Slough Nature Preserve
506	Du Page	1,057.06	Morton Arboretum
524	Du Page	33.28	Churchill Prairie Nature Preserve
526	Du Page	9.19	Belmont Prairie Nature Preserve
527	Du Page	48.64	Maple Grove Forest Preserve
528	Du Page	1.53	Hinsdale Prairie
529	Du Page	54.70	Lemont East Geological Area
530	Du Page	184.77	Fullersburg Woods Nature Center
532	Du Page	1,074.20	Waterfall Glen
534	Cook	652.41	Busse Woods
535	**Cook**	**2.83**	**Glencoe Botanical Area**
649	Lake	447.15	Wadsworth Prairie and Savanna
650	Lake	83.83	Antioch Bog
652	Lake	952.49	Fourth Lake - Rollins Road Savanna
653	Lake	17.49	River Road Woods
654	Lake	40.95	Oak Grove Botanical Area
655	Lake	124.20	Blair Woods
656	Lake	33.21	Crabtree Farm Woods
657	Lake	79.82	Tangley Oaks Woods
658	Lake	27.83	Shaw Prairie
659	**Lake**	**15.58**	**McLaughlin Prairie**
663	*Lake*	*94.07*	*Lloyd's Woods*
664	*Lake*	*40.33*	*Herrman's Woods*
666	**Lake**	**2.97**	**Ravinia Bluff**
667	*Lake*	*4.25*	*Grainger Flatwoods*
1003	*Lake*	*67.59*	*Macarthur Woods*
1006	**Lake**	**36.52**	**Lake Bluff Woods**
1007	*Lake*	*364.02*	*Edward L. Ryerson Conservation Area*
1008	**Lake**	**130.81**	**McCormick Nature Preserve**
1049	**Lake**	**605.41**	**Waukegan Beach**
1050	Lake	689.34	Redwing Slough
1066	**Lake**	**1,223.10**	**Illinois Dunes North**
1070	*Cook*	*41.09*	*Lake Calumet*
1078	**Lake**	**24.26**	**Fort Sheridan Bluff**

Table 5. Continued.

NA#[2]	County	Acres[3,4]	Name
1083	**Lake**	**2,047.82**	**Illinois Beach**
1231	Lake	4.58	Prairie White Fringed Orchid Preserve
1232	Lake	76.70	Reed-Turner Woodland
1233	Lake	25.68	Long Grove Site
1234	Lake	13.03	Riverwoods Site
1235	**Lake**	**37.50**	**Hybernia-Highmoor Prairie**
1236	Lake	8.08	Buffalo Grove Prairie
1245	**Lake**	**30.16**	**Middle Fork Savanna**
1246	**Lake**	**3.74**	**Blodgett Bluff**
1247	**Lake**	**1.82**	**Fort Sheridan Site**
1249	Lake	68.74	McDonald Woods Marsh
1250	Lake	349.30	Lyons Woods
1251	**Lake**	**8.04**	**Oak Grove White Fringed Orchid Site North**
1252	Lake	39.36	Liberty Prairie Nature Preserve
1253	Lake	244.27	Almond Marsh
1353	*Cook*	*0.00*	*Calumet Sedge Site*
1355	Cook	561.44	Wolf Lake
1375	Cook	0.00	Brookfield Prairie
1376	**Cook**	**1.63**	**Sauganash Prairie**
1377	*Cook*	*9.86*	*Schiller Woods Prairie*
1378	**Cook**	**2.30**	**Hubbard Woods Site**
1379	Cook	139.63	Carle Woods
1385	Cook	54.66	WGN Marsh
1387	**Cook**	**25.95**	**Clayton F. Smith Woods**
1388	Cook	21.18	Miami Prairie - Indigo Oak Openings
1390	**Cook**	**11.09**	**Wayside Prairie**
1391	Du Page	51.81	Swift Road Meadow
1392	Du Page	162.48	Wood Dale Grove
1399	Du Page	10.36	East Branch Marsh
1400	Du Page	19.78	Songbird Slough
1404	Du Page	94.95	Fischer Woods
1431	Cook	0.00	Thatcher Woods Prairie
1469	**Cook**	**55.52**	**Kennicott's Grove**
1471	Du Page	0.00	Lyman Woods
1495	**Cook**	**27.76**	**Glenview Naval Air Station Prairie**
1500	**Lake**	**41.28**	**Florsheim Park**
1554	*Lake*	*5.50*	*Ascension Sedge Meadow*
1555	Lake	5.24	Elm Road Woods
Total Acres in the CR/LSAA:		**5175.83**	

[1] Bold type indicates natural areas within the CR/LSAA and italics indicates natural area boundary is less than one mile from the CR/LSAA boundary.

[2] The number of the natural area (NA#) refers to the number designated in the Natural Heritage Database (Illinois Department of Natural Resources 1999) and in Figure 11.

[4] Acreage of 0.00 indicates that no figures are currently available, boundaries not yet delineated.

Among the sixteen Category I sites identified within the CR/LSAA are 47 occurrences of 24 different natural community types (some Category I sites have multiple high-quality natural communities). The Grades A and B portions of the Category I natural areas comprise a total of about 2,299.7 acres (Table 6), or about 1.03% of the total area of the CR/LSAA. This compares to 0.07% of Category I acreage for the entire state (White 1978). One of the Category I sites includes a 51-acre Grade C sand flatwoods. This community is recognized as a Category I natural area because sand flatwoods are extraordinarily rare and even Grade C sites, many of which have restoration potential, are significant. However, these Grade C acres were not included among the totals used for comparison with statewide trends.

The high-quality natural communities within the CR/LSAA include remnants of several different prairie community types (i.e., mesic prairie, wet-mesic prairie, wet prairie, dry sand prairie, dry-mesic sand prairie, mesic sand prairie, wet sand prairie, mesic gravel prairie), as well as numerous other community types (i.e. dry-mesic upland forest, mesic upland forest, dry sand savanna, dry-mesic sand savanna, mesic savanna, marsh, graminoid fen, sedge meadow, panne, pond, great lake, eroding bluff, beach, and foredune (Table 6).

The acreage information reported here is based on best available data but may not always reflect current conditions. Some natural communities at the Category II sites also may include areas that are relatively high quality and have restoration potential. These areas, if restored, ultimately may meet INAI standards for Category I natural communities. Area of all Category I and II INAI natural areas, including buffer areas, totals about 5,176 acres in the Assessment Area (about 2.3%). The majority of this acreage (5,015.7 acres [96.9%]) is at sites recognized as Category II natural areas with the majority of the acreage contained within two sites, Illinois Beach (2,047.8 acres) and Illinois Dunes North (1,223.1 acres).

Nature preserves are areas of land or water in public or private ownership that legally receive the maximum protection of significant natural features. Nature preserves are formally dedicated to receive this protection. The central goal of the nature preserve system, currently with about 293 preserves in the state, is to protect and preserve examples of all significant natural features found in Illinois for the purposes of scientific research, education, conserving biodiversity, and esthetic enjoyment. Nature preserves are administered by the Illinois Nature Preserves Commission (INPC). Preserves usually are the shared responsibility of the INPC, the Illinois Department of Natural Resources, and the land owners (McFall and Karnes 1995).

There presently are eleven nature preserves within the CR/LSAA (Table 1, Figure 11) totaling 1,868.25 acres (about 0.84% of the CR/LSAA). One of the preserves (Kennicott's Grove) occurs on the CR/LSAA boundary with portions included inside the Assessment Area and the remainder falling within the one-mile buffer zone. Preserves occur in both Lake and Cook counties. Twenty-four additional nature preserves occur outside the CR/LSAA but within the area shown in Figure 1. Three of these occur just one mile from the boundary of the Assessment Area (Table 7, Figure 11).

Table 6. Category I natural communities in the Chicago River/Lake Shore Assessment Area.[1]

Community type	Acres of Category I in the CAA			Acres of Category I in Illinois			% of Illinois Category I in the CAA		
	Grade A	Grade B	CAA Total	Grade A	Grade B	IL Total	Grade A	Grade B	% of IL Total
dry-mesic upland forest	112.0	83.0	195.0	424.0	1277.5	1701.5	26.42	6.50	11.46
mesic upland forest	40.0	57.0	97.0	706.0	979.0	1685.0	5.67	5.82	5.76
mesic prairie	17.8	17.8	35.6	55.5	267.2	322.7	32.07	6.66	11.03
wet-mesic prairie	2.0	0.0	2.0	23.7	249.2	272.9	8.44	0.00	0.73
wet prairie	0.0	3.1	3.1	12.5	247.6	260.1	0.00	1.25	1.19
dry sand prairie	122.0	16.0	138.0	123.6	352.8	476.4	98.71	4.54	28.97
dry-mesic sand prairie	219.0	20.0	239.0	247.2	72.9	320.1	88.59	27.43	74.66
mesic sand prairie	55.0	38.0	93.0	71.7	90.0	161.7	76.71	42.22	57.51
wet-mesic sand prairie	14.4	7.0	21.4	17.7	9.3	27.0	81.36	75.27	79.26
wet sand prairie	79.0	60.0	139.0	79.0	90.1	169.1	100.00	66.59	82.20
mesic savanna	0.0	20.0	20.0	0.0	40.0	40.0	0.00	50.00	50.00
dry sand savanna	111.0	10.0	121.0	118.0	573.0	691.0	94.07	1.75	17.51
dry-mesic sand svanna	13.0	19.0	32.0	53.0	461.0	514.0	24.53	4.12	6.23
marsh	31.0	681.0	712.0	295.0	1905.0	2200.0	10.51	35.75	32.36
graminoid fen	0.3	0.0	0.3	65.3	73.5	138.8	0.46	0.00	0.22
sedge meadow	39.3	10.0	49.3	193.3	575.4	768.7	20.33	1.74	6.41
panne	54.0	3.0	57.0	54.0	3.0	57.0	100.00	100.00	100.00
seep	1.6	0.0	1.6	45.6	64.3	109.9	3.51	0.00	1.46
pond	4.0	0.0	4.0	30.4	350.0	380.4	13.16	0.00	1.05
great lake	0.0	163.0	163.0	0.0	163.0	163.0	0.00	100.00	100.00
eroding bluff	10.4	1.0	11.4	14.9	9.0	23.9	69.80	11.11	47.70
beach	48.0	15.0	63.0	48.0	15.0	63.0	100.00	100.00	100.00
foredune	86.0	16.0	102.0	86.0	16.0	102.0	100.00	100.00	100.00
Totals:	**1059.8**	**1239.9**	**2299.7**	**2764.4**	**7883.8**	**10648.2**	**38.3**	**15.7**	**21.6**

[1] Category I indicates natural communities that have remained relatively undisturbed and in high-quality condition: Grades A and B (White and Madany 1978).

Table 7. Nature preserves in the Chicago River/Lake Shore Assessment Area and surrounding region[1].

NP#[2]	Corr - NA[3]	County	Acres	Name
1	**1083**	**Lake**	**1,087.17**	**Illinois Beach**
2	255	Cook	71.72	Black Partridge Woods
3	534	Cook	463.16	Busse Woods
4	422	Cook	1,537.34	Cap Sauers Holdings
5	423	Cook	976.61	Cranberry Slough
7	399	Cook	118.38	Paw Paw Woods
8	420	Cook	283.67	Salt Creek Woods
40	*1007*	*Lake*	*255.32*	*Edward L. Ryerson*
73	**396**	**Cook**	**2.45**	**Morton Grove Prairie**

Table 7. Continued.

NP#[2]	Corr - NA[3]	County	Acres	Name
75	526	Du Page	10.07	Belmont Prairie
79	228	Lake	29.39	Reed-Turner Woodland
82	*1003*	*Lake*	*59.83*	*MacArthur Woods*
83	649	Lake	248.74	Wadsworth Prairie
99	*663*	*Lake*	*53.80*	*Lloyd's Woods*
120	421	Cook	76.14	Palos Fen
121	256	Cook	9.39	Sagawau Canyon
122	**254**	**Cook**	**71.39**	**Somme Prairie**
126	936	Will	1.51	Romeoville Prairie
139	**393**	**Cook**	**1.66**	**Glenbrook North High School Prairie**
164	251	Cook	74.28	Wolf Road Prairie
166	**1066**	**Lake**	**240.38**	**North Dunes**
193	1252	Lake	40.77	Liberty Prairie
194	1253	Lake	15.28	Oak Openings
195	1253	Lake	144.32	Almond Marsh
197	**1235**	**Lake**	**24.50**	**Hybernia**
203	**1235**	**Lake**	**16.08**	**Highmoor Park**
213	**1066**	**Lake**	**213.00**	**Spring Bluff**
216	**658**	**Lake**	**114.36**	**Skokie River**
225	524	Du Page	95.84	Churchill Prairie
243	398	Cook	12.89	Chicago Ridge Prairie
254	1381	Cook	4.62	Palatine Prairie
257	1231	Lake	4.12	Eastern Prairie Fringed Orchid Preserve
258	**1500**	**Lake**	**41.71**	**Florsheim Park**
263	**1469**	**Cook**	**55.55**	**Kennicott's Grove**
265	253	Cook	11.77	Santa Fe Prairie
Total Acres in the CR/LSAA:			**1868.25**	

[1] Bold type designates nature preserves within the CR/LSAA and italics indicates natural preserve boundary is within one mile of the CR/LSAA boundry.

[2] The nature preserve number (NP#) refers to the number designated in the Natural Heritage database (Illinois Department of Natural Resources *1999*) and in Figure *11*.

[3] Each of the nature preserves is associated with a corresponding natural area (Corr.-NA) referred to in Table 5.

Natural areas within the boundary

254	*Somme Prairie*
393	Glenbrook North High School Prairie Nature Preserve
396	Morton Grove Prairie
397	Sidney R. Yates Flatwoods
535	*Glencoe Botanical Area*
654	Oak Grove Botanical Area
655	Blair Woods
656	Crabtree Farm Woods
657	Tangley Oaks Woods
658	*Shaw Prairie*
659	McLaughlin Prairie
666	Ravinia Bluff
1006	Lake Bluff Woods
1008	McCormick Nature Preserve
1049	*Waukegan Beach*
1066	Illinois Dunes North
1078	Fort Sheridan Bluff
1083	Illinois Beach
1234	Riverwoods Site
1235	*Hybernia-Highmoor Prairie*
1245	Middle Fork Savanna
1246	Blodgett Bluff
1247	Fort Sheridan Site
1250	Lyons Woods
1251	*Oak Grove White Fringed Orchid Site North*
1376	Saugansash Prairie
1378	Hubbard Woods Site
1387	Clayton F. Smith Woods
1388	*Miami Prairie - Indigo Oak Openings*
1390	Wayside Prairie
1469	Kennicott's Grove
1495	Glenview Naval Air Station Prairie
1500	Florsheim Park
1554	*Ascension Sedge Meadow*
1555	Elm Road Woods

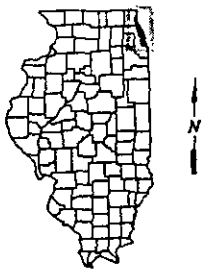
Nature preserves within the boundary

1	Illinois Beach
73	Morton Grove Prairie
122	Somme Prairie
139	Glenbrook No. High School Prairie
166	North Dunes
197	Hybernia
203	Highmoor Park
213	Spring Bluff
216	Skokie River
258	Florsheim Park
263	Kennicott's Grove

Biologically significant stream

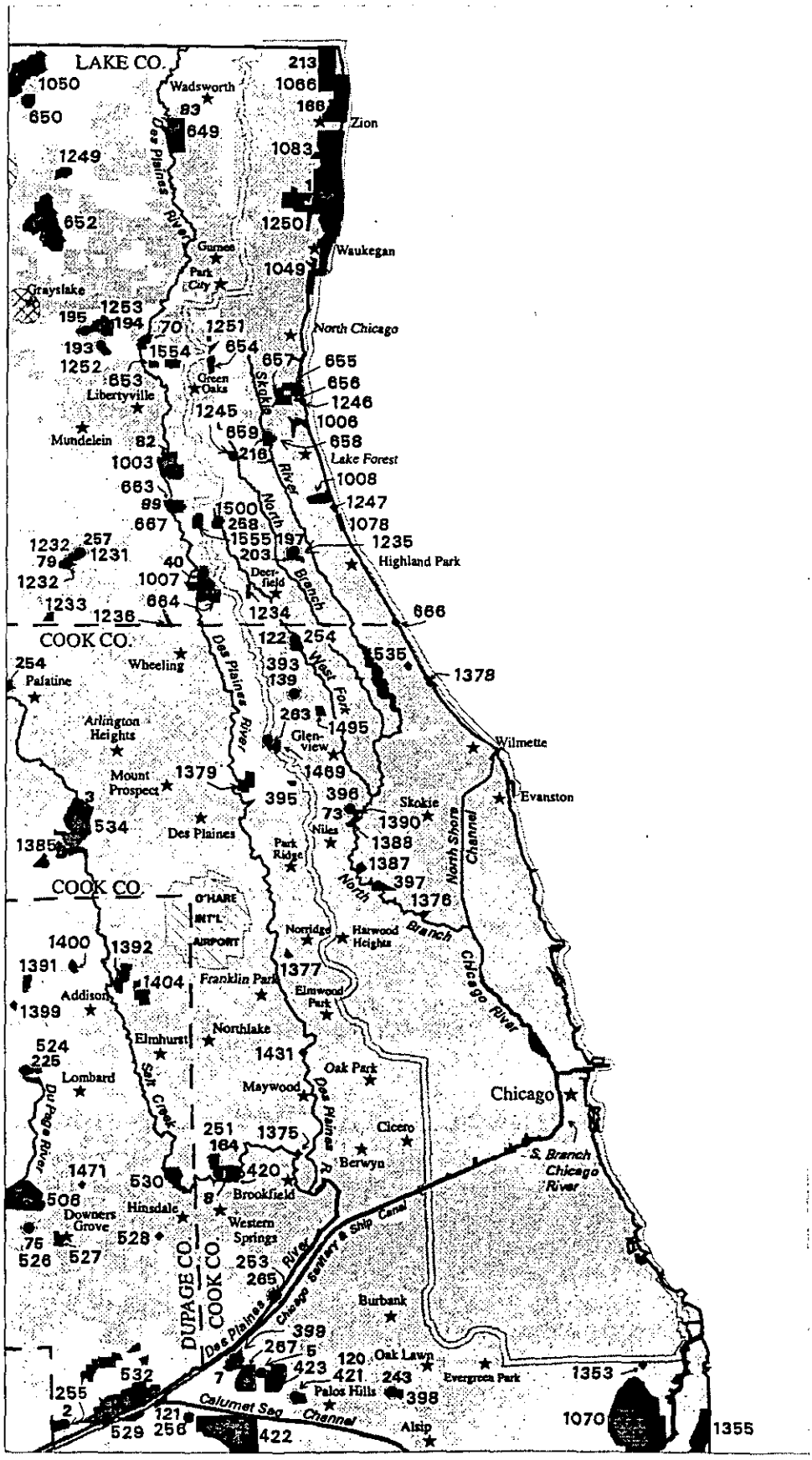
148 Nature preserve

697 Natural area



Nature preserves and natural areas *boundaries* from 1:24000 IGIS database, Jaunary, 1997.

Significant stream data from Page, L. M., et. al., 1992. Stream data *derived from* 1:100000 U.S.G.S. DLG hydrology.



Scale 1:411840

0 5 10 15 20 25 Kilometers

0 5 10 15 Miles

Figure 11. Natural areas, nature preserves and biologically significant stream segments in the Chicago River/Lake Shore Assessment Area.

Biological Stream Categorization and Biologically Significant Streams

Illinois streams have been categorized based on their quality. One stream quality index used to identify high-quality streams is the Biological Stream Characterization (BSC). The BSC was developed by the Illinois Department of Conservation and the Illinois Environmental Protection Agency (Bertrand et al. 1995) and is derived from data on fish populations, water quality, and aquatic macroinvertebrates. In the BSC, stream segments are categorized from "A" (highest quality) to "E" (lowest quality). Of the 13,521.6 stream miles rated as of 1996, 612 miles (5% of the statewide total) have received an "A" rating and another 4545 (34%) are rated as "B" streams.

Another study, "Biologically Significant Illinois Streams" (Page et al. 1992), was conducted to expand the list of high-quality streams beyond the BSC "A" streams by considering additional data on biodiversity; specifically, data on endangered and threatened species (fishes, crustaceans, mussels, and plants) and on mussel diversity. The expanded list identified the most important streams that should be protected and managed for their outstanding biological characteristics. Protection of streams identified in the Biologically Significant Streams (BSS) report (Page et al. 1992) will constitute a major step toward the protection of 100% of the stream-dependent biodiversity.

No streams in the Chicago River/Lake Shore Assessment Area were recognized as biologically significant by Page et al. (1992).

Threatened and Endangered Species

At least 56 species of threatened or endangered plants and animals occur in the CR/LSAA (Table 8). This number includes 2 that are federally threatened and one that is federally endangered. Only 15.4% of the state's 363 threatened or endangered plants are known to occur in the CR/LSAA. For other taxa, the percentage of the state's threatened or endangered species that occur in the area are as follows: birds (73.5%), reptiles (13.3%), fish (12.9%), mollusks (7.4%) and insects (8.3%). Additional information about threatened or endangered species is given in their respective chapters.

Table 8. Threatened and endangered species occurring in the Chicago River/Lake Shore Assessment Area.[1]

Common name	Scientific name	Status[2,3]
Plants:		
American sloughgrass	*Beckmannia syzigachne*	SE
arbor vitae	*Thuja occidentalis*	ST
balsam popular	*Populus balsamifera*	SE
beaked rush	*Rhynchorspora alba*	ST
bearberry	*Arctostaphylos uva-ursi*	SE
bearded wheat grass	*Elymus trachyculus (Agropyron subsecundum)*	SE
buffalo berry	*Sheperdia canadensis*	SE
capitate spike rush	*Eleocharis olivacea*	SE

Table 8. Continued.

Common name	Scientific name	Status[2,3]
club-spur	*Platanthera clavellata*	SE
clustered broomrape	*Orobanche fasciculata*	SE
common bog arrow grass	*Triglochin maritimum*	ST
Crawford's oval sedge	*Carex crawfordii*	SE
dog violet	*Viola conspersa*	ST
downy Solomon's-seal	*Polygonatum pubescens*	SE
downy yellow painted cup	*Castilleja sessiliflora*	SE
dune willow	*Salix syrticola*	SE
dwarf raspberry	*Rubus pubescens*	ST
false asphodel	*Tofieldia glutinosa*	ST
false golden sedge	*Carex garberi*	SE
flatleaf bladderwort	*Utricularia intermedia*	SE
forked aster	*Aster furcatus*	ST
golden sedge	*Carex aurea*	SE
grass pink orchid	*Calopogon tuberosus*	SE
green yellow sedge	*Carex viridula*	ST
ground juniper	*Juniperus communis*	ST
grove bluegrass	*Poa alsodes*	SE
hairy white violet	*Viola incognita*	SE
horned bladderwort	*Utricularia cornuta*	SE
inland New Jersey tea	*Ceanothus herbaceus*	SE
jack pine	*Pinus banksiana*	SE
Kalm's St. John's-wort	*Hypericum kalmianum*	SE
marram grass	*Ammophila breviligulata*	SE
marsh speedwell	*Veronica scutellata*	ST
mountain blue-eyed grass	*Sisyrinchium montanum*	SE
northern cranesbill	*Geranium bicknellii*	SE
oval milkweed	*Asclepias ovalifolia*	SE
pale false foxglove	*Agalinis skinneriana*	ST
pale vetchling	*Lathyrus ochroleucus*	ST
Pitcher's (dune) thistle	*Cirsium pitcheri*	ST,FT
prairie white-fringed orchid	*Platanthera leucophaea*	SE,FT
purple flower raspberry	*Rubus odoratus*	SE
purple-fringed orchid	*Platanthera psycodes*	SE
Richardson's rush	*Juncus alpinus*	SE
round-leaved sundew	*Drosera rotundifolia*	SE
savanna pinweed	*Lechea intermedia*	ST
sea rocket	*Cakile edentula*	ST
seaside crowfoot	*Ranunculus cymbalaria*	SE
seaside spurge	*Chamaesyce polygonifolia*	SE
shadbush	*Amelanchier sanguinea*	SE
slender bog arrow grass	*Triglochin plalustris*	ST
small bladderwort	*Utricularia minor*	SE
small sundrops	*Oenothera perennis*	ST
swollen sedge	*Carex intumescens*	ST
trailing juniper	*Juniperus horizontalis*	SE

Table 8. Continued.

Common name	Scientific name	Status[2,3]
tubercled orchid	*Platanthera flava* var. *herbiola*	SE
weak bluegrass	*Poa languida*	SE
Birds:		
Pied-billed Grebe	*Podilymbus podiceps*	ST
American Bittern	*Botaurus lentiginosus*	SE
Least Bittern	*Ixobrychus exilis*	ST
Black-crowned Night-Heron	*Nycticorax nycticorax*	SE
Yellow-crowned Night-Heron	*Nycticorax violaceus*	SE
Osprey	*Pandion haliaetus*	SE*
Bald Eagle	*Haliaeetus leucocephalus*	ST, FT*
Northern Harrier	*Circus cyaneus*	SE
Red-shouldered Hawk	*Buteo lineatus*	ST
Peregrine Falcon	*Falco peregrinus*	SE
King Rail	*Rallus elegans*	SE
Common Moorhen	*Gallinula chloropus*	ST
Sandhill Crane	*Grus canadensis*	ST
Upland Sandpiper	*Bartramia longicauda*	SE
Wilson's Phalarope	*Phalaropus tricolor*	SE*
Common Tern	*Sterna hirundo*	SE
Forster's Tern	*Sterna forsteri*	SE*
Black Tern	*Chilidonias niger*	SE
Barn Owl	*Tyto alba*	SE
Short-eared Owl	*Asio flammeus*	SE
Loggerhead Shrike	*Lanius ludovicianus*	ST
Brown Creeper	*Certhia americana*	ST
Bewick's Wren	*Thryomanes bewickii*	SE
Henslow's Sparrow	*Ammodramus henslowii*	SE
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	SE
Reptiles:		
Blanding's turtle	*Emydoidea blandingii*	ST
Kirtland's snake	*Clonophis kirtlandii*	ST
Aquatic Biota:		
Fish:		
blackchin shiner	*Notropis heterodon*	ST
longnose sucker	*Catostomus catostomus*	ST
cisco	*Coregonus artedii*	ST
Iowa darter	*Etheostoma exile*	SE
Mussels:		
slippershell mussel	*Alasmidonta viridis*	ST
spike	*Elliptio dilatata*	ST
Insects:		
Hine's emerald dragonfly	*Somatochlora hineana*	FE

[1] As determined by the Illinois Endangered Species Protection Board (Heckert 1991, 1994; Illinois Endangered Species Protection Board 1999).

[2] SE = state endangered; ST = state threatened; FT = federally threatened; FE = federally endangered.

[3] Asterisks (*) indicates that the species is found in the CR/LSAA but does not breed in the Assessment Area.

Natural Vegetation Communities

The description of the vegetation for the Chicago River/Lake Shore Assessment Area (CR/LSAA) is organized into six sections: 1) Comparison of Biodiversity in the CR/LSAA to Statewide Patterns, 2) Threatened and Endangered Species, 3) Disturbance, Habitat Quality, and Restoration Potential, 4) Natural Areas and Nature Preserves, 5) Natural Community Descriptions, and 6) Summary and Recommendations.

Comparison of Biodiversity in the CR/LSAA to Statewide Patterns

Approximately 2,299.7 acres of undegraded habitats (i.e., high-quality natural area) remain in the CR/LSAA. This total is about 1.03% of the Assessment Area compared with a proportion of 0.07% for statewide high-quality, relatively undegraded, land identified by the Illinois Natural Areas Inventory (White 1978). This total suggests that habitat degradation among all community types combined is slightly less in the CR/LSAA than statewide. In general, it is difficult to provide precise estimates for some trend data in the CR/LSAA at the level of the community class because the region historically was characterized by a complex mixture of dynamic habitat types. Nevertheless, with the data available, trends among community classes are outlined below.

Prairie - About 0.01% (2,300 acres) of the original area of prairie in the state persists in a high-quality condition (White 1978); no data are available for the total acreage of all prairie remaining in Illinois including degraded remnants. Of the approximately 169,361 acres of prairie that originally occurred within the Assessment Area, only 671.1 known acres (0.40%) of it remains in various states of condition (Table 6). Most acreage of relatively undisturbed prairie in the State is from agriculturally less suitable lands such as sand deposits (~47%) or steep loess hills (~16%) (Taft 1995a). Almost all (93.9%) of the prairie in the CR/LSAA is on sandy or gravelly soils; the remainder is on mostly silt-loam soils. Most of these prairies probably remain because they were on soils too poor for cultivation in the early days of white settlement. Many then quickly became embedded in an urban landscape matrix where agricultural practices were limited. Proposed residential developments that failed due to the economic crisis of the Great Depression also resulted in the protection of some areas of prairie.

Forest - About 30% of the original area of forest remains statewide (Iverson et al. 1989), though only about 0.3% of this and 0.1% of original forest area remains in a high-quality condition. About 12.9% (29,645 acres) of the CR/LSAA currently is forest (GIS database, Figure 5) compared with an estimated 23.8% (52,983 acres) for presettlement forest in the CR/LSAA. Based on these estimates, current forest cover in the CR/LSAA is about 56% of the original acreage. About 292 acres of forest in the CR/LSAA remain in an essentially undegraded condition (0.98% of remaining forest and 0.55% of estimated original forest

cover) (Table 6). Since forest-savanna-prairie boundaries varied considerably over time prior to settlement, interpretation of these estimates requires some caution. Nevertheless, based on these figures, post-settlement trends of forest habitat destruction and degradation appear to be somewhat less severe in the CR/LSAA compared with statewide trends.

Savanna - Savannas may have declined in area throughout Illinois and the Midwest, perhaps more than any other community class (Taft 1997a), and the CR/LSAA is no exception to this trend. About 51% of Lake County was savanna around 1840 (Moran 1978) indicating savanna formerly was a major community type in northeastern Illinois; this also appears to be true in the CR/LSAA. However, according to the results of the Illinois Natural Areas Inventory (INAI), only three areas of savanna remain in the CR/LSAA in an undegraded to fairly undegraded condition (Table 6). One of the sites is a fairly high quality mesic savanna about 20 acres in size. Two larger areas are sand savannas; one is a dry sand savanna with about 111 acres in Grade-A condition (high-quality, undegraded) and about 10 acres in Grade-B (slightly degraded) condition, the second is a dry-mesic sand savanna with about 13 acres of Grade-A and about 19 acres of Grade-B savanna. Other areas of former savanna that have restoration potential are present in the Assessment Area and restoration activities have occurred at some sites in the region.

Wetlands - Natural wetlands in Illinois have declined from presettlement statewide estimates of about 23% of the land area to about 2.6% (Havera et al. 1994), or about 11% of the original total. Only about 6,000 acres remain in a high-quality condition (White 1978). This represents about 0.65% of the total remaining acreage, and only 0.07% of the original wetland area once present in Illinois (Havera et al. 1994). The approximately 5,401 acres (2.4%) of the CR/LSAA remaining as wetland is about 12.9% of original extent, and indicates that wetland loss in the Assessment Area is slightly less than statewide trends. In addition, the rates at which these wetlands are degrading appear to be less in the CR/LSAA compared with statewide trends. The Assessment Area contains a total of 1152.7 acres of wetland that remain in a relatively undegraded condition. This is about 21.3% of remaining wetlands and 2.8% of their original extent in the CR/LSAA.

The species richness of vascular plants within the CR/LSAA at the time of European settlement is unknown. About 1059 plant taxa have been reported from within the Assessment Area (Appendix 1). About 221 of these (20.9%) are non-native to the Assessment Area and most of these adventive species are not native to North America. This list should be considered an incomplete listing of species as it probably underestimates species richness of both native and non-native taxa in the CR/LSAA. This estimate of species richness compares to about 2,200 native taxa and 3,102 total taxa reported from Illinois (Mohlenbrock 1986). Based on available information, about 48.1% of the native vascular plants from Illinois occur in the CR/LSAA, an area only 0.62% of the area of the state. Much of the native diversity is captured in the 1.03% of the CR/LSAA that is high-quality natural area.

The extraordinary loss of most habitat types in the CR/LSAA also results in reduction in population sizes for species, particularly those sensitive to habitat degradation. As

populations decline in size, they become more likely to undergo local extinctions. Richness of native species probably has declined in the CR/LSAA since European settlement as a result of habitat destruction and degradation, reduced population sizes, and local extirpations; in contrast, non-native taxa have increased. At the statewide scale, prairie species appear to form a somewhat resistant species pool. Despite the tremendous loss of prairie habitat in Illinois, only about five taxa have been extirpated from the state; however, numerous prairie species now occur at low population levels in Illinois, and about 103 are listed as threatened or endangered (Taft 1995a).

Illinois Threatened and Endangered Species

Based on information from the Illinois Department of Natural Resources (IDNR) Natural Heritage database, 56 plant species listed by the Illinois Endangered Species Protection Board (IESPB) as threatened or endangered (T&E) are considered extant within the CR/LSAA (Table 9). Included are 18 state threatened and 38 state endangered plant species, which comprises 16.9% of the 331 endangered and threatened plant species in Illinois. Two of these listed species, prairie white-fringed orchid (*Platanthera leucophaea*) and Pitcher's (dune) thistle (*Cirsium pitcheri*) are listed by the U.S. Fish and Wildlife Service as federally threatened. Outside the CR/LSAA, but within the region shown in Figure 1 are records for an additional 22 T&E species. Three of these are also federally listed; the leafy prairie clover (*Dalea foliosa*) is listed as federally endangered, and the lakeside daisy (*Hymenoxux aucaulis* var. *glabra*) and prairie bush clover (*Lespedeza leptostachya*) are listed as federally threatened (Table 9). These data are based on Herkert (1991, 1994) and IESPB (1999), figures are based IESPB (1999).

This relatively high concentration of threatened and endangered species in the CR/LSAA is due to a combination of circumstances primarily attributed to: 1) the presence of many unique habitats that support a wide variety of associated species, 2) widespread habitat destruction/degradation, and 3) many taxa that occur at the edge of their distribution ranges. Habitats supporting the most T&E species in the CR/LSAA are those associated with sandy soils of the Lake Michigan Dunes Section and the Chicago Lake Plain. Most of the T&E species have ranges that are either very localized or occur primarily northeast, north, or east of Illinois (Table 9).

Table 9. Plant species listed by the Illinois Endangered Species Protection Board as threatened or endangered in Illinois that occur in or near the Chicago River/Lake Shore Assessment Area.

Common Name	Scientific Name	Status[1]	Habitat[2]	Range in U.S. & Vicinity of LDPRAA	EOR in[3]	EOR near[4]
American sloughgrass	*Beckmannia syzigachne*	SE	wet prairies	Boreal AK & Canada, so. into W & NC U.S. Found in Lake & Cook cos.	3	1

Table 9. Continued.

Common Name	Scientific Name	Status[1]	Habitat[2]	Range in U.S. & Vicinity of CR/LSAA	EOR in[3]	EOR near[4]
arbor vitae	*Thuja occidentalis*	ST	glacial till bluffs/ ravines, sandstone/ limestone cliffs, and forested fen	E. Canada & adj. NE U.S. In IL, known from Lake, Cook, Kane, & LaSalle cos.	6	-
balsam popular	*Populus balsamifera*	SE	Lake MI bluffs/sand dunes, streambanks, bog margins, mesic prairies	Boreal & subarctic Canada & AK, so. into N U.S. Extant pops. in Lake, Cook, & McHenry cos.	3	-
beaked rush	*Rhynchorspora alba*	ST	fens, bogs, interdunal swales along Lake Michigan	Circumboreal, so. into N U.S. Found in Lake, Cook, & McHenry cos.	1	-
bearberry	*Arctostaphylos uva-ursi*	SE	sand deposits, sand prairies and dunes, sandstone outcrops	Circumpolar, so. into N U.S. Known from Lake County.	2	-
bearded wheat grass	*Elymus trachyculus (Agropyron subsecundum)*	SE	mesic prairies, dolomite outcrops	S Canada & adj. N U.S., incl. N IL. Known from Lake, Cook, Winnebago cos.	3	1
blazing star	*Liatris scariosa* var. *nieuwlandii*	ST	silt-loam savanna	NE and NC U.S. Found in 8 cos. in IL, including Lake & Will.	-	1
bog bedstraw	*Galium labradoricum*	ST	bogs, fens, sedge meadows	E Canada and NE U.S. Known from Lake, McHenry, & Kane cos.	-	1
buffalo berry	*Sheperdia canadensis*	SE	calcareous bluffs, beach ridges & shores	Boreal Canada & AK, and adj. N U.S. Extant pops. in Lake Co. IL.	5	-
buffalo clover	*Trifolium reflexum*	SE	dry-mesic savannas, flatwoods, prairies	E and C U.S. and adjacent Canada. Extant pops. in 5 IL cos., including DuPage.	-	2
bulrush	*Scirpus hattorianus*	SE	open wetlands	NE U.S, N IL, and adjacent Canada. 2 extant pops. in DuPage Co.	-	1*, 2
capitate spike rush	*Eleocharis olivacea*	SE	dune swales, wet sands Atlantic Coastal Plain	NE U.S. & adj. Canada. Found in Lake Co.	1	-
club-spur	*Platanthera clavellata*	SE	mesic sand prairies & thickets, acidic forested seeps	E U.S. & adj. Canada. Known in IL. from Lake, Cook, Iroquois, & Pope cos.	1	-
clustered broomrape	*Orobanche fasciculata*	SE	dry sand prairies	W boreal Canada, so. into NW & NC U.S. Known only from Lake Co. in IL.	2	-
common bog arrow grass	*Triglochin maritimum*	ST	fens, interdunal swales	Circumboreal, so. into N U.S & Rocky Mnts. Located in Lake, McHenry, Kane, & Will cos.	2	1
Crawford's oval sedge	*Carex crawfordii*	SE	wet meadows, marshes, swamps, shores	Nf. to B.C., so. to WA, MN, NJ, N IL, mnts of TN. Found in Lake Co.	1	-
dog violet	*Viola conspersa*	ST	mesic forests & flatwoods	E Canada, so. into NE U.S. & Appalach. Extant pops. in 5 NE IL counties.	7	5*, 1
downy Solomon's -seal	*Polygonatum pubescens*	SE	mesic forests, wet-mesic forests, bluff ravines	NE U.S. & adj. Canada. Found in Lake, Cook, Winnebago, & Will cos..	5	1

Table 9. Continued.

Common Name	Scientific Name	Status[1]	Habitat[2]	Range in U.S. & Vicinity of CR/LSAA	EOR in[3]	EOR near[4]
downy willow-herb	*Epilobium strictum*	ST	calcareous bogs, fens, seeps	NE U.S. and adjacent Canada. Found in Lake & McHenry cos.	-	1
downy yellow painted cup	*Castilleja sessiliflora*	SE	dry-mesic gravel prairie, sand prairies	C U.S. & adj. Canada. Located in Lake, Stephenson, Winnebago, Lee, & Rock Island cos.	2	-
dune willow	*Salix syrticola*	SE	sand dunes of Lake MI & Lake Huron	Lakeshore dunes of the W Great Lakes. In IL, known only from Lake Co.	2	-
dwarf raspberry	*Rubus pubescens*	ST	mesic forested ravines bogs, fens, flatwoods	Boreal Canada, so. into NE U.S. & Rocky Mnts. In IL, known from Lake, Cook, DuPage, & Kane cos.	1	1*, 3
earleaf foxglove	*Tomanthera auriculata*	ST	disturbed prairies and savannas	Ohio to MN, so. to KS & MO. Known from 10 IL cos., including Lake & Cook.	-	3
false asphodel	*Tofieldia glutinosa*	ST	wetlands, fens, interdunal swales	C & E Canada, so. into E U.S. Exant pops. in Lake, Cook, & McHenry cos.	2	-
false golden sedge	*Carex garberi*	SE	calcareous beach ridges, swales, sandy soil	E Canada & adj. NE U.S. Found in Lake & Cook cos.	2	-
fern pondweed	*Potamogeton robbinsii*	SE	glacial lakes	Boreal Canada and adjacent N U.S. Found in Lake, Cook, & McHenry cos.	-	1
fewflower spike rush	*Eleocharis pauciflora*	SE	fens, calcareous dune swales	Greenland, E Canada, NE U.S. so. in the Rocky Mnts. Found in Lake, Cook, & McHenry cos.	-	1
flatleaf bladderwort	*Utricularia intermedia*	SE	bogs, fens, interdunal swales	Circumboreal, so. into NE U.S. Known from Lake, Cook, McHenry, & Kane cos.	1	-
forked aster	*Aster furcatus*	ST	seepage zones on N. facing wooded bluffs & banks	NE U.S. Found in 9 northern IL counties.	4	1*
golden sedge	*Carex aurea*	SE	interdunal swales, wet meadows, fens	Canada, so. into N U.S. Found in Lake & Kane cos	6	-
grass-leaved pondweed	*Potamogeton gramineus*	ST	lakes	Artic and boreal AK, Canada, & Greenland, so. into N U.S. and the Rocky Mnts. Found in Lake, Cook, & McHenry cos.	-	3
grass pink orchid	*Calopogon tuberosus*	SE	wet prairie, bogs, fens	E U.S. & adj. Canada. In NE cos of IL.	1	-
green yellow sedge	*Carex viridula*	ST	dune swales, marl flats, spring runs, wet calcareous sites	Boreal AK & Canada,adj. NE U.S. & in Rocky Mnts. Known from Cook, DuPage, McHenry, & Lake cos.	2	4
ground juniper	*Juniperus communis*	ST	Lake MI dunes, glacial till bluffs & ravines near lake shore	Circumpolar, so. into NE U.S. Extant pops. in Lake, Cook, & Winnebago cos. in IL.	8	-

Table 9. Continued.

Common Name	Scientific Name	Status[1]	Habitat[2]	Range in U.S. & Vicinity of CR/LSAA	EOR in[3]	EOR near[4]
grove bluegrass	*Poa alsodes*	SE	mesic forests, wooded bluffs/ravines, sandstone canyons	E Canada, so. into NE U.S. & Appalachians. Known from Lake, Pope, Jackson, & Calhoun cos.	2	1*
hairy white violet	*Viola incognita*	SE	flatwoods, forested fens, mesic river bluff forests	Boreal E Canada & adj. NE U.S. Known from Lake, Cook, & Jo Davies cos.	1	1*
Hill's thistle	*Cirsium hillii*	ST	dry prairies	S Ontario to Pennsylvania, west to MN and SD. Known from DuPage and 14 other IL cos.	-	1
horned bladderwort	*Utricularia cornuta*	SE	bogs, wet peaty sands, fens	E Canada, & adj. NE U.S. & SE Coastal Plain. Two pops. in IL persist in Lake & McHenry cos.	1	-
inland New Jersey tea	*Ceanothus herbaceus*	SE	sand prairies, sand savannas	EC & E U.S., & adj. Canada. Known from 5 northern cos. in IL.	1	-
jack pine	*Pinus banksiana*	SE	sand ridges, sandstone outcrops	Boreal Canada, so. into Great Lakes region. Few trees in Lake Co. IL.	1	-
Kalm's St. John's-wort	*Hypericum kalmianum*	SE	mesic sand prairies, shrub prairie, interdunal swales	Great Lakes region. Found in Lake & Cook cos. in IL, near Lake MI.	3	-
lakeside daisy	*Hymenoxus acaulis* var. *glabra*	SE,FT	dolomite prairies	Will & Tazwell cos. in IL; Ottawa Co, OH; Manitoulin Island & Bruce Peninsula, Ontario. Reintroduced in Will, Tazwell, and DuPage cos.	-	1
leafy prairie-clover	*Petalostemum foliosum (Dalea foliosa)*	SE,FE	mesic dolomite prairies	TN to AL; disjunct in IL. Extant pops. in DuPage & Will cos.	-	4
marram grass	*Ammophila breviligulata*	SE	beaches, open dunes	Atlantic Coast & Great Lakes shores. Restricted to Lake & Cook cos.	7	-
marsh speedwell	*Veronica scutellata*	ST	marshes, graminoid fens, wetlands	Circumboreal, so. into NE U.S. & Rocky Mnts. In IL, known from Lake, Cook, DuPage, Will, & Iroquois cos.	1	3*, 5
millet grass	*Milium effusum*	SE	openings in northern hardwood forests	E Canada and NE U.S. In IL, known only in Cook Co.	-	1
mountain blue-eyed grass	*Sisyrinchium montanum*	SE	mesic prairies	Boreal Canada & adj. N U.S. Found in Lake & Cook cos.	4	1*, 2
northern cranesbill	*Geranium bicknellii*	SE	rock outcrops, dry woodland openings, disturbed sites	C & E Canada, & adj. N U.S. Known from Lake & Cook cos.	2	1
northern grape fern	*Botrychium multifidum*	SE	successional habitats, mesic forests, sand savannas	Circumboreal, so. into Rocky Mnts. and N U.S. Known from 6 cos in IL including Cook.	-	1
oval milkweed	*Asclepias ovalifolia*	SE	mesic & sand prairies, northern sand savannas	NC U.S & adj. Canada. In IL, known from Cook County.	1	-

Table 9. Continued.

Common Name	Scientific Name	Status[1]	Habitat[2]	Range in U.S. & Vicinity of CR/LSAA	EOR in[3]	EOR near[4]
pale false foxglove	*Agalinis skinneriana*	ST	loess hill prairies, sand prairies	SW Ontario to OH, WI, MO, & KA. Extant in 7 cos. in IL, including Lake & Cook.	2	-
pale vetchling	*Lathyrus ochroleucus*	ST	dolomite canyon, upland savannas, woodland	Boreal Canada, so. into NE U.S. Extant pops. in 4 counties in N IL.	3	1*, 3
Pitcher's (dune) thistle	*Cirsium pitcheri*	ST, FT	dune systems of Lake MI (reintroduced)	Foredunes & beaches of W Grt Lakes & E NAm. Known from Lake Co.	1	-
prairie bush-clover	*Lespedeza leptostachya*	SE,FT	dry gravel & sand prairies	IL, WI, IA, and MN. Found in 6 N IL cos, including Lake, McHenry, & DuPage.	-	2
prairie white-fringed orchid	*Platanthera leucophaea*	SE,FT	mesic to wet prairies	EC & E U.S., also Ontario. Scattered in N1/2 of IL., mainly NE.	11 11	1*, 8
pretty sedge	*Carex woodii*	ST	mesic, calcareous forests	NE U.S. and adjacent Canada. Known from Lake, Cook, Winnebago, and Jo Davies cos.	-	2*, 6
purple flower raspberry	*Rubus odoratus*	SE	forest openings and ravines near Lake MI, disturbed areas	E Canada, so. into NE U.S. & Appalachians. Known from Lake, McHenry, & Kane cos. in IL.	2	-
purple-fringed orchid	*Platanthera psycodes*	SE	flatwood openings, mesic sand prairies, low woods, bogs	Boreal E Canada, so. into NE U.S. & Appalachians. Few pops. in Lake Co. in IL.	1	2*, 2
queen-of-the-prairie	*Filipendula rubra*	SE	fens, mesic sand prairies, seeps	E U.S. Known pops. occur in 7 IL cos., inlcuding Cook & McHenry.	-	1
Richardson's rush	*Juncus alpinus*	SE	fens, interdunal swales, moist sand prairies,	Circumpolar, so. into N U.S. Known from Lake, Cook, McHenry, & DuPage cos.	1	2
round-leaved sundew	*Drosera rotundifolia*	SE	sphagnum bogs, wet peaty sand	Circumpolar, E & W U.S. Known from Lake, Cook, & McHenry cos.	1	-
savanna pinweed	*Lechea intermedia*	ST	dry, sterile, generally sandy soils	NE U.S. & adj. Canada. Found in 5 northern IL cos.	1	-
sea rocket	*Cakile edentula*	ST	open beaches & sand dunes on Lake MI	Atlantic Coast, Great Lakes shores, Iceland, Azores. In IL on Lake MI shores in Lake and Cook cos.	10	1*
seaside crowfoot	*Ranunculus cymbalaria*	SE	brackish shores, occ. freshwater; disturbed sites	Circumboreal, so. into NE & C U.S. to Mexico. Known from Lake Co.	2	-
seaside spurge	*Chamaesyce polygonifolia*	SE	beach, foredunes of . Lake MI	Atlantic Coast & Great Lakes shores. Known only from Lake Co. in IL.	7	-
shadbush	*Amelanchier interior*	SE	bogs, sand or dolomite stream bluffs, sand forests	WI, MN, IL, IA, SD. Known from Lake, DuPage, Winnebago, & Jo Davies cos.	-	2

Table 9. Continued.

Common Name	Scientific Name	Status[1]	Habitat[2]	Range in U.S. & Vicinity of CR/LSAA	EOR in[3]	EOR near[4]
shadbush	*Amelanchier sanguinea*	SE	wooded bluffs of rivers and lakes	NE U.S. & adj. Canada., so. into Appalachians. Known from Cook, Kane, Lake, and LaSalle cos.	1	-
slender sandwort	*Arenaria patula (Minuartia patula)*	ST	rock ledges, dolomite prairies	SE U.S. Pops. in Cook, DuPage, Will, Kendall, & Grundy cos.	-	3
slender bog arrow grass	*Triglochin plalustris*	ST	spring runs in fens, interdunal swales	Circumpolar, so. into N U.S. & Rocky Mnts. Small pops. in Lake, Cook, McHenry, & Will cos.	2	1
small bladderwort	*Utricularia minor*	SE	bogs, calcareous floating mats, fens, interdunal swales	Circumpolar, so. into N U.S. Extant pops. in Lake, Cook, & McHenry cos.	1	-
small sundrops	*Oenothera perennis*	ST	sand & gravel prairies; dry rocky prairie slopes & knobs	E U.S. & adj. Canada. Known from Lake, Cook, & Winnebago cos.	7	4
spotted coral-root orchid	*Corallorhiza maculata*	ST	mesic northern forests	S Canada, so. into NE U.S. and the Appalachians. Found in DuPage, Will, McHenry, & Winnebago cos.	-	1
swollen sedge	*Carex intumescens*	ST	forested wetlands	E U.S. & adj. Canada. In IL, extant pops. in Cook Co. and in the far south Johnson & Pulaski Cos.	2	-
tamarack	*Larix laricina*	ST	bogs, forested fens	Subartic and boreal Canada, so. into NE U.S. and N IL. Extant pops. in Lake & McHenry cos.	-	1
Tennessee milk-vetch	*Astragalus tennesseensis*	SE	dolomite & dry gravel prairies	TN, AL, & IL. Extant pops. In DuPage & Tazwell cos.	-	1
trailing juniper	*Juniperus horizontalis*	SE	sand dunes	Subarctic & boreal Canada, so. into N U.S. Known from Lake Co.	2	-
tubercled orchid	*Platanthera flava* var. *herbiola*	SE	wet-mesic sand prairies & thickets	NE U.S. & adj. Canada. Known from 6 counties in N1/2 of IL.	2	1*, 1
Tuckerman's sedge	*Carex tuckermanii*	SE	flatwoods, wet-mesic forests	NC U.S. and no. to adjacent Canada. Known from Lake, Cook, and DuPage cos.	-	2*, 6
weak bluegrass	*Poa languida*	SE	mesic upland forests	NE U.S. & adj. Canada. One IL pop. known in Lake Co.	1	-
white lady's slipper	*Cypripedium candidum*	ST	wet-mesic prairies, fens	NC and NE U.S. Found in 7 IL cos, including Lake & Cook.	-	10

[1] SE = state endangered, ST = state threatened, FT = federally threatened, FE = federally endangered.

[2] Habitats listed focus on Illinois occurrences. For Illinois distribution, only presumed extant populations are considered.

[3] EOR in = Element Occurrence Record. The number of populations known to occur within the Chicago River/Lake Shore Assessment Area. Information from the Illinois Natural Heritage Database (Illinois Department of Natural Resources 1999).

[4] EOR near = Element Occurrence Record. The number of populations known to occur outside the Chicago River/Lake Shore Assessment Area but within the area mapped in Figure 2. * = population occurs within one mile of boundary. Information from the Illinois Natural Heritage Database (Illinois Department of Natural Resources 1999).

Disturbance, Habitat Quality, and Restoration Potential

As is the situation across most of Illinois, habitat loss has been extensive within the CR/LSAA. Most plant communities remaining in the Assessment Area also have experienced anthropogenic disturbances resulting in habitat degradation to different degrees. Fragmentation, fire absence, and exotic species introductions are other typical consequences of intensive habitat conversion that have implications for habitat restoration potential. These issues are discussed below.

Disturbance is a general term referring to any perturbation. Plant communities (or ecosystems) are **degraded** when recovery to original condition is unlikely under normal circumstances. Degraded lands can be distinguished further by 1) those that can be *restored* to original condition through management efforts, 2) those which, at best, can be *reclaimed* for only limited use in severe examples (e.g., strip mining), or *rehabilitated* to a condition somewhat similar to the original but where compositional differences remain (Lovejoy 1975). Degraded lands are *derelict* when land uses become very limited (Brown and Lugo 1994). Perturbations that exceed the intensity, frequency, or duration of the natural disturbance regime can result in loss of species lacking tolerance or adaptations to the new levels. When certain "keystone" species, or assemblages of other taxa, are extirpated from a community, the system's capability for restoration is diminished and integrity is lowered. A common source of degradation in Illinois plant communities is overgrazing, and more recently, encroachment by invasive species; however, multiple factors often are interacting.

Fragmentation is a process describing landscape patterns where habitat remnants become isolated by landcover conversions. Fragmented habitats often undergo alterations in many environmental conditions. Increased surface area of edge compared to volume in forest communities can result in changes in soil moisture conditions and levels of solar radiation, as well as increased opportunity for exotic species invasions and wind damage. Fragmented habitats, typically, support fewer species and species at lower population levels compared to less fragmented habitats. Species at lower population levels are more prone to undergo local extirpation. Other effects of fragmentation include interruption of species migration patterns. Consequently, high levels of fragmentation limit the recovery potential of degraded sites since species immigration, needed to compensate for the local extirpation of taxa with low population levels, is seriously challenged (Taft 1996a, 1997a). Fragmentation also results in alterations in natural disturbance regimes such as fire.

Fire is an example of a large-scale natural disturbance in many Midwestern plant communities and fire frequency is an important determining factor for many community characteristics. The compositional and structural characteristics of many native Illinois plant communities demonstrate some level of fire dependency. Fire absence in these communities can result in profound changes in community characteristics that lead to reduced diversity. For example, vegetational changes common throughout Illinois such as from prairie to shrub thicket or forest, or oak-dominated woodland to maple-dominated forest, are attributable to reduced fire frequency and fire absence.

Exotic species (non-native or adventive taxa) introductions also often result in lowered integrity. Adventive taxa in a system may be sorting into disturbance or habitat niches that result in the replacement of native taxa. The establishment of adventive taxa can result in arrested development and interfere with rates of recovery processes. The recovery potential of plant communities with appropriate ecological restoration and management is an area of much needed additional research. Specific and general recommendations for restoration of natural communities in the CR/LSAA, including exotic species control measures, are offered in the Summary and Recommendations section following descriptions of natural vegetation communities.

Natural Areas and Nature Preserves

The Illinois Natural Areas Inventory (INAI) was conducted over a three-year period during the mid 1970s to document remaining significant and exceptional examples of the natural communities and other features in Illinois (White 1978). The INAI established seven categories of natural areas based on significant features. The categories are: I - High Quality Natural Communities; II - Habitat for Endangered Species; III - Habitat for Relict Species; IV - Outstanding Geological Areas; V - Approved Natural Areas and Restoration Sites; VI - Unique Natural Areas; and VII - Outstanding Aquatic Areas. The INAI established a grading system to rank natural quality (White 1978). The natural quality of a community or area was graded as "A" (relatively stable or undisturbed), "B" (late successional or lightly disturbed), or "C" (mid-successional or moderately to heavily disturbed). Grades "D" (early successional or severely disturbed) and "E" (very early successional or severely disturbed) were used for land within a natural area that is used as a buffer for protection of the significant or exceptional feature. In general, only grade "A" or "B" communities are designated as significant or exceptional features, although many natural areas include some Grade C-quality habitats. The estimates and comparisons of natural areas within the CR/LSAA and statewide are based on the best available data. In some cases, comparisons are made using recent data for natural communities within the Assessment Area and comparing to statewide data that are from White (1978) and thus over 20 years old. Consequently, if discoveries of natural areas do not equal area of recently degraded or destroyed natural areas, some data for trends among natural areas may be slightly over or under estimated.

The CR/LSAA harbors an abundance of high quality natural areas and communities. According to the Illinois Natural Areas Inventory (White 1978), Lake and Cook counties contain by far the greatest number of natural areas and significant features of all counties in Illinois. Pope County, in southern Illinois, is the only other county of close comparison. Thirty-four natural areas (11 of which include Illinois Nature Preserves) occur within the CR/LSAA boundaries (Table 5, Figure 11). Sixteen of these are Category I (high-quality, essentially undegraded) sites and ten of these include populations of species listed by the IESPB as threatened or endangered. An additional 17 sites are Category II natural areas (contain threatened and endangered species but no high-quality natural communities). Four more Category I sites (2 of which include T&E species) and four Category II sites occur within a 1-mile buffer area just outside the boundaries of the CR/LSAA.

Among the sixteen Category I sites identified within the CR/LSAA are 47 occurrences of 24 different natural community types (some Category I sites have multiple high-quality natural communities). The Grades A and B portions of the Category I natural areas comprise a total of about 2,299.7 acres (Table 6), or about 1.03% of the total area of the CR/LSAA. This compares to 0.07% of Category I acreage for the entire state (White 1978). One of the Category I sites includes a 51-acre Grade C sand flatwoods. This community is recognized as a Category I natural area because sand flatwoods are extraordinarily rare and even Grade C sites, many of which have restoration potential, are significant. However, these Grade C acres were not included among the totals used for comparison with statewide trends.

The high-quality natural communities within the CR/LSAA include remnants of several different prairie community types (i.e., mesic prairie, wet-mesic prairie, wet prairie, dry sand prairie, dry-mesic sand prairie, mesic sand prairie, wet sand prairie, mesic gravel prairie), as well as numerous other community types (i.e. dry-mesic upland forest, mesic upland forest, dry sand savanna, dry-mesic sand savanna, mesic savanna, marsh, graminoid fen, sedge meadow, panne, pond, great lake, eroding bluff, beach, and foredune [Table 6]).

Comparison of the area of Category I natural communities in relation to the total remaining in Illinois for each community type is summarized in Table 6 and described in the following report section Terrestrial Natural Community Descriptions. An additional 54 natural areas (Table 5) occur outside the CR/LSAA boundary but within the region included in Figure 1. Ten of these occur within a one-mile buffer zone around the CR/LSAA boundary.

Nature preserves are areas of land or water in public or private ownership that are formerly dedicated to receive maximum protection of significant natural features. The central goal of the nature preserve system, currently with about 293 preserves in the state, is to protect and preserve examples of all significant natural features found in Illinois for the purposes of scientific research, education, conserving biodiversity, and esthetic enjoyment. Nature preserves are administered primarily by the Illinois Nature Preserves Commission (INPC). Preserves usually are the shared responsibility of the INPC, the Illinois Department of Natural Resources, and land owners (McFall and Karnes 1995).

There presently are eleven nature preserves within the CR/LSAA (Table 7, Figure 11) totaling 1,868.25 acres (about 0.84% of the CR/LSAA). One of the preserves (Kennicott's Grove) occurs on the CR/LSAA boundary with portions included inside the Assessment Area and the remainder falling within the one-mile buffer zone. Preserves occur in both Lake and Cook counties. Twenty-four additional nature preserves occur outside the CR/LSAA but within the area shown in Figure 1. Three of these occur just one mile from the boundary of the Assessment Area (Table 7 , Figure 11). The brief descriptions below are summaries from McFall and Karnes (1995) and unpublished INPC nature preserve dedication proposals (Byers 1991, 1994; Duntemann, Masi, and Byers 1995). Additional acreage occasionally is added for individual preserves; the data presented are based on best available information. These nature preserves are floristically very rich because the sites

generally include a great variety of habitat conditions related to the different soil parent materials and different levels of available soil moisture. Several sites are associated with the dune and swale topography found in portions of the Chicago Lake Plain and the Lake Michigan Dunes Section.

Florsheim Park (Lake County) - This nature preserve is a 41.7-acre site containing high quality remnants of four different natural communities (wet-mesic prairie, sedge meadow, northern flatwoods, and dry-mesic forest). Nearly 250 species can be found on site, including the federally endangered eastern prairie-fringed orchid and three state listed species.

Glenbrook North High School Prairie Nature Preserve (Cook County) - This site is an approximately 1.5 -acre remnant of mesic black soil prairie. Some common prairie plants that can be found here include northern dropseed, sky blue aster, alumroot, and stiff-leaved goldenrod.

Highmoor Park Nature Preserve (Lake County) - Highmoor Park is a 16-acre mosaic of prairie (mesic, wet-mesic, and wet), sedge meadow, and savanna (mesic and wet) communities. It is owned by the Park District of Highland Park and adjoins the Hybernia Nature Preserve.

Hybernia Nature Preserve (Lake County) - Hybernia is a 24.5-acre site that is contiguous with Highmoor Park Nature Preserve and features a similar integrated landscape of prairie, wetland, and savanna communities.

Illinois Beach Nature Preserve (Lake County) - On October 16, 1964 Illinois Beach became the first Nature Preserve to be dedicated in Illinois. It was designated as a National Natural Landmark in 1980. This 1,087-acre site lies within the Lake Michigan Dune Section of the Northeastern Morainal Natural Division and incorporates the dunes and interdunal swales that occur along the northern Illinois shores of Lake Michigan. It is one of the richest, most biologically diverse areas in Illinois supporting more than 500 plant species and a large variety of animal species. Natural communities present include a variety that are adapted to the unique lakefront environment, including lakeshore, foredune, sand prairie, sand savanna, fen, panne, sedge meadow, marsh, and pond.

Kennicott's Grove Nature Preserve (Cook County) - This 55.6-acre site is a one of the few surviving remnants of an Illinois prairie grove. It supports two distinct plant communities, an upland oak woodland and shallow depressions that maintain unique wetland communities. The grove has a rich historical significance, once supporting such families as the Kennicotts, Peatties, and Redfields, all of who provided significant contributions toward the appreciation of natural history of Illinois.

Morton Grove Prairie Nature Preserve (Cook County) - Morton Grove Prairie is a 2.45-acre remnant of the mesic and wet-mesic tallgrass prairie that was once typical in the Chicago Lake Plain Section of the Northeastern Morainal Natural Division. This preserve

is located in an urban setting where it provides endless educational opportunities for many who may not otherwise get to experience a prairie community.

North Dunes Nature Preserve (Lake County) - This large (240-acre) and diverse site occurs along the northeastern Illinois shores of Lake Michigan. It contains wetland, prairie, savanna, and beach communities representative of the Lake Michigan Dunes Section of the Northeastern Morainal Natural Division, including the unique panne community that is restricted to the Lake Michigan shoreline.

Skokie River Nature Preserve (Lake County) - Situated along both sides of the Skokie River, this 115-acre preserve protects remnants of wetlands, mesic and wet-mesic prairies, and woodlands that once covered the valley between the Highland Park Moraine and the Blodgett Moraine. The most outstanding of these is a 15-acre remnant of a very high quality mesic prairie. Referred to locally as Shaw's Prairie and Woods, this portion of the preserve has never been plowed and only lightly grazed. It remains in nearly as pristine a condition as when Mr. Shaw first acquired and preserved the area in the early 1900s.

Somme Prairie Nature Preserve (Cook County) - Once largely overgrown in brush, this 71-acre site now provides marsh, wet prairie, mesic prairie, and oak savanna habitats that support a rich assemblage of plants including 3 state-listed T & E species.

Spring Bluff Nature Preserve (Lake County) - This 213-acre preserve occurs in the Lake Michigan Dunes Section of the Northeastern Morainal Natural Division. Similar to the Illinois Beach and North Dunes nature preserves, Spring Bluff contains natural communities that are adapted to the beach ridge and dune habitats characteristic of this Natural Division. It supports several state listed plant species in a wide diversity of high quality communities, including sand savanna, marsh, great lake, panne, graminoid fen, sedge meadow, as well as several types of prairies and sand prairies.

Terrestrial Natural Community Descriptions

The natural communities within the CR/LSAA (Table 10) were determined by examining data from several sources. Sources for confirming occurrence of natural communities include descriptions of presettlement vegetation (e.g., Moran 1978, Hanson 1981), descriptions of existing community types, and plant communities inferred to occur (or have occurred) based on availability of particular environmental conditions. Published descriptions of vegetation in the Assessment Area are limited in number (e.g., Paintin 1928, Moran 1978, Hanson 1981) or are too general or regional in scope to provide detailed community descriptions (e.g., Higley and Raddin 1891; Cowles 1899, 1901a, 1901b; Clute 1911, 1912; Kurz 1923; Pepoon 1927; Buhl 1934; Fuller 1935; Kilburn 1959, Stearns and Kobringer 1975, Lynn 1982). *Plants of the Chicago Region* (Swink and Wilhelm 1994), an indispensable botanical resource for the several county (and state) Chicago region, provides detailed lists of typical associate species for each taxon, though with the greater regional scope. It also provides county distribution maps for each species, well-written

keys to identification, and a regional overview of habitat types. Specific data sources used for the following accounts include database records on community types found in natural areas (IDNR Natural Heritage database records), descriptions from the Illinois Natural History Herbarium collection records, descriptions of vegetation in unpublished technical reports (Robertson and Phillippe 1993), unpublished reports prepared for the Illinois Department of Transportation (IDOT) (Taft 1990, 1993, 1994a, 1994b, 1994c, 1995b, 1996b, 1997b, 1997c, 1997d), and community descriptions and species lists in nature preserve proposals (Madany and Paulson 1973, Paulson 1979, Picken and Paulson 1981, Heidorn 1986, Byers 1991, Byers and Arient 2000, Christy and Byers 1992, Duntemann et al. 1995). Numerous individuals have contributed to site and community descriptions by compiling plant species lists from natural areas and other projects within the CR/LSAA. Individuals contributing to these species lists include: Steve Apfelbaum, Steve Byers, Brad Semel, Marlin Bowles, Gerald Paulson, Floyd Swink, John Taft, and Gerould Wilhelm.

Community classification used in the descriptions below follows White and Madany (1978). Botanical nomenclature generally follows Mohlenbrock (1986) with the notable exception of panic grasses (*Dichanthelium* included within *Panicum*). Scientific names corresponding to the common names used in this text and expected habitats of occurrence for each taxon are included in the summary species list (Appendix 1); an alphabetical listing by scientific name with corresponding common name is included in Appendix 2.

Forest

Much of the CR/LSAA occurs in the narrow band on the west shore of Lake Michigan that Braun (1950) considered a modified part of the eastern Beech/Maple Forest Region. Braun noted that a gap in the distribution of American beech in northeastern Illinois indicated a lack of this species from the mesophytic forests in much of this area. Beech is very scarce within the CR/LSAA, but a few spontaneous individuals can still be found in wooded ravines near Fort Sheridan and Highland Park (Swink and Wilhelm 1994). Most of the forests now present in the Assessment Area are compositionally and ecologically distinct from the eastern mesophytic forests, possibly representing a transition between the mesophytic Beech/Maple forest region and the drier Prairie Peninsula Section of the Northern Division of the Oak-Hickory Forest Region, to which the majority of Illinois belongs.

Forests in the CR/LSAA occur primarily as groves associated with dissected terrain in the Morainal and Lake Michigan Dunes sections or in association with major waterways and wetlands, situations which may have provided a level of protection from presettlement prairie fires (Meyer 1950, Hanson 1981, IGIS database using GLO records, Figure 5). Most of the current forest has developed where formerly there was prairie or savanna while forest areas have been destroyed. These changes yield about a 44.1% decrease in total forest cover from the estimated presettlement total. Approximately 29,645 acres of the originally estimated 52,983 forested acres remain. Some of the areas classified in satellite imagery as forest cover may be residential (Figures 4 and 5).

Table 10. Terrestrial natural communities known or believed to have formerly occurred in the Chicago River/Lake Shore Assessment Area.[1]

FOREST	**PRAIRIE**	**WETLAND**
Upland forest	**Prairie**	**Marsh**
dry-mesic upland forest	dry-mesic prairie	marsh
mesic upland forest	mesic prairie	**Swamp**
wet-mesic upland forest	wet-mesic prairie	shrub swamp
Sand forest	wet prairie	**Bog**
dry sand forest	**Sand prairie**	tall shrub bog
dry-mesic sand forest	dry sand prairie	low shrub bog
wet sand forest	dry-mesic sand prairie	**Fen**
Floodplain forest	mesic sand prairie	graminoid fen
mesic floodplain forest	wet-mesic sand prairie	**Sedge meadow**
wet-mesic floodplain forest	wet sand prairie	sedge meadow
wet floodplain forest		**Panne**
Flatwoods	**LAKE & POND**	panne
northern flatwoods	**Pond**	**Seep & Spring**
sand flatwoods	pond	seep
	Lake	
SAVANNA	lake	**CULTURAL**
Savanna	great lake	cropland
dry-mesic savanna		pastureland
mesic savanna	**PRIMARY**	successional field
wet savanna	**Cliff**	developed land (urban)
Sand Savanna	eroding bluff community	tree plantation
dry sand savanna	**Lake shore**	artificial pond
dry-mesic sand savanna	beach	artificial lake
	foredune	prairie restoration
		wetland reconstruction

[1] Adapted from the Illinois Natural Areas Inventory's community classification (White and Madany 1978).

Forest subclasses in Illinois include Upland forest, Floodplain forest, Sand forest, and Flatwoods (White and Madany 1978) and all occur, or formerly occurred, in the CR/LSAA. Community types within each subclass are described briefly below. Of the existing forest in the CR/LSAA, 292 acres remain in a state of high ecological integrity, (White 1978; IDNR Natural Heritage Database; IGIS data). In addition, some existing forest stands have restoration potential with appropriate protection and management (see section on Summary and Recommendations).

Common ecological problems (i.e., threats to habitat integrity) associated with forest communities, in general, include fragmentation, exotic species invasions, fire absence, particularly in upland forests and flatwoods, and altered hydrology and increased siltation in floodplains. All of these factors can result in habitat degradation. A typical source of habitat degradation in Illinois forests is overgrazing, not only by domestic livestock but also by white-tailed deer browsing, which in recent years have increased substantially in

numbers (Anderson 1997). This grazing/browsing often produces changes in forest compositional and structural characteristics. Like in much of Illinois, grazing-sensitive species may have been eliminated from some forest remnants in the CR/LSAA. In contrast, species that increase with grazing (e.g., thorn-bearing taxa [e.g., downy hawthorn, honey locust, Missouri gooseberry, and *Rubus* spp.], exotic species [e.g., multiflora rose, shrub honeysuckles, and garlic mustard], and certain weedy native species) are often abundant in grazed forests. In many cases, abundance of exotic species appears to be directly proportional to the historic grazing intensity. Recovery of these sites following cessation of grazing appears to be slow. In the Chicago region, even sites that have not been degraded severely by past grazing are infested with numerous exotic species. Some of these are particularly abundant and pernicious and represent great threats to the long-term sustainability of biodiversity in the region. Complete restoration of these degraded sites may not be possible without intensive management including efforts at reintroduction of native species. Finally, fire absence in upland forest communities typically results in compositional and structural changes in more mesic sites and primarily structural changes in drier sites, such as increases in both stem density of woody plants and shade. The result often is a reduction in cover and diversity of the herbaceous ground flora, typically the most diverse stratum in Illinois woodlands (e.g., Taft et al. 1995).

Upland Forest - The total extent of upland forest in the CR/LSAA is estimated to be about 28,022 acres (Table 2), or about 12.9 % of the total Assessment Area (IGIS data). Upland forest communities can be classified further into community types according to soil-moisture characteristics. *Xeric, dry, dry-mesic, mesic*, and *wet-mesic upland forest* communities are recognized in Illinois in context with increasing available soil moisture (White and Madany 1978). Major tree species respond in predictable ways along these soil-moisture gradients (Adams and Anderson 1980, Fralish 1994, Taft et al. 1995). The following community types occur or are suspected to have occurred in the CR/LSAA.

Dry-mesic upland forest - Dry-mesic upland forest occurs in the CR/LSAA primarily on the upper slopes and ridges of the dissected terrain bordering the major streams and rivers associated with the Lake Border Moraine, particularly the North Branch of the Chicago River and Skokie River. The total extent in the CR/LSAA is unknown, but most of it occurs in the Morainal Section and the Lake Michigan Dunes Section (Figure 3). Five areas of dry-mesic upland forest (totaling 195 acres) remain in the Assessment Area that still meet the criteria for Category I (Grades A or B) natural areas for the INAI. These criteria include: forest stands must be at least 90 years old, greater than 20 acres, and in a nearly undegraded condition (White 1978). The high quality remnants are located within 5 different natural areas in the Lake Bluff and Fort Sheridan vicinities and represent 11% of Illinois total high quality dry-mesic upland forests.

Dominant **canopy** species for dry-mesic upland forests in the CR/LSAA are white oak, red oak, sugar maple, and sometimes shagbark hickory. In general, although these species rarely form pure stands, red oak and sugar maple occur most frequently on lower-to-mid slope positions while white oak occurs most frequently on the upper slopes and nearly level to rolling uplands. Occasional canopy species include black oak, bur oak, Hill's oak (see

discussion regarding this species in Swink and Wilhelm 1994), shagbark hickory, and white ash. Common to occasional **subcanopy** species include sugar maple, serviceberry, hop hornbeam, white ash, black cherry, hawthorns (e.g., *Crataegus pruinosa*), witch hazel (local), and slippery elm. Typical **shrubs** include gray dogwood, American hazelnut, pasture rose, choke cherry, dwarf honeysuckle, red honeysuckle (rare), Missouri gooseberry, black haw, and black raspberry. Non-native shrub species can be numerous and abundant (see below). Woody vines include poison ivy, Virginia creeper, upright carrion flower, and riverbank grape.

Characteristic herbaceous **groundcover** species include: upland hog-peanut, wood anemone, tall anemone, pussytoes, wild sarsaparilla, Drummond's aster, Short's aster, yellow false foxglove, wild geranium, horsemint, starry false Solomon's seal, short-leaved bracted sedge, Pennsylvania sedge, curly styled wood sedge, woodland brome grass, shooting-star, shining bedstraw, large-flowered trillium, common cinquefoil, black snakeroot, Canadian black snakeroot, spinulose shield fern, elm-leaved goldenrod, and yellow pimpernel.

The major ecological problems associated with dry-mesic upland forests in the CR/LSAA are degradation from grazing (past grazing by domestic stock, present grazing by large deer herds), habitat fragmentation, elimination of natural regional disturbance regimes (i.e., fire), and invasion by non-native species. Though White and Madany (1978) did not recognize woodland as a separate subclass of forest, dry-mesic upland forests in the CR/LSAA could be classified as *dry-mesic woodland* to emphasize the structurally intermediate form between forest and savanna that presumably was characteristic of some sites prior to the alteration of the regional fire regime during the post-settlement era. Fire absence also can lead towards an increased importance of sugar maple in the canopy and subcanopy strata and potentially lesser importance of oaks in the canopy. Where oaks have been removed by selective logging practices, black cherry, shagbark hickory, slippery elm, white ash, and possibly sugar maple are among the species that can gain prominence in the canopy. Non-native species in dry-mesic upland forest include garlic mustard, common privet, Canada bluegrass, multiflora rose, Japanese barberry, various bush honeysuckles, common buckthorn, and European high-bush cranberry. The latter three taxa (group of taxa including the bush honeysuckles) and garlic mustard are among the most pernicious species and, because of their great abundance, form some of the most challenging exotic species problems in Illinois and North America.

Mesic upland forest - Mesic upland forests primarily are found in ravines, north-facing slopes, lower slopes on other than north-facing aspects, and on high terraces of the major streams and tributaries. The total extent of mesic upland forest in the Assessment Area is unknown. Three areas of high quality mesic forest (97 acres) remain in the CR/LSAA, one in the Morainal Section of the Northeastern Morainal Natural Division, and two in the Lake Michigan Dunes Section. These remnants occur within 3 of the 5 natural areas that also contain high quality dry-mesic forests. The quality of some other mesic forests occurring in the CR/LSAA has the potential to improve as stand age matures.

Species composition is relatively rich, often with numerous taxa at each forest stratum and sometimes no species are dominant. Characteristic **canopy tree** species include sugar maple, basswood, and red oak. Occasional species include shagbark hickory, white ash, black walnut, and bur oak. American beech can still be seen in a few wooded ravines near Fort Sheridan and Highland Park. Common **subcanopy** species include sugar maple, blue beech, frosted hawthorn, witch hazel, ironwood, black cherry, choke cherry, and slippery elm. Numerous native **shrub** species typically are present including: gray dogwood, black raspberry, maple-leaved arrowwood, black haw, dwarf honeysuckle, red honeysuckle, poison ivy, Missouri gooseberry, low shadbush, and prickly ash. **Woody vines** include Virginia creeper, upright carrion-flower, common carrion-flower, poison ivy, and riverbank grape. **Herbaceous groundcover** composition includes a rich assortment of species, particularly spring ephemerals. Selected taxa reported from the CR/LSAA include: interrupted fern, rattlesnake fern, soft agrimony, tall agrimony, wild leek, wild garlic, wood anemone, tall anemone, white bane berry, red baneberry, spikenard, Jack-in-the-pulpit, poke milkweed, big-leaved aster, Pennsylvania sedge, enchanter's nightshade, blue cohosh, spring beauty, wild yam, nodding fescue, shining bedstraw, wild geranium, white avens, white snakeroot, sharp-leaved hepatica, Virginia waterleaf, Canada mayflower, smooth sweet cicely, woodland phlox, mayapple, lopseed, common cinquefoil, bloodroot, black snakeroot, sanicle black snakeroot, late figwort, starry campion, false Solomon's seal, great Solomon's seal, broad-leaved goldenrod, early meadow rue, bellwort, and downy yellow violet.

The major ecological problems associated with mesic upland forests are degradation from grazing, habitat fragmentation including residential developments, and exotic species invasion. Among the more abundant exotic species within mesic upland forest include the shrubs multiflora rose, Japanese barberry, common buckthorn, glossy buckthorn, European high-bush cranberry, the bush honeysuckles (especially *Lonicera maackii*), and the herb garlic mustard. The latter four taxa are extremely pernicious ecologically and pose among the most severe threats to community integrity in the Assessment Area and Illinois. Dame's rocket (*Hesperis matronalis*) is an exotic herbaceous species that occurs in the region and appears to fit the model of a potentially serious invasive pest in mesic upland and floodplain forest systems. This attractive and fragrant species easily escapes from cultivation and may become a more serious pest within the CR/LSAA. Mesic upland forests are highly localized in the Assessment Area. They occur in somewhat protected locations; such as bordering natural fire breaks, ravines, or on lower slopes adjacent to floodplains. Consequently, natural fires may have been relatively infrequent compared with other upland forest communities. Because mesic upland forests are less dependent on periodic fire, compared with dry-mesic upland forest, the effects of fire absence are less pronounced. The canopy composition tends to be more stable without fire intervention compared with dry-mesic upland forest, and harm can occur to many of the less fire-tolerant species that are common in mesic upland forests should fires occur too frequently or with high intensity.

Wet-mesic upland forest - In northeastern Illinois, this forest community type occurs in the Morainal Section where there are localized drainage limitations within upland forest.

Often, drainage is limited by a slowly permeable subsoil horizon. Areas of seepage also may contribute to locally saturated soils and can support this natural community. Where depressions occur in an upland forest, ponding may occur for variable periods. No high-quality remnants have been identified within the CR/LSAA and it is unclear if this community type is present in the Assessment Area. Local areas of this community type may occur in the morainal section and the Lake Michigan section of the Assessment Area.

The most characteristic **canopy** species in this community type is swamp white oak; occasional species can include red oak, white oak, bur oak, pin oak, sugar maple, and basswood. A **subcanopy**, when present, can include shagbark hickory, slippery elm, white ash, green ash, silver maple, trembling aspen, and hop hornbeam. **Shrubs** include buttonbush (often forming a ring around pothole depressions), gray dogwood, downy hawthorn, black haw, southern arrowwood, and meadowsweet. **Woody vines** may include Virginia creeper, poison ivy, and riverbank grape. Herbaceous **groundcover** species can include fowl manna grass, common water horehound, common wood reed, spotted touch-me-not, marsh shield fern, sensitive fern, and wild blue iris. Several sedges typically associated with this habitat include *Carex tribuloides, C. lupulina, C. crus-corvi,* and *C. muskingumensis.* Many of the species indicative of this community occur within the CR/LSAA suggesting that mesic forests may very well occur but have not been surveyed or recorded as such.

Wet-mesic upland forest, because of drainage limitations, have some similarities to flatwoods on glacial moraines; however, flatwoods are defined by a sharp increase in clay content from surface to lower soil horizons (Taft et al. 1995). Generally, soils in wet-mesic upland forests have fine (e.g., clay-loam) texture even in the surface horizons (Solecki and Taft 1987). Ecological problems can include efforts to improve drainage and grazing. This specialized environment seems to resist exotic species invasions to some extent; possible exotic species problems include European high-bush cranberry, common buckthorn, and glossy buckthorn.

Several species listed by the Illinois Endangered Species Protection Board (IESPB) as endangered or threatened occur in particular upland forest communities and habitats in the CR/LSAA (Table 9). Those listed as endangered include round-leaved serviceberry (*Amelanchier sanguinea*), grove bluegrass (*Poa alsodes*), weak bluegrass (*Poa laguida*), downy Solomon's seal (*Polygonatum pubescens*), balsam poplar (*Populus balsamifera*), purple flowering raspberry (*Rubus odoratus*), Canadian buffalo-berry (*Shepherdia canadensis*), and snowberry (*Symphoricarpos albus*). Illinois threatened species include, forked aster (*Aster furcatus*), common juniper (*Juniperus communis*), pale vetchling (*Lathyrus ochroleucus*), black-seeded rice grass (*Oryzopsis racemosa*), dog violet (*Viola conspersa*), and hairy white violet (*Viola incognita*).

Sand Forest - This subclass occurs where there are deep sand deposits, permeability of soil is not strongly limited, and fire history permits forest development. Three distinct sand forest communities can be found depending on soil-moisture conditions including *dry sand forest* (on the tops of dunes), *dry-mesic sand forest* (intermediate slope and soil moisture

conditions), and *mesic sand forest* where humus content of soil is relatively high, mainly on riparian or ravine slopes (White and Madany 1978). Sand forest often merges gradually and sometimes imperceptibly with other community types such as sand savanna and sand flatwoods. The boundaries are variable over time between sand forest and sand savanna depending on fire history, while the boundary between sand forest and sand flatwoods is dependent on differences in soil drainage properties. Consequently, vegetation of sand flatwoods and sand forest can be very similar, particularly when intermediate soil moisture conditions occur. No areas of high-quality sand forest have been identified within the CR/LSAA yet forested areas on sandy soils are present locally in the Assessment Area. Because of the extensive sand dunes communities in northeastern CR/LSAA it is possible that all three types of sand forest occur within the Assessment Area, dry sand forest.

Dry sand forest - There is no estimate for the amount of dry sand forest in the CR/LSAA. The extent, if present, would be very local and limited to old beach ridges in the Chicago Lake Plain and Lake Michigan Dunes portions of the Assessment Area. The dominant **canopy** species in this community type typically is black oak. **Subcanopy** species can include serviceberry, sassafras, and possibly witch hazel. **Shrub** species can include shining sumac, smooth sumac, pasture rose, black raspberry, blackberry, black huckleberry, and early low blueberry. Herbaceous **groundcover** species can include spreading dogbane, butterflyweed, prickly pear cactus, sand bracted sedge, Pennsylvania sedge, sand coreopsis, slender sand sedge, pointed tick-trefoil, rough blazing-star, horsemint, common cinquefoil, slender mountain-mint, and black-eyed Susan.

Dry-mesic sand forest - There is no estimate for acreage of dry-mesic sand forest in the CR/LSAA. Members of this community are very similar to those of dry sand forests and if present in the CR/LSAA, would likely occur in the same areas. The dominant **canopy** species in this community type is also typically black oak. Occasional species can include Hill's oak, white oak, and bur oak. **Subcanopy** species can include serviceberry, sassafras, and possibly witch hazel. **Shrub** species can include New Jersey tea, gray dogwood, shining sumac, smooth sumac, pasture rose, black raspberry, blackberry, black huckleberry, and early low blueberry. Herbaceous **groundcover** species can include spreading dogbane, flat-top aster, sand bracted sedge, Pennsylvania sedge, enchanter's nightshade, sand coreopsis, slender sand sedge, pointed tick-trefoil, rough blazing-star, horsemint, common cinquefoil, slender mountain-mint, and black-eyed Susan.

Mesic sand forest - No estimate for the amount of mesic sand forest in the CR/LSAA is available. This is a fairly rare community and mainly occurs on the slopes of sandy river terraces. The dominant **canopy** species in this community type may include red oak, white oak, and sugar maple. Occasional species may include basswood. **Subcanopy** species can include serviceberry, choke cherry, spicebush, and possibly witch hazel. **Shrub and woody vines** species can include choke cherry, poison ivy, pasture rose, black raspberry, blackberry, and early low blueberry. Herbaceous **groundcover** species can include spreading dogbane, flat-top aster, false lily-of-the-valley, enchanter's nightshade, sand coreopsis, pointed tick-trefoil, horsemint, common cinquefoil, false starry Solomon's seal, and black-eyed Susan.

Ecological problems can include overgrazing, sand mining, and exotic species invasion. Common non-native species can include Canada bluegrass, amur honeysuckle, garlic mustard, privet, European highbush cranberry, common buckthorn, and glossy buckthorn.

Floodplain Forest - Floodplain forests are characterized by edaphic conditions of poor drainage and slow permeability. Local areas of sand and gravel increase permeability. Floodplain forest communities in Illinois include mesic, wet-mesic, and wet floodplain forest and are classified according to characteristics of flooding (White and Madany 1978). Wet floodplain forest occurs in the floodplain bordering streams and usually includes the stream bank. Wet-mesic to mesic floodplain forests occur on low and high terraces, respectively. The total extent of floodplain forest in the CR/LSAA is estimated to be about 1,623 acres (Table 3), or about 0.7% of the total area (IGIS database). In general, the flooding regime, including depth and duration of flooding, is a strong selective force on composition and species richness in floodplain forests (Bell 1974) and also in regulating tree growth (Robertson 1992). Wet floodplain forests often are seasonally flooded and/or have perched water during a portion of the year, often in late winter and spring. Generally, flooding is of shorter duration and less frequency in mesic floodplain forests while wet-mesic floodplain forests have intermediate levels of flooding frequency and duration. Diversity of species composition tends to increase from wet to mesic floodplain forest. Compositional changes favoring more flood-tolerant tree species like silver maple and box elder appear to have occurred since settlement along many Illinois streams (e.g., King and Johnson 1977, Nelson et al. 1994).

Presettlement vegetation maps indicate that wet forests or "swamp" areas were common along the major rivers, especially the North Branch of the Chicago River and the Skokie River (Moran 1978, Hanson 1981). The most common species included silver maple, elm, basswood, and ash (Hanson 1981). No high quality areas of floodplain forest remain in the CR/LSAA. A description of the composition of floodplain forests for the CR/LSAA follows. These descriptions are based more on contemporary than historical vegetation.

Mesic floodplain forest - There is no estimate of the proportion of the approximately 1,623 acres of floodplain forests within the CR/LSAA that is mesic floodplain forest. However, if present, this community type probably is confined to the Morainal Section of the CR/LSAA. No areas of mesic floodplain forest within the CR/LSAA have been identified as high-quality, undegraded natural communities and little descriptive information is available. In general, compared with other floodplain forest communities, a relatively greater importance of upland tree species often can be found in this mid-to-high terrace community since the relatively brief flooding duration and lower flooding frequency pose fewer limitations to these species. Common to occasional **canopy** tree species may include sugar maple, green ash, black walnut, red oak, swamp white oak, bur oak, white oak, pin oak, American elm, and slippery elm. **Subcanopy** species may include green ash, hawthorns (e.g., *Crataegus mollis, C. pruinosa*), slippery elm, black cherry, box elder, and hop hornbeam. **Shrubs** may include gray dogwood, Missouri gooseberry, black raspberry, spice bush, and elderberry. Bladdernut (*Staphylea trifolia*) is a typical species of this habitat that has not been reported from the CR/LSAA but could be expected. Typical

woody vines include Virginia creeper, poison ivy, and riverbank grape. **Groundcover** species may include these taxa reported from the CR/LSAA: wild leek, hog-peanut, Jack-in-the-pulpit, poke milkweed, rattlesnake fern, tall bellflower, bulbous cress, blue cohosh, nodding fescue, wild geranium, white avens, Virginia waterleaf, moonseed, false mermaid, smooth sweet cicely, woodland phlox, mayapple, false Solomon's seal, and bloodroot. Other species may be present (e.g., woodland blue grass) but have not been reported from the CR/LSAA.

No threatened or endangered plant species currently are known from mesic floodplain forest in the CR/LSAA. Ecological problems include changes in the watershed that alter the flooding regime, grazing, and exotic species invasions. Exotic species can be numerous and abundant and include garlic mustard, helleborine, amur honeysuckle, Tartarian honeysuckle, self-heal, common buckthorn, glossy buckthorn, multiflora rose, bittersweet nightshade, reed canary grass, and European high-bush cranberry.

Wet-mesic floodplain forest - There is no estimate of the proportion of floodplain forest within the CR/LSAA that is wet-mesic floodplain forest and no undegraded remnants of wet-mesic floodplain forest have been identified. Canopy composition of this community type can be relatively rich, compared with wet floodplain forest, because it includes some species from mesic as well as wet floodplain forest. Common to occasional **canopy** species include: silver maple, green ash, black walnut, cottonwood, swamp white oak, bur oak, slippery elm, and American elm. **Subcanopy** species include box elder, green ash, and slippery elm. **Shrubs and vines** include elderberry, downy hawthorn, poison ivy, and riverbank grape. **Groundcover** species include wild onion, hairy aster, panicled aster, false nettle, rattlesnake fern, tall bellflower, spring-beauty, honewort, Virginia wild-rye, annual bedstraw, white avens, fowl manna grass, Virginia waterleaf, spotted touch-me-not, white grass, fringed loosestrife, smooth sweet cicely, woodland phlox, swamp buttercup, goldenglow, sweet black-eyed Susan, and common blue violet. Other species may be present but have not been reported from the CR/LSAA (e.g., wood nettle, yellow ironweed, wild chervil, and swamp agrimony).

No threatened or endangered plant species currently are known from wet-mesic floodplain forest in the CR/LSAA. The state threatened species, shining bur sedge (*Carex intumescens*), occurs in flatwoods in the CR/LSAA and may occur in floodplain forests as well. Ecological problems are similar to those for mesic floodplain forest. However, changes to the watershed that alter the flooding regime can have a relatively greater impact in wet-mesic floodplain forests. As with mesic floodplain forest, exotic species can be numerous and locally abundant. Some additional species to those listed for mesic floodplain forest that are common in wet-mesic floodplains include ground ivy, moneywort, motherwort, and white mulberry. One exotic species, the lesser celandine (*Ranunculus ficaria*), recently has begun to spread in floodplain habitats in the Chicago region (Swink and Wilhelm 1994) and could become locally abundant, particularly on mud flats or other seasonally moist floodplain habitats where competition is limited

Wet floodplain forest - As with the other two floodplain forest community types, there is no estimate of the proportion of the floodplain forest within the CR/LSAA that is wet floodplain forest. No areas have been identified as high-quality, undegraded remnants. This community type, if present in the CR/LSAA, probably is limited to narrow riparian corridors. Compared with other floodplain forest communities, fewer tree species can be found in this natural community since flooding frequency and duration, typically, are limiting for many species. Common to occasional **canopy** species include silver maple, green ash, and cottonwood. **Subcanopy** species include box elder, and black willow. **Shrubs and vines** include buttonbush, elderberry, sandbar willow, poison ivy, and riverbank grape. **Groundcover** species include giant ragweed, panicled aster, false nettle, honewort, Virginia wild-rye, annual bedstraw, fowl manna grass, spotted touch-me-not, clearweed, mild water pepper, common smartweed, smartweed, swamp buttercup, and tall nettle.

No threatened or endangered plant species are known from wet floodplain forest within the CR/LSAA. Ecological problems in floodplain forest involve siltation from silt-laden flood waters, changes in the hydrological regime (e.g., stream entrenchment or increased flooding duration and frequency due to changes in the upper watershed), grazing, and exotic species invasion. Exotic species include many listed for mesic and wet-mesic floodplain forest.

Flatwoods - Flatwoods are open woodlands of level uplands and terraces that occur on impervious subsoil horizons (e.g., claypans) and have seasonally wet and dry soils (White and Madany 1978, Taft et al. 1995). Flatwoods are distinguished from other forests on level sites with poorly drained and slowly permeable soils by having argillic horizons. Argillic horizons (= claypans) are subsurface horizons distinguished from overlying soil horizons by a sharp increase in clay content. Microdepressions often retain water during wet periods and wetland species can be locally common. Local patterns in available water-holding capacity including soil textural differences and depth to the claypan, as well as cation availability of the soil, are important variables explaining tree species composition, diversity, and density in southern flatwoods (Taft et al. 1995). These edaphic factors also may be important in other flatwoods communities. Three different flatwoods community types have been distinguished in Illinois (White and Madany 1978) based on bioregional and edaphic factors. These include *southern flatwoods, sand flatwoods,* and *northern flatwoods*. Maintenance of groundcover species diversity in all flatwoods communities appears to be dependent on periodic fire. No high quality northern flatwoods occurs in the CR/LSAA and only one category I area of sand flatwoods remains near Edgebrook.

Northern flatwoods - Northern Flatwoods in Illinois are mainly found on poorly drained sites within the Valparaiso morainic system (White and Madany 1978), which is adjacent to the CR/LSAA. There are no high quality acreages of northern flatwoods in the Assessment Area, although there may be remnants with restoration potential. Little comprehensive data currently are available on the structure, composition, and diversity patterns in northern flatwoods. However, general trends may be similar to southern flatwoods (Taft et al. 1995) where the groundcover stratum by far supports the greatest species diversity and long

periods of fire absence appears to lead to significant reduction in overall plant species diversity. The composition is described briefly below.

Common **canopy** species may include swamp white oak, white oak, and Hill's oak; occasional species include green ash, black ash, red maple, silver maple, American elm, red oak, and bur oak. **Subcanopy** species may include box elder and trembling aspen. **Shrubs** include common dewberry and wild black currant. **Vines** may include Virginia creeper and poison ivy. **Groundcover** species generally include a wide diversity of species, including numerous sedges (*Carex* species) such as: *Carex alopecoidea, C. annectans, C. blanda, C. cristatella, C. crus-corvii, C. gracillima, C. granularis, C. grayi, C. hirtifolia, C. jamesii, C. lupuliformis, C. lupulina, C. muskingumensis, C. retroflexa, C. rosea, C. sparganioides, C. squarrosa, C. tenera,* and *C. tribuloides*. Other groundcover species may include tall agrimony, autumn bent grass, green dragon, wild sarsaparilla, common wood reed, common water plantain (ponds), swamp milkweed, Virginia rye, fowl manna grass, white avens, Virginia waterleaf, orange jewel-weed, white grass, white snakeroot, sensitive fern, blue flag (ponds), false Solomon's seal, red trillium, spinulose shield fern, and swamp buttercup.

Ecological problems associated with northern flatwoods include fire absence, habitat degradation from grazing and other disturbances, and exotic species invasion. Exotic species include common and glossy buckthorn, Tartarian honeysuckle, and garlic mustard. Altered hydrology due to urbanization and surface-water pollution by deicing salts may be compounding sources of habitat degradation and altered species composition.

Sand flatwoods - Sand flatwoods are distinguished among other flatwoods types by sandy to sandy-loam surface soil horizons (above claypan, or old lakebed in the case of sand flatwoods). The total distribution of sand flatwoods in Illinois is uncertain. Prior to settlement, based on regional edaphic characteristics there may have been minor areas of sand flatwoods in several natural divisions (e.g., sand flatwoods may have been present to a limited degree in the Oregon Section of the Rock River Hill Country, the Green River Lowland Section of the Grand Prairie Division, the Upper Mississippi River and Illinois River Bottomlands Natural Division, and the Bottomland Section of the Wabash Border Natural Division [White 1978]). One 51-acre stand of sand flatwoods remains in the CR/LSAA. Even though it has suffered some degradation (Grade-C), the Sidney R. Yates Flatwoods (formerly Edgebrook Flatwoods) in Cook County is considered a Category I community because of the rarity of this type of natural community remaining in Illinois; no sand flatwoods of the highest quality (Grade-A) have subsisted. The only Grade-B (slightly disturbed) stand of sand flatwoods in Illinois occurs just south of the CR/LSAA boundary in the Thornton-Lansing Road Nature Preserve (White 1978).

Other remnants are reported from the Kankakee Sand Area Section of the Grand Prairie Natural Division. A few flatwoods on the Southern Till Plain Natural Division near the lower Kaskaskia River, also on an old lakebed, have considerable sand content in the surface soil horizons (Taft et al. 1995) and perhaps also could be considered sand flatwoods.

In the absence of fire, sand prairies can convert to shrub prairie and eventually sand flatwoods where soil requirements are met (White 1978). Sand flatwoods also can occur associated with sand forest, which occur on somewhat better drained sites (e.g., old beach ridges, and slopes). With increasing fire, sand flatwoods may develop characteristics of sand savanna. Thus, sand flatwoods can occur within a dynamic complex of prairie-savanna-woodland-forest depending on fire history. Other sources of heterogeneity within this assemblage of natural communities include soil organic matter content, soil acidity (Kurz 1923), and available moisture and many sand flatwoods species sort into particular zones within this variability. Some species typical of sand flatwoods also occur in acid bogs (e.g., black huckleberry, bracken fern, cinnamon fern, interrupted fern, royal fern, hardhack, low-bush blueberry, Canadian mayflower, and purple chokeberry). The combination of slow permeability in flatwoods, particularly in depressions, and low cation exchange capacity of sandy soils, leads to an accumulation of hydrogen ions and organic matter.

Sites throughout the state with sandy soils and high organic matter support populations of several rare plant taxa and species listed by the IESPB as threatened and endangered, including several orchid species (Armstrong 1963, Sheviak 1974). Remnants of the sand community complex in the Chicago Lake Plain (sand flatwoods-sand savanna-sand forest-sand prairie-shrub prairie-shrub bog) can be particularly rich in rare plant species (Taft 1999). Structural and compositional characteristics of sand flatwoods are described below.

The dominant **canopy** species on drier sites (old beach ridges) is black oak; in these areas, sand flatwoods merges with dry-mesic sand forest and sand savanna. Pin oak is locally common on moist-to-wet sites. Occasional canopy species include cottonwood, and bur oak depending on local soil moisture conditions. Common to occasional **subcanopy** species are black cherry, sassafras, trembling aspen, purple chokeberry, choke cherry, pin oak, and slippery elm. **Shrubs** include gray dogwood, Michigan holly, pale dogwood, American hazelnut, black huckleberry, low-bush blueberry, meadowsweet, common blackberry, spicebush, and black raspberry. **Woody vines** include Virginia creeper, upright carrion flower, and riverbank grape. Common and characteristic herbaceous **groundcover** species include bluntleaf sandwort, flattop aster, lady fern, royal fern, cowbane, downy green sedge, swamp thistle, great Solomon's seal, Pennsylvania sedge, wood anemone, Culver's root, and wild sarsaparilla. The latter species is characteristic of the subtle beach ridges and may signal transition to sand forest.

No threatened and endangered taxa have been reported from sand flatwoods in the CR/LSAA; however several potentially could be present in remnants including Kalm's St. John's wort (*Hypericum kalmianum*), round-leaved sundew (*Drosera rotundifolia*), grass pink orchid (*Calopogon tuberosus*), wood orchid (*Platanthera clavellata*), white beak rush (*Rhynchospora alba*), and tubercled orchid (*Platanthera flava* var. *herbiola*). These species have been reported from other habitats in the CR/LSAA and may occur within sand flatwoods, though most may be confined to small openings in the sand flatwoods community.

Ecological problems associated with sand flatwoods include fire absence, habitat degradation from grazing and other disturbances, altered hydrology, sand mining, and exotic species invasion. Exotic species include numerous shrubs (e.g., common and glossy buckthorn, amur honeysuckle, common privet, multiflora rose, European high-bush cranberry) and garlic mustard.

Prairie

Six prairie subclasses are recognized in Illinois: Prairie (tallgrass prairie on silt-loam soils), Sand Prairie, Gravel Prairie, Dolomite Prairie, Hill Prairie, and Shrub Prairie (White and Madany 1978). With the exception of Shrub Prairie and Hill Prairie the prairie subclasses, like the Upland Forest and Floodplain Forest subclasses, are further distinguished into natural communities by soil-moisture characteristics (dry, dry-mesic, mesic, wet-mesic, and wet). Approximately 75.9% of the CR/LSAA was tallgrass prairie at about 1820, the time of European settlement (Iverson et al. 1989, IGIS database). Based on remnant prairies in the CR/LSAA and inferring from soil-moisture conditions that were prevalent prior to extensive urban, industrial, and other development, the following community subclasses are/were present: (silt loam) Prairie, Sand Prairie, and possibly, Gravel Prairie and Shrub Prairie. Despite extensive loss of prairie habitat, the CR/LSAA supports a greater proportion of original prairie than the statewide proportion of 0.01% (White 1978). The approximately 505.6 acres of undegraded prairie remaining within the Assessment Area is about 0.30% of the original extent of about 169,361 acres.

At least seven distinct prairie community types are found in the CR/LSAA among 17 prairie element occurrences. These occurrences are concentrated at 7 different sites indicating that many support more than one prairie community type. Existing remnants of high-quality prairie communities found in the CR/LSAA include mesic prairie, wet-mesic prairie, wet prairie, dry sand prairie, dry-mesic sand prairie, mesic sand prairie, and wet sand prairie (Table 6).

Common ecological problems associated with remnant prairies, in general, include fragmentation, exotic species invasions, fire absence, woody plant encroachment, and habitat degradation. Small, isolated fragments tend to support many species at low population levels (thus prone to local extinction) too remote to be enhanced through natural mechanisms of species dispersal. Small, isolated prairie remnants also may be lacking appropriate pollinator species for successful sexual reproduction of many outcrossing species. The greater edge-to-volume ratios of small sites offer greater opportunities for exotic species invasions since the matrix areas typically are dominated by non-native vegetation. Highly fragmented and developed landscapes also lead to altered fire regimes often eliminating fire from prairie remnants until restoration efforts commence. Fire absence results in ecological changes such as encroachment of woody plants that can eliminate many shade-intolerant prairie species. Fire absence also can lead to a severe invasion of exotic cool-season grasses such as the ubiquitous species meadow fescue, smooth brome, and Kentucky bluegrass. Exotic species and woody encroachment pose

some of the most severe threats to the integrity of existing high-quality prairie remnants in the CR/LSAA. Overgrazing by domestic stock and deer can degrade prairie remnants by eliminating many species and promoting the increase of several weedy native and non-native taxa. Soil disturbances such as past efforts at cultivation, grazing by hoofed mammals, or soil scraping (typical of many railroad rights-of-way) result in loss of species and opportunities for the establishment of weedy taxa. All of these factors, and combinations of factors, tend to result in loss of species diversity and ecological integrity for all prairie community types.

Prairie - About 75.9% (169,361 acres) of the CR/LSAA was tallgrass prairie of some type, especially in the southern section on the silt-loam of the Chicago Lake Plain (Figure 3). Much of this acreage may have included a large majority of open savanna community, especially in the northern half of the Assessment Area; the remainder was largely sand prairie associated with old sand dunes glacial Lake Chicago (see Willman and Lineback 1970). Of the prairie remaining in a high-quality condition in the Assessment Area, about 7% (35.6 acres) is silt-loam prairie found on the Chicago Lake Plain. No high-quality prairie areas are reported from the morainal section of the Assessment Area. This remaining high-quality silt-loam prairie in the CR/LSAA is about 3.9% of all remaining high-quality silt-loam prairie remaining in Illinois in an area about 0.62% of the land area of the state.

Prairie plant species respond in somewhat predictable, although individual, ways along soil-moisture and other environmental gradients; consequently, separate community types can merge gradually and imperceptibly forming complex associations. Brief descriptions of each prairie community type follow.

Dry-mesic prairie - Dry-mesic prairies were probably once part of the tallgrass prairie mosaic that occurred in the Chicago Lake Plain and Morainal sections. There are no high-quality areas of dry-mesic prairie remaining in the CR/LSAA, but degraded remnants with the potential for rehabilitation may still occur in isolated areas. The following description is based largely on a compilation list of species known to be present from the CR/LSAA and from the adjacent Assessment Area (the Lake Calumet Assessment Area) to the south that still contains 4.0 high-quality acres of this community type (Taft 2000). Consequently, some of the species listed below may not occur within the CR/LSAA.

Common **grass** species include big bluestem, Canada wild rye, June grass, little bluestem, switch grass, northern prairie dropseed, and Indian grass. Common to occasional **sedge** species include prairie sedge and running prairie sedge. Characteristic **forbs** include: pussy toes, cat's-foot, tall green milkweed, prairie milkweed, butterfly weed, short green milkweed, sky-blue aster, heath aster, New England aster, white wild indigo, false toadflax, showy tick trefoil, Illinois tick trefoil, rattlesnake master, flowering spurge, prairie sunflower, round-headed bush clover, rough blazing star, pale spiked lobelia, wild bergamot, wild quinine, white prairie clover, purple prairie clover, hoary puccoon, field milkwort, whorled milkwort, slender mountain mint, rosin weed, prairie dock, common blue-eyed grass, black-eyed Susan, early goldenrod, old-field goldenrod, common

spiderwort, Culver's root, and golden Alexanders. **Shrubs** include leadplant, New-Jersey tea, smooth sumac, pasture rose, and prairie willow. A few species typical of dry-mesic prairie have not been recorded from the Assessment Area and some of these may be present but perhaps in small population sizes (e.g., false boneset, pale purple coneflower, and wild petunia).

Typical ecological problems in remnants of dry-mesic prairie include fire absence (and consequential woody plant encroachment), habitat degradation from soil disturbances and intensive grazing, and exotic species invasion and establishment. Common exotic species include: yarrow, quack grass, musk thistle, showy centaury, wild carrot, crown vetch, white sweet clover, yellow sweet clover, wild parsnip, Canada blue grass, and Kentucky bluegrass. Many other exotic species can be present.

Mesic prairie - Mesic prairie occurs in an intermediate soil-moisture zone on the landscape between dry-mesic prairie and wet-mesic prairie. Soils can be moderately well drained but often are saturated during short periods of the growing season (White and Madany 1978). A total of about 35.6 acres of high-quality mesic tallgrass prairie remains in the CR/LSAA at 6 sites representing about 11% of the total high-quality mesic prairie remaining in Illinois (Table 6). Undegraded mesic tallgrass prairie is a natural community with among the highest levels of species density (species/unit area [e.g., quadrats]) in North America. Typical remnants contain from 12 to 25 species of vascular plants in a quarter-meter-square sampling quadrat. About 100 to 130 species can be found in individual, small (5 acre) remnants.

Common **grass** species include big bluestem, little bluestem, northern prairie dropseed, Canada wild rye, prairie brome, prairie switch grass, and Indian grass. **Sedges** may include hairy green sedge and running prairie sedge. Numerous **forb** species typically are present. Species recorded from mesic prairie in the CR/LSAA include: Sullivant's milkweed, heath aster, smooth blue aster, New England aster, white wild indigo, cream wild indigo, prairie Indian plantain, wild hyacinth, Indian paintbrush, false toadflax, prairie coreopsis, shooting star, rattlesnake master, flowering spurge, grass-leaved goldenrod, wild strawberry, prairie gentian, sawtooth sunflower, pale-leaved sunflower, alumroot, yellow star-grass, prairie blazing star, hoary puccoon, pale spiked lobelia, wild bergamot, prairie sundrops, wild quinine, wood betony, prairie phlox, false dragonhead, prairie cinquefoil, wild lettuce, slender mountain mint, common mountain mint, yellow coneflower, black-eyed Susan, rosinweed, compass-plant, prairie dock, common blue-eyed grass, starry false Solomon's-seal, stiff goldenrod, common spiderwort, Culver's root, prairie violet, and golden Alexanders. **Shrubs** include leadplant, New Jersey tea, gray dogwood, pasture rose, prairie willow, and smooth sumac.

Twenty-two threatened and endangered plant species occur in prairie habitats in the CR/LSAA; however, most (about seven) primarily occur associated with sandy soils in the Lake Michigan Dunes section and thus usually can be found in sand prairie habitats (see below). Six species listed as threatened or endangered by the IESPB occur in mesic prairie habitats in the CR/LSAA: bearded wheat grass (*Elymus trachyculus*), prairie white-fringed

orchid (*Plantanthera leucophaea*), small sundrops (*Oenothera perennis*), oval milkweed (*Asclepias ovalifolia*), golden sedge (*Carex aurea*), and mountain blue-eyed grass (*Sisyrinchium montanum*)(Table 9). Typical ecological problems in mesic prairie are similar to dry-mesic prairie. Common exotic species include: yarrow, quack grass, white sweet clover, yellow sweet clover, wild parsnip, wild carrot, Canada blue grass, Kentucky bluegrass, smooth brome, and wild asparagus. Many other exotic species can be present, including woody plants.

Wet-mesic prairie - This prairie community occurs on somewhat poorly drained sites in an intermediate zone between mesic prairie and wet prairie. Inundation periods can occur but typically are brief. Only 2 acres of high-quality (Grades A and B) wet-mesic tallgrass prairie remain in the CR/LSAA among two sites representing about 0.7% of the statewide total (Table 6). Wet-mesic prairie and the following community type, wet prairie, often merge with sedge meadow, marsh, and occasionally (in or adjacent to the morainal section) graminoid fen or seep communities forming diverse wetland/prairie complexes.

Graminoid species can be dominant including the grasses big bluestem, blue-joint grass, fowl manna grass, and prairie cord grass; numerous **sedges** also can be present including dark-scaled sedge, crested-oval sedge, broad-leaved woolly sedge, and fox sedge. Characteristic **forbs** include swamp milkweed, meadow anemone, marsh aster, cinnamon willow herb, grass-leaf goldenrod, closed gentian, rough avens, sawtooth sunflower, marsh vetchling, marsh blazing star, winged loosestrife, prairie sundrops, smooth phlox, false dragonhead, common mountain mint, Riddell's goldenrod, woundwort, prairie lily, purple meadow rue, and waxy meadow rue. **Shrubs** may include pale dogwood and pussy willow.

One species (small sundrops [*Oenothera perennis*]) listed as threatened by the IESPB has been recorded in a wet-mesic prairie in the CR/LSAA. The prairie white-fringed orchid (*Platanthera leucophea*), listed as endangered by the IESPB, occurs in wet-mesic prairie habitat in northeastern Illinois including the CR/LSAA. The biology of this orchid, which can occur in a variety of wetland habitats, has been described by Bowles (1983). Fluctuation in population levels of prairie white-fringed orchid appear to coincide directly with regional rainfall (Bowles et al. 1992).

Ecological problems in wet-mesic prairie include past efforts at drainage enhancement with field tile, intensive grazing, and other sources of trampling or soil disturbances. Fire absence can result in woody plant encroachment. Exotic species include Kentucky bluegrass, reed canary grass, bittersweet nightshade, and glossy buckthorn. Shrubs including native (gray dogwood) and non-native species (common and glossy buckthorn) often invade and form thickets on slightly higher and better-drained bordering areas.

Wet prairie - Wet prairies occur on poorly drained and slowly permeable soils. Wet prairie formerly was prevalent in the Chicago Lake Plain (Meyer 1950, Hanson 1981). Only 3.1 acres of high-quality (Grades A and B) wet tallgrass prairie remains in the CR/LSAA on one site representing about 1.2% of the statewide total (Table 6). Undegraded wet prairie

is among the rarest formerly common natural community types in Illinois. Wet prairie and the preceding community type, wet-mesic prairie, often merge with sedge meadow, marsh, and occasionally (in or near the morainal section) graminoid fen or seep communities forming diverse wetland/prairie complexes.

The characteristic **grass** species for the community type is prairie cord grass; another typical grass is blue-joint grass. **Sedges** often are common, particularly where wet prairie merges with sedge meadow. Common to occasional sedge species can include hairy lake sedge, crested-oval sedge, broad-leaved woolly sedge, and tussock sedge. Common **forbs** include meadow anemone, marsh aster, swamp milkweed, common boneset, northern bedstraw, sawtooth sunflower, common mountain mint, blue flag, marsh vetchling, common water horehound, water knotweed, late goldenrod, rough hedge nettle, waxy meadow rue, purple meadow rue, and common ironweed. **Shrubs** include meadow sweet, red-osier dogwood, petioled willow, and pussy willow.

The state threatened American sloughgrass (*Beckmannia syzigachne*) occurs in wet prairies and is known from the CR/LSAA. Ecological problems in wet prairie include altered hydrology due to urbanization affecting the soil water table and flooding regime. As was noted in the Lake Calumet region south of the CR/LSAA by Meyer (1950), fire was an occasional occurrence even in wet prairie. Fire absence probably has resulted in conversion of some wet prairie in the Assessment Area to young floodplain forest and thickets of regrowth woody vegetation. Reed canary grass is an exotic species that can become dominant when flooding duration and siltation increases. Other exotic species include purple loosestrife and glossy buckthorn, which also can be major threats in wet prairie communities.

Sand Prairie - This prairie subclass occurs on sandy soils (sandy loams, loamy sands, and sand) and natural community types are distinguished by characteristics of available soil moisture. Dry and dry-mesic sand prairies tend to occur on sand ridges. The wetter sites tend to have limits to soil permeability, such as presence of a lake bed or claypan, and have high water tables during a portion of the year. These wetter sites typically have accumulations of organic matter in the surface soil horizons. Hydrogen ion concentration can increase in moist or wet sand prairies leading to the development of acidic soils. Acidic, peaty sands can support prairie communities that include a few bog species. With fire absence in moist sand prairies, shrubs often increase resulting in formation of shrub prairie and eventually other community types. A complex of natural communities including moist sand prairie, shrub prairie, sand savanna, and sand flatwoods occurs locally in the CR/LSAA region; this complex can support numerous rare species including taxa listed by the IESPB as threatened or endangered (Table 9). Documented sand prairie community types in the Assessment Area include dry sand prairie, dry-mesic sand prairie, mesic sand prairie, wet-mesic sand prairie, and wet sand prairie. About 630.4 acres of high-quality sand prairie are recognized from the CR/LSAA, totaling about 54.6% of all the high-quality sand prairie remaining in Illinois. The characteristic composition of each community type found in the CR/LSAA is described briefly below.

Dry sand prairie - This community is limited in the CR/LSAA to the crests of sand dunes in the Lake Michigan Dunes section. A large portion (almost 39%, 138 acres) of the high-quality dry sand prairie in Illinois is protected in this Assessment Area at the Illinois Beach State Park. One hundred twenty-two of these acres are in Grade-A condition (undegraded) representing 98.7% of the Grade-A dry sand prairie statewide.

Typical **grasses** include little bluestem, sand reed, mat sandbur, June grass, fall witch grass, and porcupine grass. Common **sedges** include slender sand nut-sedge, rough sand nut-sedge, sand bracted sedge, and early oak sedge. **Forbs** include sand stiffwort, butterflyweed, rough blazing star, horsemint, prickly pear cactus, round-headed bush clover, beach pea, hairy puccoon, fringed puccoon, sand coreopsis, and beach wormwood. **Shrubs** include leadplant, New Jersey tea, pasture rose, sand cherry, early low blueberry, shining sumac, common blackberry, and prairie willow.

Dry-mesic sand prairie - This community type generally occurs in the same areas as dry sand prairies on the crests of sand dunes in the Lake Michigan Dunes section and perhaps crests and slopes of old beach ridges and well-drained sandy flats of the Chicago Lake Plain. A sum-total of 239 acres of high-quality dry-mesic sand prairie occurs at two sites in the CR/LSAA, almost 74.7% of the statewide total (Table 6). In some places in the Assessment Area, trees such as black oak may have invaded and become established in dry-mesic sand prairie during extended periods of fire absence, and initiating formation of sand savanna. Boundaries between sand prairie and sand savanna probably were dynamic throughout the lake plain depending on regional fire history.

Dry sand prairies and dry-mesic sand prairies share many common species. A typical **fern** species in dry-mesic sand prairie is bracken fern. Typical **grasses** include: big bluestem, sand reed, mat sandbur, June grass, fall witch grass, panic grass, switch grass, little bluestem, Indian grass, prairie dropseed, and porcupine grass. Common **sedges** include slender sand nut-sedge, rough sand nut-sedge, sand bracted sedge, and early oak sedge. **Forbs** include a rich variety of species such as the following: common ragweed, thimbleweed, spreading dogbane, sky-blue aster, sand cress, beach wormwood, butterfly milkweed, partridge pea, Indian paintbrush, sand coreopsis, winged pigweed, purple prairie clover, viscid grass-leaved goldenrod, rockrose, common rockrose, western sunflower, round-headed bush clover, rough blazing star, hairy puccoon, wild lupine, horsemint, ragged evening primrose, prickly pear cactus, whorled milkwort, slender knotweed, black-eyed Susan, showy goldenrod, goats-rue, Virginia spiderwort, arrow-leaved violet, and bird's foot violet. **Shrubs** include leadplant, New Jersey tea, pasture rose, sand cherry, early low blueberry, shining sumac, common blackberry, and prairie willow. When shrubs are dominant (more common under mesic soil conditions), the community is termed shrub prairie (White and Madany 1978).

Several threatened and endangered plant species have occurrences in the CR/LSAA in dry to dry-mesic sand prairie habitats. Species listed as endangered by the IESPB include grass pink orchid (*Calopogon tuberosus*), inland New Jersey tea (*Ceanothus herbaceus*), club-spur orchid (*Platanthera clavellata*), clustered broomrape (*Orobanche fasciculata*),

and beach pea (*Lathyrus japonicus* var. *glaber*; listed in IESPB [1999] as *Lathyrus maritimus*). State threatened species include the savanna pinweed (*Lechea intermedia*). Ecological problems in the above-mentioned two community types include the disruption of natural disturbance regimes (i.e., fire absence and subsequent woody encroachment), sand mining, and exotic species invasion. Common exotic species in dry to dry-mesic sand prairie include yarrow, thyme-leaved sandwort, field sorrel, common buckthorn, rough dropseed, Canada blue grass, and Kentucky blue grass (the latter two species now sometimes dominant groundcover species on dune ridges).

Mesic sand prairie - This community type occurs where soils are usually moist, but not wet or dry for long periods. The soil characteristically has organic matter accumulation in the surface horizon affording some water-holding capacity. Drainage is limited in places (e.g., former lake bed) but the sand deposit typically is deep. A sum-total of 93 acres of high-quality (grades A and B) mesic sand prairie occur in the CR/LSAA at two different sites. This is about 57.5% of the remaining high-quality examples of this community type in Illinois (Table 6). Some mesic sand prairies in the CR/LSAA have acidic soils (see discussion for the subclass) and support a unique assemblage of species, including several that also occur in bogs and sand flatwoods. **Ferns** can be common, particularly in local wet depressions, including royal fern, marsh shield fern, and sensitive fern. Common **graminoid** species include the grasses big bluestem, mat panic grass, Scribner's panic grass, prairie switch grass, little bluestem, Indian grass, porcupine grass, and prairie dropseed. Common to occasional sedges include early oak sedge, autumn sedge, hair beak-rush, and tall nutrush. Rushes can be common, but typically increase in abundance in wetter sites. Some species in mesic sand prairie include sharp-fruited rush and Dudley's rush. Common **forbs** include pale false foxglove, colic root, tall green milkweed, butterfly milkweed, flat-topped aster, white wild indigo, prairie Indian plantain, Indian paintbrush, false toadflax, purple prairie clover, shooting star, rattlesnake master, grass-leaved goldenrod, viscid grass-leaved goldenrod, fringed gentian, yellow star-grass, prairie blazing star, marsh blazing star, spiked lobelia, lance-leaved loosestrife, prairie sundrops, wild quinine, prairie phlox, false dragonhead, green fringed orchid, slender mountain mint, swamp saxifrage, starry false Solomon's seal, small yellow flax, and Culver's root. **Shrubs** include leadplant, black chokeberry, New Jersey tea, huckleberry, prairie willow, and pasture rose.

There are numerous threatened and endangered species that occur in moist sand prairies and associated natural communities within the CR/LSAA (Table 9). However, it is unclear how many occur specifically in mesic sand prairie. Three species listed as threatened or endangered by the IESPB have been documented in mesic prairies in the CR/LSAA. They include the state endangered tubercled orchid (*Platanthera flava* var. *herbiola*) and Kalm's St. John's wort (*Hypericum kalmianum*) and the state threatened pale false foxglove (*Agalinis skinneriana*). Populations of the pale false foxglove occur in the sand prairies of Illinois Beach and North Dunes nature preserves. These are the only extant populations of pale false foxglove remaining in Illinois on sand prairies. Other populations in the state occur in loess hill prairies on bluffs near the Sangamon, lower Illinois, and central Mississippi rivers (Robertson and Phillippe 1993).

Other species that have been reported from unspecified habitats in the region but where occurrence in or near mesic sand prairie can be inferred or expected include the state endangered grass pink orchid (*Calopogon tuberosus*) and club-spur orchid (*Platanthera clavellata*), the latter probably associated with shrub thickets, and the state threatened small sundrops (*Oenothera perennis*) and green yellow sedge (*Carex viridula*) (Table 9). Many of these species occur at only one or two sites and in few and small populations and thus are at risk of extirpation from the Assessment Area.

A primary ecological problem in the CR/LSAA is the disruption of natural disturbance regimes. Fire absence, in particular, has a prominent impact on vegetation structure, composition, and level of diversity. Mesic sand prairies convert to shrub prairie without frequent fire and if fire exclusion is prolonged, trees such as trembling aspen invade. The increasing levels of shade eventually eliminate the many shade-intolerant prairie species. Other ecological problems include over-browsing by deer, damage from over-visitation to rare species sites, and exotic species invasion. Exotic species include yarrow, common buckthorn, glossy buckthorn, white sweet clover, Kentucky bluegrass, and Canada bluegrass.

Wet-mesic sand prairie - The average water table is closer to the surface in this community type and wetland species increase in abundance. Wet-mesic sand prairie can occur in local depressions within other natural communities such as mesic sand prairie. Wet-mesic sand prairies also can occur as a transition in gradients from mesic to wet sand prairie. The community type considered here includes seasonally flooded moist sand habitats such as swales in dune and swale topography. The majority (79.3%, 21.4 acres) of the high-quality wet-mesic sand prairie remaining in Illinois occurs in the CR/LSAA (Table 6) at Illinois Beach and Illinois Dunes North natural areas. **Ferns** occurring in wet-mesic sand prairie include adder's tongue fern, royal fern, marsh shield fern, and sensitive fern. Characteristic **grasses** include big bluestem, blue-joint grass, and cordgrass. Several **sedge** and **rush** species can be present including broad-leaved woolly sedge, flat brook sedge, hair beak-rush, sharp-fruited rush, lake shore rush, and Canadian rush. Characteristic **forbs** include purple false foxglove, colic root, low calamint, common boneset, small fringed gentian, sand St. John's wort, bog lobelia, prairie sundrops, smooth phlox, false dragonhead, common mountain mint, Riddell's goldenrod, and lance-leaved violet. Common **shrubs** include blue-leaved willow, petioled willow, and silky willow.

Two state endangered orchids, the prairie white-fringed orchid (*Platanthera leucophaea*) and the purple-fringed orchid (*Platanthera psycodes*) occur in wet-mesic prairies in the CR/LSAA. Ecological problems are similar to mesic sand prairie.

Wet sand prairie - This community type is floristically similar to wet prairie and is characterized by surface water present for up to a few months (White and Madany 1978). A total of 139 acres of high-quality wet sand prairie from Illinois Beach and Illinois Dunes North natural areas have been identified from the CR/LSAA, representing 82.2% of this community remaining in Illinois. This community type probably was locally common in the southern section of the Assessment Area associated in the lake plain section. A map of

presettlement vegetation indicates that this area was dominated by wet prairie (Hanson 1981) and sandy deposits are scattered throughout this region (Willman and Lineback 1970). Wet sand prairie probably often occurred associated with marsh. A typical **fern** is marsh shield fern. Common **grasses** include prairie cordgrass, blue-joint grass, and rice cut grass. **Sedges** can include several species listed for wet-mesic sand prairie and wet prairie plus crested oval sedge, common lake sedge, flat brook sedge, and broad-leaved woolly sedge. **Forbs** may include swamp milkweed, nodding bur marigold, false nettle, common boneset, wild madder, sawtooth sunflower, blue flag, northern bugle weed, cowbane, water knotweed, common cattail, sand St. John's wort, Riddell's goldenrod, and blue vervain. **Shrubs** can include pale dogwood, pussy willow, blue-leaved willow, sandbar willow, and meadowsweet.

Ecological problems in wet sand prairie are similar to wet-mesic sand prairie and wet prairie.

Shrub Prairie - This community is characterized by dominance of shrubs; however, herbaceous prairie species can be codominant. Only one natural community, named same as subclass, is recognized in Illinois. All representations of the shrub prairie natural community recognized as extant during the Illinois Natural Areas Inventory occurred on sandy acidic soils, particularly in the Kankakee Sand Area and the southern portion of the Chicago Lake Plain (White and Madany 1978). However, communities dominated by hazel on silt-loam soils also have been described as present during presettlement times (Bowles and McBride 1994). Few if any of these remain today.

Shrub prairie - No areas of high-quality shrub prairie have been recognized by the INAI within the CR/LSAA. However, local occurrences of shrub-dominated prairie occur within mesic and wet-mesic sand prairie within the Assessment Area and these could be classified separately as shrub prairie. The total area of this particular shrub prairie type in the CR/LSAA is unknown. Shrub prairie can develop with periods of fire absence. The shrub species present demonstrate considerable fire tolerance and sprout readily following fire. Composition is similar to mesic and wet-mesic sand prairie, but shrub species are more prominent. **Shrub** species that are characteristic of shrub prairie zones in the CR/LSAA include black chokeberry, purple chokeberry (see discussion of the taxonomy for these chokeberry taxa in Swink and Wilhelm [1994]), huckleberry, and early low blueberry. **Mosses** can be common including *Polytrichum commune* and *Sphagnum* spp.

Savanna

Savanna habitats occurred throughout many parts of North America. The Midwest, intermediately located between the eastern forests and grasslands of the Great Plains, has the environmental conditions and fire history that supported many savanna-like habitats (Anderson 1983, Taft 1997a). Savannas are characterized by scattered, open-grown trees, with or without shrubs, and a continuous herbaceous ground cover typically dominated by graminoid species (grasses and sedges) and numerous forbs. Density and percent cover of

trees varies and is intermediate between open prairie and closed woodland or forest. Midwestern savanna-like habitats have several unifying characteristics including: 1) open-canopied structure (relative to closed forest); 2) canopy dominance by a few species of oaks; 3) a groundcover usually rich in species associated with tallgrass prairie; 4) a majority of floristic diversity contained in the groundcover; and 5) dependence on fire for maintenance of diversity and stability (Taft 1997a). Oak-dominated systems particularly appear dependent on periodic fire for persistence (Lorimer 1985, Abrams 1992). In a period of a few decades of fire absence, savannas in the Midwest were altered through vegetational changes and habitat destruction. There was a rapid conversion of open savanna to closed woodland and forest. The once widespread oak savannas have become among the rarest plant communities (e.g., Curtis 1959, White 1978, Nelson 1985, Nuzzo 1986). Presently in the Midwest, former savanna and open-woodland habitats still can be recognized occasionally by the scattered occurrence of large, open-grown oaks now within closed woodland. Some small remnants persist where woody encroachment has been retarded (though not stopped) by droughty edaphic conditions. In addition, many savanna-like areas have been structurally maintained by grazing. Typically, the groundcover at pastured sites is floristically degraded and characterized by an abundance of non-native species. According to Moran (1978) and Hanson (1981), savannas once covered a substantial portion of the landscape in the CR/LSAA, especially in the Morainal Section.

Three savanna subclasses are recognized in Illinois (White and Madany 1978): Savanna (generally on fine-textured soils), Sand Savanna, and Barrens (local inclusions of a prairie flora within an otherwise forested landscape). Savanna subclasses are further distinguished to community type by soil-moisture characteristics. Based on inferred edaphic characteristics in the CR/LSAA prior to settlement, the following savanna community types probably were present: Subclass Savanna - *dry-mesic savanna, mesic savanna, wet-mesic savanna*, and *wet savanna*; Subclass Sand Savanna - *dry sand savanna*, and *dry-mesic sand savanna*. These communities sometimes merge gradually with other community types (e.g., dry-mesic upland forest, sand flatwoods, shrub prairie, mesic prairie). Compared with other habitat types, relatively few threatened and endangered plant species appear to be dependent on savanna habitats. Floristically, savannas contain species of both prairies and open woodlands, though there are numerous taxa that occur most regularly in ecotonal zones, intermediate between prairie and forest, and thus can signal savanna, particularly when occurring with other characteristic savanna species (Packard 1988, Taft 1997a).

Savanna - Fire absence, fragmentation, habitat degradation (in particular, heavy grazing), and exotic species are primary ecological problems associated with savanna habitats. Restoration activities for savanna-like habitats include brush and tree cutting, prescribed fire, and exotic species control. A few stands of high quality savanna remnants occur in the CR/LSAA, and probably as well, some degraded remnants that have restoration potential. The following community descriptions are generalized depictions of the (former) undegraded condition for savanna habitats in northeastern Illinois.

Dry-mesic savanna - No remnants of this community type are known to exist in an undegraded condition in the CR/LSAA. However, savanna/open woodland probably

occurred in the Assessment Area on well-drained upland sites exposed to periodic fire. These conditions may have been more frequent in the morainal section of the Assessment Area. In the absence of fire, these areas rapidly developed into closed woodlands.

Tree species in dry-mesic savanna include white oak, black oak, and bur oak. Occasional species include white ash and shagbark hickory. **Subcanopy** stratum characteristics are dependent on the recent fire history and may include many of the previous species in stages of recruitment together with trembling aspen. **Shrubs** include leadplant, New Jersey tea, gray dogwood, hazelnut, dwarf honeysuckle, and pasture rose. **Groundcover** species include a rich assortment of graminoid and forb species from prairie, savanna, and open woodland habitats. Important graminoid species (grasses and sedges) include: big bluestem, little bluestem, Indiangrass, poverty oat grass, Pennsylvania sedge, and short-leaved bracted sedge. Characteristic forb species include: upland hog peanut, cat's-foot, pussytoes, tall anemone, spreading dogbane, Canadian milk vetch, yellow false foxglove, white wild indigo, pale Indian plantain, wild hyacinth, false toadflax, mullein foxglove, shooting star, purple Joe-pye-weed, woodland sunflower, false sunflower, Turk's cap lily, blunt-leaved sandwort, wild quinine, wood betony, starry Solomon's seal, yellow pimpernel, Virginia spiderwort, and Culver's root.

Ecological problems of any remnants would include fire absence and a great deal of woody encroachment resulting in loss of groundcover species diversity and cover. Grazing damage by livestock may be persistent and over-browsing by deer herds continues to be a source of habitat degradation in northeastern Illinois. Exotic species may be common. Typical exotics include common burdock, orchard grass, smooth brome, Queen Anne's lace, meadow fescue, Canada bluegrass, Kentucky bluegrass, and common buckthorn.

Mesic savanna - Mesic savannas typically were associated with prairie groves on level to slightly rolling terrain and sometimes riparian corridors. Mesic savannas in the CR/LSAA probably were limited to the morainal section. This community type is particularly dependent on recurrent fires. Without periodic fire, the soil-moisture conditions allow rapid development of woody vegetation cover. Consequently, due to several factors (e.g., fire absence, habitat loss, and overgrazing) undegraded remnants, though probably once occasional in the Assessment Area, are among the rarest plant communities in the Midwest. Only one 20-acre Grade-B (slightly disturbed) remnant is known from the CR/LSAA. This is 50% of all the high quality mesic savanna remaining in Illinois (Table 6).

Similar to the previous community type, the compositional characteristics for mesic savannas in the CR/LSAA are incompletely known, particularly concerning the species rich groundcover stratum. The most characteristic **tree** species of mesic savannas is bur oak. White oak, shagbark hickory, and Hill's oak may be common to occasional at some sites. **Shrubs** are similar to dry-mesic savanna. **Groundcover** species may include greater importance of mesic prairie species. Big bluestem and Indian grass are abundant. Many of the groundcover species from dry-mesic savanna also can be present in mesic savannas plus others including purple milkweed, starry campion, common spiderwort, American vetch, marsh vetchling, golden Alexanders. One state threatened species (pale vetchling [*Lathyrus*

ochroleucus]) occurs in this stand. Ecological problems associated with mesic savannas are similar to dry-mesic savanna.

Wet-mesic and *Wet savanna* - Some stream valleys in Illinois contained savanna-like natural communities prior to European settlement and the subsequent alteration of the fire and flooding regimes (Zawacki and Hausfater 1969, Thomas and Anderson 1990, Nelson et al. 1994). A presettlement vegetation map of Lake County indicates several areas where savanna bordered the Des Plaines River, particularly in the upper stream section (Moran 1978); these areas may have supported wet-mesic and wet savanna. In the prairies on the Chicago lake plain section, little forest occurred at the time of the Government Land Office surveys (Meyer 1950, Hanson 1981); the limited occurrence of forest has been attributed to a history of frequent, intense fires (Meyer 1950). While little forest was present, scattered fire-resistant trees, such as bur oak, may have occurred locally within wet to wet-mesic prairie in this portion of the lake plain and possibly forming wet-mesic to wet savanna community types. However, little evidence remains for such communities since these systems, like mesic savannas, evidently developed rapidly into (floodplain) forests in the absence of periodic fire or were altered with urban development. No noteworthy remnants have been reported from the CR/LSAA.

Tree species composition in wet to wet-mesic savannas in the CR/LSAA may have included bur oak, swamp white oak, and pin oak; trees with less fire tolerance that occasionally may have been present include American elm, sycamore, and cottonwood. This community probably was influenced not only by fire but also flooding. **Subcanopy** and **shrub** strata were probably highly variable depending on recent fire and flooding history; species may have included box elder, elderberry, and pale dogwood. Characteristic **groundcover** species may have included several sedges, common wood reed, big bluestem, prairie cord grass, blue-joint grass, sawtooth sunflower, glade mallow, and goldenglow (the latter two not reported from the CR/LSAA). The floristic composition of these natural communities probably will remain poorly understood.

Sand Savanna - As the name implies, soils in this community subclass are sandy. In the CR/LSAA, they occur associated with the dune complexes in the Michigan Lake Dunes section and the old dunes and beach ridges in the lake plain section. Undulating topography may have limited the severity of fires and allowed a savanna to develop instead of a sand prairie. The herbaceous cover is similar to that of sand prairies, and the two community types can intergrade. In the CR/LSAA, this community type may also have occurred associated with sand flatwoods. About 153 acres of high-quality sand savanna are reported from the CR/LSAA, this includes both dry sand savanna and dry-mesic sand savanna (Table 6).

Dry sand savanna - This community survives under extremely dry conditions on the crests of the highest dunes and typically there is little or no development on an A horizon in the soil. Grasses tend to be shorter than 1 meter and species diversity generally is low (White and Madany 1978). One large stand with 121 acres of high-quality dry sand savanna occurs in the Illinois Beach State Park. This represents 17.5% of all the high-quality dry

sand savanna statewide. Most of this (111 acres) is in undegraded (Grade-A) condition representing 94.1% of all the Grade-A dry sand savanna remaining in Illinois (Table 6).

The dominant **tree** species is black oak. Sassafras can be occasional in the subcanopy. Common to occasional **graminoid** species include plains three-awned grass, June grass, little bluestem, porcupine grass, Pennsylvania sedge, sand bracted sedge, and sand reed. **Forbs** may include sand cress, beach wormwood, round-headed bush-clover, flowering spurge, rough blazing star, hairy puccoon, wild lupine, horsemint, cleft phlox, clammy false foxglove, downy yellow painted cup, prickly pear cactus, goat's rue, old-field goldenrod, and showy goldenrod. **Shrubs** may include sand cherry, Carolina rose, inland New Jersey tea, dwarf honeysuckle, and witchhazel.

Downy yellow painted cup (*Castilleja sessiliflora*) and inland New Jersey tea (*Ceanothus herbaceus*) listed above are two state endangered species that occur in this stand of sand savanna in the CR/LSAA.

Dry-mesic sand savanna – In the CR/LSAA this community is limited to dune complexes of the Lake Michigan Dunes section and the dune ridges in the lake plain section. One 32-acre stand of high-quality (Grades A and B) dry-mesic sand savanna occurs at the Illinois Dunes North natural area in the CR/LSAA, representing 6.2% of the high-quality dry-mesic sand savanna known statewide (Table 6). Most of this community type remaining in northeastern Illinois is in the Kankakee Sand Area Section of the Grand Prairie Natural Division.

The dominant **tree** species is black oak. Additional trees can include white oak, scarlet oak, and bur oak. Sassafras can be occasional in the subcanopy. A common **fern** is bracken fern. Common to occasional **graminoid** species include plains three-awned grass, June grass, panic grass, little bluestem, Indian grass, porcupine grass, Pennsylvania sedge, sand bracted sedge, early oak sedge, slender sand nut-sedge, rough sand nut-sedge, and tall nutrush. **Forbs** may include upland hog-peanut, spreading dogbane, sand cress, wild sarsaparilla, beach wormwood, butterfly milkweed, flax-leaved aster, pointed tick-trefoil, flowering spurge, woodland sunflower, round-headed bush-clover, rough blazing star, hairy puccoon, wild lupine, horsemint, wild quinine, purple milkwort, whorled milkwort, slender knotweed, old-field goldenrod, showy goldenrod, goat's rue, common spiderwort, Virginia spiderwort, and bird's foot violet. **Shrubs** may include black chokeberry, New Jersey tea, dwarf honeysuckle, huckleberry, shining sumac, and early low blueberry.

Ecological problems associated with dry and dry-mesic sand savannas are similar to those discussed for the Savanna subclass and dry-mesic savanna. No threatened or endangered plants are known from dry-mesic sand savanna habitats in the CR/LSAA; however, threatened and endangered species discussed under the dry sand savanna and the dry to dry-mesic sand prairie possibly could be associated with dry-mesic sand savanna habitats.

Wetland

There are about 5,401 acres of wetland remaining in the CR/LSAA, or about 2.4% of the total Assessment Area (Table 3); this total is estimated to be about 12.9% of original extent. Wetland community types in the CR/LSAA, following natural community classification of White and Madany (1978), include floodplain forests, marsh, shrub swamp, fen, sedge meadow, and panne. Floodplain forests, often also wetland communities, were described previously under the Forest community class. Lakes and ponds fall under their own heading and will be discussed in the Lake and Pond section. Wetlands in the CR/LSAA are scattered throughout with notable absence of wetland in the highly urbanized southern half of the region. Concentrations of wetland habitats occur in the northern half, particularly in the northeastern edge along the Lake Michigan shoreline in the Illinois Beach State Park and Illinois Dunes North (Figure 7).

About 1,152.7 acres of wetland (33.2% of remaining wetland total and approximately 2.8% of original extent) are recognized as high-quality and undegraded natural communities, mostly marsh, and wet sand prairie. Other high-quality wetland community types include wet-mesic prairie, wet prairie, wet-mesic sand prairie, sedge meadow, graminoid fen, panne, seep, and pond (Table 6). Typical ecological problems for wetlands include altered hydrology resulting in increased or reduced flooding, increased runoff from cultivated uplands (not prominent in Cook County, of course), runoff from urban pavement and roadway deicing salts, grazing, invasion of non-native species, and erosion along the Lake Michigan shoreline.

Marsh - Marshes are palustrine wetlands characterized by having water at or near the surface during most of the growing season, dominance by herbaceous vegetation, and with organic or mineral soils (White and Madany 1978). Two marsh community types are recognized in Illinois: *marsh* and *brackish marsh*. Only *marsh* is found in the CR/LSAA, although ditches bordering highways, due to runoff of roadway salts, can support species of brackish marsh (e.g., alkali bulrush). Community structure is controlled largely by water depth. Shallow-water zones are dominated by emergent, rooted herbaceous vegetation. In deeper-water zones, floating aquatics and open water become more prominent. In transitional zones, a combination of these species exists and vegetation cover is intermediate between deep and shallow-water zones. Shores of marshes often are dominated by superior competitors such as cattail and common reed.

Marsh - Marshes in northeastern Illinois often co-occur with sedge meadow, wet prairie, wet sand prairie, and sometimes seep, graminoid fen, shrub swamp, and open-water pond communities. These community types often gradually merge; consequently, distinguishing community boundaries can be somewhat arbitrary. In general, certain species signal each community type with cordgrass suggesting wet prairie, tussock sedge suggesting sedge meadow, marsh marigold, swamp wood betony, and sometimes the sedge *Carex sterilis* suggesting seep, buttonbush and willows suggesting shrub swamp, and presence of cattail, rice cut-grass, and common water plantain (and low abundance or absence of signal species for other community types) indicating marsh. However, an interpretation of natural

community type based solely on these general indicator species should be done with caution. A total of 712 acres of marsh from two sites is recognized by the INAI as high-quality natural area representing 32.4% of the Illinois total (Table 6). The occurrence of marsh vegetation was noted in the region by early surveyors; marsh typically associated with wet prairie and was located throughout much of the CR/LSAA (Moran 1978, Hanson 1981).

Common to occasional **fern and fern allies** include water horsetail, common horsetail, scouring rush, marsh shield fern, and sensitive fern. Characteristic **graminoid** species include the grasses creeping bent grass, blue-joint grass, bog reed grass, rice cut grass, floating manna grass, and fowl manna grass. Common to occasional sedges include hairy lake sedge, common lake sedge, running marsh sedge, red-rooted spike rush, hard-stemmed bulrush, dark green bulrush, wool grass, river bulrush, and bulrush. Rushes include Dudley's rush and Torrey's rush. **Common forb** and other **monocot** species include sweet flag, water plantain, swamp milkweed, marsh aster, several beggar's ticks species (*Bidens* spp.), false nettle, marsh bellflower, bulbous cress, water hemlock, cinnamon willow herb, spotted Joe-pye-weed, common boneset, wild madder, yellow avens, rough avens, sawtooth sunflower, spotted tough-me-not, common water horehound, tufted loosestrife, winged loosestrife, wild mint, cowbane, water knotweed, mild water pepper, heartease, common smartweed, pale dock, marsh skullcap, water parsnip, late goldenrod, common bur-reed, woundwort, germander, cattail, and blue vervain. **Shrubs** include buttonbush, pale dogwood, red-osier dogwood, and pussy willow. The **small trees** black willow and sandbar willow are often associated with marshes in northeastern Illinois.

Several species listed as threatened or endangered by the IESPB occur in marsh habitats of the CR/LSAA (Table 9). The prairie white-fringed orchid (*Platanthera leucophaea*) is one of the state endangered species that is also listed as Federally threatened. Other state listed species include the state endangered speckled alder (*Alnus incana* ssp. *rugosa*) and Crawford's oval sedge (*Carex crawfordii*), and the state threatened marsh speedwell (*Veronica scutellata*).

Ecological problems in marsh are the same as listed for the Wetland community class; these problems tend to promote invasion of exotic species and an overabundance of aggressive and disturbance-tolerant native species. The total effect is for a reduction in the ecological integrity of the community type. When changes in flooding dynamics result in increased frequency and/or duration of flooding, species intolerant of the new levels will decline and species tolerant of the new levels will increase. Increasers under conditions of siltation and increased flooding often include reed canary grass, common reed, river bulrush, and common and narrow-leaved cattail. Compared with upland habitats, relatively few exotic species are present in wetland communities (Havera et al. 1994). However, these relatively few taxa (e.g., purple loosestrife, glossy buckthorn, narrow-leaved cattail, and reed canary grass) are difficult-to-eliminate pests that can lower the diversity of a wetland site. Common reed is a native species which also can become quite invasive. Other exotic species present within the CR/LSAA include barnyard grass, bittersweet nightshade, and hybrid crack willow (for insightful discussion regarding exotic willows see Swink and Wilhelm [1994]).

Swamp - The Swamp subclass in Illinois includes two community types: (forested) *swamp* and *shrub swamp* (White and Madany 1978). These wetlands are inundated throughout much of the year. Shrub swamp may be present, but no descriptions are available for sites within the CR/LSAA. To some extent, recognition of this community depends on the scale of consideration. Small, shrub-dominated zones occur in many wetlands.

Shrub swamp - A shrub swamp is a typically inundated wetland with at least 50% cover of shrubs (White and Madany 1978). Sites with extensive peat development are classified as shrub bog or shrub fen communities. Portions of some marsh and sedge meadow communities in the CR/LSAA may be dominated by shrubs and may meet the criteria for this classification; such areas could be considered local inclusions of shrub swamp communities. However, no shrub swamp communities within the CR/LSAA have been identified as high-quality natural areas.

Typically, species composition includes many taxa from the marsh (previously described) or sedge meadow (see below) community types. However, **shrubs** are dominant including: buttonbush, pale dogwood, red-osier dogwood, pussy willow, sandbar willow, blue leaf willow, petioled willow, heart-leaved willow, and meadow sweet. No threatened or endangered species are reported from shrub swamp within the CR/LSAA. Ecological problems are similar to the marsh community type. The exotic shrub glossy buckthorn can be particularly abundant in shrub-dominated zones in wetlands.

Bog - Bogs are acid peatlands and in Illinois mostly are oligotrophic (poorly fed) wetlands (Taft and Solecki 1990). Peatlands formerly occurred throughout much of the northern third of Illinois (Soper and Osbon 1922, Havera et al. 1994); however, habitat destruction peat mining, and other sources of degradation have reduced their size, number, and integrity. Presently, bogs are restricted in Illinois to the Morainal Section of the Northeast Morainal Natural Division and most occur in the Fox River basin. Four bog communities are recognized in Illinois: *forested bog, tall-shrub bog, low-shrub bog*, and *graminoid bog* (White and Madany 1978). Remnants of bog communities, even degraded sites, can contain numerous species listed by the IESPB as threatened or endangered. Bog-like communities can develop in some of the interdunal swales that occur along the shores of Lake Michigan. Low areas in the swales intercept the water table and provide conditions that result in peat accumulation; inadequate buffering cations in the sandy soils permits hydrogen ion concentrations to rise and increasing soil acidity (lowering soil pH).

If these conditions occur in the CR/LSAA small areas of shrub bog communities (acidic peatland dominated by shrubs) may occur locally in the Assessment Area within a complex of other, more widespread, natural communities (e.g., sand prairie, shrub prairie, sedge meadow, marsh, shrub swamp). However, no shrub bog habitats have been described. Forested wetlands with species including tamarack have been mapped, based on Public Land Survey data, from localities in the Chicago Lake Plain just south of the CR/LSAA (Meyer 1950). Furthermore, as noted by Cowles (1901a) "There are many undrained swamps, some with tamaracks, in the Calumet valley." Cowles probably was referring to bogs in the valley of the former Grand Calumet River in Indiana or near the state border.

However, Cowles (1901a) indicates that typical peat bogs in the Chicago area are scarce suggesting they may have been present, though infrequent, in the Illinois portion of the Chicago Lake Plain. While tamarack historically may have been an occasional tree in bog-like peatlands in the CR/LSAA, there are no remnants of such wetlands today in the CR/LSAA. The following is a general description of shrub bog habitat that may occur in the Assessment Area and is based on observations from the Thorn Creek Assessment Area which lies south of the CR/LSAA (and south of the Calumet Assessment Area).

(Tall and low)-shrub bog - Bog-like habitats dominated by shrubs in the CR/LSAA, if present, are scarce and small and it is unclear if any true bogs are or were present. Most of the region where these communities may have been found has been destroyed for urban development. Typical **shrubs** in shrub-dominated bog-like habitats include the following species known from the CR/LSAA: chokeberry, huckleberry, sage willow, blue-leaved willow, early low blueberry, and meadowsweet. The herbaceous groundcover typically varies within this zone with open areas supporting a distinct flora compared with shaded areas and species on elevated microsites (e.g., hummocks) distinct from species in low-lying areas. However, all herbaceous species in the following description are listed together regardless of the particular zone they can be expected in. Several **ferns** can be present including cinnamon fern, royal fern, sensitive fern, bracken fern, marsh shield fern, and northern adder's tongue. Characteristic **graminoid** species include the grasses fowl manna grass and slender panic grass, and several sedges (e.g., *Carex scoparia, C. stricta, Cladium mariscoides, Rhynchospora capitellata, Scirpus cyperinus*). Numerous rush species can be present (e.g., *Juncus acuminatus, J. canadensis, J. effusus, J. interior, J. marginatus, J. tenuis, J. torreyi*). Common to occasional **forbs** include flat-topped aster, false foxglove, swamp agrimony, swamp milkweed, northern willow herb, wild madder, small fringed gentian, Canadian mayflower, purple twayblade orchid, green-fringed orchid, Fraser's St. John's wort, and twisted yellow-eyed grass. **Mosses**, particularly *Sphagnum* species, are characteristic. Not all of the above-mentioned species have been verified from the CR/LSAA.

Many species listed by the IESPB as threatened or endangered that can be associated with this or similar habitat occur within the CR/LSAA (Table 9) at very low populations. The majority of these species are considered endangered in Illinois and include the grass pink orchid (*Calopogon tuberosus*), round-leaved sundew (*Drosera rotundifolia*), tuberculed orchid (*Platanthera flava* var. *herbiola*), purple-fringed orchid (*Platanthera psycodes*), balsam poplar (*Populus balsamifera*), horned bladderwort (*Utricularia cornuta*), flatleaf bladderwort (*Utricularia intermedia*), and small bladderwort (*Utricularia minor*). One state threatened species (dwarf raspberry [*Rubus pubescens*]) is another species that occurs in the Assessment Area and is often associated with bog-like communities.

Ecological problems in this community type include altered hydrology, intense browsing by deer, demographic threats to species with low population sizes (species with small populations have an increased risk of extirpation), small habitat size and habitat isolation, and exotic species invasion. The chief non-native species in this habitat is glossy buckthorn, which can be abundant. With altered hydrology, increased flooding duration can

provide opportunities for invasion and dominance by reed canary grass. Runoff of deicing salts also may pose a threat to this community.

Fen - Fens are minerotrophic peatlands (peat accumulates when plant growth exceeds decomposition). In general, fens are slightly to strongly calcareous and constantly recharged with mineral-rich groundwater that has percolated through calcareous gravel in adjacent moraines. The majority of the peat is derived from graminoid species, particularly sedges (Moran 1981, Stynoff and Hess 1986). Some fens occur within basins bordered by moraines; typically, cool, calcareous, artesian groundwater seeps up through the floor of the basin. Other fens form on slopes at the base of moraines or valley walls where calcareous water seeps out. In both situations, the wetland receives constant recharge of groundwater. Spring runs often can be found within fens. Within Illinois, fens are most common in the upper Fox River basin. Five separate fen community types are recognized in Illinois: calcareous floating mat, graminoid fen, low-shrub fen, tall-shrub fen [very rare], and forested fen (White and Madany 1978). The graminoid fen community type occurs within the CR/LSAA.

Ecological problems associated with fens include grazing, altered hydrology such as lowering of water table or increased flooding, fire absence, and exotic species invasion. Moran (1981) gives lists of herbaceous and woody species that increase with disturbances. Exotic species include purple loosestrife and glossy buckthorn. Fens are characterized by a specialized flora (including several threatened or endangered species), though many taxa also occur in seep, sedge meadow, and wet to wet-mesic prairie communities. In northeastern Illinois, fens often occur within complexes of several wetland community types and separate delineation based on floristic composition at times requires somewhat arbitrary distinctions.

Graminoid fen - This community type is a minerotrophic peatland dominated by herbaceous vegetation. In some instances, mesic prairie grasses are the dominant species and in other cases the dominants are sod-forming sedges. Although the peat can be elevated slightly, it resists decay due to the high levels of calcium and magnesium carbonate. Overall diversity of plant species can be quite high as a number of prairie, sedge meadow, and seep species occur in addition to typical fen species. Only one small area (0.3 acres) of high-quality graminoid fen occurs at one site in the CR/LSAA representing about 0.22% of the Illinois total (Table 6).

Common to occasional **graminoid** species include the grasses big bluestem, prairie brome, blue-joint grass, wiry panic grass, prairie cord grass, and prairie dropseed, and the sedges early fen sedge, fen star sedge, and wedge-fruited oval sedge. Common to occasional **forbs** include nodding onion, marsh aster, flat-top aster, prairie Indian plantain, low calamint, marsh marigold, bulbous cress, turtlehead, swamp thistle, fen-willow herb, northern willow herb, spotted Joe-pye-weed, common boneset, small fringed gentian, marsh blazing star, bog lobelia, grass-of-Parnassus, swamp betony, smooth phlox, common mountain mint, false dragonhead, Ohio goldenrod, and purple meadow rue. A **fern** common to this habitat is the marsh shield fern.

Ecological problems are as described for the Fen subclass. Exotic species found in fens include purple loosestrife and glossy buckthorn.

Sedge Meadow - Sedge meadow is a wetland subclass dominated by sedges that occur on mineral or organic (peat or muck) soils (White and Madany 1978). These wetlands are saturated during much of the year, but are usually not inundated for long periods. Sedge meadows often merge gradually with other wetland community types (e.g., wet prairie, wet-mesic prairie, marsh, seep, graminoid fen) forming complexes with no clear boundaries. Only one natural community type is recognized in Illinois, the *sedge meadow*.

Sedge meadow - This community type, typically, is characterized by a predominance of the hummock sedge (*Carex stricta*). Hummock sedge characteristically forms mounds, or hummocks, that are somewhat difficult to walk through. In fact, where sedge meadows occur within pastures, it appears that cattle avoid these wetlands somewhat, presumably due to the difficulty in walking, but also because other more palatable forage may be available. A total of 49.3 acres of high-quality sedge meadow occur in the CR/LSAA at two sites representing about 6.4% of the total undegraded sedge meadow in Illinois (Table 6). Other sedge meadows may be present within the Assessment Area that with management and removal of the degradation factors may improve in quality.

Floristic composition of sedge meadows can include the **ferns and fern allies** sensitive fern, marsh shield fern, horsetail, water horsetail, and smooth scouring rush. **Graminoid** species are prominent in sedge meadows including the grasses blue-joint grass, fowl manna grass, rice cut grass, and sedges fox sedge, hairy lake sedge, long-scaled tussock sedge, common lake sedge, narrow-leaved woolly sedge, running marsh sedge, red-rooted spike rush, hard-stemmed bulrush, dark green bulrush, wool grass, bulrush. Rush species can include Dudley's rush and Torrey's rush. Common to occasional **forbs** include swamp milkweed, marsh aster, tall swamp marigold, marsh bellflower, cinnamon willow-herb, fen willow-herb, spotted Joe-Pye weed, common boneset, wild madder, rough avens, marsh vetchling, common mountain mint, marsh skullcap, turtlehead, late goldenrod, and blue vervain. Common **shrubs** include buttonbush, red-osier dogwood, pale dogwood, and sandbar willow.

Two species listed as endangered by the IESPB, the prairie white-fringed orchid (*Platanthera leucophaea*) and bearded wheat grass (*Agropyron trachycaulum* var. *unilaterale* [*Elymus trachycaulus*]) are found in these high-quality sedge meadows in the CR/LSAA. The prairie white-fringed orchid also is a federally threatened species.

Ecological problems include altered hydrology, past efforts at cultivation or other developments, overgrazing, and exotic species invasion. Exotic species include Kentucky bluegrass, glossy buckthorn, and in wetter areas purple loosestrife.

Panne - This is a very unique community that occurs only within the CR/LSAA of Illinois. Pannes occupy the wet and wet-mesic interdunal swales that form in calcareous sand between the dunes along Lake Michigan. They are restricted to a 1-mile undeveloped zone

of the Lake Michigan shoreline, primarily occurring within the Illinois Beach State Park and Illinois Dunes North. This community shares considerable floristic overlap with graminoid fen and calcareous seep communities (White 1978). As the level of the water changes during the seasons, a progression of species can be observed as the margins of the ponds become exposed (Havera et al. 1994). Fifty-seven acres of high-quality panne community survive within two sites in the CR/LSAA. Representing 100% of the high-quality panne community occurring in Illinois (Table 6). Due to the calcareous nature of the surrounding sand, conditions in pannes tend to be very alkaline. Several of the species listed below have become specifically adapted to these conditions and occur primarily within this or similar communities (Havera et al. 1994).

Common to occasional **graminoid** species include the grasses blue-joint grass and prairie switch grass, and sedges green yellow sedge, false golden sedge, twig rush, wrinkled-sheathed spike-rush, tall nut rush, and hair beak rush. Rushes include the lake shore rush. **Forbs** characteristic of pannes include horned bladderwort, small yellow flax, common bog arrow-grass, and slender bog arrow-grass. Other forbs common to occasional include false asphodel, rice button aster, flat-leaved bladderwort, purple false foxglove, fringed gentian, few-flowered goldenrod, grass-leaved goldenrod, common water horehound, nodding ladies' tresses orchid, and bog lobelia. Shrubby cinquefoil and Kalm's St. John's wort are common **shrubs**.

Many of the above mentioned species are listed as threatened or endangered by the IESPB. State endangered species include false golden sedge (*Carex garberi*), wrinkled-sheathed spike-rush (*Eleocharis olivacea*), Kalm's St. John's wort (*Hypericum kalmianum*), flat-leaved bladderwort (*Utricularia intermedia*), and horned bladderwort (*Utricularia cornuta*). Species listed as state threatened include false asphodel (*Tofieldia glutinosa*), common bog arrow-grass (*Triglochin maritima*), slender bog arrow-grass (*Triglochin palustris*), and green yellow sedge (*Carex viridula*).

Ecological threats include erosion of the beach along the northeastern shores, altered hydrology, disturbance from visitors, or trampling from trail bikes.

Seep & Spring - Seeps are wetland communities characterized by a constant diffuse flow of groundwater. Typically, seeps emit from the lower slopes of glacial moraines, ravines, and terraces (White and Madany 1978). Generally, peat formation does not occur in the seep community; however, muck (highly decomposed organic matter) often is present. The boundary of the community generally is considered to be the zone of saturation due to seepage. The groundwater chemistry is influenced by the material it flows through and this in turn influences to some extent floristic composition. In Illinois, five different seep community types are recognized: *seeps* are circumneutral and occur where the groundwater is not strongly influenced by bedrock or parent material chemistry; *acid gravel seeps* occur associated with sandstone bedrock or gravel; *calcareous seeps* occur where the groundwater is mineralized by alkaline bedrock (e.g., limestone) and/or soil parent materials like glacial drift; *sand seeps* emerge from sand deposits and may be calcareous, acid, or neutral. Spring communities occur where a channel is formed.

Seep - Seeps often occur as small areas within other community types such as marsh, forest, or wet to wet-mesic prairie. Two high quality (Category I) *seeps*, totaling 1.6 acres, are reported from within the CR/LSAA (Table 6). Both of these seeps are associated with rich forested fens in the eastern section of the Assessment Area. Typical **graminoid** and **forb** species in the region include swamp goldenrod, marsh marigold, spotted Joe-pye-weed, white turtlehead, northern willow herb, low calamint, closed gentian, skunk cabbage, swamp betony, marsh vetchling, Riddell's goldenrod, brook flat-sedge, grass-of-parnassus, porcupine sedge, fen star sedge, prairie star sedge, short-headed rush, and joint rush. Common **woody plants** include black ash, alder buckthorn, red raspberry, and shining willow.

Forked aster (*Aster furcatus*), a state endangered species, and butternut (*Juglans cinerea*), a species on the Illinois watch list, have been recorded in seeps in the CR/LSAA.

Ecological problems associated with seeps include degradation by grazing, alterations to the watershed that influence groundwater discharge, foot traffic damage in the sensitive soils, and exotic species invasions. Common forget-me-not is an exotic species that occurs in seeps in the Assessment Area, other species that occur in the CR/LSAA and may occur in seeps include creeping Charlie, self heal, and moneywort.

Lake and Pond

Lake and pond are open-water habitats; however, for this report shore vegetation also is included (except for Lake Michigan shore, which is discussed under Primary communities [see below]). In the CR/LSAA, lake and pond habitats are concentrated in the north-central portion, mainly west of the Skokie River (Figure 9). Lake and Pond are the two subclasses of the Lake and Pond natural community class recognized in Illinois. Only a single natural community type, *pond*, occurs in the Pond subclass while *lake* and *great lake* are natural communities under the Lake subclass (White and Madany 1978). *Pond*, *lake* and *great lake* are the natural communities present in the CR/LSAA in this community class. Ponds are less than 20 acres in size (lakes are larger). A total of about 916.4 acres of open-water wetland and 281.9 acres of lacustrine habitat occur in the Assessment Area (Table 3); about 118 of the open-water habitat is considered to be natural pond (National Wetland Inventory database).

One hundred sixty-three acres of *great lake* that occurs along the Michigan Lake shores in the northeastern corner of Lake County (Illinois Dunes North natural area) qualifies as Grade-B (slightly degraded from pollution). Only one 4-acre *pond* in the CR/LSAA, located in Illinois Beach State Park, is considered high quality. No *lakes* in the Assessment Area remain in high-quality condition. Habitat integrity of the natural pond and lake habitats in the CR/LSAA has been degraded considerably compared with the floristically rich aquatic habitats described in the early part of the 20th century (Cowles 1901a, Peattie 1925). Sources of degradation are related to the extensive industrial and urban development throughout this region and include sewage and industrial pollution, and

filling of wetland. The floristic composition, including threatened and endangered species, is discussed in more detail under the *pond* natural community (below).

Pond - This community subclass contains the single natural community *pond*, discussed below.

Pond - Natural ponds are usually shallow enough to allow rooted aquatic plants to grow throughout. Within the CR/LSAA are an estimated 118 acres of natural ponds; only one of these, a 4-acre pond in Illinois Beach State Park, has remained in high quality condition. In addition to natural ponds, there are artificial ponds in the Assessment Area. These include impoundments, sewage-treatment lagoons, and excavated ponds. Natural ponds often occur in association with marsh and/or sedge meadow natural communities. Like in marshes, vegetation associated with ponds can be described in terms of the organization of the community with particular species associated with shore habitats, and others sorting into near-shore shallow-water habitats and deeper-water habitats more distant from the shore.

Open-water habitats in the CR/LSAA have been degraded considerably by human activities. The following floristic description is based on species associated with the high quality pond in the CR/LSAA and on taxa reported from early 20th century descriptions (Cowles 1901a, Peattie 1925). Many of the species listed here still may occur associated with pond and shore habitats in the CR/LSAA, but others may not. A **fern ally** known from shore habitat in the CR/LSAA is water horsetail. **Graminoid** species associated with shore habitat include the grasses salt-marsh cockspur grass, reed grass, blue-joint grass, rice-cut grass, and wild rice. Sedges in the shore habitat include a rich assemblage including red-rooted nut sedge, field nut sedge, rusty nut sedge, brook sedge, bristly sedge, twig rush, three-way sedge, needle spikerush, blunt spike rush, angled spike rush, hair beak rush, red bulrush, and bulrush. Rush species include lake shore rush, short-headed rush, common rush, and joint rush. Common to occasional **forbs** of the shore zone include purple false foxglove, long-leaved ammania, nodding bur marigold, clammy hedge hyssop, rose mallow, seedbox, false loosestrife, winged loosestrife, ditch stonecrop, mild water pepper, heartease, marsh cress, marsh St. John's wort, and common cattail. Forbs common in shallow-water zones, on exposed mudflats or moist sand, include water plantain, water star-grass, marsh purslane, fogfruit, water knotweed, cursed crowfoot, common arrowhead, water parsnip, and bur-reed. Floating aquatics and species of deeper water zones include watershield, coontail, waterweed, several duckweed species, spiked water milfoil, naiad, yellow pondlily, American lotus, white water-lily, several pondweed species, yellow water-crowfoot, white water-crowfoot, common bladderwort, watermeal, and horned pondweed. **Woody plants** at the shore can include silver maple, cottonwood, swamp loosestrife, buttonbush, and several willow species.

Threatened and endangered species that have been recorded from open-water or shore habitats in the CR/LSAA include the state threatened green yellow sedge (*Carex viridula*) and the state endangered Richardson's rush (*Juncus alpinus*).

Ecological problems were outlined previously in the description of the Lake and Pond community class. Non-native plant species such as curly pondweed, European water milfoil, narrow-leaved cattail, purple loosestrife, and seaside goldenrod can become common to abundant.

Lake - This community subclass contains the natural communities *great lake* and *lake*, which are discussed below.

Great lake - The northeastern border of the CR/LSAA along Lake Michigan (Figure 9) includes a small portion of the lake (163 acres) that is recognized as a high-quality great lake habitat (Grade-B), largely based on the type of limnetic life inhabiting the area. However, due to the paucity of vascular plants in this habitat, the lake flora will not be discussed further here. See a brief discussion of great lake shore vegetation under the Primary community class (below).

Lake (natural) - Lakes are distinguished from ponds by several characteristics: lakes are larger (>20 acres) and deeper (>2 meters) than ponds, thermal stratification is more prominent in lakes compared with ponds, wave action typically produces locally a semi-barren shore zone, and portions of lakes generally are too deep to support rooted aquatic plants. Natural lakes were once present throughout Illinois, but most have been drained or drastically altered. Most natural lakes that remain in Illinois are in the Northeastern Morainal Division. Presently, no lakes in the CR/LSAA are considered to be of high ecological quality. See generalized description for the pond natural community class for species composition.

Stream

Streams are permanent flowing waters and have been classified, according to White and Madany (1978) into two subclasses, Creek and River. The two subclasses are distinguished on the basis of size; a *Creek* has a watershed <200 sq. mi. (520 sq. km.) and a *River* has a watershed >200 sq. mi. (520 sq. km.). The individual natural communities within the subclasses are described according to gradient and size, and include the *Low-Gradient Creek, Medium-Gradient Creek, High-Gradient Creek, Low-Gradient River, Medium-Gradient River*, and *Major River.*

Instead of acreage, streams are generally measured in terms of miles. No biologically significant stream segments have been identified within the CR/LSAA. While streams can be extremely significant for many animal groups, plants are generally infrequent in this natural community due to the scouring effects of rushing floods. The aquatic plants generally inhabit the calm waters in backwaters along streams under the subclasses Creek and River that would generally be classified as Ponds. River banks are generally classified as part of Floodplain Forests, and include the woody plants as well as many herbs adapted to inundation. Large streams occur in the CR/LSAA, the most prominent being the Chicago River, the North Branch of the Chicago River, the Middle and West Forks of the

North Branch of the Chicago River, and the Skokie River (Figures 2 and 9). Seven separate drainage subbasins occur in the CR/LSAA (Figure 2). Plants that most frequently grow along rivers and other streams are listed in Appendix 1 within the Stream category, but many species associated with rivers are also located within the Floodplain forest, and Lake and Pond subclasses. A few species are characteristic of streams and their immediate margins, and these are listed below.

Plants characteristic of streams and their immediate margins include these **forbs:** tall water hemp, nodding bur marigold, common beggar ticks, panicled aster, common horsetail, monkeyflower, hairy marsh yellow cress, spotted smartweed, common arrowleaf, cinnamon willow-herb, and smooth hedge nettle. Slower moving areas along the river may have typical marsh plants such as the river bulrush, common burreed, and common cattail. **Trees** include species listed as typical of wet floodplain forest (see previous description above), particularly sandbar willow and silver maple.

Ecological problems in streams receive wide publicity and include channelization, siltation from cultivated land, pollution from industrial and sewage inputs, degradation from direct and indirect livestock use, and fertilizer and pesticide runoff from agricultural land.

Primary

This community class includes natural communities where soil is thin or absent with the parent material near the surface; the communities are maintained indefinitely at an early stage of Primary succession by the substrate or natural disturbances. Primary communities in Illinois include three community subclasses: Cliff, Glade, and Lake Shore (White and Madany 1978). Cliff and Lake Shore are present in the CR/LSAA. Shore vegetation for smaller lakes were discussed in the previous description of marsh vegetation.

Cliff – This natural community subclass includes vertical exposures of resistant bedrock as well as unconsolidated associated materials. Soil generally is nonexistent or poorly developed and the communities are delimited based upon rock type. Several different types of cliff communities are recognized in Illinois: *sandstone cliff, limestone cliff, dolomite cliff, sandstone overhang*, and *eroding bluff* (White and Madany 1978). Only *eroding bluff* occurs in the CR/LSAA.

Eroding bluff – Eroding bluffs consist of eroded, unconsolidated material (e.g. glacial drift) or weak rock (e.g. shale) on a steep slope that is maintained by erosion from stream or lake action. The biotic community is usually poorly developed because of continual slumping (White and Madany 1978) and consists predominantly of species that can establish and reproduce rapidly to accommodate to the frequent disturbance. There are 11.4 acres of high-quality eroding bluff community in the CR/LSAA on 3 sites, representing 47.7% of all the eroding bluff community considered high quality in Illinois.

Poverty oat grass is a characteristic **grass** of eroding bluffs. **Forb** species that can occur include old field goldenrod, annual bedstraw, white avens, grass-leaved goldenrod, pale

corydalis, false toadflax, and common woodsorrel. Common to occasional **shrubs** or **trees** include round-leaved dogwood, running Juneberry, common juniper, white pine, white cedar, and low shadbush.

Common juniper (*Juniperus communis*) and white cedar (*Thuja occidentalis*) are state threatened shrubs that occur on eroding bluffs in the CR/LSAA.

Lake Shore – The Lake Shore subclass includes two natural communities, *beach* and *foredune*. Lake-deposit sands form the substrate for these communities; both of which are limited to the shoreline of Lake Michigan. The majority of the remaining occurrences of these communities are located along the northeastern shores of CR/LSAA at Illinois Beach State Park and Illinois Dunes North. Historically they probably occurred all along the Illinois shores of Lake Michigan but due to urbanization and other disturbances very little of these communities remain. Several species listed by the IESPB as threatened or endangered occur in beach and foredune habitats (Herkert 1991) as well as many unique species that are specially adapted to the dry, sandy conditions.

Beach – Beaches are the most recently formed of these two natural communities and soil development is minimal. Two stages generally can be seen in the beach community; the nearly bare-sand zone nearest the lake and the more stabilized vegetated dunes, mostly grassland, further away from shore (White and Madany 1978). A total of 63 acres (48 acres Grade-A, 15 acres Grade-B) of beach have been recognized as high-quality habitat in the CR/LSAA. This constitutes the 100% of high-quality beach habitat in Illinois (Table 6). Most of this occurs in the Illinois Beach natural area, with 5 acres occurring at Illinois Dunes North.

Ferns and **fern allies** that can occur in beach habitat include common horsetail and smooth scouring rush. Common to occasional **graminoid** species include the grasses beach grass, creeping bent grass, mat sandbur, the sedges red-rooted spike-rush, rough sand sedge, and rushes Dudley's rush, joint rush, lake shore rush, and Richardson's rush. **Forbs** can include beach wormwood, dune thistle, seaside spurge, silverweed, Illinois tick-trefoil, sea rocket, white and purple prairie clovers, cleft phlox, winged pigweed, beach pea, waxy meadow rue, tufted loosestrife, grass-leaved goldenrod, old field goldenrod, sand cress, common evening primrose, prairie cinquefoil, prairie violet, arrow-leaved violet, alumroot, wild lupine, and sleepy catchfly. Very few **shrubs** inhabit the beach community.

Several species listed as threatened or endangered by the IESPB occur in this habitat in the CR/LSAA. State endangered species include beach grass (*Ammophila breviligulata*), Richardson's rush (*Juncus alpinus*), and seaside spurge (*Chamaesyce polygonifolia*). Species that are listed as state threatened include sea rocket (*Cakile edentula* ssp. *lacustris*) and rarely the dune thistle (*Cirsium pitcheri*) which also is listed as federally endangered (Table 9).

Foredune – This community is slightly further from the lake shore compared with the beach community where natural disturbance from wave action is less frequent and intense.

Consequently, the vegetative strata of foredune communities are more developed than those in the beach communities. Foredunes contain many perennials (woody and herbaceous) that stabilize the sand and are characterized by the beginning of soil development (White and Madany 1978). Illinois Beach and Illinois Dunes North natural areas contain the only remaining high-quality foredune habitat in Illinois; 102 acres total, which includes 86 acres of Grade-A habitat and 16 acres of Grade-B.

Ferns and fern allies that occur in foredunes can include marsh shield fern, common horsetail, and smooth scouring rush. **Graminoid** species can include little bluestem, needle grass, beach grass, Canada wild rye, prairie switch grass, mat sandbur, white-haired panic grass, sand reed, lake shore rush, golden-stemmed spike-rush, wild rye, perennial rye grass, and many others also listed under the beach community above. **Forbs** found in CR/LSAA foredunes can include lion's-foot, colic-root, low calamint, common bugseed, clustered broomrape, sky-blue aster, dune thistle, Illinois tick-trefoil, white and purple prairie clovers, cleft phlox, waxy meadow rue, tufted loosestrife, old field goldenrod, prairie cinquefoil, prairie violet, arrow-leaved violet, alumroot, wild lupine, and sleepy catchfly. Common to occasional **shrubs and small trees** include Canadian buffalo-berry, sand cherry, bearberry, dwarf birch, common juniper, trailing juniper, jack pine, pasture rose, and several willows such as blue-leaved willow, sandbar willow, pussy willow, sage willow, silky willow, and sand-dune willow

This community also harbors many threatened and endangered species unique to the dry, sandy habitats as does the beach community. State endangered species occurring in the foredunes of the CR/LSAA include Canadian buffalo-berry (*Shepherdia canadensis*), bearberry (*Arctostaphylos uva-ursi* var. *coactilis*), clustered broomrape (*Orobanche fasciculata*), beach grass (*Ammophila breviligulata*), trailing juniper (*Juniperus horizontalis*), beach pea (*Lathyrus joponicus* var. *glaber*), jack pine (*Pinus banksiana*), and sand-dune willow (*Salix syrticola*). State threatened species include common juniper (*Juniperus communis*), sea rocket (*Cakile edentula ssp. lacustris*), and dune thistle (*Cirsium pitcheri*), the latter also is listed as federally threatened (Table 6).

Ecological concerns for beach and foredune communities include shoreline erosion, trampling and other human disturbance, and exotic species invasion. Exotic species that occur in these communities include goutweed, lyme grass, Russian thistle.

Cultural

This class describes communities formed entirely by human activities and disturbances and includes cropland, pastureland, old fields, developed land (e.g., urban), tree plantations, artificial lakes and ponds, and prairie reconstructions (White and Madany 1978). Cultural, mostly urban, is the major community class in the CR/LSAA comprising about 81% of the total land area (Table 2). Cultural habitats generally do not provide habitat for threatened or endangered species. One exception for the CR/LSAA is the endangered species seaside crowfoot (*Ranunculus cymbalaria*) (Table 9); a few occurrences of this species have been

reported from ditches and degraded moist ground in the Assessment Area. Cultural areas impose some of the most challenging ecological problems for natural habitats in the CR/LSAA (see discussion below). Exceptions include the prairie reconstruction, termed prairie restoration by the INAI (White and Madany 1978), and wetland reconstructions. Prairie restoration is mentioned below as an example of habitat reconstruction efforts.

Prairie restoration - Typically, prairie reconstructions are plantings of prairie species on grassland soils where the original natural community has been destroyed. Prairie species are planted, sometimes in an effort to produce a warm-season grassland and sometimes with the goal of attempting to recreate the original prairie community. Prairie reconstructions often are species poor and strongly dominated by only a few taxa. The total area of prairie reconstruction within the CR/LSAA is unknown. None have developed into communities that mimic undegraded tallgrass prairie in species richness or structure. Reconstructed prairies require considerable time (>5 years and probably >20 years) to develop into systems that structurally and compositionally resemble natural communities.

Summary and Recommendations

Trends in the Chicago River/Lake Shore Assessment Area among all natural communities combined indicate that the total proportion of original communities that now remain in an undegraded, high-quality condition is about 1.03% of the area, slightly greater than the statewide estimate of 0.07%. However, there is variation in degree of habitat loss and degradation among community classes. Cover of forest in the CR/LSAA is about 56% of its original total, while the statewide trend is only about 30% of the original forest cover remaining. A total of 292 acres (.55%) of this remains in high-quality condition, which is still quite a bit greater than the statewide figure of 0.08% of the original extent. For prairie, a greater proportion of prairie remains in the CR/LSAA in a high-quality condition (0.30%) compared with statewide trends (0.01%). Probably few, if any, comparably sized areas in Illinois support a greater proportion of high-quality prairie, especially high-quality sand prairie. Although grades C and D (somewhat to greatly degraded) prairies occur in most regions of Illinois, total acreages are unknown. Degraded habitats such as these often provide great potential for restoration. For savanna and flatwoods, the trends are difficult to compare since no detailed information is available on the original extent statewide or in the Assessment Area. Remaining in the Assessment Area is a total of 20 acres of high-quality savanna and 153 high quality sand savanna, plus a 51-acre stand of slightly degraded, but still Category I, flatwoods. For wetlands, the trends for extent of remaining wetlands appear to be lower than the statewide average. An estimated approximately 8.3% of the original extent of wetlands remain in the CR/LSAA compared to about 11% statewide. However, a substantially greater proportion of remaining wetlands are high quality compared with statewide trends; about 2.8% of the original and 33.2% of the remaining wetland acreage are high-quality compared with statewide values of 0.07% and 0.64%, respectively. For assessing wetland trends, acreages of wet and wet-mesic prairie were included among wetland acres; however, double counting these acres was avoided for estimates of total area of high-quality natural areas in the CR/LSAA. Additional survey

efforts in the CR/LSAA may identify noteworthy and/or restorable remnants of natural communities and new populations of threatened or endangered species.

Despite the availability of some descriptive information regarding natural communities in the CR/LSAA, there remain many knowledge gaps such as the diversity and species abundance patterns over time, long-term trends among many remnant natural communities, and many issues related to ecological management, the control of exotic species, and the maintenance of biodiversity. Further, since remnants of any community type tend to have floristic differences (no two natural areas are the same), and very few undegraded remnants exist for each community type, there is an incomplete knowledge of floristic characteristics for many community types that historically were widespread in the Assessment Area. Examples where detailed floristic data particularly are limited include the forest, savanna, and wetland communities.

Throughout the natural community descriptions for the CR/LSAA are consistent references to a set of related ecological problems that threaten the long-term maintenance of biodiversity in the Assessment Area. These include habitat fragmentation and isolation, habitat degradation, exotic species invasion, and, for several community types, fire absence. The following five steps are recommended as an approach for gaining further insights of the natural communities in the CR/LSAA and developing a plan for the long-term maintenance of biodiversity.

1. Inventory

The Illinois Natural Areas Inventory (INAI) provides data on the distribution and abundance of statewide-significant natural communities (White 1978). However, many natural communities occur in Illinois that, though they do not meet the qualitative standards chosen for the INAI for undegraded and statewide-significant natural areas, contain regionally noteworthy and exceptional natural features. Many natural communities in the CR/LSAA, though somewhat degraded, retain relatively high levels of ecological integrity and have potential for further improvement through restoration efforts. Since the INAI sites are few and small in total area the somewhat degraded but restorable natural communities that remain are critical for the long-term maintenance of biodiversity in the region. Restorable remnants among all community classes (e.g., forest, prairie, savanna, wetland) need to be identified. Floristic Quality Assessment, a method for evaluating the natural quality of habitat remnants that employs numerous parameters of community characteristics, is a promising technique for distinguishing remnants of native vegetation that have restoration potential (Swink and Wilhelm 1994, Taft et al. 1997).

2. Map

All results from natural community inventory efforts should be categorized and mapped to provide a spatial context for the locations of habitats with differing ecological condition. This will aid in identifying concentrations of noteworthy natural communities that can serve as focus areas for establishing large preserve complexes or macrosites. Figure 10 in this report shows locations of high-quality natural areas and nature preserves within the CR/LSAA thus indicating the considerable effort already established in this regard within

the Assessment Area. Trends in total area of qualitative classes for each community type would serve as an aid in measuring success in restoration efforts.

3. Protection

The natural communities with the greatest integrity need to be protected from further anthropogenic degradation (e.g., urban sprawl, grazing, off-road vehicle impacts, siltation). Inventory and mapping in the Assessment Area will aid in the prioritization of protection efforts. Highly isolated remnants pose distinct conservation and protection challenges compared with clusters of restorable natural communities. Staff of the Illinois Nature Preserves Commission (524 S. Second St., Springfield, IL 62701) is familiar with the various protection options and incentives for private landowners.

4. Identification and prioritization of ecological problems

As previously indicated, a host of related ecological problems consistently are present among remnant natural communities in the CR/LSAA (e.g., habitat fragmentation, habitat degradation, exotic species invasion, and fire absence). Some problems can be addressed more readily than others. *Habitat fragmentation* is a widespread problem with potentially devastating consequences for ecological integrity often resulting in an interruption of biological interactions, ecological processes, species migrations, and a reduction in habitat heterogeneity (Wilcove et al. 1986). High levels of fragmentation often result in a loss of species richness because species immigration, needed to compensate for local extirpation (and emigration) of species, is seriously challenged. However, "solutions" to restoring biological connectivity and ecosystem-level processes are extraordinarily complex and costly if the goal is to recreate corridors for all species among regional habitats. If functional dispersal corridors can not be established for most species, maintaining biodiversity in the highly fragmented landscape of the CR/LSAA may require distinct management actions among several remnants of each community type in order to simulate the landscape-scale heterogeneity needed to accomplish this goal. Unfortunately, where habitat loss is pronounced, that option seldom is available.

In contrast, *habitat degradation* is a widespread problem that can be slowed and/or minimized at many sites by removing the degradation factor (e.g., grazing, soil disturbances), although restoration to predisturbance condition in severe cases may require intensive vegetation management. It is difficult to find a woodland in Illinois that does not bear indications of past livestock grazing. Furthermore, particularly in the Chicago region, intense deer browsing is negatively impacting many native plant communities. The effects of overgrazing can be persistent. Certain species (e.g., many ferns, orchids, trilliums, blue cohosh, bellflower, bloodroot, several grass and sedge species) appear to be sensitive to grazing disturbance and often are absent while certain grazing increasers (e.g., unpalatable species, thorn-bearing species, and plants with bristly fruits) are dominant. For instance, a typical situation in northeastern Illinois woodlands is a groundcover and shrub flora dominated by common snakeroot, white snakeroot, buckbrush, Missouri gooseberry, blackberries (*Rubus* spp.), Virginia creeper, and exotics such as garlic mustard. Usually, confounding influences such as grazing, increased shade, and siltation or other soil disturbances are involved.

Exotic species invasion can be considered a species-level, a community-level, and a landscape-level problem, particularly in the Chicago region. The area of northeastern Illinois supports more exotic species than any other region of Illinois and natural communities in the region often are infested with a multitude of pernicious exotic species. In particular, glossy buckthorn, common buckthorn, European high-bush cranberry, the bush honeysuckles (e.g., *Lonicera maackii, L. tatartica*), garlic mustard, bittersweet nightshade, and purple loosestrife are so ubiquitous that it is difficult to imagine eliminating them from natural communities in the region. However, some community-level management activities address more than one ecological problem. For example, garlic mustard abundance possibly can be reduced with a vigilant program of appropriately timed applications of fire (Nuzzo 1991, Schwartz and Heim 1996). Other serious exotic pests such as purple loosestrife require direct treatment or biological control (Thompson et al. 1987, Malecki et al. 1993). Recommended control measures for several of the most threatening and abundant exotic species are summarized in Table 11 (modified from Solecki 1997).

Fire is an ecological force that historically influenced many aspects of natural communities in the CR/LSAA. Many community types require fire for maintenance of community characteristics and diversity. Fire absence has resulted in changes in forest structure, composition, and diversity. Invasion of mesophytic species such as sugar maple into oak-hickory forests is a statewide phenomenon related to fire absence also occurring in northeastern Illinois and the morainal section of the CR/LSAA. Many forests in Illinois are dominated in the canopy by oaks but have few oak saplings. Rather, shade-tolerant (and fire intolerant) species like sugar maple often are extraordinarily more common and occur at higher density than prior to settlement. An obvious consequence of this change is the possible loss of oak woodlands and the plant and wildlife species that depend on them. A rich assemblage of spring wildflowers still can be found in some woodlands because these spring ephemerals largely escape the ensuing shade of the dense overstory and thus selectively persist while typically only a few shade-tolerant species can be found in the summer and fall. Infrequent application of prescribed fire may be inadequate to reverse these trends. Rather, a long-term program of repeated applications of prescribed fire is often necessary before compositional stability is achieved in fire-dependent communities. Fire absence in prairie communities typically results in invasion by woody plants leading to reduction in area of the prairie and in species richness; eventually, entire prairie remnants can be eliminated by ensuing shrub thickets and regrowth forest with great loss of biodiversity. Prescribed fires can be implemented to a wide variety of remnants and community types, at little cost, and achieve measurable improvements in many parameters of ecosystem integrity. However, consideration needs to be given to the whole natural community. Spatially heterogeneous burns appear most effective at maintaining viable populations of fire-dependent and fire-sensitive species.

5. Application of appropriate vegetation management and monitoring

Once the ecological problems for a natural community are identified and prioritized according to restoration effort and gain, a program of vegetation management needs to be implemented. Record keeping is vital to tracking activities and levels of success in

implementing each treatment plan. Floristic Quality Assessment methods may provide a framework useful in measuring progress of each restoration activity. Methods for making spatial and time-series comparisons and statistical analysis using Floristic Quality data have been described (Taft et al. 1997).

Table 11. List of invasive exotic species known or suspected to occur in the Chicago River/Lake Shore Assessment Area, and recommended eradication methods.

Common Name *Scientific Name*	Cut & Apply Stump-Treatmt Herbicide[1]	Foliar Herbicide Application	Prescribed Fire	Cut &/or Hand Pull (get root)	Dig Root	Biological Control	Cover w/ Black plastic
asparagus *Asparagus officinale*	X				X		
barberry, common *Berberis vulgaris*	X	X	X		X		
barberry, Japanese *Berberis thunbergii*	X	X	X		X		
bittersweet, round-leaved *Celastrus orbiculatus*	X	X		X			
bouncing-bet *Saponaria officinalis*		X					
brome, awnless *Bromus inermis*		X					
buckthorn, European *Rhamnus cathartica*	X	X	X				
buckthorn, glossy *Rhamnus frangula*	X	X	X				
burdock, common *Arctium minus*		X		X	X		
carrot, wild *Daucus carota*		X		X	X		
clover, white sweet *Melilotus alba*			X	X			
clover, yellow sweet *Melilotus officinalis*		X	X				
daisy, ox-eye *Leucanthemum vulgare*		X	X	X			
day lily, orange *Hemerocallis fulva*		X			X		X
dock *Rumex* spp.		X		X			
elm, Siberian *Ulmus pumila*	X						
fescue, meadow *Festuca pratensis*		X	X		X		
foxtail *Setaria* spp.		X					
grass, barnyard		X	X	X			

Table 11. Continued.

Common Name *Scientific Name*	Cut & Apply Stump-Treatmt Herbicide[1]	Foliar Herbicide Application	Prescribed Fire	Cut &/or Hand Pull (get root)	Dig Root	Biological Control	Cover w/ Black Plastic
Echinochloa crus-galli grass, Canada blue		X	X				
Poa compressa grass, cheat		X					
Bromus tectorum grass, Kentucky blue		X	X				
Poa pratensis grass, quack		X	X				
Agropyron repens grass, reed canary		X	X	X			
Phalaris arundinacea hemp		X		X			
Cannabis sativa honeysuckle, amur	X	X					
Lonicera maackii honeysuckle, common fly	X	X					
Lonicera x *muendeniensis* honeysuckle, Japanese		X					
Lonicera japonica honeysuckle, Morrow's	X	X					
Lonicera morrowi honeysuckle, showy fly	X	X					
Lonicera x *bella* honeysuckle, Tartarian	X	X					
Lonicera tatarica ivy, ground		X		X			
Glechoma hederacea lily-of-the-valley		X			X		
Convallaria majalis locust, black		X - Garlon 4					
Robinia pseudoacacia loosestrife, purple		X		X		X	
Lythrum salicaria moneywort		X					
Lysimachia nummularia motherwort		X		X	X		
Leonurus cardiaca mulberry, white	X						
Morus alba mullein, common		X	X		X		
Verbascum thapsus mustard, black		X		X			

Table 11. Continued.

Common Name *Scientific Name*	Cut & Apply Stump-Treatmt Herbicide[1]	Foliar Herbicide Application	Prescribed Fire	Cut &/or Hand Pull (get root)	Dig Root	Biological Control	Cover w/ Black Plastic
Brassica spp. mustard, garlic		X	X	X			
Alliaria petiolata olive, autumn	X						
Elaeagnus umbellatus orange, Osage	X						
Maclura pomifera parsnip, wild*		X		X	X		
Pastinaca sativa periwinkle, common		X					
Vinca minor pink, deptford				X			
Dianthus armeria poplar, white	X		X				
Populus alba rocket, Dame's			X		X		
Hesperis matronalis rocket, yellow		X	X	X		X	
Barbarea vulgaris rose, multiflora	X	X	X				
Rosa multiflora spurge, cypress		X		X	X		
Euphorbia cyparissias spurge, leafy*		X		X	X		
Euphorbia esula teasel, common		X		X	X		
Dipsacus sylvestris teasel, cut-leaved		X		X	X		
Dipsacus laciniatus thistle, bull		X					
Cirsium vulgare thistle, field		X					
Cirsium arvense thistle, musk		X	X	X			
Carduus nutans tree-of-heaven	X			X			
Ailanthus altissima willow, white	X						
Salix alba yarrow				X			
Achillea millefolium							

[1] The recommended herbicide, typically, is Round-up (glyphosate) except for black locust (Solecki 1997).
[2] Asterisk (*) indicates plant can cause skin rashes. Direct skin contact should be avoided.

Birds

Introduction

Information in this section is derived from standard references of Illinois, including the Illinois Natural Heritage Database (Illinois Department of Natural Resources 1999), The Birds of Illinois (Bohlen 1989) and The Illinois Breeding Bird Atlas (Kleen in litt.), the state's former (Illinois Birds and Birding) and current (The Meadowlark) ornithological journals, the Checklist of Illinois State Birds (Illinois Ornithological Records Committee 1999), Birds of the greater Chicago area: A seasonal checklist (Chicago Audubon Society 1998), as well as the results of extensive field work by personnel from the Illinois Natural History Survey (much of it ongoing and not yet published). In addition, the Illinois Endangered Species Protection Board (1999) recently updated its list of threatened and endangered species for the state.

The Chicago River/Lake Shore Assessment Area (CR/LSAA) is a unique area, especially as it compares to other primarily urban landscapes found in the state. With the entire eastern border of the CR/LSAA being formed by the Lake Michigan shoreline, all of the CR/LSAA lies within a major, and often narrow, avian flight corridor, both along the lakeshore itself and within a few miles (west) of the lake. For this reason, the area is perfectly situated for major influxes of migrating birds of all kinds. This can be seen quite dramatically at such locally "famous" birdwatching sites as the "Magic Hedge" near Montrose Harbor in Lincoln Park and at the "Wooded Isle" portion of Jackson Park, when hundreds if not thousands of birds including dozens of species "fall out" before and after a frontal system passes through during migration.

The remaining public lands in this increasingly urbanized environment are becoming more and more important as critical stopover habitat for migrant species of all habitat types. However, virtually all non-urbanized habitats are found as isolated areas in a highly fragmented state, or in narrow corridors such along the Skokie and Chicago Rivers. The largest blocks of habitat occur along these river valleys, in the many city and county lakefront parks, and at Illinois Beach State Park (IBSP). For a brief, general description of these areas and most other public landholdings within the CR/LSAA, as well as the associated birdlife to be found there, see Mlodinow (1984), Williamson (1996), Carpenter and Greenberg (1999), and De Vore (2000). Unfortunately, for many birds of most habitat types within the region, these areas are likely population "sinks" as breeding areas, in which there is insufficient reproductive success to replace adults that die each year of natural causes. For these reasons, the best management strategy may be to focus on enhancing habitat for birds of wetlands, grasslands, and shrublands, and for improving stopover habitat for migrating birds in route to northern breeding areas or southern

wintering areas. Nevertheless, the existence of a few relatively large public land holdings, such as IBSP and the Skokie Preserves, creates some opportunities for reducing the negative effects of fragmentation.

Both the breeding species list, as well as the list in general, has benefited from the existence of the numerous public land holdings of both the Cook Co. Forest Preserve District, Cook Co. Park Districts, Lake Co. Forest Preserve District, and the large Illinois Department Natural Resources site at IBSP (Table 4, Figure 10). The entire Lake Michigan shoreline is especially important as a navigational aid, bringing species both to and through the area. The lake acts as a natural "funnel" for birds passing around the lake to destinations north, northwest and northeast (from the south and southwest) during spring migration (including Willets, Sanderlings, Bonaparte's Gulls, various terns and a variety of passerines, especially warblers) and for species that are heading south and east around the bottom of the lake (including such diverse species as loons, Tundra Swans, scoters and other ducks, various hawks especially Broad-winged, accipiters, and falcons, Sandhill Cranes, jaegers, and Black-throated Blue, Connecticut, and Mourning Warblers) in fall. The list of species that have been noted along the Lake Michigan shoreline in the CR/LSAA is longer and more extensive than in any other area of its size in Illinois. Although many have been rare, vagrant species, the area also has a long list of species that are found regularly as migrants here, that are not found regularly anywhere else in the state, including such diverse species as Red-necked Grebe, Harlequin Duck, Long-tailed Duck, Peregrine Falcon (as a migrant and breeder), Whimbrel, Purple Sandpiper, Parasitic Jaeger, and several species of gulls.

Although a very small part of the avian population in the area, a list of rarities that have been found migrating through or otherwise occurring in the CR/LSAA shows the unique position that this area has within a major migratory corridor. This list, along with the other species which have already been noted, as well as the regular species list for the area, contains more species seen for one area of its size, than anywhere else in the state, and with few exceptions, anywhere else in the interior U.S. This list includes: Pacific Loon, Northern Gannet, American White Pelican, Brown Pelican, Magnificent Frigatebird, Snowy Egret, Tricolored Heron, Reddish Egret, *Plegadis* sp., Trumpeter Swan, Brant, Cinnamon Teal, Eurasian Wigeon, Tufted Duck, Black Vulture, Swallow-tailed Kite, Mississippi Kite, Swainson's Hawk, Prairie Falcon, Black Rail, Purple Gallinule, Whooping Crane, Black-necked Stilt, Eskimo Curlew (last reported at Lincoln Park in 1923), Long-billed Curlew, Hudsonian Godwit, Curlew Sandpiper, Ruff, Red-necked Phalarope, Pomarine Jaeger, Black-headed Gull, Mew Gull, California Gull, Western Gull, Ross's Gull, Ivory Gull, Gull-billed Tern, Royal Tern, Sandwich Tern, Arctic Tern, Least Tern, Ancient Murrelet, Grove-billed Ani, Burrowing Owl, Chuck-wills-widow, Williamson's Sapsucker, Say's Phoebe, Vermilion Flycatcher, Ash-throated Flycatcher, Scissor-tailed Flycatcher, Bell's Vireo, Steller's Jay, Scrub Jay, Black-billed Magpie, Common Raven, Violet-green Swallow, Carolina Chickadee, Rock Wren, Varied Thrush, Bicknell's Thrush, Sage Thrasher, Sprague's Pipit, Black-throated Gray Warbler, Townsend's Warbler, Yellow-throated Warbler, Kirtland's Warbler, Swainson's Warbler, "Brewster's" Warbler, "Lawrence's" Warbler, Western Tanager, Black-headed Grosbeak, Blue Grosbeak, Painted Bunting, Green-tailed Towhee, Cassin's Sparrow, Brewer's Sparrow, Black-throated

Sparrow, Lark Bunting, Spotted Towhee, Golden-crowned Sparrow, Smith's Longspur, Hoary Redpoll, and Eurasian Tree Sparrow. Several other species have been reported (but with little or no documentation) which were probably accurately identified, as well as a number of exotic species.

Many arctic tundra and boreal species have occurred within the area (many overwintering) either rarely or with rare to semi-regular incursions of their populations which move south of their normal wintering range. Other than species that more or less regularly occur such as Snowy Owl, Northern Shrike and Common Redpoll, rarities such as Trumpeter Swan, Ross's Goose, Common Eider, King Eider, Barrow's Goldeneye, Gyrfalcon, Willow Ptarmigan, Ivory Gull, Ross's Gull, Northern Hawk-Owl, Boreal Owl, Black-backed Woodpecker, Common Raven, Boreal Chickadee, Townsend's Solitare, Varied Thrush, Bohemian Waxwing, Pine Grosbeak and Hoary Redpoll have all been found, some with more regularity than others, within the relatively small CR/LSAA.

The CR/LSAA has a rich and lengthy history of ornithological investigations by both professional as well as amateur ornithologists. These include important contributions by early ornithologists such as P. Brodkorb, H. Coale, C.B. Cory, E.R. Ford, B.T. Gault, R. Kennicott, E.W. Nelson, F. Pitelka, H.L. Stoddard, and F.M. Woodruff. Important early "amateur" ornithologists included C.T. Black, E. Blake, C.T. Clark, W. Dreuth, R. Deane, C.W.G. Eifrig, J. Ferry, M.M. Nice, and C.C. Sanborn. Many of these, as well as many of the following, were affiliated with the Chicago Academy of Sciences, the Field Museum of Natural History or were/are members of the Evanston North Shore Bird Club, Chicago Audubon Society, or the Chicago Ornithological Society, and they have contributed heavily to the records and knowledge of avian life of the area. More recent observers have included both professional and "amateur" ornithologists such as A. Anderson, L. Balch, L. Binford, R. Biss, P. Clyne, D. Dann, D. Diaz, J. Greenberg, S. Hickman, K. Hirabayashi, R. Hughes, D. Johnson, J. Landing, D. Mandell, W. Marcisz, S. & M. Mlodinow, C. Monday, J. Neal, J. O'Brien, S. Patti, G. Rosenband, B. Semel, A. Sigler, J. Steffen, A. Stokie, D. Stotz, E. Walters, D. Willard, G. and C. Williamson and many others too numerous to mention. As a result, we know far more about the birds of this area than we do about most other primarily urbanized partnership areas and we have a far better grasp of how we can improve habitat even in areas that will always be primarily urban.

The CR/LSAA is notable primarily for its rich potential for forest and wetland bird communities; however, the species list is much more varied than most of the urbanized sections of the northern tip of the state. At least 288 of the 300 species that regularly occur in the state (exclusive of vagrants) can be found in the area (Table 12). Of these 287 species, 156 breed or formerly bred there (Table 12). Of these, 69 are either locally extinct, or are rare during the breeding season (species with a "®" in Table 12), which suggest that some habitats may be in short supply in the CR/LSAA. Several globally extinct species (Passenger Pigeon - *Ectopistes migratorius* and Carolina Parakeet - *Conuropsis carolinensis*) formerly occurred in the basin. In addition, the possibly extirpated Eskimo Curlew (*Numenius borealis*) and the federally endangered Whooping Crane were common migrants in the region and Willow Ptarmigan occasionally wintered (see Kennicott 1854).

Birds such as the locally extirpated (or nearly so) Bald Eagle, Osprey, Swallow-tailed Kite, Ruffed Grouse, Sharp-tailed Grouse, Greater Prairie-Chicken, Wild Turkey, Northern Bobwhite, Yellow Rail, Black Rail, Piping Plover, Long-billed Curlew, Black Tern, Barn Owl, Loggerhead Shrike, Common Raven, Lark Sparrow and Bachman's Sparrow, were either somewhat regularly encountered or were formerly relatively common to abundant nesting birds in the CR/LSAA (see Kennicott 1854, Nelson 1876, Woodruff 1907, Ford et al. 1934, and Byre 1990). There are also several species on the list which have only nested very infrequently, and will probably only sporadically continue to do so, if at all. These include such species as Northern Shoveler, Northern Harrier, Sharp-shinned Hawk, Long-eared Owl, Short-eared Owl, Northern Saw-whet Owl, Western Kingbird, Red-breasted Nuthatch, Bewick's Wren, Northern Mockingbird, Nashville Warbler, Pine Warbler, Prairie Warbler and Red Crossbill.

Bird species composition in the CR/LSAA is extremely diverse due to the wide range of habitat types that are still to be found in the region. For excellent descriptions of all of the main habitat types to be found within the CR/LSAA, see Swink and Wilhelm (1994). Contained within these areas are a wide variety of grassland and wetland habitats, including natural and restored prairies (including wet and dry, but especially, sand prairie), dune and swale, marsh, savanna, riparian forest, upland forest, and open lake, to name a few. Ferry (1907), Sanborn and Goelitz (1915) and Evers and Page (1977) give particularly interesting descriptions and perspectives, both historical and present day on the natural (and unnatural) communities and their associated birdlife for the area encompassing areas within the CR/LSAA, particularly the present day Illinois Beach State Park area. However, Sanborn (1922) and Ford (1931) relate how many areas within the CR/LSAA, including the birdlife found there, had already changed considerably in their time, and urban and suburban sprawl continues to usurp still more habitat yet today, especially wetland and savanna, particularly in Lake County. This loss of habitat can be seen in the numbers of species considered rare in the bird species list for the area.

Most forest patches are small and narrow and are unlikely to have successful breeding populations of most species (Brawn and Robinson 1996), which suggests that restoration of grassland, savanna, and shrubland bird communities may be more important. For this reason, wetland and more "savanna-like" habitats should be the primary focus of conservation efforts in the region, especially those with adjacent grassland habitats to buffer them from surrounding agricultural and residential areas. We know little, however, about the effects of fragmentation on wetland habitats. The use by migratory birds of the forested corridor along the Skokie and Chicago Rivers may be intense.

The bird species that live in the CR/LSAA are ecologically diverse and, although some species are able to live in a variety of habitats, many species occupy only one or a few habitats (Table 12). The following sections describe the bird communities typically found in the major habitat types of the CR/LSAA, as well as the habitat-specific environmental problems and management solutions for bird communities in each habitat.

Table 12. Bird species that regularly occur in the Chicago River/Lake Shore Assessment Area. These are species that are likely to be present all or most years. This list excludes extinct species and the many wandering or "vagrant" species that have been recorded in the area. The purpose is to list only those species that have or could have significant populations in the area. The table also lists the habitats that are most likely to be occupied during each season.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Red-throated Loon *Gavia stellata*			L
Common Loon *Gavia immer*			L
Pied-billed Grebe - ST ***Podilymbus podiceps***	L W ®		L W
Horned Grebe *Podiceps auritus*			L
Red-necked Grebe *Podiceps grisegena*		L	
Eared Grebe *Podiceps nigricollis*	L		
Western Grebe *Aechmophorus occidentalis*			L
Double-crested Cormorant *Phalarocorax auritus*			L
American Bittern - SE ***Botaurus lentiginosus***	**W ®**		**W**
Least Bittern - ST ***Ixobrychus exilis***	**W**		**W**
Great Blue Heron *Ardea herodias*	L W Fs F	L W	L W
Great Egret *Ardea albus*			L W
Cattle Egret *Bubulcus ibis*			C G W
Green Heron *Butorides virescens*	L W Fs		L W Fs
Black-crowned Night-Heron - SE ***Nycticorax nycticorax***	**Fs W ®**		**Fs W**
Yellow-crowned Night-Heron - SE ***Nycticorax violaceus***	**Fs ®**		**Fs**
Turkey Vulture *Cathartes aura*	F G C Fs Sav ®		F G C S Sav Fs
Greater White-fronted Goose *Anser albifrons*		L W	L W
Snow Goose *Chen caerulescens*		L C	L W C
Canada Goose *Branta canadensis*	L W C	L W C R	L W C R
Mute Swan* *Cygnus olor*	L W	L W	L W

Table 12. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Tundra Swan *Cygnus columbianus*			L W
Wood Duck *Aix sponsa*	W Fs		L W Fs
Gadwall *Anas strepera*			L W
American Wigeon *Anas americana*			L W
American Black Duck *Anas rubripes*		L W C Fs	L W C Fs
Mallard *Anas platyrhynchos*	L W C Fs G	L W C Fs	L W C Fs
Blue-winged Teal *Anas discors*	W G		L W
Northern Shoveler *Anas clypeata*	W ®		L W
Northern Pintail *Anas acuta*			L W C
Green-winged Teal *Anas crecca*			L W
Canvasback *Aythya valisineria*			L W
Redhead *Aythya americana*			L W
Ring-necked Duck *Aythya collaris*			L W
Greater Scaup *Aythya marila*		L	L W
Lesser Scaup *Aythya affinis*		L	L W
Harlequin Duck *Histrionicus histrionicus*		L	L
Surf Scoter *Melanitta perspicillata*			L
White-winged Scoter *Melanitta fusca*			L
Black Scoter Melanitta nigra			L
Long-tailed Duck *Clangula hyemalis*		L	L
Bufflehead *Bucephala albeola*		L	L W
Common Goldeneye *Bucephala clangula*		L	L
Hooded Merganser *Lophodytes cucullatus*	Fs ®	L	L W Fs

Table 12. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Common Merganser *Mergus merganser*		L	L
Red-breasted Merganser *Mergus serrator*		L	L W
Ruddy Duck *Oxyura jamaicensis*	W ®		L W
Osprey - SE ***Pandion haliaetus***			**L**
Bald Eagle - ST, FT ***Haliaeetus leucocephalus***		**L**	**L**
Northern Harrier - SE ***Circus cyaneus***	**G W**	**G C W**	**G C W**
Sharp-shinned Hawk *Accipiter striatus*	F®	F S R Fs Sav	F S R Fs Sav
Cooper's Hawk *Accipiter cooperii*	F S Sav	F S R Sav	F S R Sav
Northern Goshawk *Accipiter gentilis*		F S	F S W L
Red-shouldered Hawk - ST ***Buteo lineatus***	**Fs**	**Fs**	**Fs**
Broad-winged Hawk *Buteo platypterus*	F		F
Red-tailed Hawk *Buteo jamaicensis*	F C G R S	F C G R S	F C G R S
Rough-legged Hawk *Buteo lagopus*		C G	
Golden Eagle *Aquila chrysaetos*			F S G
American Kestrel *Falco sparverius*	R C G Sav	R C G Sav	R C G Sav
Merlin *Falco columbarius*			All
Peregrine Falcon - SE ***Falco peregrinus***	**R ®**	**R**	**All**
Ring-necked Pheasant* *Phasianus colchicus*	C G S	C G S	C G S
Northern Bobwhite *Colinus virginianus*	S G C Sav ®	S G C Sav	S G C Sav
Yellow Rail *Coturnicops noveboracensis*			G W
Black Rail - SE ***Laterallus jamaicensis***	**W ®**		**G W**
King Rail - SE ***Rallus elegans***	**G W**		**G W**
Virginia Rail *Rallus limicola*	W		W G

Table 12. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Sora *Porzana carolina*	W		W G
Common Moorhen - ST ***Gallinula chloropus***	**W ®**		**W**
American Coot *Fulica americana*	W	L	L W
Sandhill Crane - ST ***Grus canadensis***	**W ®**		**W G C**
Black-bellied Plover *Pluvialis squatarola*			L W
American Golden-Plover *Pluvialis dominica*			L W C G
Semipalmated Plover *Charadrius semipalmatus*			L W
Piping Plover *Charadrius melodus*	L ®		L
Killdeer *Charadrius vociferus*	W R G C		W R G C
American Avocet *Recurvirostra americana*			L W
Greater Yellowlegs *Tringa melanoleuca*			W
Lesser Yellowlegs *Tringa flavipes*			W
Solitary Sandpiper *Tringa solitaria*			W
Willet *Catoptrophorus semipalmatus*			L W
Spotted Sandpiper *Actitis macularia*	L		L W
Upland Sandpiper - SE ***Bartramia longicauda***	**G**		**G**
Whimbrel *Numenius phaeopus*			L
Marbled Godwit *Limosa fedoa*			L W
Ruddy Turnstone *Arenaria interpres*			L W
Red Knot *Calidris canutus*			L
Sanderling *Calidris alba*			L W
Semipalmated Sandpiper *Calidris pusilla*			W
Western Sandpiper *Calidris mauri*			W

Table 12. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Least Sandpiper *Calidris minutilla*			W
White-rumped Sandpiper *Calidris fuscicollis*			L W
Baird's Sandpiper *Calidris bairdii*			L W G
Pectoral Sandpiper Calidris melanotos			C W G
Purple Sandpiper *Calidris maritima*			L
Dunlin *Calidris alpina*			L W
Stilt Sandpiper *Calidris himantopus*			W
Buff-breasted Sandpiper *Tryngites subruficollis*			L W G
Short-billed Dowitcher *Limnodromus griseus*			W
Long-billed Dowitcher *Limnodromus scolopaceus*			W
Common Snipe *Gallinago gallinago*	W ®		W G
American Woodcock *Scolopax minor*	F Fs S		F Fs S
Wilson's Phalarope - SE ***Phalaropus tricolor***			**L W**
Red Phalarope *Phalaropus fulicaria*			L W
Parasitic Jaeger *Stercorarius parasiticus*			L
Laughing Gull *Larus atricilla*			L
Franklin's Gull *Larus pipixcan*			L W C
Little Gull *Larus minutus*			L
Bonaparte's Gull *Larus philadelphia*			L W C
Ring-billed Gull *Larus delawarensis*	L W	L W C	L W C
Herring Gull *Larus argentatus*	L W®	L	L W C
Thayer's Gull *Larus thayeri*			L
Iceland Gull *Larus glaucoides*			L

Table 12. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Lesser Black-backed Gull *Larus fuscus*			L
Glaucous Gull *Larus hyperboreus*			L
Great Black-backed Gull *Larus marinus*			L
Sabine's Gull *Xema sabini*			L
Black-legged Kittiwake *Rissa tridactyla*			L
Caspian Tern *Sterna caspia*			L
Common Tern - SE ***Sterna hirundo***	**L®**		**L**
Forster's Tern - SE ***Sterna forsteri***			**L W**
Black Tern - SE ***Chilidonias niger***	**W®**		**L W**
Rock Dove* *Columba livia*	R C	R C	R C
Eurasian Collared-Dove* *Streptopelia decaocto*	R®	R	R
Mourning Dove *Zenaida macroura*	R C S	R C S	R C S
Monk Parakeet* *Myiopsitta monachus*	R®	R	R
Black-billed Cuckoo *Coccyzus erythropthalmus*	S®		F S Sav
Yellow-billed Cuckoo *Coccyzus americanus*	F S Fs Sav		F S Fs Sav
Barn Owl - SE ***Tyto alba***	**C G R Sav®**	**C G Sav**	**C G Sav**
Eastern Screech-Owl *Otus asio*	R S Sav	R S Sav	R S Sav
Great Horned Owl *Bubo virginianus*	F C R Fs Sav	F C R Fs Sav	F C R Fs Sav
Snowy Owl *Nyctea scandiaca*		L G	
Barred Owl *Strix varia*	F Fs®	F Fs	F Fs
Long-eared Owl *Asio otus*	F®	F S	F S
Short-eared Owl - SE ***Asio flammeus***	**G®**	**G**	**G**
Northern Saw-whet Owl *Aegolius acadicus*	F®	F S	F S

Table 12. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Common Nighthawk *Chordeiles minor*	R Sav		R G C Sav
Whip-poor-will *Caprimulgus vociferus*	F Sav ®		F Sav
Chimney Swift *Chaetura pelagica*	R F Fs Sav		All
Ruby-throated Hummingbird *Archilochus colubris*	S R F Fs Sav		S R F Fs Sav
Belted Kingfisher *Ceryle alcyon*	L W	L W	L W
Red-headed Woodpecker *Melanerpes erythrocephalus*	Fs R C	F Fs Sav	F Fs C R Sav
Red-bellied Woodpecker *Melanerpes carolinus*	F Fs S R Sav	F Fs S R Sav	F Fs S R Sav
Yellow-bellied Sapsucker *Sphyrapicus varius*		F Fs R Sav	F Fs R Sav
Downy Woodpecker *Picoides pubescens*	F Fs R S Sav	F Fs R S Sav	F Fs R S Sav
Hairy Woodpecker *Picoides villosus*	F Fs R Sav	F Fs S R Sav	F Fs S R Sav
Northern Flicker *Colaptes auratus*	F Fs S R Sav	F Fs S R Sav	F Fs S R Sav
Pileated Woodpecker *Dryocopus pileatus*	F Fs Sav ®	F Fs R Sav	F Fs R Sav
Olive-sided Flycatcher *Contopus cooperi*			F Fs S R Sav
Eastern Wood-Pewee *Contopus virens*	F Fs R Sav		F Fs R Sav
Yellow-bellied Flycatcher *Empidonax flaviventris*			F Fs S
Acadian Flycatcher *Empidonax virescens*	F Fs ®		F Fs
Alder Flycatcher *Empidonax alnorum*			W S Sav
Willow Flycatcher *Empidonax traillii*	W S		W S Sav
Least Flycatcher *Empidonax minimus*	F Sav		F Fs S R Sav
Eastern Phoebe *Sayornis phoebe*	Fs R		Fs R
Great Crested Flycatcher *Myiarchus crinitus*	F Fs Sav		F Fs S R Sav
Western Kingbird *Tyrannus verticalis*	S G R ®		S G R
Eastern Kingbird *Tyrannus tyrannus*	S G C Sav		F S G C Sav

Table 12. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Loggerhead Shrike - ST	**S G C ®**		**S G C**
Lanius ludovicianus			
Northern Shrike		G C S	
Lanius excubitor			
White-eyed Vireo	Fs S Sav ®		Fs S Sav
Vireo griseus			
Blue-headed Vireo			F Fs Sav
Vireo solitarius			
Yellow-throated Vireo	F Fs		F Fs R
Vireo flavifrons			
Warbling Vireo	Fs S R Sav		F Fs S R Sav
Vireo gilvus			
Philadelphia Vireo			F S R Sav
Vireo philadelphicus			
Red-eyed Vireo	F Fs Sav		F Fs S R Sav
Vireo olivaceus			
Blue Jay	F Fs S R C Sav	F Fs S R C Sav	F Fs S R C Sav
Cyanocitta cristata			
American Crow	All	All	All
Corvus brachyrhynchos			
Horned Lark	G C	G C	G C
Eremophila alpestris			
Purple Martin	L R W G		L W G
Progne subis			
Tree Swallow	L W Fs G		L W Fs G
Tachycineta bicolor			
Northern Rough-winged Swallow	L W Fs G		L W G
Stelgidopteryx serripennis			
Bank Swallow	L W G		L W G
Riparia riparia			
Cliff Swallow	L W G		L W G
Petrochelidon pyrrhonota			
Barn Swallow	C R W L G S		C R W L G S
Hirundo rustica			
Black-capped Chickadee	F Fs S R Sav	F Fs S R Sav	F Fs S R Sav
Poecile atricapillus			
Tufted Titmouse	F Fs R Sav ®	F Fs R Sav	F Fs R Sav
Baeolophus bicolor			
Red-breasted Nuthatch	F ®	F R	F R
Sitta canadensis			
White-breasted Nuthatch	F Fs R Sav	F Fs R Sav	F Fs R Sav
Sitta carolinensis			
Brown Creeper - ST	**Fs ®**	**F Fs R**	**F Fs R**
Certhia americana			
Carolina Wren	F Fs S R Sav ®	F Fs S R Sav	F Fs S R Sav
Thryothorus ludovicianus			

Table 12. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Bewick's Wren - SE	**S R** ®		**S R**
Thryomanes bewickii			
House Wren	F S R Sav		F S R Sav
Troglodytes aedon			
Winter Wren		F Fs W	F Fs W
Troglodytes troglodytes			
Sedge Wren	W G		W G
Cistothorus platensis			
Marsh Wren	W		W
Cistothorus palustris			
Golden-crowned Kinglet		F Fs R Sav	F Fs R Sav
Regulus satrapa			
Ruby-crowned Kinglet			F S Sav
Regulus calendula			
Blue-gray Gnatcatcher	F Fs S Sav		F Fs S Sav
Polioptila caerulea			
Eastern Bluebird	F G S R Sav	F G S R Sav	F G S R Sav
Sialia sialis			
Veery	F Fs ®		F Fs R Sav
Catharus fuscescens			
Gray-cheeked Thrush			F Fs R Sav
Catharus minimus			
Swainson's Thrush			F Fs S R Sav
Catharus ustulatus			
Hermit Thrush		F Fs S R Sav	F Fs S R Sav
Catharus guttatus			
Wood Thrush	F		F Fs R Sav
Hylocichla mustelina			
American Robin	F Fs S R Sav	F Fs S R Sav	F Fs S R C G Sav
Turdus migratorius			
Gray Catbird	Fs S R Sav		Fs S R Sav
Dumetella carolinensis			
Northern Mockingbird	S R ®	S R	S R
Mimus polyglottos			
Brown Thrasher	S R C G Sav		S R C Sav
Toxostoma rufum			
European Starling*	F Fs R C Sav	R C	R C
Sturnus vulgaris			
American Pipit			C W
Anthus rubescens			
Cedar Waxwing	F Fs S R Sav	F Fs S R Sav	F Fs S R Sav
Bombycilla cedrorum			
Blue-winged Warbler	S		F S R Sav Fs
Vermivora pinus			
Golden-winged Warbler	S ®		F Fs S R Sav
Vermivora chrysoptera			

Table 12. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Tennessee Warbler *Vermivora peregrina*			F Fs S R Sav
Orange-crowned Warbler *Vermivora celata*			F Fs S R Sav
Nashville Warbler *Vermivora ruficapilla*	F S ®		F Fs S R Sav
Northern Parula *Parula americana*			F Fs R Sav
Yellow Warbler *Dendroica petechia*	S W		Fs S W R Sav
Chestnut-sided Warbler *Dendroica pensylvanica*	S ®		S F Fs R Sav
Magnolia Warbler *Dendroica magnolia*			F Fs S R Sav
Cape May Warbler *Dendroica tigrina*			F Fs R Sav
Black-throated Blue Warbler *Dendroica caerulescens*			F Fs R Sav
Yellow-rumped Warbler *Dendroica coronata*		F Fs Sav	F Fs S R Sav
Black-throated Green Warbler *Dendroica virens*			F Fs R Sav
Blackburnian Warbler *Dendroica fusca*			F Fs R Sav
Yellow-throated Warbler *Dendroica dominica*			F Fs
Pine Warbler *Dendroica pinus*	F ®		F Fs R Sav
Prairie Warbler *Dendroica discolor*	S ®		S
Palm Warbler *Dendroica palmarum*			F Fs S R W G Sav C
Bay-breasted Warbler *Dendroica castanea*			F Fs S R Sav
Blackpoll Warbler *Dendroica striata*			F Fs S R Sav
Cerulean Warbler *Dendroica cerulea*	F Fs		F Fs R Sav
Black-and-white Warbler *Mniotilta varia*			F Fs S R Sav
American Redstart *Setophaga ruticilla*	Fs		F Fs S R Sav
Prothonotary Warbler *Protonotaria citrea*	Fs ®		Fs
Worm-eating Warbler *Helmitheros vermivorus*			F

Table 12. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Ovenbird *Seiurus aurocapillus*	F		F S R Sav
Northern Waterthrush *Seiurus noveboracensis*			Fs R
Louisiana Waterthrush *Seiurus motacilla*	F ®		F Fs
Kentucky Warbler *Oporornis formosus*	F ®		F Fs Sav
Connecticut Warbler *Oporornis agilis*			F Fs S R Sav
Mourning Warbler *Oporornis philadelphia*	Fs S ®		F Fs S R Sav
Common Yellowthroat *Geothlypis trichas*	G C W S R Sav		G C W S R Sav
Hooded Warbler *Wilsonia citrina*	F ®		F R
Wilson's Warbler *Wilsonia pusilla*			F Fs S R Sav
Canada Warbler *Wilsonia canadensis*			F Fs S R Sav
Yellow-breasted Chat *Icteria virens*	S ®		S Sav
Summer Tanager *Piranga rubra*			F Sav R
Scarlet Tanager *Piranga olivacea*	F Fs Sav		F Fs Sav R
Eastern Towhee *Pipilo erythrophthalmus*	F S	F S	F Fs S R
American Tree Sparrow *Spizella arborea*		G C S R W Sav	G C S R W Sav
Chipping Sparrow *Spizella passerina*	F R Sav		F G S R Sav
Clay-colored Sparrow *Spizella pallida*			S
Field Sparrow *Spizella pusilla*	S C G Sav	S C G W Sav	S C G W Sav
Vesper Sparrow *Pooecetes gramineus*	C G ®		C G
Lark Sparrow *Chondestes grammacus*	S G ®		S C G
Savannah Sparrow *Passerculus sandwichensis*	G		C G W
Grasshopper Sparrow *Ammodramus savannarum*	G		G
Henslow's Sparrow - SE ***Ammodramus henslowii***	**G**		**G**

Table 12. Continued.

Species[1, 2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Le Conte's Sparrow *Ammodramus leconteii*			G W
Nelson's Sharp-tailed Sparrow *Ammodramus nelsoni*			W
Fox Sparrow *Passerella iliaca*		Fs F S	Fs F S R Sav
Song Sparrow *Melospiza melodia*	S R W C G	S R W C G	S R W C G
Lincoln's Sparrow *Melospiza lincolnii*			Fs S R W
Swamp Sparrow *Melospiza georgiana*	W	Fs W S G	Fs S W G
White-throated Sparrow *Zonotrichia albicollis*		F Fs S R Sav	F Fs S R Sav
Harris's Sparrow *Zonotrichia querula*			S R G
White-crowned Sparrow *Zonotrichia leucophrys*		S R G	S R G
Dark-eyed Junco *Junco hyemalis*		F Fs S R C G Sav	F Fs S R C G Sav
Lapland Longspur *Calcarius lapponicus*		C G	C G
Snow Bunting *Plectrophenax nivalis*		C G	
Northern Cardinal *Cardinalis cardinalis*	F Fs S R C Sav	F Fs S R C Sav	F Fs S R C Sav
Rose-breasted Grosbeak *Pheucticus ludovicianus*	F Fs S Sav		F Fs S R Sav
Blue Grosbeak *Guiraca caerulea*	S ®		S
Indigo Bunting *Passerina cyanea*	F Fs S Sav		F Fs S C Sav
Dickcissel *Spiza americana*	C G		C G
Bobolink *Dolichonyx oryzivorus*	G		G W
Red-winged Blackbird *Agelaius phoeniceus*	W C S R G Sav	F Fs C G	W C S R G Sav
Eastern Meadowlark *Sturnella magna*	C G	C G	C G
Western Meadowlark *Sturnella neglecta*	C G		C G
Yellow-headed Blackbird - SE ***Xanthocephalus xanthocephalus***	W ®		W
Rusty Blackbird *Euphagus carolinus*		F Fs C	Fs R C W

Table 12. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Brewer's Blackbird *Euphagus cyanocephalus*	C G ®	C G	C G
Common Grackle *Quiscalus quiscula*	Fs F R W	F Fs C R	F Fs C R Sav
Brown-headed Cowbird *Molothrus ater*	All	F Fs C R	All
Orchard Oriole *Icterus spurius*	S R W Sav ®		F FsS R W Sav
Baltimore Oriole *Icterus galbula*	F Fs S R Sav		F Fs S R Sav
Purple Finch *Carpodacus purpureus*		F Fs R	F Fs S R Sav
House Finch* *Carpodacus mexicanus*	S R	S R	F Fs S RSav
Red Crossbill *Loxia curvirostra*	F ®	F R	F R
White-winged Crossbill *Loxia leucoptera*		F R	
Common Redpoll *Carduelis flammea*		F S R G	
Pine Siskin *Carduelis pinus*	F S R ®	F S R	F S R
American Goldfinch *Carduelis tristis*	S R G	F Fs S R G Sav	F Fs S R G Sav
Evening Grosbeak *Coccothraustes vespertinus*		F Fs R	F Fs R
House Sparrow* *Passer domesticus*	R C	R C	R C

[1] Bold type indicates an Illinois threatened (ST), Illinois endangered (SE), and/or federally endangered (FE) species by the Illinois Endangered Species Protection Board (1999).

[2] * = an introduced species.

[3] Breeding = species that currently or historically have bred in the area.

[4] Winter = species present from December through February.

[5] Migrant = species present during the March-May and late August-November periods.

[6] The following habitat codes are used:

L = Lakes, ponds, impoundments, rivers, larger streams
C = Crops
G = Grassland (including pasture and hayfield)
W = Wetland (seasonally flooded, open habitats such as marshes and sedge meadows)
Fs = Forested swamp (forested wetland, including wet floodplain forest)
Sav = Savannah
F = Upland and mesic forest
R = Residential areas (including urban centers and the "urban forest")
S = Shrublands (open habitats dominated by shrubs, including old fields).

[7] ® designates a species that is currently a rare and local breeder and may be locally extirpated. Some of these species are good candidates for reestablishment in restored habitats.

Forest

Regularly Occurring Species

Most of the remaining forest habitat is found along the Skokie and Chicago rivers (Figure 5). Upland and mesic forests of the region have been well characterized (Swink and Wilhelm 1994), and there are several references which give at least a brief description of one of the more unique areas within the CR/LSAA, IBSP, as well as a representation of the birdlife to be found there (Gates 1912, Evers and Page 1977, Hickman and Neal 1981). Mohlenbrock (1986) and Sullivan (1999) give descriptions of the forests to be found, specific to the region. There is a little more than 28,600 acres of forested lands remaining in the CR/LSAA (13.6% of the total area). These areas are somewhat depauperate because of the pronounced area-sensitivity of many species (Blake 1986). Nevertheless, many forest songbirds characteristic of this latitude have a few small, to some fairly large, breeding populations in the remaining forest patches, especially at and near IBSP and along the Skokie and Chicago Rivers.

Typical Species - Typical species of forest habitats in the CR/LSAA include: Cooper's Hawk (uncommon but increasing), Red-tailed Hawk, Yellow-billed Cuckoo (erratic), Great Horned Owl, Eastern Screech Owl, Red-headed Woodpecker (more open forests), Red-bellied Woodpecker, Downy Woodpecker, Hairy Woodpecker, Northern Flicker, Eastern Wood-Pewee, Great Crested Flycatcher, Yellow-throated Vireo, Red-eyed Vireo, Blue Jay, Black-capped Chickadee, White-breasted Nuthatch, House Wren, Veery (uncommon to rare), Wood Thrush, American Robin, Ovenbird, Scarlet Tanager, Northern Cardinal, Rose-breasted Grosbeak, Indigo Bunting, and Brown-headed Cowbird. Rarer forest species that also nest within the CR/LSAA include Broad-winged Hawk, Barred Owl, Whip-poor-will, Acadian Flycatcher, Least Flycatcher, Carolina Wren (population fluctuates depending upon winter weather), Blue-gray Gnatcatcher, Cerulean Warbler, American Redstart, Louisiana Waterthrush, Kentucky Warbler, Hooded Warbler and Baltimore Oriole (mostly in more open forests). In addition, the Black-throated Green Warbler, Black-and-white Warbler and Canada Warbler may be rare, infrequent breeding birds in the area (see Bohlen 1989), but nests have yet to be found within the CR/LSAA.

Threatened and Endangered Species - State threatened (ST) species that occur in the forests of the area include Red-shouldered Hawk (ST) and Brown Creeper (ST), both of which occur in forested wetlands (see below). The Cooper's Hawk, recently removed from the state's threatened and endangered list, has already become relatively common as a nesting species (Herkert 1997), and numerous backyard birdwatchers in the CR/LSAA are reporting increasing predation events at their feeders (pers. comm.).

Exotic Species - European Starlings were introduced into the U.S. in 1890-1891 and spread to Illinois by 1922 (Bohlen 1989). They are now one of the most abundant species in Illinois and may be detrimental to native species because they complete with residents for nesting cavities, especially in smaller woodlots.

There are few stands of pine in this area outside of urban or suburban settings. Only very small, relict stands of jack and white pines are native to the CR/LSAA. However, there are scattered pine plantations throughout and some have produced bird communities typical of more northern affinities, especially Lyons Woods Forest Preserve in Lake County. In addition to more generalized forest species, pine plantations in central and other northern Illinois locations occasionally attract nesting Long-eared Owls (also in winter), Solitary Vireos, Pine Siskins, Yellow-bellied Sapsuckers, Golden-crowned Kinglets, Red-breasted Nuthatches, Yellow-throated Warblers, and Black-throated Green Warblers. Chipping Sparrows are often the most abundant species nesting in pine plantations. In winter, pines attract winter finches (e.g., crossbills, Pine Siskin, and rarely Pine Grosbeaks), as well as Yellow-bellied Sapsuckers, Hermit Thrushes and occasionally such rarities as Black-backed Woodpecker, Boreal Chickadee, Townsend's Solitare, and Bohemian Waxwing (see Ferry 1907, Sanborn 1922, Walters 1996).

Population Dynamics and Management

Many bird species are declining across part or all of their breeding range in the Midwest (Peterjohn et al. 1994). The causes of such changes are likely related to problems with reproduction in highly fragmented landscapes. The primary factors controlling productivity of birds in the CR/LSAA are predation on eggs or young in nests, and brood parasitism by Brown-headed Cowbirds. Cowbirds lay their eggs in the nests of other species, and often destroy one of the host's eggs when they lay their own. Cowbird young also grow faster than their host young and out-complete them for food, often leading to the starvation of the host young. Rates of nest predation and brood parasitism generally increase as a habitat becomes more fragmented, creating more feeding habitat for cowbirds and travel corridors for mammalian predators such as raccoons that often inhabit the edges of open country (Robinson et al. 1995). Given the relatively small size of most forest tracts in the CR/LSAA, it is likely that levels of nest predation and brood parasitism by Brown-headed Cowbirds are extremely high (Robinson et al. 1995). In general, nest predation rates in Illinois forests of less than 500 acres average 70-90% and parasitism levels for cowbird hosts average 70-80%. These levels are so high that woodlots in this region are very likely to be population "sinks" (Brawn and Robinson 1996) in which reproduction is far below rates necessary to sustain regional populations. Urban developments may increase abundance of some predators (e.g. raccoons and feral cats).

Remarkably, in spite of low productivity, many species nest commonly in regional woodlots and are not obviously declining. This strongly suggests that their populations are being "rescued" by the settlement of individuals from much larger forest tracts outside of the region, or even outside of the state (Brawn and Robinson 1996). Therefore, to understand the population dynamics of breeding forest birds, it is necessary to monitor both population size and nesting success. Previous research on this subject in Illinois (Robinson et al. in press) suggests that the best candidates for forest restoration are tracts that are, or can be 500 acres or larger. Few forests in the CR/LSAA are large enough to escape extreme levels of parasitism and predation. As will be described below, savanna

restoration may be the best strategy for many sites given the high value of oaks to migrant birds (Graber and Graber 1983) and as source of mast and the fact that most forest tracts are too small to have anything but maximal rates of nest predation and brood parasitism. The north-south orientation of the wooded Skokie and Chicago River floodplains may lead to intensive use by migrating forest songbirds.

Wetland

Although historically there had been considerably more wetland in the CR/LSAA (especially wet prairie), wetland habitats represent one of the more significant avian habitats in the basin, including the dune ridge and swale type wetland complex found at IBSP. Although non-forested wetlands historically accounted for a large percentage of the land in the CR/LSAA (Havera 1999), less than 3,500 acres (1.6%) of this type of wetland habitat are left, and only 5,099 acres of total wetland habitats remain. This represents only 2.3% of the CR/LSAA (Table 3, Figure 7). Most of the wetlands have been drained and filled for development (see the discussion of wetlands in the introduction). IBSP provides excellent examples of the various types of palustrine emergent wetlands that were once common in this part of Illinois, which are becoming increasingly rare (especially in Lake County) both here, and in most of the state (Suloway and Hubbell 1994). Some of the marshes at the north end of IBSP provide one of the more consistent areas in the entire state for breeding American Bittern, King Rail, and Common Snipe. Although these types of shallow and deepwater marshes are rare within the CR/LSAA, other types of forested swamp and open water type wetlands are still relatively common, especially in Lake County. However, the extensive wetlands and marshlands described by Sanborn and Goelitz (1915) in an area formerly known as the Skokie Valley Slough, along the Skokie River, are all but gone, along with the bitterns, rails and other marsh species that were once found there.

Regularly Occurring Species

Typical Species - Typical wetland species include the Pied-billed Grebe (ST), Great Blue Heron, Green Heron, Canada Goose, Wood Duck, Mallard, Killdeer, American Woodcock, Belted Kingfisher, Red-headed Woodpecker (forested), Northern Flicker (forested), Acadian Flycatcher (forested), Willow Flycatcher (shrubby), Purple Martin, Tree Swallow, Northern Rough-winged Swallow, Barn Swallow, Sedge Wren, Marsh Wren, Blue-gray Gnatcatcher (forested), Veery (forested), Gray Catbird (shrubby), Warbling Vireo (forested), Yellow Warbler (shrubby), Cerulean Warbler (forested), American Redstart (forested), Common Yellowthroat, Song Sparrow, Swamp Sparrow, Red-winged Blackbird, Common Grackle, and Baltimore Oriole. Rarer species might include the Blue-winged teal, Hooded Merganser (forested), Spotted Sandpiper, and Common Snipe. Alder Flycatchers may occasionally breed along the edges of bogs and other open, wetland habitats. In addition, other wetland species such as Double-crested Cormorant, Great Egret, Cattle Egret, Little Blue Heron, several species of duck, Black Rail (SE), and Forster's Tern (SE) do or have occurred during the breeding season, and have nested in nearby areas.

Threatened and Endangered Species - A large number of state threatened (ST) and endangered (SE) species occur in the wetland habitats of the CR/LSAA. There are records of breeding Pied-billed Grebe (ST), American Bittern (SE), Least Bittern (ST), Black-crowned Night Heron (SE), Yellow-crowned Night Heron (SE), Northern Harrier (SE), Red-shouldered Hawk (ST), King Rail (SE), Common Moorhen (ST), Sandhill Crane (ST), Common Tern (SE), Black Tern (SE), and Yellow-headed Blackbird (ST). Also, formerly considered a state endangered species, the state's only regular occurring "colony" of nesting Brewer's Blackbirds are found at IBSP. Notable sites for these species include IBSP as well as numerous other small marshes and wetlands throughout, especially areas owned by the Lake County Forest Preserve District. Protection of remaining wetlands, especially marshes, is an extremely high priority for this area.

Exotic Species - The only non-native wetland species is the Mute Swan, which nests but is more common just to the west and south of the CR/LSAA. Further expansion and increase in numbers of this species into addition wetlands in the region could be detrimental to other native wetland species (Ciaranca et al. 1997).

Population Dynamics and Management

Currently, the main problem for birds inhabiting wetlands is habitat loss and suburban encroachment. The filling and degradation of wetlands, especially marshes, in the CR/LSAA continues to threaten the health and continued existence of both the rarer bird species of the area, as well as the wetlands themselves. This is especially apparent in the remaining wetlands of Lake County. Some forested wetland species likely suffer from the same problems with fragmentation that affect forest species (cowbird parasitism and nest predation). We know little, however, about the effects of fragmentation on other wetland habitats. However, at least one study, conducted in nearby areas of Lake and other adjacent counties, has shown that nesting success of most wetland-dependent species (especially marsh nesting species) is relatively high, especially when compared with other habitat types in Illinois (see Paine 1997). Potentially, wetland species are more resistant to fragmentation, which may make this habitat a good target for conservation efforts in this landscape. Wetland habitats are also used heavily by migrating waterfowl, shorebirds, rails and long-legged waders (herons, bitterns, and egrets). These habitats therefore have the potential to be important stopover sites for birds during migration. Wetland conservation should be the highest priority in the region for birds for reasons outlined above.

Savanna

Savanna habitats were once widespread in the Midwest, but due to habitat destruction and the absence of fire they are now extremely rare in the CR/LSAA (see Chapter on Natural Vegetation Communities), but are actively being restored in several areas by the Lake and Cook County Forest Preserve Districts.

Regularly Occurring Species

Typical Species - Savannas share many species with forest habitats. Perhaps the most typical species of savannas would be: Whip-poor-will (rare in the region), Yellow-billed Cuckoo, Black-billed Cuckoo (uncommon to rare), Red-headed Woodpecker, Great Crested Flycatcher, Eastern Wood-Pewee, Blue Jay, House Wren, American Robin, Eastern Bluebird, Yellow-throated Vireo, Baltimore Oriole, Rose-breasted Grosbeak, Indigo Bunting, American Goldfinch, Field Sparrow, and Chipping Sparrow. Other forest species remain common in savannas, including the Great Horned Owl, Northern Flicker, Red-bellied, Downy, and Hairy Woodpeckers, Black-capped Chickadee, White-breasted Nuthatch, Brown-headed Cowbird, Scarlet Tanager, and Northern Cardinal. The open, park-like structure of some savannas also attracts some species that are more characteristic of grassland habitats, such as the Red-tailed Hawk. For many of these species, Illinois contains a significant portion of their global population.

Threatened and Endangered Species - None of the species inhabiting savannas in this area are threatened or endangered, although the Barn Owl (SE) which has been virtually extirpated from the CR/LSAA, may have been a bird of very open savannas.

Exotic Species - European Starlings are now one of the most abundant species in Illinois. They are detrimental to some native savanna species, particularly other cavity nesting species (such as woodpeckers and blue birds) because they compete for nest sites.

Population dynamics and Management

Savannas may be associated with high levels of cowbird abundance and parasitism levels, although some species may have higher nesting success in savanna restorations than in unburned forest (Brawn 1998). Many of the species that are most abundant in savannas are resistant to cowbirds (e.g., cavity nesters, American Robins, Baltimore Orioles). Unlike many forest birds, these species are able to recognize cowbird eggs and either eject them from their nests or rebuild the nests over them (Rothstein and Robinson 1994). A detailed study of the effects of savanna restoration on bird populations, ecology, and nesting success was recently completed in adjacent watersheds (Brawn 1998). This study should be fully applicable to savannas in the CR/LSAA.

Savannas also appear to be very favorable habitat for migrants. The heavy use of oaks by spring migrants (Graber and Graber 1983) and by mast-consuming species suggests that savanna restoration should be a high priority for birds in this region.

Prairie/Grassland

Native prairie habitat is rare in the CR/LSAA (see Chapter on Natural Vegetation Communities), however, many bird species that historically lived in prairies are also able to live in grassland habitat such as hay fields, and sometimes pastures. These habitats are

also relatively rare in the CR/LSAA (Table 2, Figure 6). There are only about 3900 acres of "grassland" in the basin (1.8% of the land area). Nonetheless, although most patches of available grassland habitat in the CR/LSAA are small, they have considerable potential for restoration and contain many typical grassland species. Pastures in the area are mostly heavily grazed and little-used by grassland birds. They are also favored sites for foraging Brown-headed Cowbirds.

Regularly Occurring Species

Typical Species - Typical species in these habitats include a subset of those found on larger grasslands throughout the state: Red-tailed Hawk, American Kestrel, Ring-necked Pheasant, Eastern Kingbird (with scattered trees), Willow Flycatcher (shrubs), Horned Lark (recently burned), Barn Swallow, Brown Thrasher (shrubs), Sedge Wren, Common Yellowthroat, Eastern Meadowlark, Red-winged Blackbird, Dickcissel (uncommon), Savannah Sparrow, Song Sparrow, Grasshopper Sparrow, Vesper Sparrow (uncommon to rare), Field Sparrow, Bobolink, and American Goldfinch. See Table 12 for a more complete list of grassland species found in the Chicago River/Lake Shore region. Many species of waterfowl, including Canada Geese and various ducks, need areas of grassland near wetlands to successfully breed as well.

Threatened and Endangered Species - Currently, the Upland Sandpiper (SE) and Henslow's Sparrow (SE) are the only endangered grassland species known to breed in the area. However, Northern Harriers (SE) and Short-eared Owls (SE) have been known to nest in the area, and could do so again. Loggerhead Shrikes (ST) formerly nested but have been virtually extirpated from the CR/LSAA as a breeding species.

Exotic Species - Two introduced species are found in the grasslands of the CR/LSAA. The Ring-necked Pheasant, which is native to Asia, was first released in Illinois in about 1890 (Bohlen 1989) and they continue to be released. European Starlings feed in grasslands following grazing, mowing, or burning.

Population Dynamics and Management

Certain species, such as the Grasshopper Sparrow and Bobolink, have declined precipitously as grasslands have been converted to row crops (Herkert 1991). Currently, prairie remnants and other grassland habitats are probably too small to sustain regular breeding populations and successful nesting of most prairie species. For example, the Short-eared Owl (SE) is highly area-sensitive and will require larger grasslands than exist currently to maintain a regular breeding population. Records of Henslow's Sparrows (SE) come mainly from IBSP; this species is also area-sensitive and requires taller, ranker grass that has not recently been burned (Herkert 1994). King Rails (SE) and Northern Harriers (SE) would also be good candidates for reestablishment in restored grasslands, especially near wetlands. Upland Sandpipers (SE) nest in nearby areas, but they require mowing, grazing, or burning to keep the grass short. Upland Sandpipers are also area-sensitive and

likely require larger grassland areas than are currently available. Other rare or locally extirpated species that would be likely to increase rapidly if grasslands were restored include Sedge Wren, Loggerhead Shrike (ST), Bobolink, and Brewer's Blackbird. Because of the short supply of available grassland, prairie restoration and enhancement and/or increased participation by farmers and other landowners in CRP and other government set-aside programs will be needed to attract grassland birds.

Removal of woody vegetation may also be beneficial. Shrubland species that would be lost are of less regional concern because they have large global populations and are common throughout Illinois (e.g., Gray Catbird, Brown Thrasher, House Wren). Perhaps the best way to maintain desired shrubland birds (Bell's Vireo, Willow Flycatcher, Blue-winged Warbler) would be to allow willow thickets to grow in low, wet areas that would not burn in most areas. Natural hazel thickets may also have provided habitat for these species historically. The guidelines provided by Herkert et al. (1993) for grassland management should be followed. In particular, dense, tall stands of prairie grasses are rarely used by grassland birds and should be avoided.

Migrant birds use grasslands as stopover habitat, especially Lapland Longspurs and Snow Buntings, various rails, bitterns, American Golden Plovers, Pectoral Sandpipers and Buff-breasted Sandpipers.

Lakes, Ponds, and Impoundments

There are numerous natural lakes or ponds in the CR/LSAA (see Chapter on Aquatic Biota), as well as a number of impoundments. Lake Michigan is the most important body of water in the region, especially as it affects the migratory movements of the large numbers of birds that pass through the CR/LSAA.

Regularly Occurring Species

Typical Species - Double-crested Cormorants often forage in ponds and lakes in the region and could be attracted to artificial nesting structures, as they are at Baker's Lake in Cook County and Lake Renwick in Will County. Artificial nest structures could also be used to attract nesting Ospreys to lakes in the region as they have in other areas (Thayer 1999). Human-made and natural ponds with "islands" in the middle attract nesting Canada Geese. Other artificial "islands" are already attracting other species like Ring-billed and Herring Gulls, which will usually only nest in such "predator-free" environments like these areas provide (see Milosevich 1994 and Walters 1999).

Green Herons often nest along ponds lined with dense, woody vegetation. Spotted Sandpipers may occasionally breed around lakes, ponds, and impoundments. Belted Kingfishers, Northern Rough-winged Swallow and Bank Swallows nest in steep, exposed banks along the edges of lakes and ponds. Barn Swallows, Cliff Swallows, Purple Martins, Tree Swallows, and Eastern Phoebes forage over the open-water habitats as long as nest

sites are available. Warbling Vireos and Baltimore Orioles nest along the tree-lined edges of ponds and lakes. Willow Flycatchers and Yellow Warblers like willow-lined edges of ponds and lakes. Common Yellowthroats, Common Grackles, Red-winged Blackbirds, Swamp Sparrows and Song Sparrows nest along ponds, especially those with gradual shorelines and some emergent vegetation (e.g., *Typha*) along the edge.

Threatened and Endangered Species - The Piping Plover (SE) is the only endangered species to have bred along natural lakeshore habitats in the CR/LSAA with the most recent nesting in 1979 (Bohlen 1989), but the bird is now considered extirpated from the state. This species will probably not occur again as a nesting species unless restoration attempts are made (as Indiana is doing in nearby Indiana Dunes State Park) and the birds are given some kind of protection from both humans and their pets (e.g. dogs). The most obvious and probably only place where this could occur would be at IBSP, their historic area of occurrence in the area. Common Terns (SE) hold a precarious position as a nesting bird in the region, with the only known breeding population in the entire state nesting on small "fly-ash" tailings "islands" and other human-made substrates at a power plant in Waukegan (see Dann 1999).

Exotic Species - The Mute Swan is the only non-native species that occurs in the area. This species should not be encouraged to nest further in the region due to their negative affects on native waterfowl that might otherwise attempt to breed (see Ciaranca et al. 1997).

Population Dynamics and Restoration

One of the most important roles of lakes, ponds, and impoundments is as resting habitat for migrating waterbirds. These open-water habitats are often the only deepwater habitat available for loons, grebes, scaup, Common Goldeneyes, Buffleheads, and mergansers, all of which dive to catch food. Similarly, gulls and terns forage over open water during migration. Lake Michigan and its immediate shoreline provide most of this type of habitat for a large percentage of waterbirds passing through the area during migration. At low water, the edges of lakes are also used by shorebirds, herons, and egrets. All species of swallows use open-water for foraging, especially during cold weather. One of the CR/LSAA's more interesting wintering species, the Snowy Owl is almost always found along or very near the Lake Michigan shoreline, with several of these rare birds sometimes occurring during "invasion" years (see Johnson 1992).

A comparative study of the use of various ponds, lakes, and impoundment by migrating birds might help improve their design and management, but probably the most useful way to enhance these habitats is by increasing the amount of emergent vegetation along their edges. This essentially involves creating shallow wetlands along the edges of open water. Also, colonies of waterbirds nesting along the edges of lakes should be protected from disturbances. Nesting platforms could attract Double-crested Cormorants, herons and Ospreys.

Creeks and Rivers

The Skokie and Chicago Rivers have been highly altered by human activities, but still hold some associated river species.

Regularly Occurring Species

Typical Species - Among the species found along creeks and rivers are the following: Canada Goose, Mallard, Wood Duck (forested), Cooper's Hawk (forested corridors), Great Blue Heron, Green Heron (forested), Killdeer, Great Horned Owl (forested), Barred Owl (forested; rare), Belted Kingfisher, Eastern Phoebe (especially near bridges), Barn Swallow, Northern Rough-winged Swallow, House Wren (in woody debris), Cedar Waxwing, Warbling Vireo (woody corridors, especially cottonwoods and willows), Yellow Warbler (shrubby corridors), Common Yellowthroat (grassy and shrubby streamsides), Common Grackle, Red-winged Blackbird, Baltimore Oriole (woody corridors), Indigo Bunting, and Song Sparrow (shrubby streamsides).

Population Dynamics and Management

We lack data on populations and nesting success of birds in riparian corridors of varying widths and of their use by migrants. However, increasing the amount of woody riparian corridor habitat should enhance populations of many species, and would help restore natural hydrology. Restoring the hydrology would, in turn, improve wetland habitat in the floodplain, both in woody backwaters and in oxbows (see above). A nearby area along the Des Plaines River has shown the positive affects of restoration and experimental wetlands using hydrologic controls along a stretch of river floodplain (Moskoff 1996). It would also be interesting to measure the movements of migrants along corridors to determine if they act as flyways.

Cultural Habitats: Cropland

Extremely little (2,630 acres or 1.2%) of the CR/LSAA is in cropland and the amount of acreage devoted to this habitat type is likely only to decrease with urban sprawl.

Regularly Occurring Species

Typical Species - Cropland bird communities in the CR/LSAA have the same bird species that are common statewide in this structurally simple habitat: Mallard, Red-tailed Hawk, American Kestrel, Ring-necked Pheasant, Killdeer, Rock Dove, Mourning Dove, Great Horned Owl, Eastern Phoebe (farmsteads), Horned Lark, Barn Swallow, American Crow, Eastern Bluebird (where nest boxes are provided), European Starlings, House Sparrow, Common Grackle, Brown-headed Cowbird, Red-winged Blackbird, Vesper Sparrow, Savannah Sparrow (areas with some grass) and Field Sparrow. Also, species such as

Canada Goose, Mallard, Sandhill Crane (ST) and Ring-billed Gull spend a considerable amount of time during the both the breeding season and migration, resting and foraging in agricultural fields in the area. Some species characteristic of recently burned and heavily grazed, dry grasslands have adapted to croplands, including the Horned Lark, Vesper Sparrow, and Loggerhead Shrike (ST). The shrike, however, also requires spiny hedgerows for nesting and it is now virtually extirpated from the area.

Threatened and Endangered Species - The Loggerhead Shrike (ST) is the only threatened or endangered species known to utilize this habitat type in the area, and it has been virtually extirpated from the area as a breeding species.

Intensively farmed areas offer little in the way of stopover habitat except around farmsteads and wet fields in the spring and fall for Sandhill Cranes (ST), shorebirds and waterfowl.

Exotic Species - Introduced species thrive in the agricultural habitats of the CR/LSAA. In fact, four of the most abundant species in the cropland of the CR/LSAA, Ring-necked Pheasant, Rock Dove, European Starling and House Sparrow, were all introduced from Europe or Asia.

Population Dynamics and Management

Warner (1994) documented the extent to which intensively used agricultural areas have few nesting birds and low nesting success. These areas are increasingly less suitable for game species such as Ring-necked Pheasants, and studies have been conducted in east-central Illinois which have demonstrated this (Warner 1984, Warner et al. 1992). They also often have high populations of feral cats (Warner 1985), which are nest predators. However, CRP acreage can produce breeding habitat for some native grassland species such as Northern Harriers, Short-eared Owls, Bobolinks, Henslow's, Grasshopper, Vesper and Savannah Sparrows. Unfortunately, with the loss of most of the "pasture type" crops such as alfalfa, clover, and other hayfields, what little habitat that is left is to small (e.g. fragmented) or unsuitable to provide productive nesting environments for most species (Herkert et al. 1993). In addition, what little pasture acreage remains is now mowed early and more frequently, which adversely affects many species (Warner and Etter 1989, Bollinger et al. 1990, Frawley and Best 1991). The importance of pastured areas to rare or endangered grassland bird species should not be overlooked (see Dorio and Grewe 1979). However, enhancement of grassy roadsides, shrubby streamsides, and riparian corridors can enormously increase the bird diversity within agricultural landscapes. The importance of any "edge" habitat at all within areas of intensive cultivation, has been shown to have a significant effect on avian diversity within an area (Best 1990).

Several studies in central Illinois and other parts of the Midwest have shown for some time that many of the changing farm practices, especially in intensively row-cropped areas such as can be found in central Illinois, can have serious, negative effects on both game (Warner

et al. 1984, Hallett et al. 1988, Mankin and Warner 1992) and non-game species (Good and Dambach 1943, Best 1990). Intensively farmed areas offer very little in the way of stopover habitat for migrant birds. However, some farming practices can be helpful in increasing the usefulness of these areas as wildlife habitat (Warner and Havera 1989). Flooded fields are sometimes used by large numbers of shorebirds (especially Lesser Golden Plovers and Pectoral Sandpipers). Most species of dabbling ducks, Snow, Greater White-fronted and Canada Geese, Sandhill Cranes, Ring-billed Gulls and various blackbirds will often forage in agricultural fields during migration. In migration and winter, flocks of American Pipits, Snow Buntings and Lapland Longspurs join the resident Horned Larks, Rough-legged Hawks, and Northern Harriers to forage over some agricultural fields.

Cultural Habitat: Successional Fields

Successional habitats, such as abandoned fields and pastures, are relatively uncommon in the CR/LSAA. These habitats, which are often dominated by non-native plant species of shrubs and vines, may be structurally similar to native successional habitats that historically occurred along the edges of meandering rivers or in large treefall gaps. Such habitats usually have dense, protective cover and are often rich in fruit producing plants, and therefore offer valuable habitat for breeding and migrating birds. However, given the scarcity of natural shrublands in the Midwest, we know little about "natural" shrublands. Nonetheless, many local species that use shrubby vegetation now depend almost entirely on anthropogenic disturbances to set back succession.

Regularly Occurring Species

Typical Species - Ring-necked Pheasant, American Woodcock (wet areas), Mourning Dove, Black-Billed Cuckoo (uncommon to rare), Ruby-throated Hummingbird, Northern Flicker, Downy Woodpecker, Eastern Kingbird, Willow Flycatcher (wet thickets), White-eyed Vireo (rare this far north), Blue Jay, Black-capped Chickadee, House Wren, Carolina Wren (rare this far north), Gray Catbird, Brown Thrasher, American Robin, Eastern Bluebird, Cedar Waxwing, Yellow Warbler, Blue-winged Warbler, Golden-winged Warbler (rare), Chestnut-sided Warbler (rare), Mourning Warbler (rare), Common Yellowthroat, Yellow-breasted Chat, Red-winged Blackbird, Northern Cardinal, Rose-breasted Grosbeak (older thickets), Indigo Bunting, House Finch, American Goldfinch, Eastern Towhee, Field Sparrow, and Song Sparrow. Successional habitats add greatly to local diversity, although only a few of these species have nationally declining populations (Yellow-breasted Chat, Field Sparrow, Blue-winged Warbler).

Threatened and Endangered Species - The only threatened or endangered species known to depend on successional habitats in the CR/LSAA is the Loggerhead Shrike (ST), and it has been virtually extirpated from the region. Both Ford (1956) and Graber et al. (1973) hypothesize with many others throughout this species range that this birds localized

extirpation can be at least partially explained by the loss of hedgerows, especially Osage orange hedgerows.

Exotic Species - Most species found in successional habitats are native, although Ring-necked Pheasants use early successional fields, and House Finches breed in shrubbery.

Population Dynamics and Management

Although nest predation rates appear to be very high in successional habitats, brood parasitism levels are generally moderate or low (Robinson et al. 1999). Some species nesting in these habitats eject cowbird eggs (Gray Catbird, Brown Thrasher, Cedar Waxwing, Eastern Kingbird, Baltimore Oriole, American Robin), nest in cavities that are inaccessible to cowbirds (both Wrens, Chickadees, Eastern Bluebird), abandon many parasitized nests (Yellow Warbler, Field and Chipping Sparrows), defend their nests aggressively (Red-winged Blackbird, Eastern Kingbird, Willow Flycatcher, Common Grackle), have inappropriate diets for cowbird nestlings (House Finch, American Goldfinch), or continue nesting until very late in the season when cowbirds have stopped laying (Mourning Dove, Yellow-billed Cuckoo, Gray Catbird, Cedar Waxwing, White-eyed Vireo, Northern Cardinal, Indigo Bunting, American Goldfinch, and Eastern Towhee). As a result, early successional species may be able to thrive even in small patches in agricultural landscapes. An intensive study of habitat requirements, nesting success, and population dynamics of shrubland birds is now underway (Robinson et al. 1999). The results of this study should be applicable to shrubland birds in the CR/LSAA.

In addition to use during the breeding season, shrublands are very heavily used by migrating species, especially in habitats mingled with scattered trees. Shrubland-preferring migrants include, Northern Saw-whet Owl (mainly in evergreens), Yellow-bellied Flycatcher, Alder Flycatcher, Least Flycatcher, Philadelphia Vireo, Golden-winged Warbler, Orange-crowned Warbler, Chestnut-sided Warbler, Mourning Warbler, Connecticut Warbler, Wilson's Warbler, Canada Warbler, and Lincoln's Sparrow. Shrubland habitats therefore provide real benefits to migrant birds and greatly increase local biodiversity.

Cultural Habitats: Developed Land

Residential and urban areas represent the overwhelming majority of land area within the CR/LSAA, covering 175,700 acres, or 81% of the area (Table 2, Figure 4). Many of the forest preserves, parks, and other otherwise undeveloped areas in the CR/LSAA are totally surrounded by an urban or suburban setting, making private landholdings within the area all the more important, especially as migratory stopover habitat and especially within a few miles of the Lake Michigan shoreline. However, most of these areas, scattered with lawns, parks, and other manicured vegetation, offer suitable breeding habitat for relatively few bird species.

Regularly Occurring Species

Typical Species - Typical breeding species include: Red-tailed Hawk (in more sparsely inhabited areas), American Kestrel (especially farmsteads), Killdeer (roofs, roads), Rock Dove, Mourning Dove, Eastern Screech-owl, Great Horned Owl, Common Nighthawk (rooftops), Chimney Swift, Ruby-throated Hummingbird, Northern Flicker, Red-bellied Woodpecker ("urban forests"), Eastern Wood-Pewee, Eastern Phoebe, Barn Swallow, Purple Martin, Blue Jay, American Crow, Black-capped Chickadee, Tufted Titmouse, White-breasted Nuthatch, House Wren, Carolina Wren, Gray Catbird, Brown Thrasher, American Robin, Eastern Bluebird (farmsteads), European Starling, Warbling Vireo, Common Yellowthroat, House Sparrow, Common Grackle, Brown-headed Cowbird, Baltimore Oriole, Northern Cardinal, House Finch, American Goldfinch, Chipping Sparrow, and Song Sparrow.

Developed lands contain an unusual mix of species that can use ornamental shrubs (e.g., Northern Cardinal and Song Sparrow), shade trees (e.g., Baltimore Oriole, Warbling Vireo, Black-capped Chickadee, Eastern Wood-Pewee), short mowed grass (e.g., American Robin, Common Grackle, Northern Flicker, American Crow, Brown-headed Cowbird, Mourning and Rock Doves, European Starling, and Chipping Sparrow), and can nest safely in human structures (e.g., American Kestrel, Killdeer, Common Nighthawk, Chimney Swift, Eastern Phoebe, Barn Swallow, Purple Martin, House and Carolina Wrens, American Robin, Eastern Bluebird, European Starling, House Sparrow and House Finch). This community has no parallel in the natural world.

Threatened and Endangered Species - The only threatened or endangered species found in residential or urban areas in the CR/LSAA is the Peregrine Falcon (SE) which has become a regular breeding bird in the region again due to the efforts of the Chicago Peregrine Release and Restoration Project (Hennen 1993). The Loggerhead Shrike (ST), which often forages in mowed grass of rural farmsteads, but have practically been extirpated from the area.

Exotic Species - Many species in developed areas are introduced. Huge populations of introduced European Starlings, House Sparrows, Rock Doves, and House Finches compete with native species for nest sites and food at bird feeders. House Finches are native to the western United States but after a population was released on Long Island in the 1940s, they spread west from New York and are now common in the urban and rural areas of Illinois. See Bent (1996) for a good account of its spread throughout Illinois. Monk Parakeets are established nesters in some residential and urban areas. See Hyman and Pruett-Jones (1995) and South (1999) for a thorough history and discussion of this species, which was recently added to the official list of Illinois' avifauna (Illinois Ornithological Records Committee 1999). The Eurasian Collared-Dove has recently been found in the area and will almost surely increase dramatically in numbers within urban and suburban areas throughout the CR/LSAA, much like the House Finch has within the last decade (see Bohlen 1998).

Migrating birds make heavy use of shade trees in developed areas and, when available, also use shrubs. Typical migrants of urban/suburban habitats include: Cooper's and Sharp-shinned Hawks (both forage at bird feeders), Common Nighthawk, Ruby-throated Hummingbird (especially at feeders), Northern Flicker, Yellow-bellied Sapsucker, Red-breasted Nuthatch (conifers), Brown Creeper, Hermit Thrush, Golden-crowned Kinglet, Ruby-crowned Kinglet, Cedar Waxwing, Red-eyed Vireo, Tennessee Warbler, Cape May Warbler (conifers), Black-throated Green Warbler, Blackburnian Warbler, Bay-breasted Warbler, Blackpoll Warbler, American Redstart, Rusty Blackbird, Evening Grosbeak (feeders), Purple Finch (feeders), Pine Siskin (feeders, conifers), American Goldfinch (feeders), Common Redpoll (feeders), Eastern Towhee (feeders), Dark-eyed Junco (feeders), American Tree Sparrow, White-crowned Sparrow, and White-throated Sparrow. However, the unique position of many Chicago city parks right on the Lake Michigan shoreline makes any greenspace along the lake all the more important for migrants of all kinds (see Williamson 1996).

Population Dynamics and Management

Developed areas are characterized by abnormally high population densities of species that occasionally or regularly depredate nests (e.g., Blue Jay, American Crow, House Wren, Gray Catbird, Common Grackle, and Brown-headed Cowbird). Bird feeders further augment populations of many species in rural or urban areas, especially the Northern Cardinal, House Finch, Monk Parakeet and Eurasian Collared-Dove, by increasing winter survival.

Nesting success of species of developed areas has not been systematically studied. Such studies could lead to recommendations for enhancing populations of the native species that have adapted to human developments. However, high populations of predatory birds, domestic cats, and other mammalian predators may make it difficult for many species that build open-cup nests in accessible locations to nest successfully.

Undoubtedly the main importance to birds found in the habitats within the CR/LSAA is as a resting and feeding area during migratory stopover. The line of city parks along the lakefront from the south side of Chicago to the Wisconsin line has seen more species of birds than any other area of comparable size in the state, and may be extremely important to the survival to tens of thousands of migrants passing through the Chicago area, annually. Unfortunately, many of the large buildings in downtown Chicago also act as deathtraps to thousands of migratory birds each year (Philip 1994).

Management Recommendations

The CR/LSAA contains several rich wetland bird communities and an extremely important migration corridor, both in its position in the Mississippi River Flyway and in Lake Michigan's position in relation to both summering areas for species heading north, and for species heading south and southeast in the winter. Wetland conservation should clearly be

of the highest priority in the CR/LSAA because of relatively large populations of many state threatened and endangered species. Grassland restoration, especially around existing wetlands, would provide habitat for declining grassland birds, help buffer wetlands from surrounding development, and provide nesting habitat for many wetland species. Similarly, wooded buffer strips around wetlands can perform some of the same functions. This coordinated management of wetland habitats, especially large wetlands, or complexes of nearby smaller wetlands, offers the best hope for sustaining populations of endangered and threatened species.

Most forest sites in the CR/LSAA are small and have little potential to be enlarged sufficiently to create tracts large enough to avoid extremely high levels of nest predation and brood parasitism. For these areas, restoration of native plant communities coupled with judicious consideration of the needs of migrant birds (some shrubby areas and oak trees) might be the best management strategy.

Developed areas, especially urban forest and parks, can be managed to improve habitat by encouraging oaks and leaving shrubby areas for migrants. Since most of the CR/LSAA is comprised of urban and suburban settings, these areas should be enhanced as much as possible through plantings, changing otherwise "sterile" mowed lawns and other open areas, into areas where tired and hungry migrants can rest and refuel. Planning of future high rise and other downtown buildings should avoid the large-paned, reflective glass and lighted beacons which many of the larger downtown skyscrapers and corporate office buildings (which cause the most deaths of migrant birds) have incorporated into their buildings.

Agricultural areas benefit from increased cover provided by CRP fields, shrub-lined drainage ditches, and unmowed roadsides.

Mammals

Introduction

Information in this section was compiled largely from range maps and historical records in Hoffmeister (1989). The Illinois Natural Heritage Database (INHD; Illinois Department of Natural Resources) was checked for recent records (as of June 1999) of threatened and endangered species. Taxonomy follows Wilson and Reeder (1993).

Mammals known or likely to occur in the Chicago River/Lake Shore Assessment Area (CR/LSAA) are listed in Table 13. These 44 species represent 74.6% of the 59 mammal species that currently occur in Illinois (Hoffmeister 1989). Eight species of bats are listed in Table 13, but the silver-haired bat may be present only during spring and autumn migration periods and the only species that might remain in the CR/LSAA during the winter is the big brown bat. The Lake Michigan shoreline of the CR/LSAA seems to be an important migration route for bats. Of the eight mammal species listed as endangered and threatened in Illinois (Illinois Endangered Species Protection Board 1999, U.S. Fish and Wildlife Service 1991) only two, the federally endangered Indiana bat (*Myotis sodalis*) and the state threatened river otter (*Lontra canadensis*), are widely distributed in the state (Herkert 1992). An Indiana bat collected in Cook County in September 1928 (Hoffmeister 1989) would have been a migrant. There are no recent records for this species in northeastern Illinois (Illinois Department of Natural Resources 1999, Gardner et al. 1996) and it is not included in Table 13. There are no river otter records within the CR/LSAA (INHD), but its presence has been documented in Cook County (Bluett 2000). Sightings of the formerly state threatened bobcat (*Lynx rufus*) have been reported for Cook and Lake counties (Woolf 1996) so the potential exists for this species, as well as the river otter, to occur in the CR/LSAA. The population status of many mammals in the CR/LSAA is unknown; in these cases designations in Table 13 are projections based on their status in other parts of northern Illinois.

The vast majority (81.0%) of the land in the CR/LSAA is urban, including the city of Chicago and some of its northern suburbs such as Skokie, Northbrook, Highland Park, Waukegan, and Zion. The only natural community that occupies a substantial portion of the CR/LSAA is upland forest (12.9%). Most of the forest occurs in the area between Evanston and North Chicago, near Lake Michigan and along the Skokie River and the North Branch and West Fork of the Chicago River. Small amounts of grassland and wetland also are present in the CR/LSAA; most of these habitat types occur along the lake shore north of Waukegan. Many mammal species are generalists that use a variety of habitats and have adapted to living in landscapes that have been altered by human activity. Larger mammals that now occur in suburban areas include the Virginia opossum, eastern cottontail, fox and gray squirrels, coyote, red fox, raccoon, striped skunk, and white-tailed

deer. Several small mammals, including the eastern mole, northern short-tailed shrew, thirteen-lined ground squirrel, deer mouse, and prairie and meadow voles, can occupy maintained areas such as roadsides, cemeteries, parks, and lawns. Some bats, especially big brown and little brown bats, roost primarily in buildings. Thus, the suburban areas of the CR/LSAA can support a fairly diverse mammalian fauna, although this is not the case for its densely populated urban areas.

The Norway rat and house mouse are the only exotic and non-domesticated mammals that occur regularly in Illinois. These species are strongly associated with human structures (e.g. houses, barns, warehouses), but both can be found in natural habitats near buildings. The house mouse, in particular, can sometimes reach substantial numbers in grasslands near structures (Hoffmeister 1989). These species are now so widespread that they are part of the mammalian fauna throughout the United States. They can cause extensive economic damage in agricultural and developed areas, but could not be eliminated easily from natural habitats. A black rat (*R. rattus*) collected in Chicago in 1972 was caught in a railroad car and may have come into the city from elsewhere (Hoffmeister 1989). The potential exists for this exotic species to reach Chicago via ocean-going vessels although they might be unable to compete with Norway rats. Large numbers of free-roaming and feral domestic cats (*Felis silvestris*) occur in Illinois as elsewhere (Warner 1985, Coleman and Temple 1996). They can have a negative impact on populations of birds (especially ground-nesting birds) and small mammals and reduce prey availability for native predators (Warner 1985, Churcher and Lawton 1987, Coleman and Temple 1996). Unvaccinated cats or dogs (*Canis familiaris*) have the potential to transmit diseases to wild mammals or humans (Coleman and Temple 1996).

Table 13. List of mammal species known or likely to occur in the Chicago River/Lake Shore Assessment Area.[1]

Common name	Order *Scientific name*	Habitat[2]	Population status[3]
Marsupials	Didelphimorphia		
Virginia opossum	*Didelphis virginiana*	F, W, G	C
Insectivores	Insectivora		
masked shrew	*Sorex cinereus*	G, F, W	C
pygmy shrew	*Sorex hoyi*	F, W, G	R?
northern short-tailed shrew	*Blarina brevicauda*	F, G, W	C
least shrew	*Cryptotis parva*	G	U?
eastern mole	*Scalopus aquaticus*	F, G	C
Bats	Chiroptera		
little brown bat	*Myotis lucifugus*	F, buildings, caves	C
northern long-eared bat	*Myotis septentrionalis*	F, buildings, caves	U?
silver-haired bat	*Lasionycteris noctivagans*	F, caves (hibernation)	C[4]
eastern pipistrelle	*Pipistrellus subflavus*	F, buildings, caves	R?
big brown bat	*Eptesicus fuscus*	F, buildings, caves	C
red bat	*Lasiurus borealis*	F	C

Table 13. Continued.

Common name	Order *Scientific name*	Habitat[2]	Population status[3]
hoary bat	*Lasiurus cinereus*	F	C?
evening bat	*Nycticeius humeralis*	F, buildings	U?
Rabbits	Lagomorpha		
eastern cottontail	*Sylvilagus floridanus*	G, F (edges)	C
Rodents	Rodentia		
eastern chipmunk	*Tamias striatus*	F	C
woodchuck	*Marmota monax*	G, F (edges)	C
thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*	G	C
Franklin's ground squirrel	*Spermophilus franklinii*	G	R?
gray squirrel	*Sciurus carolinensis*	F, urban areas	C
fox squirrel	*Sciurus niger*	F	C
southern flying squirrel	*Glaucomys volans*	F	C?
beaver	*Castor canadensis*	W	C
western harvest mouse	*Reithrodontomys megalotis*	G	R?
deer mouse	*Peromyscus maniculatus*	G	C?
white-footed mouse	*Peromyscus leucopus*	F, G, W (mostly F)	C
meadow vole	*Microtus pennsylvanicus*	G	C
prairie vole	*Microtus ochrogaster*	G	C
woodland vole	*Microtus pinetorum*	F	U?
muskrat	*Ondatra zibethicus*	W	C
southern bog lemming	*Synaptomys cooperi*	G, W	R?
Norway rat*	*Rattus norvegicus*	buildings	C
house mouse*	*Mus musculus*	mostly buildings	C
meadow jumping mouse	*Zapus hudsonius*	G, F, W	U?
Carnivores	Carnivora		
coyote	*Canis latrans*	F, G, W	C
red fox	*Vulpes vulpes*	G, F, W	C?
gray fox	*Urocyon cinereoargenteus*	F	R?
raccoon	*Procyon lotor*	F, W, G	C
least weasel	*Mustela nivalis*	G, W	C
long-tailed weasel	*Mustela frenata*	F, W, G	C
mink	*Mustela vison*	W, G, F	C
striped skunk	*Mephitis mephitis*	F, G, W	C
badger	*Taxidea taxus*	G	U?
Even-toed ungulates	Artiodactyla		
white-tailed deer	*Odocoileus virginianus*	F, W, G	C

[1] Compiled from range maps and known records reported in Hoffmeister (1989) and Illinois Department of Natural Resources (1999).

[2] Habitats: W = wetland, G = grassland, F = forest.

[3] Population status: C = common, U = uncommon, R = rare, ? = status uncertain

[4] Common during migration periods, absent remainder of the year

Forest

Typical Species

Mammals known or likely to occur in the CR/LSAA that are restricted to forested habitats are the hoary bat, eastern chipmunk, southern flying squirrel, woodland vole, and gray fox. Species that are primarily associated with forests but also utilize other types of habitat include the Virginia opossum, pygmy shrew, red bat, fox and gray squirrels, white-footed mouse, raccoon, and white-tailed deer. The little brown bat, big brown bat, northern long-eared bat, eastern pipistrelle, and evening bat forage in forested habitats, but they roost in buildings or other human-made structures as well as trees. Some species, such as the eastern cottontail and woodchuck, specialize in the use of forest edges. Other habitat generalists that would occur in forests in the CR/LSAA are listed in Table 13.

Most mammal species associated with forests are not restricted to a specific type of forest (i.e. upland or bottomland). Species that hibernate (e.g. woodchuck, eastern chipmunk) or are primarily fossorial (e.g. eastern mole, woodland vole) need sites with well-drained, uninundated soils. Raccoons and opossums are most abundant in forest tracts in proximity to water (Hoffmeister 1989). The gray fox apparently requires extensive forest cover and has become less common in parts of Illinois (Hoffmeister 1989). There are about 28,000 acres of forest in the CR/LSAA, including fairly large stretches along riparian corridors, so the area may still support gray foxes. Gray squirrels inhabit extensive tracts of mature forest with a dense understory, while fox squirrels can occupy open forests, woodlots, and fencerows (Hoffmeister 1989). Consequently, gray squirrel numbers also have declined in parts of Illinois (Nixon et al. 1978). Gray squirrels, however, also live in city parks and residential areas and are common in Chicago and its suburbs (Nixon et al. 1978). Tree squirrels, flying squirrels, and chipmunks tend to be most abundant in forests containing large numbers of mast-producing trees such as oaks and hickories.

Threatened and Endangered Species

None of the forest mammals known or likely to occur in the CR/LSAA is listed as threatened or endangered. A specimen of the federally endangered Indiana bat was collected in Cook County (on the Chicago lakefront) during September 1928 (Hoffmeister 1989). This individual would have been a migrant. Although many Indiana bats hibernate in Blackball Mine in LaSalle County in north-central Illinois (Illinois Department of Natural Resources 1999), maternity colonies have been found only as far north in the state as Henderson and Ford counties (Gardner et al. 1996). Therefore, it is very unlikely that this species is present in the CR/LSAA.

Information Gaps

Information on the distribution and population status of several forest-dwelling species in the CR/LSAA is limited. The Natural Heritage Database (Illinois Department of Natural Resources (1999) contains no records for the bobcat in the CR/LSAA, but Woolf (1996) compiled recent bobcat sightings for Cook and Lake counties (specific localities not given). The southern half of the CR/LSAA probably is too urbanized to provide suitable habitat for resident bobcats, but surveys should be conducted to determine if this species occurs in the northern half of the area. The current status of the gray fox in the northern CR/LSAA also should be determined. Until recently only two specimens of the pygmy shrew had been collected in Illinois, one near Palatine in Cook County (Hoffmeister 1989). At least four specimens have been collected in Cook and McHenry counties during the 1990s (Mierzwa 1991, Sliwinski 1994, Illinois Natural History Survey [INHS] Mammal Collection). Additional surveys on the distribution and abundance of this species in the CR/LSAA would be of interest. Although northeastern Illinois is within the range of the eastern pipistrelle there are very few records of this species from the region (Hoffmeister 1989, INHS bat record databases, Field Museum of Natural History Mammal Collection [FMNH]). There also are limited records for the evening bat, northern long-eared bat, and woodland vole in northeastern Illinois (Hoffmeister 1989, INHS bat record databases, FMNH). Therefore, additional information is needed on the distribution and abundance of these four species. Bat surveys in the CR/LSAA might also detect the presence of the Indiana bat. Flying squirrels and eastern chipmunks are absent from small, isolated patches of forest in the agricultural landscape of east-central Illinois (Rosenblatt et al. 1999). It would be interesting to assess the ability of forest mammals to maintain viable populations and disperse between forested tracts in the urban landscape of the CR/LSAA. Finally, a growing concern is the impact of overabundant species such as the white-tailed deer and raccoon on the flora and fauna of urban/suburban nature preserves.

Prairie/Grassland

Typical Species

Mammal species restricted to grassland habitats that occur or potentially occur in the CR/LSAA are the least shrew, thirteen-lined and Franklin's ground squirrels, western harvest mouse, deer mouse, prairie and meadow voles, and badger. The masked shrew, northern short-tailed shrew, eastern cottontail, woodchuck, southern bog lemming, meadow jumping mouse, and red fox are strongly associated with grassland habitats. Additional habitat generalists of the CR/LSAA that use grasslands are listed in Table 13.

Most mammals designated as grassland species are not restricted to native or undisturbed grasslands. Rather, the vegetative composition and structure of rights-of-way, hayfields, pastures, fencerows, old fields, and prairie restorations provide suitable habitat for many of these species. The thirteen-lined ground squirrel inhabits sites with closely mowed grass such as roadsides, cemeteries, golf courses, and lawns. The masked shrew, northern short-

tailed shrew, meadow vole, southern bog lemming, and meadow jumping mouse generally prefer more mesic grasslands (Hoffmeister 1989). Eastern cottontails and woodchucks are most abundant where grassland habitat is adjacent to forested areas and can be considered edge species. The white-footed mouse, a forest species, will be found in grasslands if scattered trees or shrubs are present.

Threatened and Endangered Species

None of the mammals primarily associated with grasslands in the CR/LSAA is listed as a threatened or endangered species in Illinois.

Information Gaps

Information is needed on the current distribution and abundance of several grassland mammals in the CR/LSAA. Franklin's ground squirrel is known historically from several locations in northeastern Illinois, including the CR/LSAA (Hoffmeister 1989). However, this species is thought to have declined in the eastern portion of its range, including Illinois (Lewis and Rongstad 1992). The current status of this species in the CR/LSAA should be determined. Although the entire state of Illinois is within the range of the southern bog lemming, Hoffmeister (1989) found no records from the northeastern counties. Therefore, surveys should be conducted to determine the presence of this species in the CR/LSAA. The western harvest mouse was first captured in northwestern Illinois in 1953 and has since expanded its range southward and eastward in the state (Hoffmeister 1989). There are no records for the CR/LSAA (Hoffmeister 1989, FMNH) so the presence of this species in the area needs to be documented. There are very few records of the least shrew and meadow jumping mouse (Hoffmeister 1989, FMNH) in northeastern Illinois and information on the distribution and abundance of these species in the CR/LSAA would be of interest. Warner and Ver Steeg (1995) recently investigated the status of the badger in Illinois. They reported its presence in Cook and Lake counties (no specific localities) and grasslands in the CR/LSAA should be surveyed for badgers. The red fox is not strictly a grassland species, but it is often associated with open habitats. It has been suggested that recent increases in the abundance of coyotes may have negatively affected populations of red fox; therefore, the status of the red fox in the CR/LSAA should be evaluated. The amount of grassland in northeastern Illinois has decreased through development and ecological succession; thus, grassland habitat in the CR/LSAA is highly fragmented. The persistence of grassland small mammal populations in these areas and the ability of small mammals to travel between such habitat islands could be investigated.

Wetland

Typical Species

Mammals in the CR/LSAA that require wetland or aquatic habitats are the beaver, muskrat, and mink. Beavers and muskrats are highly specialized for aquatic life and need open water; mink are more terrestrial but typically occur near water. Raccoons and opossums are most abundant in proximity to water (Hoffmeister 1989). Bats occurring in the CR/LSAA would forage above wetlands as well as aquatic habitats. The masked shrew, northern short-tailed shrew, southern bog lemming, and meadow jumping mouse use emergent wetlands (marshes, sedge meadows, and wet meadows) extensively in addition to other types of habitats. Small mammals such as these are not adapted for aquatic life and occupy the vegetation along the edges of wetlands or move into wetlands when standing water is not present. Other habitat generalists that use wetlands opportunistically are listed in Table 13.

Threatened and Endangered Species

The Illinois Natural Heritage Database (Illinois Department of Natural Resources 1999) contains no recent records for the state-threatened river otter in the CR/LSAA, but a river otter was seen at Illinois Beach Nature Preserve in Lake County in 1971 (Anderson 1995). The presence of this species along the Des Plaines River in Cook County has been documented recently (Bluett 2000).

The main breeding population of native river otters in Illinois inhabits the backwaters and tributaries of the Mississippi River in the northwestern corner of the state (Anderson 1995). Smaller populations occur in southern Illinois and the numbers of reports along the Rock River and the middle section of the Mississippi River have been increasing (Anderson 1995). Since 1994 the IDNR has released 346 river otters at 15 locations in the Kaskaskia, Wabash, and Illinois river systems (Bluett 1997). None of the release sites was within 75 miles of the CR/LSAA. Habitat in the CR/LSAA may be only marginal for river otters. Although the North Shore Channel and a short segment of the North Branch of the Chicago River were rated as C streams (moderate aquatic resources), most of the waterways in the CR/LSAA were given only a D rating (limited aquatic resources) by the Illinois Biological Stream Characterization Work Group (1995). Furthermore, the CR/LSAA may be too urbanized to be occupied by resident river otters.

Information Gaps

If the number of river otters in Illinois continues to increase some individuals might immigrate into the CR/LSAA and aquatic habitats in the area should be monitored for otters. The presence of beavers is considered favorable for otters, but the impact of beaver populations on the physical structure of riparian systems in the CR/LSAA should be

evaluated. Prior to European settlement 40-61% of Cook and Lake counties consisted of wetlands (Suloway and Hubbell 1994). Wetlands currently cover only 2.4% of the CR/LSAA and many of the remaining emergent wetlands are small and isolated. It would be interesting to see if these wetlands are used by small mammals other than those occupying surrounding habitat types and to assess the ability of these mammals to move between wetlands.

Enhancement and Restoration Potential

Preservation of upland and bottomland forests in the CR/LSAA could enhance the suitability of the area as habitat for a variety of forest-dwelling species, including the bobcat and gray fox. Development surrounding smaller forest tracts probably limits their ability to support some of the larger forest mammals. Efforts to maintain and establish wildlife corridors linking forest tracts (e.g. along rivers) might increase their suitability for some species. Preservation or restoration of riparian forests also would be necessary if the CR/LSAA were ever to provide potential habitat for river otters. Streambank stabilization and the reduction of silt and chemical runoff into rivers, creeks, and wetlands in the CR/LSAA would enhance their ability to support river otters and mink. Retaining large snags with exfoliating bark would provide potentially suitable roost sites for bats (including Indiana bats if any were ever to occupy the area).

Preservation of native prairie remnants and other types of grassland habitats, coupled with prairie restoration or creation, would provide habitat for the red fox and badger as well as smaller mammals. Management efforts, such as prescribed burns or brush removal, may increase the suitability of prairie remnants in the CR/LSAA as habitat for grassland small mammals. Vegetation along abandoned railroad rights-of-way in the CR/LSAA should be maintained or restored to provide habitat and travel corridors for mammals. If they are found to be rare (or absent) in the CR/LSAA, Franklin's ground squirrels could be introduced into suitable grasslands on state or county property.

Amphibians and Reptiles

Introduction

Information in this section has been compiled from range maps in Smith (1961), the Illinois Natural Heritage Database, the Illinois Amphibian and Reptile Vouchered Database (an INHS computer database that contains information on specimens from museum, university, and private collections), unvouchered records from the literature, and unvouchered records taken from reliable biologists and naturalists. There has not been a systematic survey of the amphibians and reptiles of the Chicago River/Lake Shore Assessment Area (CR/LSAA) but Anton (1999) reported on the distribution and status of the amphibians and reptiles of Cook County. The CR/LSAA contains portions of four of Smith's (1961) eleven Herpetofaunal Divisions for the state; Grand Prairie, Woodlands of the Grand Prairie, Sand Areas, and Northeastern Mesic Woodlands.

Amphibian and reptile species that are known or likely to occur in the CR/LSAA are listed in Table 14. The 14 amphibian species and 21 reptile species in Table 14 represent 35% of the amphibian species and 35% of the reptile species of the State. Two threatened species are known to exist in the CR/LSAA. Kirtland's Snake, *Clonophis kirtlandii* and Blanding's turtle, *Emydoidea blandingii*. Two state endangered species, the Four-toed Salamander, *Hemidactylium scutatum*, and the massasauga, *Sistrurus catenatus* have probably been extirpated from the CR/LSAA.

There have been reports of exotic reptile species in the CR/LSAA. See below under "Creeks and Rivers".

When referring to the habitat designations in Table 14, keep in mind that most amphibian and reptile species are not restricted to a single habitat type. For example, all but two of Illinois' amphibians require some type of aquatic habitat (wetland, pond, creek ,or river) for breeding but the adults can also be found in a variety of terrestrial habitats. Some species require a combination of two habitat types throughout their life. For example, the Smooth Green Snake requires prairie or forest habitat, but wetlands must be present. On the other hand, some species have narrower habitat requirements than the designations in Table 14 might suggest. For example, the Queen Snake is listed as occurring in rivers and creeks, but it is only found in medium-sized creeks with rocky substrates.

Habitat Requirements and Current Status of the Listed Species in CR/LSAA

Kirtland's Water Snake (*Clonophis kirtlandii*)- This semiaquatic snake prefers wet prairies with abundant cover, especially prairies that are seasonally flooded and adjacent to upland habitats. *Clonophis* utilize crayfish burrows as shelter although they have been taken in

vacant lots in some urban areas where crayfish burrows have been destroyed. In these situations they rely on boards and other surface debris for cover.

Older records exist for Illinois Beach State Park and near Glenview from 1984 and 1993, respectively.

Blanding's Turtle (*Emydoidea blandingii*)- Prairie marshes and floodplain sloughs of larger rivers are the primary habitat of this semiaquatic turtle. They are most commonly found in shallow (10-20 cm) open water areas of cattail marshes, sloughs, ponds, and flooded ditches. Aquatic plants, especially emergent vegetation and a mud bottom are important habitat components. The activity period in northern Illinois is probably late March to October. Nesting occurs in June in sandy, well-drained soil near the aquatic habitat. Hatching usually takes place in September.

The most recent verified records are Illinois Beach State Park and Waukegan from 1972 and 1938, respectively.

Table 14. Amphibian and reptile species known or likely to occur in the Chicago River/Lake Shore Assessment Area with an indication of habitat preference and relative abundance.

Common Name[1, 2]	Scientific Name	Habitat[3]	Abundance[4]
Amphibians			
blue-spotted salamander	*Ambystoma laterale*	F,W,L	C
spotted salamander	*Ambystoma maculatum*	F,W,L	C
tiger salamander	*Ambystoma tigrinum*	W,P,L	C
central newt	*Notophthalmus viridescens*	F,W,L	R
redback salamander	*Plethodon cinereus*	F	R
mudpuppy	*Necturus maculosus*	R,L	U
American toad	*Bufo americanus*	U	C
spring peeper	*Pseudacris crucifer*	F,W,L	U
western chorus frog	*Pseudacris triseriata*	U	C
gray treefrog	*Hyla chrysoscelis*	F,W	C
gray treefrog	*Hyla versicolor*	F,W	C
bullfrog	*Rana catesbeiana*	U	C
green frog	*Rana clamitans*	F,W,R	C
northern leopard frog	*Rana pipiens*	U	C
Reptiles			
snapping turtle	*Chelydra serpentina*	W,L,R	C
musk turtle	*Sternotherus odoratus*	L	R
Blanding's turtle - ST	***Emydoidea blandingii***	**W**	**U**
eastern box turtle	*Terrapene carolina*	F	R
slider	*Trachemys scripta*	L,R	C
painted turtle	*Chrysemys picta*	W,L,R	C
map turtle	*Graptemys geographica*	L,R	U

Table 14. Continued.

Common Name[1, 2]	Scientific Name	Habitat[3]	Abundance[4]
spiny softshell turtle	*Apalone spinifera*	W,L,R	C
five-lined skink	*Eumeces fasciatus*	F	?
racer	*Coluber constrictor*	U	C
smooth green snake	*Opheodrys vernalis*	F,W,P	U
fox snake	*Elaphe vulpina*	F,P,C	C
milk snake	*Lampropeltis triangulum*	F,W,P	U
plains garter snake	*Thamnophis radix*	U	C
common garter snake	*Thamnophis sirtalis*	U	C
brown snake	*Storeria dekayi*	U	C
red-bellied snake	*Storeria occipitomaculata*	F,W	U
Graham's crayfish snake	*Regina grahamii*	W,P,L	U
queen snake	*Regina septemvittata*	R	R
Kirtland's snake - ST	***Clonophis kirtlandii***	**F,W,P,L**	**R**
northern water snake	*Nerodia sipedon*	U	C

[1] Nomenclature follows Collins (1990) unless noted.
[2] Bold type indicates an Illinois threatened (ST) species.
[3] F = forest W = wetland P = prairie and savanna L = lakes, ponds, impoundments R = rivers & creeks C = cultural U = ubiquitous (all habitats)
[4] C = common U = uncommon R = rare ? = status uncertain

Forest

Typical Species

Amphibian species of the CR/LSAA that are typical of forested habitats include Blue-spotted Salamander and both species of Gray Treefrog. As outlined above, some amphibians also require aquatic habitats for breeding. The Gray Treefrogs and Blue-spotted salamander breed in forested wetlands and upland forested ponds. Among the reptiles of the CR/LSAA, the Brown Snake is typical of forested areas.

Enhancement and Restoration Potential

Maintaining small, temporary, fishless ponds in forests of the CR/LSAA would benefit almost all of the reptiles and amphibians of the CR/LSAA as well as other species groups that depend on them for food. Creating or restoring small ponds in upland forests is particularly valuable because these habitats are among the rarest in the CR/LSAA and the state. The Central Newt and both Gray Treefrogs breed in this habitat. Kirtland's Snake and Blanding's Turtle, both state-listed species, would benefit from restoration or creation of woodland ponds.

Wetland

Typical Species

Amphibian species of the CR/LSAA that are typical of wetland habitats include the Green Frog and Northern Leopard Frog. As outlined above, almost all amphibians require some type of aquatic habitat for breeding and most breed in wetlands. Among the reptiles of the CR/LSAA, the Painted Turtle and Common Garter Snake are typical of wetlands. Both listed species rely on wetland habitats.

Enhancement and Restoration Potential

Wetlands are central to the continued existence of both listed species in the CR/LSAA, Kirtland's Snake and Blanding's Turtle. Maintaining even small, temporary wetlands in the CR/LSAA would benefit almost all of the reptiles and amphibians of the region, as well as other groups that depend on them for food. The importance of cattail marshes under one acre should not be underestimated. Mowing in the vicinity of wetlands should be avoided.

Prairie/Grassland

Typical Species

Of the amphibian species listed in Table 14, the Tiger Salamander and Western Chorus Frog are typical of prairie habitats in the CR/LSAA. The Tiger Salamander requires fishless ponds and wetlands for breeding. Because of the destruction and degradation of these habitats, the tiger salamander has declined in the CR/LSAA. The Western Chorus Frog has a shorter larval period and therefore can breed in more temporary aquatic habitats such as flooded fields and ditches. Reptile species in the CR/LSAA that are typical of prairie habitats include the Fox Snake and Plains Garter Snake. Both of these snakes can tolerate disturbed habitats such as mowed right-of-way, pasture, old field, and agricultural edge. Kirtland's snakes rely on wet prairie habitats.

Enhancement and Restoration Potential

Restoring native prairie, especially wet prairie, in the CR/LSAA would benefit a variety of amphibians and reptiles especially the Tiger Salamander, and Kirtland's Snake.

Lakes, Ponds, and Impoundments

Typical Species

Of the amphibian species listed in Table 14, the Bullfrog and Cricket Frog are typical of lakes, ponds, and impoundments in the CR/LSAA. Both of these species have developed strategies for coexisting with fish and are usually more widely distributed than most amphibians. Among the reptiles of the CR/LSAA the Snapping Turtle, Painted Turtle, Common Garter Snake, and Northern Water Snake are typical of lakes, ponds, and impoundments.

Enhancement and Restoration Potential

Restoration of fishless, forested ponds in upland areas would benefit the Tiger Salamander and Gray Treefrogs. Leaving at least part of the shore around ponds, lakes and impoundments unmowed and providing forest or grassland connections among ponds, lakes and impoundments in the CR/LSAA would benefit a variety of amphibians and reptiles including the listed species.

Creeks and Rivers

Typical Species

The Green Frog and Northern Leopard Frog are typical of creeks and small rivers in the CR/LSAA. The Bullfrog is common in most aquatic habitats of the CR/LSAA. Among the reptiles of the CR/LSAA, the Northern Water Snake is typical of creeks and small rivers while the Snapping Turtle is typical of a wide variety of aquatic habitats.

Enhancement and Restoration Potential

Restoring the riparian zone and associated floodplain forests and wetlands along the waterways of the CR/LSAA would benefit a variety of amphibians and reptiles. Water quality must also be improved if any significant progress is expected.

Exotic Species

Anton (1999) reported 11 species of introduced turtles that have been observed in Cook County. Many of these were observed only in the Des Plaines River, but a few may be expected in the Chicago River. Reproduction has not been verified for any of these species.

Cultural Habitats

Typical Species

Of the amphibian species listed in Table 14, the American Toad, Western Chorus Frog, and Bullfrog are typical of cultural habitats in the CR/LSAA. These species can be found in cropland, pasture, successional field, developed land, and tree plantations providing that adequate breeding sites (ditches, flooded fields, stock tanks, remnant marshes) are present. Among the reptiles of the CR/LSAA, the Plains Garter Snake, Common Garter Snake, Brown Snake, and Northern Water Snake are typical of cultural habitats in the CR/LSAA.

Enhancement and Restoration Potential

The American Toad, Western Chorus Frog, and Bullfrog do well in patches of cattail marsh less than one acre, even when the marsh is surrounded by developed land. It is always best to strive for larger size and connectivity of habitat, but the utility of these smaller areas should not be underestimated. It is important to leave a moderate buffer of unmowed grasses around these habitats.

Overall Habitat Quality and Current Management Concerns

Overall, opportunities for amphibians and reptiles in the CR/LSAA are poor. Compared to presettlement, the present landscape of the CR/LSAA lacks a significant amount of wet prairie. Almost all of the water resources in the CR/LSAA have been severely compromised.

The most critical management concerns for the CR/LSAA are restoration of aquatic habitats including their associated riparian zones. Intact riparian zones may act as dispersal corridors for many amphibians and reptiles, thus reducing the effects of habitat fragmentation.

Aquatic Biota

Introduction

The Chicago River/Lake Shore Assessment Area is located in Cook and Lake counties in northeastern Illinois. Two natural divisions are encompassed - Northeastern Morainal (Morainal, Lake Michigan Dunes, and Chicago Lake Plain sections) and a small portion of Major Water Bodies (Lake Michigan Section) (Schwegman 1973). Waterbodies in the Assessment Area include Lake Michigan, the Chicago River drainage, and a segment of the Chicago Sanitary and Ship Canal. The entire Assessment Area is part of the greater Chicago metropolitan region and has been extensively developed for urban and industrial use.

Statewide Comparison of Aquatic Biota

The Chicago River/Lake Shore Assessment Area historically supported a fair diversity of aquatic species. Recorded from the area are 77 species of fishes, 16 species of bivalves, and 12 species of malacostracans (large crustaceans). Many species have disappeared from the area in recent decades; however, with improvements in water quality, species that have been extirpated could return and natural communities could become reestablished in areas where they have been eliminated or altered. However, in some areas, especially the North Branch, species will unlikely return due to the presence of dams.

The CR/LSAA most likely supports only a low moderate diversity of aquatic macroinvertebrates, particularly those species tolerant of marginal water quality and able to utilize marginal habitat during their life cycle. The majority of the non-insectan macroinvertebrates listed in Table 21 were documented by Metropolitan Water Reclamation District of Greater Chicago (MWRDGC)(1990) and Polls et al. (1991, 1992) from the Chicago Sanitary & Ship Canal, the Calumet Sag Channel (Calumet Assessment Area), and/or the Little Calumet River (Calumet Assessment Area) - all habitats seriously impacted by domestic and industrial effluents, periodic channelization, and extensive commercial as well as pleasure boat and barge traffic; those taxa in the insect orders Ephemeroptera, Odonata, Plecoptera, Trichoptera, and Heteroptera (listed in Table 21) represent records from Cook and Lake counties, exclusive of these marginal habitats.

Minor tributaries of Lake Michigan, however, may support a higher diversity of aquatic macroinvertebrates. One particular study, conducted in 1975 by INHS personnel (INHS 1976a, b) surveyed the aquatic macroinvertebrates and other flora and fauna associated with habitats in and adjacent to Illinois Beach State Park. During that study, small lakes, ponds, marshes, and the Dead River within the park boundaries were surveyed.

Common Species

Seventy-seven species of fishes are known from the Chicago River/Lake Shore Assessment Area (Tables 15 and 16). The most common species in Lake Michigan are the alewife, spottail shiner, and, along the shoreline, the longnose dace, bluntnose minnow, and mottled sculpin. The longnose dace and mottled sculpin are northern species that, although common in Lake Michigan, are rare elsewhere in Illinois. In some areas of the lake, the recently introduced round goby has become abundant and is now the most common species of fish.

The most common fishes in the highly degraded Chicago River are the common carp, goldfish, bluntnose minnow, and gizzard shad.

There have been few published surveys on the freshwater mussel fauna of the Chicago River/Lake Shore Assessment Area (Baker 1898, 1930) and very little historical data are available in museum collections. Fifteen species of native freshwater mussels have been reported from the Assessment Area (Tables 17 and 18). Of these, none have been collected alive in the past 20 years. Formerly common species include the threeridge, white heelsplitter, giant floater, plain pocketbook, Wabash pigtoe, and cylindrical papershell (Cummings and Mayer 1997, INHS Mollusk Collection data).

Twelve species of crayfishes, isopods, and amphipods are found in the Assessment Area (Tables 19 and 20). The most common crayfish is the virile crayfish, which is found in rocky areas and appears to be more tolerant of silt and degraded water than most crayfishes. The most common isopod is *Caecidotea intermedia*, which lives in rocky areas and on woody debris. The amphipod *Gammarus fasciatus* is common in some areas of Lake Michigan.

With the exception of information compiled by the MWRDGC for the major drainages in the CR/LSAA and that of INHS (1976a, b), little distributional information for aquatic macroinvertebrates and natural community associations of these species in this Assessment Area is available, particularly for the smaller and higher quality streams. The lack of adequate surveys for aquatic macroinvertebrates in the higher quality streams precludes summarization of typical, unique, or rare species, or to identify exotic species in this Assessment Area. Several extensive lists of aquatic macroinvertebrates known to occur in the larger drainages in Cook and Will counties are available, most notably those provided in Page et al. (1998) for the upper Des Plaines River, and Sparks et al. (1986) and Page et al. (2000.) for the lower Des Plaines River.

Additional records of insect species known to occur in Cook and Lake counties, noted in Table 21, have been taken from Burks (1953), Frison (1935), Illinois Natural History Survey (1976a,b), Lauck (1959), Malloch (1915a, b), Metropolitan Water Reclamation District of Greater Chicago (1990), Pechuman et al. (1983), Polls et al. (1991, 1992), Randolph and McCafferty (1998), Ross (1944, 1947), Taylor (1996), Wetzel (1992), Wooldridge (1967), and the INHS Insect and Annelida collections.

Table 15. Freshwater fishes recorded from the Chicago River/Lake Shore Assessment Area[1].

FAMILY *Scientific Name*[2,3,4]	Common Name	Headwaters	Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
PETROMYZONTIDAE						
*Petromyzon marinus**	sea lamprey				X	X
CLUPEIDAE						
Alosa pseudoharengus#*	alewife				X	X
Dorosoma cepedianum#	gizzard shad			X	X	X
CYPRINIDAE						
Carassius auratus#*	goldfish		X	X	X	X
Couesius plumbeus	lake chub		X	X	X	X
*Ctenopharyngodon idella**	grass carp				X	
Cyprinella lutrensis	red shiner		X	X	X	
Cyprinella spiloptera	spotfin shiner		X	X	X	
Cyprinus carpio#*	common carp			X	X	X
Hybognathus hankinsoni	brassy minnow	X	X			
Luxilus cornutus	common shiner		X	X	X	
Notemigonus crysoleucas	golden shiner			X	X	X
Notropis atherinoides	emerald shiner				X	
Notropis dorsalis	bigmouth shiner		X	X	X	
***Notropis heterodon*-ST**	**blackchin shiner**					X
Notropis hudsonius#	spottail shiner				X	
Notropis ludibundus	sand shiner		X	X	X	
Notropis volucellus	mimic shiner				X	
Pimephales notatus#	bluntnose minnow	X	X	X	X	
Pimephales promelas	fathead minnow		X	X		
Rhinichthys cataractae#	longnose dace		X	X		
Semotilus atromaculatus	creek chub	X	X			
CATOSTOMIDAE						
Carpiodes cyprinus	quillback		X	X	X	
***Catostomus catostomus*-ST**	**longnose sucker**				X	
Catostomus commersoni	white sucker		X	X	X	
Erimyzon sucetta	lake chubsucker		X			X
Ictiobus bubalus	smallmouth buffalo				X	
Ictiobus niger	black buffalo				X	
Moxostoma anisurum	silver redhorse			X	X	
Moxostoma macrolepidotum	shorthead redhorse			X	X	
COBITIDAE						
*Misgurnus anguillicaudatus**	Oriental weatherfish		X	X		
ICTALURIDAE						
Ameiurus melas	black bullhead		X	X	X	X
Ameiurus natalis	yellow bullhead		X	X	X	X
Ictalurus punctatus	channel catfish			X	X	X
Noturus gyrinus	tadpole madtom		X	X		
ESOCIDAE						
Esox americanus	grass pickerel	X	X	X		X
Esox lucius	northern pike			X	X	X

Table 15. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Headwaters	Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
UMBRIDAE						
Umbra limi	central mudminnow	X			X	
OSMERIDAE						
*Osmerus mordax**	rainbow smelt				X	X
GADIDAE						
Lota lota	burbot				X	
SALMONIDAE						
***Coregonus artedii*-ST**	**cisco**					**X**
***Coregonus clupeaformis*-EX**	**lake whitefish**					**X**
Coregonus hoyi	bloater					X
Coregonus nigripinnis	blackfin cisco					X
*Oncorhynchus kisutch**	coho salmon				X	X
*Oncorhynchus mykiss**	rainbow trout		X	X		
*Oncorhynchus tshawytscha**	chinook salmon				X	X
Prosopium cylindraceum	round whitefish					X
*Salmo trutta**	brown trout		X	X		
Salvelinus fontinalis	brook trout	X	X			
Salvelinus namaycush	lake trout					X
PERCOPSIDAE						
Percopsis omiscomaycus	trout-perch				X	
POECILIIDAE						
Gambusia affinis	mosquitofish	X	X			X
GASTEROSTEIDAE						
Culaea inconstans	brook stickleback	X	X			X
*Gasterosteus aculeatus**	threespine stickleback		X	X	X	X
Pungitius pungitius	ninespine stickleback			X		X
COTTIDAE						
Cottus bairdi#	mottled sculpin	X	X			
Cottus cognatus	slimy sculpin	X	X			
Myoxocephalus thompsoni	deepwater sculpin					X
MORONIDAE						
*Morone americana**	white perch			X	X	
Morone chrysops	white bass			X	X	
CENTRARCHIDAE						
Ambloplites rupestris	rock bass		X	X	X	
Lepomis cyanellus	green sunfish		X	X	X	X
Lepomis gibbosus	pumpkinseed		X	X	X	X
Lepomis gulosus	warmouth		X	X	X	X
Lepomis humilis	orangespotted sunfish			X	X	X
Lepomis macrochirus	bluegill		X	X	X	X
Lepomis megalotis	longear sunfish		X	X	X	
Micropterus dolomieu	smallmouth bass		X	X	X	X
Micropterus salmoides	largemouth bass		X	X	X	X
Pomoxis nigromaculatus	black crappie		X	X	X	X

Table 15. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Headwaters	Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
PERCIDAE						
***Etheostoma exile*-SE**	**Iowa darter**	X	X			X
Etheostoma microperca	least darter	X	X			X
Etheostoma nigrum	johnny darter	X	X	X	X	
Perca flavescens	yellow perch		X	X		X
SCIAENIDAE						
Aplodinotus grunniens	freshwater drum			X	X	
GOBIIDAE						
*Neogobius melanostomus**#*	round goby				X	X

[1] Data from the Illinois Natural History Survey Fish Collection.
[2] Bold type indicates an Illinois Threatened (ST), Illinois Endangered (SE), or Illinois extripated (EX) species.
[3] * = non-native species; # = common species.
[4] Total number of species = 77 (63 native, 14 introduced).

Table 16. Freshwater fishes recored from the Chicago River/Lake Shore Assessment Area, by habitat[1].

FAMILY *Scientific Name*[2,3,4]	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
PETROMYZONTIDAE						
*Petromyzon marinus**	sea lamprey			X	X	X
CLUPEIDAE						
*Alosa pseudoharengus**#*	alewife			X		X
Dorosoma cepedianum#	gizzard shad		X			X
CYPRINIDAE						
*Carassius auratus**#*	goldfish			X	X	
Couesius plumbeus	lake chub			X	X	
*Ctenopharyngodon idella**	grass carp		X	X		
Cyprinella lutrensis	red shiner		X	X		
Cyprinella spiloptera	spotfin shiner		X	X		
*Cyprinus carpio**#*	common carp			X	X	
Hybognathus hankinsoni	brassy minnow			X		
Luxilus cornutus	common shiner		X	X		
Notemigonus crysoleucas	golden shiner			X	X	X
Notropis atherinoides	emerald shiner			X		
Notropis dorsalis	bigmouth shiner		X	X		
***Notropis heterodon*-ST**	**blackchin shiner**				X	
Notropis hudsonius #	spottail shiner			X	X	X
Notropis ludibundus	sand shiner		X	X		

Table 16. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
Notropis volucellus	mimic shiner		X	X		
Pimephales notatus#	bluntnose minnow		X	X		
Pimephales promelas	fathead minnow			X		
Rhinichthys cataractae#	longnose dace	X				
Semotilus atromaculatus	creek chub			X		
CATOSTOMIDAE						
Carpiodes cyprinus	quillback		X	X		
***Catostomus catostomus*-ST**	**longnose sucker**		**X**	**X**		
Catostomus commersoni	white sucker		X	X		
Erimyzon sucetta	lake chubsucker			X		
Ictiobus bubalus	smallmouth buffalo			X		
Ictiobus niger	black buffalo			X		
Moxostoma anisurum	silver redhorse		X	X		
Moxostoma macrolepidotum	shorthead redhorse		X	X		
COBITIDAE						
*Misgurnus anguillicaudatus**	Oriental weatherfish			X		
ICTALURIDAE						
Ameiurus melas	black bullhead			X	X	
Ameiurus natalis	yellow bullhead			X	X	
Ictalurus punctatus	channel catfish		X	X	X	
Noturus gyrinus	tadpole madtom		X	X		
ESOCIDAE						
Esox americanus	grass pickerel			X	X	
Esox lucius	northern pike			X	X	
UMBRIDAE						
Umbra limi	central mudminnow			X	X	
OSMERIDAE						
*Osmerus mordax**	rainbow smelt			X		X
GADIDAE						
Lota lota	burbot		X	X		
SALMONIDAE						
***Coregonus artedii*-ST**	**cisco**					**X**
***Coregonus clupeaformis*-EX**	**lake whitefish**					**X**
Coregonus hoyi	bloater					X
Coregonus nigripinnis	blackfin cisco					X
*Oncorhynchus kisutch**	coho salmon					X
*Oncorhynchus mykiss**	rainbow trout		X	X		
*Oncorhynchus tshawytscha**	chinook salmon			X		X
Prosopium cylindraceum	round whitefish					X
*Salmo trutta**	brown trout		X	X		
Salvelinus fontinalis	brook trout		X	X		
Salvelinus namaycush	lake trout					X
PERCOPSIDAE						
Percopsis omiscomaycus	trout-perch		X	X		

Table 16. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
POECILIIDAE						
Gambusia affinis	mosquitofish			X	X	
GASTEROSTEIDAE						
Culaea inconstans	brook stickleback			X	X	
*Gasterosteus aculeatus**	threespine stickleback				X	X
Pungitius pungitius	ninespine stickleback				X	X
COTTIDAE						
Cottus bairdi#	mottled sculpin	X				
Cottus cognatus	slimy sculpin	X				
Myoxocephalus thompsoni	deepwater sculpin				X	
MORONIDAE						
*Morone americana**	white perch			X		
Morone chrysops	white bass			X		
CENTRARCHIDAE						
Ambloplites rupestris	rock bass			X		
Lepomis cyanellus	green sunfish			X		X
Lepomis gibbosus	pumpkinseed			X		
Lepomis gulosus	warmouth			X	X	
Lepomis humilis	orangespotted sunfish				X	
Lepomis macrochirus	bluegill			X	X	
Lepomis megalotis	longear sunfish			X		
Micropterus dolomieu	smallmouth bass			X	X	X
Micropterus salmoides	largemouth bass			X	X	X
Pomoxis nigromaculatus	black crappie			X	X	X
PERCIDAE						
Etheostoma exile SE	Iowa darter			X	X	
Etheostoma microperca	least darter		X	X	X	
Etheostoma nigrum	johnny darter		X	X		
Perca flavescens	yellow perch			X	X	
SCIAENIDAE						
Aplodinotus grunniens	freshwater drum			X		
GOBIIDAE						
Neogobius melanostomus#*	round goby			X	X	

[1] Data from the Illinois Natural History Survey Fish Collection.

[2] Bold type indicates an Illinois Threatened (ST), Illinois Endangered (SE), or Illinois extripated (EX) species.

[3] * = non-native species; # = common species.

[4] Total number of species = 77 (63 native, 14 introduced).

Table 17. Freshwater mussels recorded from the Chicago River/Lake Plain Assessment Area[1].

ORDER Subfamily *Scientific Name*[2,3,4]	Common Name	Headwaters/ Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
UNIONIDAE					
Anodontinae					
Alasmidonta marginata	elktoe		X	X	
***Alasmidonta viridis* - ST**	**slippershell mussel**	X	X		
Anodontoides ferussacianus	cylindrical papershell	X	X		X
Lasmigona complanata#	white heelsplitter	X	X	X	X
Pyganodon grandis#	giant floater	X	X	X	X
Strophitus undulatus	squawfoot		X	X	X
Ambleminae					
Amblema plicata	threeridge		X	X	
***Elliptio dilatata* - ST**	**spike**		X	X	
Fusconaia flava	Wabash pigtoe		X	X	
Lampsilinae					
Lampsilis cardium	plain pocketbook		X	X	
Lampsilis siliquoidea	fatmucket		X	X	X
Leptodea fragilis	fragile papershell		X	X	
Obliquaria reflexa	threehorn wartyback			X	
Toxolasma parvus	lilliput	X	X	X	X
Truncilla truncata	deertoe			X	
DREISSENIDAE					
*Dreissena polymorpha**	zebra mussel			X	

[1]Data from the Illinois Natural History Survey Mollusk Collection.
[2]Bold type indicates an Illinois Threatened (ST) species.
[3]* = non-native species; # = common species.
[4]Total number of species = 16 (15 native, 1 introduced).

Table 18. Freshwater mussels recorded from the Chicago River/Lake Shore Assessment Area, by habitat.[1]

FAMILY Subfamily *Scientific Name* [2,3,4]	Common Name	Streams			Standing Water
		Riffles	Runs	Pools	Littoral Zone
UNIONIDAE					
Anodontinae					
Alasmidonta marginata	elktoe	X	X		
***Alasmidonta viridis* - ST**	**slippershell mussel**	X	X		
Anodontoides ferussacianus	cylindrical papershell		X	X	X
Lasmigona complanata#	white heelsplitter		X	X	X
Pyganodon grandis#	giant floater		X	X	X
Strophitus undulatus	squawfoot		X	X	X

Table 18. Continued.

FAMILY Subfamily *Scientific Name* [2,3,4]	Common Name	Streams Riffles	Runs	Pools	Standing Water Littoral Zone
Ambleminae					
Amblema plicata	threeridge	X	X	X	
***Elliptio dilatata* - ST**	**spike**	**X**	**X**		
Fusconaia flava	Wabash pigtoe	X	X		
Lampsilinae					
Lampsilis cardium	plain pocketbook	X	X	X	
Lampsilis siliquoidea	fatmucket	X	X	X	X
Leptodea fragilis	fragile papershell	X	X	X	
Obliquaria reflexa	threehorn wartyback	X	X	X	
Toxolasma parvus	lilliput	X	X	X	X
Truncilla truncata	deertoe	X	X		
DREISSENIDAE					
*Dreissena polymorpha**	zebra mussel		X	X	

[1]Data from the Illinois Natural History Survey Mollusk Collection.
[2]Bold type indicates an Illinois Threatened (ST) species.
[3]* = non-native species; # = common species.
[4]Total number of species = 16 (15 native, 1 introduced).

Table 19. Freshwater crustaceans recorded from the Chicago River/Lake Shore Assessment Area.[1]

ORDER Family *Scientific Name*[2, 3, 4]	Caves & Springs	Headwaters	Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
ISOPODA (Isopods)						
Asellidae						
Caecidotea intermedia#	X	X	X	X	X	
Lirceus sp.		X	X			
AMPHIPODA (Amphipods)						
Gammaridae						
Gammarus fasciatus#						X
Hyalellidae						
Hyalella azteca		X	X	X	X	X
Pontoporeiidae						
Monoporeia affinis						X
DECAPODA (Crayfishes & shrimps)						
Cambaridae						
Procambarus acutus White River crawfish			X	X	X	X
Procambarus gracilis prairie crayfish			burrower			
Orconectes immunis calico crayfish		X	X	X		X
Orconectes propinquus clearwater crayfish			X	X	X	

Table 19. Continued.

ORDER Family *Scientific Name*[2, 3, 4]		Caves & Springs	Headwaters	Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
*Orconectes rusticus**	rusty crayfish		X	X	X	X	
Orconectes virilis#	virile crayfish		X	X	X		X
Cambarus diogenes	devil crawfish				burrower		

[1]Data from the Illinois Natural History Survey Crustacean Collection.
[2]* = non-native species; # = common species.
[3]Total number of species = 12 (11 native, 1 introduced).

Table 20. Freshwater crustaceans recorded from the Chicago River/Lake Shore Assessment Area, by habitat[1].

ORDER Family *Scientific Name*[2,3]		Caves & Springs	Streams			Standing Water	
			Riffles	Runs	Pools	Littoral	Open Water
ISOPODA (Isopods)							
Asellidae							
Caecidotea intermedia#		X	X		X		
Lirceus sp.			X	X			
AMPHIPODA (Amphipods)							
Gammaridae							
Gammarus fasciatus#						X	
Hyalellidae							
Hyalella azteca			X	X	X	X	
Pontoporeiidae							
Monoporeia affinis						X	X
DECAPODA (Crayfishes & shrimps)							
Cambaridae							
Procambarus acutus	White River crawfish				X	X	
Procambarus gracilis	prairie crayfish				burrower		
Orconectes immunis	calico crayfish				X	X	
Orconectes propinquus	clearwater crayfish		X				
*Orconectes rusticus**	rusty crayfish		X			X	
Orconectes virilis#	virile crayfish		X	X		X	
Cambarus diogenes	devil crawfish			burrower			

[1]Data from the Illinois Natural History Survey Crustacean Collection.
[2]* = non-native species; # = common species.
[3]Total number of species = 12 (11 native,1 introduced).

Table 21. Aquatic macroinvertebrates, exclusive of the Crustacea and unionid Mollusca, recorded for the Chicago River/Lake Shore Assessment Area.[1]

Phylum ANNELIDA - Segmented Worms
Class OLIGOCHAETA - Oligochaete Worms
Haplotaxida
Haplotaxidae
Haplotaxis cf. *gordioides*
Lumbriculida
Lumbriculidae
Lumbriculus variegatus
Stylodrilus heringianus
Tubificida
Enchytraeidae
Species indeterminate
Naididae
Amphichaeta leydigi
Chaetogaster diaphanus
Chaetogaster diastrophus
Chaetogaster limnaei
Dero digitata
Haemonais waldvogeli
Nais bretscheri
Nais communis
Nais elinguis
Nais pardalis
Nais pseudobtusa
Nais simplex
Nais variabilis
Ophidonais serpentina
Paranais frici
Pristinella jenkinae
Specaria josinae
Stylaria lacustris
Slavina appendiculata
Uncinais uncinata
Vejdovskyella intermedia
Tubificidae
Aulodrilus limnobius
Aulodrilus pigueti
Aulodrilus pluriseta
Branchiura sowerbyi
Ilyodrilus templetoni
Limnodrilus cervix
Limnodrilus cervix variant
Limnodrilus claparedianus
Limnodrilus hoffmeisteri
Limnodrilus maumeensis
Limnodrilus spiralis
Limnodrilus tortilipenis
Limnodrilus udekemianus
Potamothrix bavaricus
Potamothrix moldaviensis
Potamothrix vejdovskyi
Rhyacodrilus coccineus
Quistadrilus multisetosus
Tasserkidrilus superiorensis
Tubifex tubifex
Varichaetadrilus angustipenis
Lumbricidae
Species indeterminate
Class HIRUDINEA - Leeches
Rhynchobdellida
Glossiphoniidae
Alboglossiphonia heteroclita
Glossiphonia complanata
Helobdella fusca
Helobdella stagnalis
Helobdella transversa
Pharyngobdellida
Erpobdellidae
Dina parva
Erpobdella punctata
Mooreobdella microstoma
Nephelopsis obscura

Phylum ARTHROPODA
Class INSECTA - Insects
Order Ephemeroptera - Mayflies
Baetidae
Callibaetis ferrugineus
Callibaetis fluctuans
Callibaetis skokianus
Labiobaetis frondalis
Caenidae
Caenis amica
Caenis ridens
Ephemeridae
Ephemera guttulata
Hexagenia rigida
Pentagenia vittigera
Heptageniidae
Leucrocuta maculipennis
Nixe inconspicua

Table 21. Continued.

Stenacron interpunctatum
Stenonema femoratum

Order Odonata - Damselflies and Dragonflies
Zygoptera - Damselflies
Calopterygidae
Calopteryx maculata
Coenagrionidae
Anomalagrion hastatum
Argia apicalis
Argia moesta
Argia tibialis
Enallagma basidens
Enallagma carunculatum
Enallagma civile
Enallagma ebrium
Enallagma geminatum
Enallagma hageni
Enallagma signatum
Enallagma vesperum
Ischnura verticalis
Nehalennia irene
Lestidae
Lestes disjunctus
Lestes dryas
Lestes rectangularis
Lestes unguiculatus
Lestes vigilax
Anisoptera - Dragonflies
Aeshnidae
Aeshna clepsydra
Anax junius
Corduliidae
Epitheca spinigera
Somatochlora linearis
***Somatochlora hineana* - FE**
Gomphidae
Gomphus graslinellus
Libellulidae
Celithemis elisa
Celithemis eponina
Erythemis simplicicollis
Ladona julia
Leucorrhinia intacta
Libellula luctuosa
Libellula pulchella
Libellula semifasciata
Pachydiplax longipennis
Perithemis tenera
Plathemis lydia
Sympetrum costiferum
Sympetrum internum
Sympetrum obtrusum
Sympetrum rubicundulum
Sympetrum vicinum

Order Plecoptera - Stoneflies
Capniidae
Allocapnia vivipara
Perlidae
Acroneuria evoluta
Perlesta decipiens
Perlesta placida
Perlodidae
Isoperla bilineata
Taeniopterygidae
Taeniopteryx burksi
Order Heteroptera - True Bugs
Nepidae
Nepa apiculata
Ranatra fusca
Ranatra kirkaldyi
Ranatra nigra
Belostomatidae
Belostoma flumineum
Benacus griseus
Lethocerus americanus
Notonectidae
Buenoa margaritacea
Notonecta undulata
Notonecta raleighi
Notonecta irrorata
Pleidae
Neoplea striola
Corixidae
Hesperocorixa vulgaris
Hesperocorixa obliqua
Palmacorixa buenoi
Sigara alternata
Sigara grossolineata
Trichocorixa calva
Trichocorixa naias
Gerridae
Aquarius remigis

Table 21. Continued.

Gerris argenticollis
Gerris buenoi
Gerris comatus
Gerris marginatus
Limnoporus dissortis
Rhuematobates palosi
Trepobates knighti
Hebridae
Hebrus tuckahoanus
Merragata hebroides
Hydrometridae
Hydrometra martini
Veliidae
Mesovelia mulsanti
Microvelia americana
Microvelia buenoi
Microvelia pulchella
Order Coleoptera - Beetles
Dytiscidae
Coptotomus lenticus
Coptotomus longulus
Graphoderes librus
Hydaticus piceus
Laccophilus maculosus
Laccophilus proximus
Elmidae
Stenelmis crenata
Haliplidae
Haliplus blanchardi
Haliplus borealis
Haliplus conexus
Haliplus cribrarius
Haliplus immaculicollis
Haliplus longulus
Haliplus subquttatus
Haliplus triopsis
Peltodytes edentulus
Peltodytes pedunculatus
Peltodytes sexmaculatus
Hydrophilidae
Anacaena limbata
Hydrochara obtusata
Hydrochus granulatus
Hydrochus rufipes
Hydrochus pseudosquamifer
Hydrochus squamifer
Hydrophilus triangularis
Paracymus subcupreus
Tropisternus blatchleyi modestus
Tripisternus glaber
Tripisternus lateralis nimbatus
Tripisternus mixtus
Tripisternus natator
Order Trichoptera - Caddisflies
Brachycentridae
Brachycentrus lateralis
Hydrophychidae
Cheumatopsyche analis
Cheumatopsyche campyla
Hydropsyche orris
Hydropsyche recurvata
Potamyia flava
Leptoceridae
Ceraclea ancylus
Ceraclea dilutus
Ceraclea tarsipunctatus
Ceraclea transversa
Leptocerus americanus
Mystacides sepulchralis
Nectopsyche albida
Oecetis cinerascens
Oecetis inconspicua
Triaenodes aba
Triaenodes baris
Triaenodes injustus
Limnephilidae
Leptophylax gracilis
Limnephilus consocius
Limnephilus hyalinus
Limnephilus submonilifer
Pycnopsyche guttifer
Molannidae
Molanna uniophila
Phryganeidae
Agrypnia vestita
Banksiola crotchi
Fabria inornata
Phryganea cinerea
Phryganea sayi
Polycentropodidae
Neureclipsis bimaculata
Paranyctiophylas uncus
Polycentropus cinereus
Polycentropus crassicornis

Table 21. Continued.

Polycentropus flavus
Polycentropus interruptus
Polycentropus remotus

Order Diptera - Flies

Chironomidae
Glyptotendipes barbipes

Culicidae
Aedes canadensis
Aedes cinereus
Aedes fitchii
Aedes flavescens
Aedes mitchellae
Aedes sticticus
Aedes stimulans
Aedes triseriatus
Aedes trivittatus
Aedes vexans
Anopheles quadrimaculatus
Anopheles punctipennis
Anopheles walkeri
Culex apicalis
Culex pipiens
Culex restuans
Culex salinarius
Culex tarsalis
Culiseta inornata
Psorophora ciliata
Uranotaenia sapphirina

Tabanidae
Chrysops aberrans
Chrysops aestuans
Chrysops brunneus
Chrysops callidus
Chrysops cincticornis
Chrysops montanus
Chrysops niger
Chrysops pikei
Chrysops sackeni
Chrysops sequax
Chrysops striatus
Chrysops univittatus
Chrysops vittatus
Hybomitra epistates
Hybomitra frontalis
Hybomitra lasiophthalma
Hybomitra sodalis
Stonemyia rasa
Tabanus atratus
Tabanus calens
Tabanus limbatinevris
Tabanus lineola
Tabanus pumilis
Tabanus quinquevittatus
Tabanus reinwardtii
Tabanus sackeni
Tabanus similis
Tabanus stygius
Tabanus trimaculatus

Phylum MOLLUSCA - Mollusks (not including Unionidae)

Gastropoda - Snails
Bithynia tentaculata
Ferrissia rivularis
Physella gyrina
Physella integra
Valvata tricarinata

Pelecypoda - Bivalve Mollusks (exclusive of the Corbiculidae, Dreissenidae, and Unionidae)

Sphaeriidae
Musculium lacustre f. jayense
Musculium transversum
Pisidium casertanum
Pisidium compressum
Pisidium subtruncatum
Pisidium variabile
Sphaerium corneum

[1] Current literature discussing federal and state listed threatened and endangered species, species under consideration for such listing, or other species considered rare or of special concern (Herkert 1992, 1994; Illinois Endangered Species Protection Board 1999; U.S. Department of Interior, Fish and Wildlife Service 1996, 1997) note one insect species - *Somatochlora hineana* (Hine's emerald dragonfly - as federally endangered.

Threatened and Endangered Species

Fishes:

State threatened fishes known from the Chicago River/Lake Shore Assessment Area include the blackchin shiner, last observed in 1968, the cisco, observed in 1988, and the longnose sucker, observed as recently as 1999. The state endangered Iowa darter was observed in the Assessment Area as recently as 1997.

The blackchin shiner inhabits clear vegetated lakes and quiet areas of streams. It may be extirpated from the CR/LSAA, not having been observed there since 1968 when it was found in Dead River in Illinois Beach State Park. The blackchin shiner has an extremely restricted distribution in Illinois and may now be found only in the Fox River system.

The longnose sucker is a northern species that is nearly restricted in Illinois to the cold waters of Lake Michigan. Although listed as a threatened species in Illinois, the longnose sucker has been observed more frequently in recent years and may be increasing in abundance.

The cisco is also a northern species that is widespread through much of Canada and the northern U.S. In Illinois it is restricted to the cold open water of Lake Michigan. Although probably still in Lake Michigan in low numbers, its presence has not been confirmed since 1988.

The Iowa darter, which inhabits vegetated lakes and pools of quiet streams, was found in the Lake Michigan basin in Lake County in 1993 (West Fork North Branch Chicago River) and 1997 (Old School Pond near Libertyville). The species once was widespread in the northern half of Illinois but now occurs only sporadically and uncommonly in extreme northern Illinois and in one locality in Vermilion County in the central part of the state.

Mussels:

Two state threatened mussels (slippershell mussel, spike) have been reported from the Chicago River/Lake Shore Assessment Area. Neither has been collected in the Assessment Area in over 50 years. Data used in the following summaries have been taken from Cummings and Mayer (1997) and the INHS Mollusk Collection database.

Slippershell mussel: The slippershell was formerly found in the South Branch Chicago River and in Lake Michigan. The last reported collection of this species in the area was made in Lake Michigan at 63rd Street beach in 1948. It is presumed extirpated from the area.

Spike: Considered widespread and common in Illinois by Parmalee (1967), the spike has been declining statewide for the past few decades and has been eliminated from most of its

former range in the state. Historical records for the spike in the Assessment Area are known from Lake Michigan at Randolph Street in 1903 and from Winnetka in 1896. It is presumed extirpated from the area.

Twelve species of crustaceans are known from this region (Tables 19 and 20). None is considered threatened or endangered.

Non-native Species

The sea lamprey is native to the Atlantic Ocean and Lake Ontario. The species was first found in Lake Michigan in 1936 attached to a lake trout (Laird and Page 1996). It presumably reached the lake through the Welland Canal which allowed this and other migratory fishes to bypass Niagara Falls and move from Lake Ontario to the western Great Lakes. Once abundant in Lake Michigan, the sea lamprey population was reduced through, at least in part, the use of a chemical that kills lamprey larvae. Adults are parasitic and feed on large fishes. They were so abundant in Lake Michigan in the 1940s and 1950s that they had a profoundly negative impact on the fishery. The species is still in Lake Michigan but is uncommon.

The alewife is native to the Atlantic Ocean and streams of the Atlantic coast of North America. It was first found in Lake Michigan in 1949, became abundant there in the 1950s and 1960s, and remains common today (Laird and Page 1996). The species rarely is found in Illinois other than in Lake Michigan, but occasionally is found in the Calumet River and Lake Calumet. It is an open-water species found only in lakes and medium to large rivers.

The common carp is found throughout Illinois. It can be found in almost any type of habitat but prefers warm sluggish waters of streams and lakes and is very tolerant of high turbidity and low oxygen levels. Native to Eurasia, the common carp has been present in Illinois since the earliest surveys, making its effect on native species difficult to determine. The species tends to destroy vegetation and increase water turbidity by dislodging plants and rooting around in the substrate, causing a deterioration of habitat for species requiring vegetation and clear water. The common carp attains a large size and has become an important commercial food species in Illinois; however, it may have done so at the expense of ecologically similar native species such as carpsuckers and buffalos. It was distributed throughout Illinois by the time of Forbes and Richardson's (1908) survey of Illinois fishes and was described as abundant in all parts of the state by Smith (1979) (Laird and Page 1996). It remains common in most areas of Illinois, including the Chicago River/Lake Shore Assessment Area.

The goldfish is ecologically similar to the common carp but is much less common. It is found mainly in shallow, muddy pools and backwaters of sluggish rivers, ponds, and lakes. It is most common in warm turbid or vegetated water, and is more tolerant than most fishes of some forms of pollution. The goldfish is native to Eurasia and has been reproducing in Illinois waters since at least 1876 (Laird and Page 1996).

The grass carp is native to eastern Asia and introduced to North America in the 1960s as a biological control for aquatic vegetation. The first collection of the species in Illinois was in 1971, and Smith (1979) reported its occurrence as far north as Pike County in western Illinois. Today, the species is common in southern Illinois and is regularly seen in central Illinois. It is likely to become more numerous and widespread, especially in large rivers and bottomland lakes. Because it feeds on aquatic plants, the grass carp has the potential to destroy habits that are important to many native species, including waterfowl and fishes that rely on plants for cover, substrate for prey, and as spawning sites (Laird and Page 1996).

The Oriental weatherfish is native to Asia and presumably was released into North Shore Channel, Cook County, by an aquarist. It was first found there in 1987. Although the species has reproduced, it has not spread to other bodies of water. The species inhabits soft-bottomed areas of streams and lakes (Laird and Page 1996).

The rainbow smelt is native to more northern drainages in North America and Eurasia. It became established in Lake Michigan as the result of being stocked in Michigan in 1912 (Hubbs and Lagler 1941). Today, it is common in Lake Michigan, and occasionally is found in the Illinois, Mississippi, Ohio, and Wabash rivers (Laird and Page 1996).

Coho and chinook salmon are native to the western coast of North America and the northeastern coast of Asia. They were first introduced to Lake Michigan in 1967 as sport fishes and to control the alewife population. The coho is now the most common salmonid in Lake Michigan. Although these salmon are aiding in control of the alewife and support a popular sport fishery, they also may be competing with the native lake trout and other native species (Laird and Page 1996).

The rainbow trout is native to west coast drainages of North America. It has been stocked repeatedly in Lake Michigan (Laird and Page 1996). The species remains uncommon in Illinois because little suitable habitat exists for the species. Rarely, individuals stray from Lake Michigan into Calumet River.

The brown trout is native to Europe, Asia, and northern Africa. It has been stocked throughout much of the world, including Lake Michigan and streams in northern Illinois. Because of its popularity as a sport fish, it has been stocked repeatedly in Illinois; however, there is little suitable habitat for the species, and it remains uncommon in Illinois (Laird and Page 1996).

The threespine stickleback is a recent invader of Illinois, having been first collected in Lake Michigan in 1988 (Johnston 1991, Laird and Page 1996). Its native range in North America encompassed the Great Lakes-St. Lawrence River drainage only as far west as Lake Ontario. Threespine sticklebacks are found in shallow, sluggish waters of lakes, ponds, large lowland rivers and estuaries.

The white perch is native to Lake Ontario and Atlantic Slope drainages. It recently invaded the western Great Lakes and was first recorded in Illinois in 1988 (Savitz et al. 1989). It is rapidly expanding its range in Illinois and has been recorded from Lake Michigan, Wolf Lake, Lake Calumet, and the Calumet, Illinois, and Mississippi rivers (Laird and Page 1996). The species is closely related to and is likely to compete with the larger white and yellow basses.

The round goby is native to the Black and Caspian seas and their drainages. It was first collected in the Great Lakes drainage in the St. Clair River in Michigan in 1990, and first found in Illinois in the Calumet River in 1993. It is becoming common in the Calumet River system and is rapidly spreading north along the shore of Lake Michigan. The round goby is a benthic fish that may have severe impacts on sculpins and other native benthic fishes (Laird and Page 1996).

The exotic Chinese mystery snail has been reported from many states in North America (Burch 1989). This species has been found in scattered localities in Illinois (particularly northeastern Illinois). It was first collected in the Assessment Area from the Jackson Park Lagoon in 1938. It was subsequently collected in the lagoon in the 1940s, 1950s, 1960s, and 1970s. Outside of Jackson Park it was collected in the Dead River at Illinois Beach State Park in 1992. Its effect on our native biota has not been investigated.

In northeastern Illinois, the zebra mussel has been found in the Chicago Sanitary & Ship Canal, Illinois River, and Lake Michigan. The zebra mussel is having negative impacts on many Illinois species, particularly the native mussels that are restricted to large rivers and lakes (Tucker and Atwood 1995, Nalepa 1994, Nalepa et al. 1998, Schneider et al. 1998).

Although not known from the Assessment Area, the Asian clam has been reported from southeastern Lake Michigan (White et al. 1984) and may be present in the southwestern part of the lake as well.

The rusty crayfish was first reported in this region in the 1980s. Native to the Ohio River drainage of Indiana, Ohio, and northern Kentucky, the rusty crayfish is rapidly expanding its range as a result of bait-bucket introductions and is common in many streams in northeastern Illinois. As the rusty crayfish expands its range in Illinois, it is causing declines in native crayfishes, particularly the virile and clearwater crayfishes (Taylor and Redmer 1996).

Of the few aquatic macroinvertebrate taxa known or thought likely to occur in the Chicago River/Lake Shore Assessment Area (Table 22), none other than one aquatic worm species is thought to have been introduced. *Branchiura sowerbyi* (Annelida: Oligochaeta: Tubificidae) was first reported in the USA from a lake in Ohio in 1932, and thought likely to have been introduced to the continent with imported aquatic and semiaquatic plants or other aquatic organisms. Originally thought to be restricted to thermally influenced habitats, *B. sowerbyi* is now commonly collected from a variety of stream and lake systems. This species is widespread throughout North America and Europe, and has been

recorded from all continents except Antarctica. *Branchiura sowerbyi* does not appear to pose any threat to native populations of aquatic macroinvertebrates.

Information Gaps

The CR/LSAA has been well studied with respect to fishes and crayfishes, less so for mussels. Unfortunately, little if any published research, specifically, has focused on the aquatic macroinvertebrate communities occurring within the CR/LSAA. Additional survey work would better define the limits of some of the species, and possibly uncover additional populations of state endangered and other rare species. Surveys for aquatic macroinvertebrates in small drainages in Cook and Lake counties, particularly the small direct tributaries of Lake Michigan, would provide us with substantive distributional records for little-studied groups of aquatic fauna occurring in this area of Illinois.

Long-term population monitoring of selected species and communities is needed throughout the state to provide information on trends in biological resources and on the success of various management strategies.

Water Quality

The Illinois Water Quality Report (Illinois Environmental Protection Agency 1996) rated the streams in the Assessment Area at or below "Partial Support/Minor Impairment" (water quality has been impaired, but only to a minor degree). Skokie River, North Branch Chicago River between North Shore Channel and West Fork North Branch Chicago River, and North Shore Channel from near Oakton Street to Lake Michigan were rated as "Partial Support/Minor Impairment." South Fork South Branch Chicago River was rated as "Nonsupport" (water quality has been severely impaired and is not capable of supporting the designated use to any degree). The remainder of the streams in the Assessment Area were rated as "Partial Support/Moderate Impairment" (water quality conditions are impaired to a greater degree inhibiting the waterbody from meeting all the needs for that designated use) or not rated. Degraded water conditions were primarily due to urban surface water runoff, municipal and industrial discharges, contaminated sediments, land development, and channelization. Lake Michigan was not rated.

The Biological Stream Characterization (Bertrand et al. 1996) rated Skokie River from its mouth to Dundee Road as a "Class C" Stream (Moderate Aquatic Resource). On their map, they rated North Shore Channel as a "Class C" Stream, but in the report it is listed as a "Class D" stream (Limited Aquatic Resource). Skokie River upstream of Dundee Road, North Branch Chicago River, West Fork North Branch Chicago River, and Chicago Sanitary & Ship Canal were rated as "Class D" streams. Lake Michigan was not rated.

Smith (1971) did not rate the Chicago River or Lake Michigan.

Biologically Significant Streams

No streams in the CR/LSAA were recognized as biologically significant by Page et al. (1992). The only recent records of threatened or endangered fishes, mussels, or crustaceans from the Assessment Area are of longnose suckers from Lake Michigan and Iowa darters from two localities in Lake County. No systematic mussel surveys have been conducted in any of the streams of this region in the past 80 years; therefore, no assessment of stream quality based on mussel diversity can be made.

Environmental Problems

Stream ecosystems are fragmented by landscape changes that render stream habitats unsuitable for aquatic organisms and by instream modifications that eliminate stream habitats. Smith (1971) ranked the causes of extirpation or declines in fish species in Illinois as follows: siltation (as the primary factor responsible for the loss of 2, and decimation of 14, species), drainage of bottomland lakes, swamps, and prairie marshes (0, 13), desiccation during drought (0, 12), species introductions (2, 7), pollution (2, 5), impoundments (0, 4), and increased water temperatures (0, 1). All of these factors render habitats unsuitable for many aquatic species throughout Illinois and lead to extirpations.

Streams in Illinois naturally have wooded floodplains that are extremely important in maintaining a healthy aquatic environment. The vegetation on a floodplain shades the stream and keeps it from becoming excessively hot during the summer, stabilizes the streambank and reduces erosion, and acts as a filter that removes topsoil and pesticides which would otherwise reach the stream as water drains from croplands. During periods of high water, vegetated floodplains provide feeding and spawning areas for many species of aquatic organisms and nurseries for developing larvae. When floodplains are converted to crop production as they have been throughout much of Illinois, they no longer provide these benefits to aquatic organisms.

Another major landscape change that has negatively impacted streams has been the tiling of land for agriculture. Land that once drained slowly drains quickly once it is tiled. Rapid drainage of land increases the pulse of a flood and increases the intensity and duration of low-flow once the water has moved downstream. These artificially extreme fluctuations in water levels subject stream organisms to environmental conditions to which they are not adapted and can lead to the extirpation of populations.

Siltation, increased water temperatures, and desiccation follow the removal of riparian vegetation. The excessive siltation associated with the removal of floodplain vegetation is among the most damaging forms of stream pollution. The clean rock and gravel substrates that are normally characteristic of riffles and other stream habitats with fast-flowing water provide living space for many species of aquatic insects and other invertebrates and important spawning habitat for many species of fishes. The deposition of silt covers the rocks, leaving no place for small organisms to hide or for fishes to hide their eggs. Silt can

also cover the leaves of aquatic plants and, if sufficient to prevent gas exchange or photosynthesis, will cause the plants to die. The reduction of plant life in a stream has a cascading negative impact on the stream ecosystem. Many animals, in particular insect larvae and fishes, use the plants as places to hide and forage. Some fishes use plants to hide from predators, others use plants as sites from which to ambush prey. As plants are eliminated, populations of insects and fishes are reduced or eliminated because they have fewer places to live.

The impact of increased water temperatures resulting from the loss of riparian vegetation and reduced water flow during warm seasons is difficult to separate from the effects of siltation and other factors that occur concomitantly. However, throughout Illinois, increased water temperatures per se are probably especially harmful to cool-water species such as northern pike and species dependent on springs and spring-fed streams, such as the southern redbelly dace and many species of amphipods, isopods, and crayfishes. Stream desiccation is thought to be primarily an effect of the artificially extreme fluctuations in water levels that follow tiling of fields for agriculture. The rapid drainage of surrounding land increases the intensity and prolongs the duration of low-flow once the water has moved downstream. A drought that historically would have had the impact of decreasing the flow in a stream can now lead to a dry stream bed.

The impacts of introduced fishes include competition, predation, inhibition of reproduction, environmental modification, transfer of parasites and diseases, and hybridization. Freshwater mussels and crayfishes have been seriously impacted in Illinois in recent decades by non-native invaders, most notably the zebra mussel and the rusty crayfish. Nalepa (1994) documented the severe decline in native mussels due to the invasion of zebra mussels in Lake St. Clair over a six-year period. He found that mussel densities declined from $2.4/m^2$ in 1986 to $0/m^2$ in 1992 in areas heavily infested with zebra mussels. The rusty crayfish, introduced through its use as fishing bait, is rapidly spreading through Illinois and displacing native crayfishes (Taylor and Redmer 1996).

Point sources of pollution include industrial wastes and domestic sewage. In Illinois, considerable progress has been made in identifying and eliminating point sources of pollution, and water quality has improved as a result.

Impounding a stream converts it into a standing body of water that lacks the riffles, runs, pools, and other habitats that stream-inhabiting organisms require. When a stream is dammed, most native species are eliminated from the inundated area, and upstream and downstream populations become isolated from one another. Dams block migrations of fishes that in many species are necessary for reproduction. The loss of migratory fishes from a stream ecosystem can lead to the loss of mussels using the migratory fishes as glochidial hosts.

Channelization is the straightening of a stream to enhance drainage of the surrounding land. Fifty-six miles of human-made channel are found in the CR/LSAA. The straightening converts the diversity of habitats in a stream to one continuous straight channel that

supports few species. Because of their sedentary nature mussels are particularly susceptible to the effects of channelization.

Potential Management Strategies for Aquatic Species

Management strategies for aquatic ecosystems must consider each watershed on an individual basis. Attempting to correct problems locally without consideration of upstream activities and downstream implications will result in partial, and probably temporary, improvement.

Correction of some factors that have led to stream habitat fragmentation in past decades is relatively easy. Important initiatives include avoiding the construction of mainstream impoundments when possible, stopping the removal of riparian vegetation and creating additional riparian buffers as well as managing existing buffers for native species, cessation of stream channelization, requiring more public education and governmental action such as perhaps providing better incentives to landowners. Assuming that pollution will be held at current levels or reduced, nothing will be more beneficial to the biota of Illinois streams than to have natural riparian vegetation restored. Siltation, desiccation, and higher than normal temperatures would all be reduced to acceptable levels if streams were lined with native plants that shaded the stream, stabilized the banks, and filtered sediment and chemicals from runoff before they reached the stream.

Most introductions of non-native fishes have been done in an effort to improve sport or commercial fishing, and usually governmental agencies have been responsible for the introductions. We now know that non-native species alter ecosystems, and the long-term effect of any introduction is likely to be negative rather than an improvement.

Given the opportunity, streams will restore themselves and, often, the best approach to restoration may be to encourage restoration of the native vegetation of the drainage basin, in particular the riparian zone, correct any additional existing pollution problems, and let the stream return to natural conditions. In some instances additional measures, such as reintroducing extirpated species, may be advisable.

References

Introduction

Anderson, R.C. 1970. Prairies in the prairie state. Transactions of the Illinois State Academy of Science 63(2): 214-221.

Anderson, R.C. 1983. The eastern prairie-forest transition - an overview. Pp. 86-92 *in*: R. Brewer, (ed.). Proceedings of the Eighth North American Prairie Conference. Western Michigan University, Kalamazoo, MI.

Anderson, R.C. 1990. The historic role of fire in the North American grassland. Pp. 8-18, *in*: S. Collins and L. Wallace, (eds.). Fire in tallgrass prairie ecosystems. University of Oklahoma Press, Norman, OK.

Axelrod, D.I. 1985. Rise of the grassland biome, central North America. Botanical Review 51: 163-202.

Bertrand, W.A., R.L. Hite, and D.M. Day. 1995. Biological Stream Characterization (BSC): Biological Assessment of Illinois Stream Quality through 1993. Illinois Environmental Protection Agency Report No. IEPA/BOW.96-058. December 1996. 40 pages + map.

Fehrenbacher, J.B., J.D. Alexander, I.J. Jansen, R.G. Darmody, R.A. Pope, M.A. Flock, E.E. Voss, J.W. Scott, W.F. Andrews, and L.J. Bushue. 1984. Soils of Illinois. Agricultural Experiment Station Bulletin 778. College of Agriculture, University of Illinois at Urbana-Champaign in co-operation with the Soil Conservation Service, U.S. Department of Agriculture. 85 pp.

Hanson, P. C. 1981. The presettlement vegetation of the plain of glacial Lake Chicago in Cook County, Illinois. Pages 159-164 *in*: R.L. Stuckey and K.J. Reese. (eds.). Proceedings of the Sixth North American Prairie Conference. Ohio Biological Survey Notes 15. Columbus.

Illinois Department of Natural Resources. 1999. Biological and Conservation Database System (BCD), Division of Natural Heritage, Office of Resource Conservation, Illinois Department of Natural Resources.

Illinois Department of Natural Resources. 2000. Chicago River/Lake Shore Assessment Area, Volume 2: Water resources. Illinois Department of Natural Resources. Springfield, IL.

Illinois Geographic Information System. Digital Data at the Illinois Natural History Survey.

Iverson, L.R., R.L. Oliver, D.P. Tucker, P. G. Risser, C.D. Burnett, and R.G. Rayburn. 1989. The forest resources of Illinois: an atlas and analysis of spatial and temporal trends. Illinois Natural History Survey Special Publication 11.

Leighton, M.M., G.E. Ekblaw, and C.L. Horberg. 1948. Physiographic divisions of Illinois. Journal of Geology 56: 16-33.

McFall, D. and J. Karnes, eds. 1995. A Directory of Illinois Nature Preserves, Volume1 and Volume 2. Illinois Department of Natural Resources, Springfield. vol. 1:195 pp, vol. 2:327 pp.

Moran, R.C. 1978. Presettlement vegetation of Lake County, Illinois. Pages 12-18 *in*: D. C. Glenn-Evans and R. Q. Landers, Jr., (eds.). Proceedings of the Fifth Midwest Prairie Conference, Iowa State University, Ames.

Page, L.M., K.S. Cummings, C.A. Mayer, S.L. Post, and M.E. Retzer. 1992. Biologically significant Illinois streams. An evaluation of the streams of Illinois based on aquatic biodiversity. Final report prepared for the Illinois Department of Energy and Natural Resources and the Illinois Department of Conservation. Illinois Natural History Survey, Center for Biodiversity Technical Report. 1992(1a): v + 485 pp.

Schwegman, J.E., G.B. Fell, M.D. Hutchinson, G. Paulson, W.M. Shephard, and J. White. 1973. Comprehensive plan for the Illinois Nature Preserve system. Part 2. The natural divisions of Illinois. Illinois Nature Preserves Commission, Rockford, IL. 32 pp.

Suloway, L. and M. Hubbell. 1994. Wetland resources of Illinois: an analysis and atlas. Illinois Natural History Survey Special Publication 15. Illinois Natural History Survey: Champaign. 88 pp.

Taft, J.B. 1997. Savanna and Open-Woodland Communities. pp. 24-54, chapter 2 *in*: Mark W. Schwartz, (ed.). Conservation in Highly Fragmented Landscapes, Chapman and Hall Press.

Taft, J.B., M.W. Schwartz, and L.R. Phillippe. 1995. Vegetation ecology of flatwoods on the Illinoian till plain. Journal of Vegetation Science 6: 647-666.

White, J. 1978. Illinois natural areas inventory technical report. Vol. 1. Survey methods and results. Illinois Natural Areas Inventory, Urbana. 426 pp.

White, J. and M.H. Madany. 1978. Classification of natural communities in Illinois. Pages 310-405 (Appendix 30) *in:* J. White. Illinois Natural Areas Technical Report, Volume 1. Survey Methods and Results. Illinois Natural Areas Inventory. Urbana

Wiggers, R. 1997. *Geology Underfoot in Illinois*. Mountain Press Publishing Company. Missoula, Montana. 303pp.

Willman, H.B. 1971. Summary of the Geology of the Chicago Area. Illinois State Geological Survey, Urbana, Illinois. Circular 460.

Willman, H.B., and J.A. Lineback. 1970. Surficial geology of the Chicago region. Map *in*: Willman, H. B. 1971.

Willman, H.B., E. Atherton, T.C. Buschbach, C. Collinson, J.C. Frye, M.E. Hopkins, J.A. Lineback, and J.A. Simon. 1975. Handbook of Illinois stratigraphy: Illinois State Geological Survey, Bulletin 95, 261 pp.

Vestal, A.G. 1931. Strategic habitats and communities in Illinois. Illinois State Academy of Science Transactions 24: 80-85.

Natural Vegetation Communities

Abrams, M. D. 1992. Fire and the development of oak forests. BioScience 42(5): 346-353.

Adams, D.E., and R.C. Anderson. 1980. Species response to a moisture gradient in central Illinois forests. American Journal of Botany 67: 381-392.

Anderson, R.C. 1983. The eastern prairie-forest transition - an overview. Pp. 86-92 *in*: R. Brewer, (ed.). Proceedings of the Eighth North American Prairie Conference. Western Michigan University, Kalamazoo, MI.

Anderson, R.C. 1997. Native pests: the impact of deer in highly fragmented habitats. Pages 117-137 *in*: M. W. Schwartz, (ed.). Conservation in Chronically Fragmented Landscapes. Chapman and Hall, New York.

Armstrong, A.C. 1963. The vegetation of Zanders Woods with emphasis on the sand pits. M. Ed. Thesis. University of Chicago. 251 pp.

Bell, D.T. 1974. Tree stratum composition and distribution in the streamside forest. American Midland Naturalist 92:3546.

Bowles, M.L. 1983. The tallgrass prairie orchids *Platanthera leucophaea* (Nutt.) Lindl. and *Cypripedium candidum* Muhl. ex. Willd.: some aspects of their status, biology, and ecology, and implications toward management. Natural Areas Journal 3(4): 14-37.

Bowles, M.L., R. Flakne, and R. Dombeck. 1992. Status and population fluctuations of the Eastern Prairie Fringed Orchid [*Platanthera leucophaea* (Nutt.) Lindl.] in Illinois. Erigenia 12: 26-40.

Bowles, M.L. and J.L. McBride. 1994. Presettlement barrens in the glaciated prairie region of Illinois. Pg. 75-86 *in*: J. S. Fralish, R. C. Anderson, J. E. Ebinger, and R. Szafoni, (eds.). Proceedings of the North American Conference on Barrens and Savannas. Illinois State University, Normal.

Braun, E.L. 1950. Deciduous forests of eastern North America. Hafner Publishing Company, New York.

Brown, S. and A.E. Lugo. 1994. Rehabilitation of tropical lands: a key to sustaining development. Restoration Ecology 2: 97-111.

Buhl, C.A. 1934. Supplement to an annotated flora of the Chicago area by H.S. Pepoon. Chicago Academy of Sciences. Natural History Survey Bulletin 5: 5-12.

Byers, S. 1991. Proposal to dedicate Fort Sheridan Bluff and Ravine Nature Preserve in Lake County, Illinois. Prepared for Illinois Nature Preserves Commission. Illinois Nature Preserves Commission meeting #130, Item 8.

Byers, S. 1994. Proposal for dedication of Kennicott's Grove in Cook County, Illinois as an Illinois Nature Preserve. Prepared for the Glenview Park District and the Illinois Nature Preserves Commission. Illinois Nature Preserves Commission meeting #144, Item 9.

Byers, S. and L. Arient. 2000. Proposal for an addition to Spring Bluff Nature Preserve in Lake County, Illinois. Prepared for Lake County Forest Preserve District and Illinois Nature Preserves Commission. Illinois Nature Preserves meeting #167, Item 16.

Christy, S. and S. Byers. 1992. Proposal for Dedication of the Skokie River Nature Preserve in Lake County, Illinois as an Illinois Nature Preserve. Prepared for the Lake Forest Open Lands Association and the Illinois Nature Preserves Commission. Illinois Nature Preserves Commission meeting #134, Item 11.

Clute, W. N. 1911. The flora of the Chicago plain. American Botanist 17: 65-70.

Clute, W. N. 1912. The summer flora of the Chicago plain. American Botanist 18:97-100.

Cowles, H.C. 1899. The ecological relations of the vegetation on the sand dunes of Lake Michigan. Botanical Gazette 27:95-117, 167-202, 281-308, 361-391.

Cowles, H.C. 1901a. The plant societies of Chicago and vicinity. Geographic Society of Chicago Bulletin 2: 13-76.

Cowles, H.C. 1901b. The physiographic ecology of Chicago and vicinity: a study of the origin, development, and classification of plant societies. Botanical Gazette 31: 73-108, 145-182.

Curtis, J.T. 1959. The vegetation of Wisconsin. Univ. Wisconsin Press, Madison, WI.

Duntemann, M., S. Masi, and S. Byers. 1995. Proposal for Dedication of Florsheim Park as an Illinois Nature Preserve. Prepared for Village of Lincolnshire and Illinois Nature Preserves Commission. Illinois Nature Preserves Commission meeting #150, Item 12.

Fralish, J.S. 1994. The effect of site environment on forest productivity in the Illinois Shawnee Hills. Ecological Applications 4: 134-143.

Fuller, G.D. 1935. Post-glacial vegetation of the Lake Michigan region. Ecology 16: 473-488.

Hanson, P.C. 1981. The presettlement vegetation of the plain of glacial Lake Chicago in Cook County, Illinois. Pages 159-164 *in*: R. L. Stuckey and K. J. Reese, (eds.). Proceedings of the Sixth North American Prairie Conference. Ohio Biological Survey Notes 15. Columbus.

Havera, S.P., L.B. Suloway, J.B. Taft, P.M. Malmborg, J. Hofmann, A. Nugteran, M. Morris. 1994. Wetlands. Pages 87-152 *in*: Illinois Department of Energy and Natural Resources. The Changing Illinois Environment: Critical Trends. Volume 3 Technical Report. Illinois Department of Energy and Natural Resources. Springfield, IL, ILENR/RE-94/05.

Heidorn, R.R. 1986. Proposal for the Dedication of North Dunes Nature Preserve in Illinois Beach State Park, Lake County, Illinois. Illinois Nature Preserves Commission meeting #112, Item 11.

Herkert, J.R. *(ed.)*. 1991. Endangered and Threatened Species of Illinois: Status and Distribution, Volume 1 - Plants. Illinois Endangered Species Protection Board, Springfield, Illinois.

Herkert, J.R., *(ed.)*. 1994. Endangered and threatened species of Illinois: status and distribution. Volume 1–plants. Illinois Endangered Species Protection Board, Springfield, Illinois. iii + 158 pp.

Higley, W. K., and C.S. Raddin. 1891. The flora of Cook County, Illinois, and a part of Lake County, Indiana. Chicago Academy of Sciences Bulletin, Vol. 2, No. 1. 168 pp.

Illinois Department of Natural Resources. 1999. Biological and conservation database system (BCD), Division of Natural Heritage, Office of Resource Conservation, Illinois Department of Natural Resources.

Illinois Endangered Species Protection Board. 1999. Checklist of endangered and threatened animals and plants of Illinois. Illinois Endangered Species Protection Board and the Illinois Department of Conservation, Springfield.

Illinois Geographic Information System. Digital data at the Illinois Natural History Survey.

Iverson, L.R., R.L. Oliver, D.P. Tucker, P.G. Risser, C.D. Burnett, and R.G. Rayburn. 1989. The forest resources of Illinois: an atlas and analysis of spatial and temporal trends. Illinois Natural History Survey Special Publication 11.

Kilburn, P.D. 1959. The forest-prairie ecotone in northeastern Illinois. American Midland Naturalist 62: 206-217.

King, F.B. and J.B. Johnson. 1977. Presettlement forest composition of the central Sangamon River Basin, Illinois. Transactions of the Illinois State Academy of Sciences 70: 153-163.

Kurz, H. 1923. Hydrogen ion concentration in relation to ecological factors. Botanical Gazette 76: 1-29.

Lorimer, C.G. 1985. The role of fire in the perpetuation of oak forests. Pages 8-25 *in:* Johnson, J.E., (ed.). *Challenges in Oak Management and Utilization.* Cooperative Extension Service, University of Wisconsin, Madison, WI.

Lovejoy, T.E. 1975. Rehabilitation of degraded tropical forest lands. The Environmentalist 5: 13-20.

Lynn, E.T. 1982. Plants of the Illinois Dunesland. The Illinois Dunesland Preservation Society.

Madany, M. and G. Paulson. 1973. Illinois Nature Preserves System Master Plan, Sand Ridge Prairie Nature Preserve, Cook County, Illinois. Illinois Nature Preserves Commission meeting #47, Item 12.

Malecki, R.A., B. Blossey, S.D. Hight, D. Schroeder, L.T. Kok, and J.R. Coulson. 1993. Biological control of purple loosestrife. BioScience 43: 680-686.

McFall, D. and J. Karnes, *(eds.).* 1995. A Directory of Illinois Nature Preserves, Volume 1 - Northeastern Illinois. Volume 2 - Northwestern, Central, and Southern Illinois. Illinois Department of Natural Resources, Springfield.

Meyer, A.R. 1950. Fundamental vegetation of the Calumet region, northwest Indiana - northeast Illinois. Michigan Academy of Science, Arts, and Letters Papers 36: 177-182.

Mohlenbrock, R.H. 1986. Guide to the Vascular Flora of Illinois. Revised and enlarged edition. Southern Illinois University Press, Carbondale.

Moran, R.C. 1978. Presettlement vegetation of Lake County, Illinois. Pages 12-18 *in:* D.C. Glenn-Evans and R. Q. Landers, Jr., (eds.). Proceedings of the Fifth Midwest Prairie Conference, Iowa State University, Ames.

Nelson, P.W. 1985. The terrestrial natural communities of Missouri. Missouri Department of Natural Resources and Missouri Department of Conservation, Jefferson City.

Nelson, J. C., A. Redmond, and R. E. Sparks. 1994. Impacts of settlement on floodplain vegetation at the confluence of the Illinois and Mississippi rivers. Transactions of the Illinois State Academy of Science 87: 117-133.

Nuzzo, V. A. 1986. Extent and status of Midwest oak savanna: presettlement and 1985. Natural Areas Journal 6: 6-36.

Nuzzo, V. A. 1991. Experimental control of garlic mustard [*Alliaria petiolata* (Bieb.) Cavara & Grande] in northern Illinois using fire, herbicide, and cutting. Natural Areas Journal 11: 158-167.

Packard, S. 1988. Just a few oddball species: restoration and rediscovery of the tallgrass savanna. Restoration and Management Notes 6: 13-22.

Paintin, R.D. 1928. The Morphology and Nature of a Prairie in Cook County, Illinois. Illinois State Academy of Science Transactions 21:152-175.

Paulson, G.A. 1979. Master Plan for Morton Grove Prairie Nature Preserve, Cook County, Illinois. Illinois Nature Preserves Commission meeting #74, Item 8.

Peattie, D.C. 1925. Plants of Wolf Lake, Indiana-Illinois. American Botanist 31: 94-99.
Pepoon, H. S. 1927. An annotated flora of the Chicago area. Chicago Academy of Sciences, Natural History Survey Bulletin 8: 1-554.
Picken, J.L., and G.A. Paulson. 1981. Proposal for Dedication of Somme Prairie Cook County, Illinois. Illinois Nature Preserves Commission meeting #83, Item 7.
Robertson, P. A. 1992. Factors affecting tree growth on three lowland sites in southern Illinois. American Midland Naturalist 128: 218-236.
Robertson, K.R. and L. R. Phillippe. 1993. The Current Status of *Agalinis skinneriana* (Wood) Britton in Illinois. Prepared for the Illinois Department of Conservation, Division of Natural Heritage. Springfield, Illinois.
Schwartz, M.W. and J. Heim. 1996. Effects of a prescribed fire on degraded forest vegetation. Natural Areas Journal 16: 184-191.
Sheviak, C.J. 1974. An introduction to the ecology of the Illinois Orchidaceae. Illinois State Museum Scientific Papers XIV. Springfield. 89 pp.
Solecki, M.K. 1997. Controlling invasive plants. Pages 251-278 *in*: S. Packard and C.F. Mutel, (eds.). The Tallgrass Restoration Handbook for Prairies, Savannas, and Woodlands. Society for Ecological Restoration by Island Press, Washington, DC and Covelo, California.
Solecki, M.K., and J.B. Taft. 1987. Master plan for Thorn Creek Woods Nature Preserve, Will County, Illinois. Submitted to: Illinois Nature Preserves Commission. 61 p. + appendices.
Soper, E.K., and C.C. Osbon. 1922. The occurrence and uses of peat in the United States. U. S. Geological Survey Bulletin 728.
Stearns, F., and N. Kobringer. 1975. Vegetation of the Lake Michigan drainage basin. Argonne National Laboratory ANL/ES-40. Argonne, Illinois.
Stynoff, N.A. and W.J. Hess. 1986. Bluff City fen: communities, vegetation history, and management. Transactions of the Illinois State Academy of Sciences 79: 53-58.
Swink, F. and G. Wilhelm. 1994. Plants of the Chicago region. 4th edition. xiv + 920 pp. The Morton Arboretum, Lisle, Illinois and the Indiana Academy of Science, Indianapolis.
Taft, J.B. 1990. Unpublished report for the Illinois Department of Transportation for a botanical survey of the proposed FAP 9 and FAP 120 project areas.
Taft, J.B. 1993. Unpublished report for the Illinois Department of Transportation for a botanical survey of the proposed FAU 2744 (Sheridan Road) project area.
Taft, J.B. 1994a. Unpublished report for the Illinois Department of Transportation for a botanical survey of the proposed FAP 120 project area.
Taft, J.B. 1994b. Unpublished report for the Illinois Department of Transportation for a botanical survey of the proposed FAP 352 (Illinois Route 137/Illinois Route 43) project area.
Taft, J.B. 1994c. Unpublished report for the Illinois Department of Transportation for a botanical survey of the proposed FAP 305 (Willow Road [Illinois Route 21 to Interstate-94]) project area.
Taft, J.B. 1995a. Ecology, distribution, and rareness patterns of threatened and endangered prairie plants in Illinois. Pages 21-31 *in*: T. E. Rice (ed.). Proceedings of the fourth Central Illinois Prairie Conference. Milliken University, Decatur, IL.

Taft, J.B. 1995b. Unpublished report for the Illinois Department of Transportation for a botanical survey of the proposed North Chicago (U.S. Route 41/Illinois Route 137) project area.

Taft, J.B. 1996a. Reading the signs: plants as indicators of site history. Illinois Steward, Spring 1996: 20-24.

Taft, J.B. 1996b. Unpublished report for the Illinois Department of Transportation for a botanical survey of the proposed FAP 305 (Willow Road [Illinois Route 21 to Interstate-94]) project area.

Taft, J.B. 1997a. Savannas and open woodlands. Pp. 27-57 (Chapter 2) *in*: Mark W. Schwartz (ed.). Conservation in Highly Fragmented Landscapes, Chapman and Hall Press.

Taft, J.B. 1997b. Unpublished report for the Illinois Department of Transportation for a botanical survey of the proposed FAU 2724 (Sheridan Road) project area.

Taft, J.B. 1997c. Unpublished report for the Illinois Department of Transportation for a botanical survey of the proposed FAU 2744 (Sheridan Road) project area.

Taft, J.B. 1997d. Unpublished report for the Illinois Department of Transportation for a botanical survey of the proposed FAP 337 (Illinois Route 22) project area.

Taft, J.B. 1999. Introduction; Terrestrial vegetation communities. Pages x-xx *in*: Illinois Department of Natural Resources. Thorn Creek Area Assessment. Technical Report of the Critical Trends Assessment Project - Phase II. Illinois Department of Natural Resources, Illinois Natural History Survey Division, in conjunction with Illinois State Geological Survey, Illinois State Water Survey, and Office of Realty and Environmental Planning.

Taft, J.B. 2000. Vegetation of the Lake Calumet Assessement Area. Lake Calumet Assessment Area, vol. 3, Living Resources. Illinois Department of Natural Resources, Illinois Natural History Survey Division, in conjunction with Illinois State Geological Survey, Illinois State Water Survey, and Office of Realty and Environmental Planning.

Taft, J.B. and M.K. Solecki. 1990. Vascular flora of the wetland and prairie communities at Gavin Bog and Prairie Nature Preserve, Lake County, Illinois. Rhodora 92: 142-165.

Taft, J.B., M.W. Schwartz, and L.R. Phillippe. 1995. Vegetation ecology of flatwoods on the Illinoian till plain. Journal of Vegetation Science 6: 647-666.

Taft, J.B., G. Wilhelm, D. Ladd, and L. Masters. 1997. Floristic quality assessment and analysis for Illinois. Erigenia 15: 3-95.

Thomas, R. and R.C. Anderson. 1990. Presettlement vegetation of the Mackinaw River Valley, Central Illinois. Transactions of the Illinois State Academy of Science 83: 10-22.

Thompson, D.Q., R.L. Stuckey, and E.B. Thompson. 1987. Spread, impact, and control of purple loosestrife (*Lythrum salicaria*) in North American wetlands. U.S. Fish Wildlife Service Resources Report 2.

Willman, H.B., and J.A. Lineback. 1970. Surficial geology of the Chicago region. Map *in*: Willman, H. B. 1971.

Wilcove, D.S., C.H. McLellan, and A.P. Dobson. 1986. Habitat fragmentation in the temperate zone. Pages 237-256 *in*: M. E. Soule (ed.). *Conservation Biology*. The Science of Scarcity and Diversity. Sinauer Associates, Inc., Sunderland, MS.

White, J. 1978. Illinois natural areas inventory technical report. Vol. 1. Survey methods and results. Illinois Natural Areas Inventory, Urbana. 426 pp.
White, J. and M.H. Madany. 1978. Classification of natural communities in Illinois. Pages 310-405 (Appendix 30) *in*: White, J. Illinois Natural Areas Technical Report, Volume 1. Survey Methods and Results. Urbana. Illinois Natural Areas Inventory.
Zawacki, A.A. and G. Hausfater. 1969. Early vegetation of the lower Illinois valley. Illinois State Museum Reports of Investigation 17. Springfield. 67pp.

Birds

Bent, N. 1996. The House Finch in Illinois. Meadowlark 5(1): 7-10.
Best, L.B. 1990. Use of cornfields by birds during the breeding season: The importance of edge habitat. American Midland Naturalist 123: 84-99.
Blake, J.G. 1986. Species-area relationship of migrants in isolated woodlots. Wilson Bulletin 98: 291-296.
Bohlen, H.D. 1989. The Birds of Illinois. Indiana University Press, Bloomington. 222 pp.
Bohlen, H.D. 1998. A new dove colonizing Illinois. The Living Museum 59 (4): 6-7.
Bollinger, E.K., P.B. Bollinger, and T.A. Gavin. 1990. Effects of hay-cropping on eastern populations of the Bobolink. Wildlife Society Bulletin 19: 135-142.
Brawn, J.D., and S.K. Robinson. 1996. Source-sink population dynamics may complicate the interpretation of long-term census data. Ecology 77:3-12.
Brawn, J.D. 1998. Effects of oak savanna restoration on avian populations and communities in Illinois. Final Report to the Illinois Department of Natural Resources. 48 pp.
Byre, V.B. 1990. Some notable Illinois records from the Chicago Academy of Sciences oology collection. Meadowlark 6(1): 5.
Carpenter, L., and J. Greenberg. 1999. A birder's guide to the Chicago region. Northern Illinois University Press. 242 pp.
Chicago Audubon Society. 1998. Birds of the greater Chicago area: A seasonal checklist. Chicago Audubon Society. 8 pp.
Ciaranca, M.A., C.C. Allin, and G.S. Jones. 1997. Mute Swan (*Cygnus olor*). *in:* The Birds of North America, No. 273, A. Poole and F. Gill, (eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.
Dann, D.R. 1999. Successful breeding Common Terns in Illinois: With a summary of Common Tern nesting occurrences in Illinois. Meadowlark 8(1):12-13.
De Vore, S.L. 2000. Birding Illinois. Falcon Publishing Co., Helena, Mt. 304 pp.
Dorio, J.C. and A.H. Grewe. 1979. Nesting and brood rearing habitat of the Upland Sandpiper. Journal of the Minnesota Academy of Sciences: 45(1): 8-11.
Evers, R.A. and L.M. Page. 1977. Some unusual natural areas in Illinois. IllinoisNatural History Survey Biological Notes No. 100. 47 pp.
Ferry, J.F. 1907. Ornithological conditions in northeastern Illinois, with notes on some winter birds. Auk 24: 121-129.

Ford, E.R. 1931. Recollections of bird life in Chicago 40 years ago. Chicago Academy of Sciences Program of Activities 2: 1-2.

Ford, E.R. 1956. Birds of the Chicago Region. Chicago Academy of Sciences Special Publication 12. 117 pp.

Ford, E.R., C.C. Sanborn, and C.B.Coursen. 1934. Birds of the Chicago Region. Chicago Academy of Sciences Program of Activities 5: 17-80.

Frawley, B.J., and L.B. Best. 1991. Effects of mowing on breeding bird abundance and species composition in alfalfa fields. Wildlife Society Bulletin 19: 135-142.

Gates, F.C. 1912. The vegetation of the beach area in northeastern Illinois and southeastern Wisconsin. Bulletin of the Illinois State Laboratory of Natural History 9: 255-372.

Good, E.E., and C.A. Dambach. 1943. Effect of land use practices on breeding bird populations in Ohio. Journal of Wildlife Management 7(3): 291-297.

Graber, R.R., J.W. Graber, and E.L. Kirk. 1973. Illinois birds: Lanidae. Illinois Natural History Survey Biological Notes 83. 18 pp.

Graber, J.W., and R.R. Graber. 1983. Feeding rates of warblers in spring. Condor 85:139-150.

Hallett, D.L., W.R. Edwards, and G.V. Burger, editors. 1988. Pheasants: Symptoms of wildlife problems on agricultural lands. North Central Section of The Wildlife Society, Bloomington, Indiana, USA.

Havera, S.P. 1999. Waterfowl of Illinois: status and management. Illinois Natural History Survey Special Publication 21. xliii + 628pp.

Hennen, M. 1993. The status of the Chicago Peregrine Release Project. Meadowlark 2(2): 42-46.

Herkert, J.R. 1991. Prairie birds of Illinois: Population responses to two centuries of habitat change. Illinois Natural History Survey Bulletin 34:393-399.

Herkert, J.R. 1994. Breeding bird communities of mid-western prairie fragments: The effects of prescribed burning and habitat area. Natural Areas Journal 14:128-135.

Herkert, J.R. 1997. Good news for the Cooper's Hawk. Illinois Audubon. No. 262: 26-27.

Herkert, J.R., R.E. Szafoni, V.M. Kleen, and J.E. Schwegman. 1993. Habitat establishment, enhancement, and management for forest and grassland birds in Illinois. Illinois Department of Conservation, Natural Heritage Technical Publication No.1. 20 pp.

Hickman, S., and J. Neal. 1981. Illinois Beach State Park Avian Ecological Investigation. Final report to the Illinois Department of Conservation. 32 pp.

Hyman, J., and Stephen Pruett-Jones. 1995. Natural History of the Monk Parakeet in Hyde Park, Chicago. Wilson Bulletin 107(3): 510-517.

Illinois Department of Natural Resources. 1999. Biological and conservation database system (BCD), Division of Natural Heritage, Office of Resource Conservation, Illinois Department of Natural Resources.

Illinois Endangered Species Protection Board. 1999. Checklist of endangered and threatened animals and plants of Illinois. State of Illinois. 20 pp.

Illinois Ornithological Records Committee. 1999. Checklist of Illinois State Birds.Illinois Ornithological Society Special Publication No.1. 20 pp.

Johnson, D.B. 1992. Snowy Owl invasion: Birders witness second largest flight in state's history. Meadowlark 1(3): 82-87.

Kennicott, R. 1854. Catalogue of animals observed in Cook County, Illinois. Illinois State Agricultural Society Transactions 1: 577-595.

Kleen, V., ed. In litt. Illinois Breeding Bird Atlas - Bird Distribution Maps. Illinois Department of Natural Resources and Illinois Natural History Survey. Springfield, Il.

Mankin, P.C., and R.E. Warner. 1992. Vulnerability of ground nests to predation on a agricultural habitat island in east-central Illinois. American Midland Naturalist 128: 281-291.

Milosevich, J.B. 1994. A tale of two colonies: Ring-billed Gulls struggle against predation in Will and Grundy counties. Meadowlark 3(1): 7-9.

Mlodinow, S. 1984. Chicago area birds. Chicago: Chicago Review Press. 220 pp.

Mohlenbrock, R.H. 1986. Guide to the vascular flora of Illinois. Southern Illinois University Press, Carbondale. 507 pp.

Moskoff, W. 1996. The critical role of habitat in the breeding and migratory success of wetland birds. Meadowlark 5(3): 82-87.

Nelson, E.W. 1876. Birds of north-eastern Illinois. Essex Institute Bulletin 8(9-12):90-155.

Paine, C. 1997. Abundance and nesting productivity of wetland-dependent birds in northeastern Illinois. Final Report to USFWS. 78 pp.

Peterjohn, B.G., J.R. Sauer, and W.A. Link. 1994. The 1992 and 1993 summary of the North American Breeding Bird Survey. Bird Populations 2:46-61.

Philip, C. 1994. Death traps: Birds and urban mortality. Meadowlark 3(4): 122-126.

Robinson, S.K., F.R. Thompson III, T.M. Donovan, D.R. Whitehead, and J. Faaborg. 1995. Regional forest fragmentation and the nesting success of migratory birds. Science 267:1987-1990.

Robinson, S.K., E.J. Heske, and J.D. Brawn. 1999. Factors affecting the nesting success of edge and shrubland birds. Final Report to the Illinois Department of Natural Resources.

Robinson, S.K., J.P. Hoover, and J.R. Herkert. in press. Cowbird parasitism in a fragmented landscape: Effects of tract size, habitat, and abundance of cowbird hosts. *in:* J.N.M. Smith, S.K. Robinson,S.I. Rothstein, S.G. Sealy, and T. Cook, (eds.). Ecology and management of cowbirds, University of Texas Press, Austin, Texas.

Rothstein, S.I., and S.K. Robinson. 1994. Conservation and co-evolutionary implication of brood parasitism by cowbirds. Trends in Ecological Evolution 9: 162-164.

Sanborn, C.C. 1922. Recent notes from an old collecting ground in northeastern Illinois. Auk 39: 367-373.

Sanborn, C.C., and W.A. Goelitz. 1915. A two-year nesting record in Lake County, Ill. Wilson Bulletin 27: 434-448.

South, J. 1999. The status of the Monk Parakeet in Illinois: with comments on its native habitat and habits. Meadowlark 8(1): 2-5.

Sullivan, J. 1999. Chicago Wilderness: An Atlas of Biodiversity. Chicago Region Biodiversity Council. 64 pp.

Suloway, L. and M. Hubbell. 1994. Wetland Resources of Illinois: an analysis and atlas. Illinois Natural History Survey Special Publication 15. 88 pp.

Swink, F., and G. Wilhelm. 1994. Plants of the Chicago region. 4th ed. Indianapolis: Indiana Academy of Science. 921 pp.
Thayer, C. 1999. Illinois' second confirmed breeding Osprey. Meadowlark 8(1): 6-7.
Walters, E. 1996. Townsend's Solitare winters near Waukegan. Meadowlark 5(3): 109.
Walters, E. 1999. An intimate view: The Ring-billed Gull life cycle in the newWaukegan colony. Meadowlark 8(1): 14-17.
Warner, R.E. 1984. Effects of changing agriculture on Ring-necked Pheasant brood movements in Illinois. Journal of Wildlife Management 48(3): 1014-1018.
Warner, R.E. 1985. Demography and movements of free-ranging domestic cats in rural Illinois. Journal of Wildlife Management 49(2): 340-346.
Warner, R.E. 1994. Agricultural land use and grassland habitat in Illinois: Future shock for Midwestern birds? Conservation Biology 8:147-156.
Warner, R.E., and S.L. Etter. 1989. Farm conservation measures to benefit wildlife especially pheasant populations. Transactions of the North American Wildlife and Natural Resources Conference 50: 135-141.
Warner, R.E. and S.P. Havera. 1989. Relationships of conservation tillage to the quality of wildlife habitat in row-crop environments of the mid-western United States.Journal of Environmental Management 29: 333-343.
Warner, R.E., S.L. Etter, G.B. Joselyn, and J.A. Ellis. 1984. Declining survival of Ring-necked Pheasant chicks in Illinois agricultural ecosystems. Journal of Wildlife Management 48(1): 82-88.
Warner, R.E., L.M. David, S.L. Etter, and G.B. Joselyn. 1992. Costs and benefits of roadside management for Ring-necked Pheasants in Illinois. Wildlife Society Bulletin 20: 279-285.
Williamson, C. 1996. New decade dawns for Chicago area lakefront birding. Meadowlark 5(2): 42-48.
Woodruff, F.M. 1907. Rare northern birds near Chicago, Il. Auk 24: 107.
Woodruff, F.M. 1907. The birds of the Chicago area. Chicago Academy of Science Natural History Survey Bulletin 6. 221 pp.

Mammals

Anderson, E. 1995. Status in the Midwest and Illinois. Pages 23-32 *in:* Illinois river otter recovery plan. R. Bluett, (ed.). Illinois Department of Natural Resources, Division of Wildlife Resources Technical Bulletin 7. 96 pp.
Bluett, B. 1997. River otter recovery update. Illinois Department of Natural Resources, Division of Wildlife Resources, Furbearer Program Management Note 97-1. [3 pp.]
Bluett, B. 2000. 2000 furbearer sign survey. Illinois Department of Natural Resources, Division of Wildlife Resources, Furbearer Program Management Note 00-2. [5 pp.]
Churcher, P.B. and J.H. Lawton. 1987. Predation by domestic cats in an English village. Journal of Zoology 212:439-455.
Coleman, J.S. and S.A. Temple. 1996. On the prowl. Wisconsin Natural Resources 20(6):4-8.

Gardner, J.E., J.E. Hofmann, and J.D. Garner. 1996. Summer distribution of the federally endangered Indiana bat (*Myotis sodalis*) in Illinois. Transactions of the Illinois State Academy of Science 89:187-196.

Herkert, J.R. (ed.) 1992. Endangered and threatened species of Illinois: status and distribution. Volume 2 - animals. Illinois Endangered Species Protection Board, Springfield. 142 pp.

Hoffmeister, D.F. 1989. Mammals of Illinois. University of Illinois Press, Urbana and Chicago. 348 pp.

Illinois Biological Stream Characterization Work Group. 1995. Biological stream characterization of Illinois streams 1995. Illinois Environmental Protection Agency and Illinois Department of Conservation, Springfield, and Illinois Natural History Survey, Champaign. map.

Illinois Department of Natural Resources. 1999. Biological and conservation database system (BCD), Division of Natural Heritage, Office of Resource Conservation, Illinois Department of Natural Resources.

Illinois Endangered Species Protection Board. 1999. Checklist of endangered and threatened animals and plants of Illinois. Illinois Department of Natural Resources, Springfield. ii+20 pp.

Lewis, T.L. and O.J. Rongstad. 1992. The distribution of Franklin's ground squirrel in Wisconsin and Illinois. Transactions of the Wisconsin Academy of Sciences, Arts & Letters 80:57-62.

Mierzwa, K. 1991. The masked shrew and pygmy shrew in McHenry County, Illinois. Unpublished report. 10 pp.

Nixon, C.M., S.P. Havera, and R.E. Greenberg. 1978. Distribution and abundance of the gray squirrel in Illinois. Illinois Natural History Survey Biological Notes 105. 55 pp.

Rosenblatt, D.L., E.J. Heske, S.L. Nelson, D.M. Barber, M.A. Miller, and B. MacAllister. 1999. Forest fragments in east-central Illinois: islands or habitat patches for mammals? American Midland Naturalist 141:115-123.

Sliwinski, R.P. 1994. Mammals of the Poplar Creek Forest Preserve Cook County, Illinois. Unpublished report. 23 pp.

Suloway, L. and M. Hubbell. 1994. Wetland resources of Illinois: at analysis and atlas. Illinois Natural History Survey Special Publication 15. Champaign. 88 pp.

U.S. Fish and Wildlife Service. 1991. Endangered and threatened wildlife and plants; animal candidate review for listing as endangered and threatened species. 50 CFR Part 17. Federal Register 56(225):58804-58836.

Warner, R.E. 1985. Demography and movements of free-ranging domestic cats in rural Illinois. Journal of Wildlife Management 49:340-346.

Warner, R.E. and B. Ver Steeg. 1995. Illinois badger studies. Final report, Federal Aid to Wildlife Project No. W-103-R, 1-6, submitted to Illinois Department of Natural Resources. Illinois Natural History Survey, Champaign. 161 pp.

Wilson, D.E. and D.M. Reeder (eds). 1993. Mammal species of the world, a taxonomic and geographic reference. Second edition. Smithsonian Institution Press, Washington, D.C. 1206 pp.

Woolf, A. 1996. Status of the bobcat in Illinois. Annual performance report, Federal Aid Project W-126-R-1, submitted to Illinois Department of Natural Resources. Cooperative Wildlife Research Laboratory, Carbondale, IL.

Reptiles and Amphibians

Anton, T.G. 1999. Current distribution and status of amphibians and reptiles in Cook County, Illinois. Transactions of the Illinois State Academy of Science 92(3,4):211-232.

Collins, J.T., (ed.). 1990. Standard common and current scientific names for North American amphibians and reptiles. Society for the Study of Amphibians and Reptiles. Herpetological Circular No. 19. 41 pp.

Illinois Department of Natural Resources. 1999. Biological and Conservation Database System (BCD), Division of Natural Heritage, Office of Resource Conservation, Illinois Department of Natural Resources.

Smith, P.W. 1961. The Amphibians and Reptiles of Illinois. Illinois Natural History Survey Bulletin 28(1):1-298.

Aquatic Biota

Baker, F.C. 1898. The Mollusca of the Chicago area, Part I: The Pelecypoda. Bulletin of the Chicago Academy of Science 3(1):1-130 + 27 plates.

Baker, F.C. 1930. The molluscan fauna of the southern part of Lake Michigan and its relationship to glacial Lake Chicago. Transactions of the Illinois State Academy of Science 22:186-194.

Bertrand, W.A., R.L. Hite, and D.M. Day. 1996. Biological Stream Characterization (BSC): Biological Assessment of Illinois Stream Quality through 1993. Illinois Environmental Protection Agency Report No. IEPA/BOW.96-058. December 1996. 40 pages + map.

Burks, B.D. 1953. The mayflies, or Ephemeroptera, of Illinois. Bulletin of the Illinois Natural History Survey 26(1):1-216.

Cummings, K.S., and C.A. Mayer. 1997. Distributional checklist and status of Illinois freshwater mussels (Mollusca: Unionacea). pp. 129-145 *in:* K.S. Cummings, A.C. Buchanan, C.A. Mayer, and T.J. Naimo, (eds.). Conservation and management of freshwater mussels II: Initiatives for the future. Proceedings of a UMRCC Symposium, 16-18 October 1995, St. Louis Missouri. Upper Mississippi River Conservation Committee, Rock Island, Illinois. 293 pp.

Forbes, S.A., and R.E. Richardson. 1908. The fishes of Illinois. Illinois State Laboratory of Natural History, Danville. cxxxvi + 357 pp.

Frison, T. H. 1935. The stoneflies, or Plecoptera, of Illinois. Bulletin of the Illinois Natural History Survey 20(4):281-471.

Herkert, J.R. 1992. Endangered and threatened species in Illinois: status and distribution, Volume 2 - animals. Illinois Endangered Species Protection Board, Springfield. iv + 142 pp.

Herkert, J.R. 1994. Endangered and threatened species in Illinois: status and distribution, Volume 3 - 1994 changes to the Illinois list of endangered and threatened species. Illinois Endangered Species Protection Board, Springfield. iv + 33 pp.

Hubbs, C.L. and K.F. Lagler. 1941. Guide to the fishes of the Great Lakes and tributary waters. Cranbrook Institute of Science Bulletin 18. 100 pp.

Illinois Environmental Protection Agency. 1996. Illinois Water Quality Report (1994-95). State of Illinois, Environmental Protection Agency, Division of Water Pollution Control, Planning Section, Springfield. 241 pp.

Illinois Natural History Survey. 1976a. Illinois Coastal Zone Management Program: component study of biological communities. [Text]. Project report prepared by the Illinois Natural History Survey for the Illinois Coastal Zone Management Program. v + 53 pp. + bibliography.

Illinois Natural History Survey. 1976b. Illinois Coastal Zone Management Program: component study of biological communities. Appendix - Biological inventory. Project report prepared by the Illinois Natural History Survey for the Illinois Coastal Zone Management Program. Aiii + A-1 - A-186.

Lauck, D.R. 1959. The taxonomy and bionomics of the aquatic Hemiptera of Illinois. Unpubl. M.S. thesis, University of Illinois, Urbana. xxii + 353 pp.

Johnston, C.E. 1991. Discovery of the threespine stickleback (*Gasterosteus aculeatus*) (Pisces: Gasterosteidae) in Lake Michigan drainage, Illinois. Transactions of the Illinois State Academy of Science 84:173.

Laird, C.A., and L.M. Page. 1996. Non-native fishes inhabiting the streams and lakes of Illinois. Illinois Natural History Survey Bulletin 35:1-51.

Malloch, J.R. 1915a. The Chironomidae, or midges, of Illinois, with particular reference to the species occurring in the Illinois River. Bulletin of the Illinois State Laboratory of Natural History 10(6):275-543.

Malloch, J.R. 1915b. Some additional records of Chironomidae for Illinois and notes on other Illinois Diptera. Bulletin of the Illinois State Laboratory of Natural History 11(4): 305-363.

Metropolitan Water Reclamation District of Greater Chicago. 1990. Comprehensive water quality evaluation. Distribution of benthic invertebrate species in the Chicago Waterway System during 1989. Report No. 90-30. Metropolitan Water Reclamation District of Greater Chicago - Research and Development Department. December. xii + 61 pp. + Appendix AI-1 - AI-44; AII-1 - AII-47; AIII-1 - 44.

Nalepa, T.F. 1994. Decline of native unionid bivalves in Lake St. Clair after infestation by the zebra mussel, *Dreissena polymorpha*. Canadian Journal of Fisheries and Aquatic Sciences 51(10):2227-2233.

Nalepa, T.F., D.J. Hartson, D.L. Fanslow, G.A. Lang, and S.J. Lozano. 1998. Declines in benthic macroinvertebrate populations in southern Lake Michigan, 1980-1993. Canadian Journal of Fisheries and Aquatic Sciences 55(11):2402-2424.

Page, L.M., K.S. Cummings, C.A. Mayer, S.L. Post, and M.E. Retzer. 1992. Biologically significant Illinois streams. An evaluation of the streams of Illinois based on aquatic biodiversity. Final report prepared for the Illinois Department of Energy and Natural Resources and the Illinois Department of Conservation. Illinois Natural History Survey, Center for Biodiversity Technical Report 1992(1a): v + 485 p.

Page, L.M., K.S. Cummings, C.A. Mayer, M.J. Wetzel, and D.W. Webb. 1998. Aquatic biota. Pp. 111-130; pp. 142-145, In: Illinois Department of Natural Resources - Critical Trends Assessment Program. Upper Des Plaines River Area Assessment, Volume 3. Living resources. Illinois Department of Natural Resources, Office of Scientific Research and Analysis, Natural History Survey Division, Champaign.

Page, L.M., K.S. Cummings, C.A. Mayer, M.J. Wetzel, and D.W. Webb. 2000. Aquatic biota. Pp. xxx-xxx, *in:* Illinois Department of Natural Resources - Critical Trends Assessment Program. Lower Des Plaines River Area Assessment, Volume 3. Living resources. Illinois Department of Natural Resources, Office of Scientific Research and Analysis, Natural History Survey Division, Champaign. *In Prep.*

Parmalee, P.W. 1967. The fresh-water mussels of Illinois. Illinois State Museum Popular Science Series. 8:1-108.

Pechuman, L.L., D.W. Webb, and H.J. Teskey. 1983. The Diptera, or true flies, of Illinois. I. Tabanidae. Illinois Natural History Survey Bulletin 33(1):1-122.

Polls, I., S.J. Sedita, D.R. Zenz, and C. Lue-Hing. 1991. Comprehensive evaluation of water quality. Distribution of benthic invertebrate species in the Chicago Waterway System during 1990. Report No. 91-22. Metropolitan Water Reclamation District of Greater Chicago - Research and Development Department. June. xii + 61 pp. + Appendix AI-1 - AI-40; AII-1 - AII-46; AIII-1 - 45.

Polls, I., S.J. Sedita, B. Sawyer, D.R. Zenz, and C. Lue-Hing. 1992. Comprehensive evaluation of water quality. Distribution of benthic invertebrate species in the Chicago Waterway System during 1991. Report No. 92-22. Metropolitan Water Reclamation District of Greater Chicago - Research and Development Department. August. xii + 61 pp. + Appendix AI-1 - AI-42; AII-1 - AII-43; AIII-1 - 43.

Randolph, R.P. and W.P. McCafferty. 1998. Diversity and distribution of the Mayflies (Ephemeroptera) of Illinois, Indiana, Kentucky, Michigan, Ohio, and Wisconsin. Ohio Biological Survey Bulletin NS 13(1):1-188.

Ross, H.H. 1944. The caddis flies, or Trichoptera, of Illinois. Bulletin of the Illinois Natural History Survey 23(1):1-326.

Ross, H.H. 1947. The mosquitoes of Illinois (Diptera: Culicidae). Bulletin of the Illinois Natural History Survey 24(1):1-96.

Savitz, J., C. Aiello, and C.L. Bardygula. 1989. The first record of the white perch (*Morone americana*) in Illinois waters of Lake Michigan. Transactions of the Illinois State Academy of Science 82:57-58.

Schneider, D.W., C.D. Ellis, and K.S. Cummings. 1998. A transportation model assessment of the risk to native mussel communities from zebra mussel spread. Conservation Biology 12(4):788-800.

Schwegman, J.E. 1973. Comprehensive plan for the Illinois nature preserves system. Part 2. The natural divisions of Illinois. Illinois Nature Preserves Commission, Springfield, Illinois. 32 pp.

Smith, P.W. 1971. Illinois streams: a classification based on their fishes and analysis of factors responsible for disappearance of native species. Illinois Natural History Survey Biological Notes No. 76. 14 pp.

Smith, P.W. 1979. The fishes of Illinois. University of Illinois Press, Urbana. xxix + 314 pp.

Sparks, R.E., P.P. Tazik, K.D. Blodgett, G.L. Warren, and M.J. Wetzel. 1986. Des Plaines River long-term monitoring program. Phase I report. Aquatic Biology Technical Report 1986 (6): iii + 110 pp. [final report submitted to Commonwealth Edison Co., Chicago].

Taylor, C.A., and M. Redmer. 1996. Dispersal of the crayfish *Orconectes rusticus* in Illinois, with notes on species displacement and habitat preference. Journal of Crustacean Biology 16:547-551.

Taylor, S. J. 1996. Habitat preferences, species assemblages, and resource partitioning by Gerromorpha (Insecta: Heteroptera) in southern Illinois, with a faunal list and keys to species of the state. Unpubl. Ph.D. thesis, Department of Zoology, Southern Illinois University, Carbondale. xviii + 345 pp.

Tucker, J.K., and E.R. Atwood. 1995. Contiguous backwater lakes as possible refugia for unionid mussels in areas of heavy zebra mussel (*Dreissena polymorpha*) colonization. Journal of Freshwater Ecology 10(1):43-48.

U.S. Department of the Interior, Fish and Wildlife Service. 1996. Endangered and threatened wildlife and plants; review of plant and animal taxa that are candidates for listing as endangered or threatened. Proposed Rule. 28 February 1996. Federal Register 61(40):7596-7613. FR Doc. 96-4412.

U.S. Department of Interior, Fish and Wildlife Service (USDI, FWS). 1997. Endangered and threatened wildlife and plants. Federal Register, 50 CFR Part 17.11 and 17.12. October 31, 1996. 46 pp. [This document is a compilation and special reprint, current as of October 31, 1996, that was printed by the U.S. Government Printing Office in 1997].

Wetzel, M. J. 1992. Aquatic Annelida of Illinois: Introduction and checklist of species. Transactions of the Illinois State Academy of Science 85(1 and 2):87-101.

Wooldridge, D. P. 1967. The aquatic Hydrophilidae of Illinois. Transactions of the Illinois State Academy of Science 60(4):422-431.

White, D.S., M.H. Winnel, and D.J. Jude. 1984. Discovery of the Asiatic Clam, *Corbicula fluminea*, in Lake Michigan. Journal of Great Lakes Research 10(3):329-331.

Appendix 1

List of vascular plants known from the Chicago River/Lake Shore Assessment Area, with notes on their habitat associations.

Class[1]	Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]	Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4] / Scientific name[3,4,5]																				
agrimony, soft *Agrimonia pubescens*	x																			
agrimony, tall *Agrimonia gryposepala*	x							x												
alder, black* *Alnus glutinosa**																				x
alder, speckled - SE *Alnus incana* **ssp. *rugosa* - SE**										?										
alfalfa* *Medicago sativa**																				x
alumroot *Heuchera richardsonii* var. *grayana*						x														
alumroot, tall *Heuchera americana* var. *hirsuticaulis*	x					x		x												
alyssum, hoary* *Berteroa incana**																				x
amaranth, green* *Amaranthus hybridus**																				x
amaranth, prostrate* *Amaranthus graecizans**																				x
anemone, Carolina *Anemone caroliniana*						x														
anemone, meadow *Anemone canadensis*						x				x										
anemone, tall *Anemone virginiana*	x							x												
anemone, wood *Anemone quinquefolia*	x							x												
apple* *Malus pumila**																				x
apricot* *Prunus armeniaca**																				x
arbor vitae - ST *Thuja occidentalis* **- ST**	x																			
arrow-wood, downy *Viburnum rafinesquianum*	x							x												
arrowfeather *Aristida purpurascens*							x		x											
arrowleaf *Sagittaria rigida*															x					
arrowleaf, common *Sagittaria latifolia*										x					x					
arrowleaf, grass-leaved *Sagittaria graminea*										x										
arrowwood, maple-leaved *Viburnum acerifolium*	x																			
arrowwood, smooth* *Viburnum dentatum**	x																			x
ash, black *Fraxinus nigra*	x		x											x						
ash, green *Fraxinus pennsylvanica*	x		x	x																x
ash, wafer *Ptelea trifoliata*	x																			
ash, white *Fraxinus americana*	x		x					x												
rice grass, black-seeded *Oryzopsis racemosa* **- ST**	x																			
asparagus* *Asparagus officinalis**						x														x
aspen, large-toothed *Populus grandidentata*	x																			x
aspen, quaking *Populus tremuloides*	x				x	x													x	
asphodel, false - ST *Tofieldia glutinosa* **- ST**											x		x							

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
aster, arrow-leaved	*Aster sagittifolius*	x							x												
aster, big-leaved	*Aster macrophyllus*	x							x												
aster, Drummond's	*Aster drummondii*	x							x												x
aster, false	*Boltonia asteroides*										x										
aster, flat-top	*Aster umbellatus*					x				x		x									
aster, forked - ST	***Aster furcatus* - ST**	x													x						
aster, hairy	*Aster pilosus*			x																	x
aster, heath	*Aster ericoides*						x	x													
aster, marsh	*Aster puniceus*										x	x	x								
aster, New England	*Aster novae-angliae*						x	x													
aster, Ontario	*Aster ontarionis*			x																	
aster, panicled	*Aster simplex*			x							x		x								x
aster, rice button	*Aster dumosus*							x						x							
aster, shining	*Aster puniceus* var. *firmus*										x	x	x								
aster, side-flowering	*Aster lateriflorus*			x																	x
aster, silky	*Aster sericeus*						x	x	x	x										x	
aster, sky-blue	*Aster azureus*						x	x	x	x										x	
aster, smooth blue	*Aster laevis*						x	x													
aster, willow	*Aster praealtus*						x														x
Aunt Lucy	*Ellisia nyctelea*			x																	x
avens, prairie	*Geum triflorum*						x														
avens, rough	*Geum laciniatum*			x							x		x								
avens, white	*Geum canadense*	x		x			x														
avens, yellow	*Geum aleppicum*										x		x								
balsam, old field	*Gnaphalium obtusifolium*							x													x
baneberry, red	*Actaea rubra*	x																			
baneberry, white	*Actaea pachypoda*	x																			
barberry, common*	*Berberis vulgaris**	x																			x
barberry, Japanese*	*Berberis thunbergii**	x																			x
basswood	*Tilia americana*	x																			
beak rush, hair	*Rhynchospora capillacea*											x		x	x						
beak rush, white - ST	***Rhynchospora alba* - ST**											x		x							
bearberry - SE	***Arctostaphylos uva-ursi* var. *coactilis* - SE**							x		x										x	
beard tongue, smooth	*Penstemon calycosus*						x														x
beard-tongue, foxglove	*Penstemon digitalis*	x					x		x												
beard-tongue, pale	*Penstemon pallidus*	x							x												
bedstraw, annual	*Galium aparine*			x																	x
bedstraw, northern	*Galium boreale*						x						x								
bedstraw, shining	*Galium concinnum*	x																			
bedstraw, small	*Galium trifidum*										x										
bedstraw, stiff	*Galium tinctorium*	x																			
bedstraw, sweet-scented	*Galium triflorum*	x																			
beech, American	*Fagus grandifolia*	x																			
beech, blue	*Carpinus caroliniana*	x																			
beggar's-ticks, common	*Bidens frondosa*										x		x								x

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
beggar's-ticks, tall	*Bidens vulgata*										x		x								
bellflower, marsh	*Campanula aparinoides*										x		x								
bellflower, tall	*Campanula americana*			x																	
bellflwoer, European*	*Campanula rapunculoides**	x																			
bellwort	*Uvularia grandiflora*	x																			
bergamot, wild	*Monarda fistulosa*						x	x	x	x											
betony, swamp	*Pedicularis lanceolata*											x			x						
betony, wood	*Pedicularis canadensis*						x	x	x	x											
bindweed, American	*Calystegia sepium*			x			x				x										x
bindweed, black*	*Polygonum convolvulus**																				x
bindweed, dwarf	*Calystegia spithamaea*								x												
bindweed, field*	*Convolvulus arvensis**																				x
bindweed, hedge	*Convolvulus sepium*						x														x
birch, dwarf	*Betula pumila*							x													
birch, paper	*Betula papyrifera*	x																			
birch, yellow - SE	***Betula alleghaniensis* (historical?) - SE**	?																			
bittersweet, climbing	*Celastrus scandens*	x		x					x												x
bittersweet, round-leaved*	*Celastrus orbiculatus**	x																			x
black grass*	*Juncus gerardii**										x										
black haw	*Viburnum prunifolium*	x																			
blackberry, common	*Rubus allegheniensis*	x				x	x	x	x	x											x
bladdernut	*Staphylea trifolia*			x																	
bladderwort, common	*Utricularia vulgaris*										x			x			x				
bladderwort, flat-leaved- SE	***Utricularia intermedia* - SE**													x			x				
bladderwort, horned - SE	***Utricularia cornuta* - SE**													x			x				
bladderwort, humped	*Utricularia gibba*													x			x				
bladderwort, small - SE	***Utricularia minor* - SE**													x			x				
blazing star, cylindrical	*Liatris cylindracea*							x												x	
blazing star, marsh	*Liatris spicata*						x	x		x		x								x	
blazing star, prairie	*Liatris pycnostachya*						x	x	x	x											
blazing star, rough	*Liatris aspera*						x	x	x	x										x	
blazing star, savanna	*Liatris scariosa* var. *nieuwlnadii (S&W 1994)*						x		x												
bloodroot	*Sanguinaria canadensis*	x																			
blue-eyed grass, common	*Sisyrinchium albidum*						x		x												x
blue-eyed grass, mountain - SE	***Sisyrinchium montanum* - SE**						x														
blue-flag	*Iris shrevei*										x		x								
bluebells	*Mertensia virginica*	x		x																	
blueberry, low-bush	*Vaccinium angustifolium*	x	x			x				x											
bluestem, big	*Andropogon gerardii*						x	x	x	x		x									x
bluestem, little	*Schizachyrium scoparium*						x	x	x	x										x	

Appendix 1. Continued.

Common name[3,4]	Scientific name[3,4,5]	Class[1] / Sub-class[2]	Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
			Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
bog arrow-grass, common - ST	***Triglochin maritima* - ST**														x							
bog arrow-grass, slender - ST	***Triglochin palustris* - ST**														x							
boneset, common	*Eupatorium perfoliatum*											x		x								
boneset, tall	*Eupatorium altissimum*							x														x
bouncing-bet*	*Saponaria officinalis**																					x
bower, Virgin's	*Clematis virginiana*		x		x																	
boxelder	*Acer negundo*				x																	
brome, awnless*	*Bromus inermis**							x		x												x
brome, prairie	*Bromus kalmii*							x					x									
broomrape, clustered - SE	***Orobanche fasciculata* - SE**								x												x	
broomrape, one-flowered	*Orobanche uniflora*		x					x														
buckbean	*Menyanthes trifoliata* var. *minor*											x										
buckthorn, alder	*Rhamnus alnifolia*												x			x						
buckthorn, European*	*Rhamnus cathartica**		x		x			x		x		x										x
buckthorn, glossy*	*Rhamnus frangula**				x	x	x					x		x								x
buckwheat, climbing false	*Polygonum scandens*				x				x		x											x
buffalo-berry, Canadian - SE	***Shepherdia canadensis* - SE**		x																			
bugleweed	*Lycopus virginicus*											x										
bugleweed, northern	*Lycopus uniflorus*											x										
bugseed, common	*Corispermum hyssopifolium*																			x	x	
bulrush, dark green	*Scirpus atrovirens*				x							x		x								
bulrush, great	*Scirpus tabernaemontanii*											x		x								
bulrush, hard-stemmed	*Scirpus acutus*											x		x								
bulrush, red	*Scirpus pendulus*				x							x		x								x
bulrush, river	*Scirpus fluviatilis*											x										x
burdock, common*	*Arctium minus**									x												x
burning bush*	*Kochia scoparia**																					x
burreed, common	*Sparganium eurycarpum*											x										
bush, running strawberry	*Euonymus obovatus*		x																			
bush-clover, hairy	*Lespedeza hirta*										x											
bush-clover, round-headed	*Lespedeza capitata*							x	x	x	x											
bush-clover, silky*	*Lespedeza cuneata**																					x
butter-and-eggs*	*Linaria vulgaris**																					x
butterbur*	*Petasites hybridus**		x																			
buttercup, bristly	*Ranunculus pensylvanicus*											x										x
buttercup, rough	*Ranunculus hispidus*				?																	
buttercup, small-flowered	*Ranunculus abortivus*				x					x												x
buttercup, swamp	*Ranunculus septentrionalis*				x																	
buttercup, tall*	*Ranunculus acris**																					x
butternut	*Juglans cinerea*		x		x											x						
buttonbush	*Cephalanthus occidentalis*											x						x				
buttonweed	*Diodia teres*								x		x											

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
cactus, prickly pear	*Opuntia humifusa*							x		x											
calamint, low	*Calamintha arkansana*											x		x	x						
campion, bladder*	*Silene cucubalus**																				x
campion, starry	*Silene stellata*	x							x												
campion, white*	*Lychnis alba**																				x
caraway*	*Carum carvi**																				x
cardinal flower	*Lobelia cardinalis*				x	x					x										
carpet bugle*	*Ajuga reptans**																				x
carrion-flower, common	*Smilax lasioneura*	x					x														x
carrion-flower, Illinois	*Smilax illinoensis*	x																			
carrion-flower, upright	*Smilax ecirrhata*	x																			
carrot, wild*	*Daucus carota**						x	x													x
cat's-foot	*Antennaria neglecta*	x					x		x												
catchfly, sleepy	*Silene antirrhina*																				x
catchfly, sweet William*	*Silene armeria**																				x
catnip*	*Nepeta cataria**	x																			x
cattail, common	*Typha latifolia*										x										x
cattail, narrow-leaved*	*Typha angustifolia**										x										x
cedar, Eastern red	*Juniperus virginiana*	x						x													x
celandine, lesser*	*Ranunculus ficaria**			x																	x
centuary*	*Centaurium pulchellum**																				x
charlock	*Brassica kaber*																				x
cherry, choke	*Prunus virginiana*	x							x	x											x
cherry, European bird*	*Prunus padus**	x																			x
cherry, Nanking**	*Prunus tomentosa*																				x
cherry, sand	*Prunus susquehanae*							x		x										x	
cherry, wild black	*Prunus serotina*	x					x	x	x												x
chess, Japanese*	*Bromus japonicus**																				x
chickweed, common*	*Stellaria media**																				x
chickweed, common mouse-ear*	*Cerastium vulgatum**																				x
chickweed, giant*	*Myosoton aquaticum**																				x
chicory*	*Cichorium intybus**						x														x
chokeberry, black	*Aronia melanocarpa*		x			x		x													
chokeberry, purple	*Aronia prunifolia (S&W 1994)*		x			x		x													
cinquefoil, common	*Potentilla norvegica*																				x
cinquefoil, common	*Potentilla simplex*	x					x		x												
cinquefoil, marsh	*Potentilla palustris*										x										
cinquefoil, prairie	*Potentilla arguta*						x														
cinquefoil, shrubby	*Potentilla fruticosa*							x												x	
cinquefoil, sulfur*	*Potentilla recta**																				x
clammyweed	*Polanisia dodecandra*																				x
clearweed	*Pilea pumila*			x																	
clover, alsike*	*Trifolium hybridum**																				x
clover, red*	*Trifolium pratense**																				x

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
clover, white*	*Trifolium repens**																				x
clover, white sweet*	*Melilotus alba**						x														x
clover, yellow sweet*	*Melilotus officinalis**						x														x
club moss, marsh	*Selaginella apoda*													x	x						
cocklebur	*Xanthium strumarium*																				x
cohosh, blue	*Caulophyllum thalictroides*	x		x																	
colic-root	*Aletris farinosa*							x												x	
coltsfoot*	*Tussilago farfara**																				x
columbine	*Aquilegia canadensis*	x					x														
compass-plant	*Silphium laciniatum*						x														
coneflower, pale purple	*Echinacea pallida*						x	x	x												
coneflower, yellow	*Ratibida pinnata*						x		x												
coontail	*Ceratophyllum demersum*															x	x				
coreopsis, prairie	*Coreopsis palmata*						x														
coreopsis, sand	*Coreopsis lanceolata*							x		x											
coreopsis, tall	*Coreopsis tripteris*						x		x												
cotoneaster, Peking*	*Cotoneaster acutifolus**																				x
cotton grass	*Eriophorum tenellum*													?							
cotton grass, narrow-leaved	*Eriophorum angustifolium*												x		x						
cottonweed, large	*Froelichia floridana* var. *campestris*							x													x
cottonweed, small*	*Froelichia gracilis**																				x
cottonwood, Eastern	*Populus deltoides*			x																	x
cowbane	*Oxypolis rigidior*					x	x				x		x								
crab, Iowa	*Malus ioensis*	x																			x
cranesbill, Carolina	*Geranium carolinianum*																				x
cranesbill, northern - SE	***Geranium bicknellii* - SE**		x							x											x
creeper, thicket	*Parthenocissus inserta*	x																			x
cress, bulbous	*Cardamine bulbosa*	x		x							x		x								
cress, common whitlow	*Draba reptans*							x													x
cress, common yellow	*Rorippa palustris* var. *fernaldiana*										x						x				
cress, creeping yellow*	*Rorippa sylvestris**																				x
cress, field*	*Lepidium campestre**																				x
cress, field penny*	*Thlaspi arvense**																				x
cress, hairy marsh yellow	*Rorippa islandica* var. *hispida*										x		x				x				
cress, Pennsylvania bitter	*Cardamine pensylvanica*	x																			
cress, purple spring	*Cardamine douglassii*			x	x																
cress, sand	*Arabis lyrata*		x					x												x	
cress, smooth bank	*Arabis laevigata*	x																			
crowfoot, cursed	*Ranunculus sceleratus*										x										x
crowfoot, seaside - SE	***Ranunculus cymbalaria* - SE**										x										x
crowfoot, white water	*Ranunculus longirostris*										x						x				
crowfoot, yellow water	*Ranunculus flabellaris*										x						x				
cuckoo-flower - SE	***Cardamine pratensis* var. *palustris* (historical?) - SE**										x										
cucumber, bur	*Sicyos angulatus*			x																	
cucumber, wild	*Echinocystis lobata*			x																	

Appendix 1. Continued.

Common name[3,4]	Scientific name[3,4,5]	Class[1] / Sub-class[2]	Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
			Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Culver's-root	*Veronicastrum virginicum*		x					x		x												x
currant, red*	*Ribes rubrum**		x		x																	x
currant, wild black	*Ribes americanum*		x		x							x		x								
daisy, ox-eye*	*Leucanthemum vulgare**							x														x
daisy, Peruvian*	*Galinsoga quadriradiata**																					x
dandelion, common*	*Taraxacum officinale**		x					x		x												x
dandelion, false	*Krigia biflora*							x		xx												
dandelion, red-seeded*	*Taraxacum laevigatum**							x	x													x
day lily, orange*	*Hemerocallis fulva**																					x
dayflower, common*	*Commelina communis**																					x
dewberry, common	*Rubus flagellaris*		x				x	x		x												
dittany	*Cryptotaenia canadensis*				x																	
dock, curly*	*Rumex crispus**											x										x
dock, great water	*Rumex orbiculatus*											x										
dock, Mexican	*Rumex mexicanus*																					x
dock, pale	*Rumex altissimus*											x		x								
dock, prairie	*Silphium terebinthinaceum*							x														
dock, swamp	*Rumex verticillatus*											x		x								
dodder, common	*Cuscuta gronovii*		x		x																	
dogbane, intermediate	*Apocynum x medium*		x																			
dogbane, spreading	*Apocynum androsaemifolium*		x					x		x	x											
dogwood, alternate-leaved	*Cornus alternifolia*		x																			
dogwood, gray	*Cornus racemosa*		x					x		x		x		x								x
dogwood, pale	*Cornus obliqua*											x		x								
dogwood, red-osier	*Cornus stolonifera*											x	x	x							x	x
dogwood, rough-leaved	*Cornus drummondii*		x																			
dogwood, round-leaved	*Cornus rugosa*		x																x			
dragonhead, false	*Physostegia virginiana*							x		x												
dropseed, prairie	*Sporobolus heterolepis*							x	x													
dropseed, rough	*Sporobolus asper*							x	x													x
dropseed, sand	*Sporobolus cryptandrus*								x		x											
duckweed, forked	*Lemna trisulca*											x						x				
duckweed, small	*Lemna minor*											x						x				
elderberry	*Sambucus canadensis*		x		x			x						x								x
elm, American	*Ulmus americana*		x		x																	
elm, Siberian*	*Ulmus pumila**		x																			x
elm, slippery	*Ulmus rubra*		x		x																	x
evening-primrose, common	*Oenothera biennis*							x														x
evening-primrose, ragged	*Oenothera laciniata*								x													x
evening-primrose, sand	*Oenothera rhombipetala*								x												x	
fennel, dog*	*Anthemis cotula**																					x
fern, adder's tongue	*Ophioglossum vulgatum* var. *pseudopodum*								x													
fern, bladder	*Cystopteris bulbifera*		x																			
fern, bracken	*Pteridium aquilinum*			x			x		x		x											

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
fern, interrupted	*Osmunda claytoniana*	x				x															
fern, lady	*Athyrium angustum*	x				x															
fern, maidenhair	*Adiantum pedatum*	x																			
fern, marsh shield	*Thelypteris palustris* var. *pubescens*					x		x			x	x		x							
fern, ostrich	*Matteuccia struthiopteris*	x		x																	
fern, rattlesnake	*Botrychium virginianum*	x																			
fern, royal	*Osmunda regalis* var. *spectabilis*					x		x			x										
fern, sensitive	*Onoclea sensibilis*			x	x	x					x		x								
fern, spinulose shield	*Dryopteris carthusiana*	x				x				x											
fescue, meadow*	*Festuca pratensis**						x		x												x
fescue, nodding	*Festuca obtusa*	x																			
fescue, red*	*Festuca rubra**						x														x
fescue, sheep*	*Festuca duriuscula**																				x
fescue, six weeks	*Vulpia octoflora*							x		x											
fescue, tall*	*Festuca elatior**																				x
figwort, early	*Scrophularia lanceolata*	x	x	x																	x
figwort, late	*Scrophularia marilandica*	x		x																	
fireweed	*Erechtites hieracifolia*	x				x					x										x
flat-sedge, brook	*Cyperus rivularis*														x	x					x
flat-sedge, smooth	*Cyperus houghtonii*									x											x
flax, slender yellow	*Linum virginianum*	x																			
flax, small yellow	*Linum medium* var. *texanum*							x						x			x				
fleabane, annual	*Erigeron annuus*						x														x
fleabane, daisy	*Erigeron strigosus*						x	x		x											x
fleabane, dwarf	*Conyza ramosissima*							x		x											x
fleabane, marsh	*Erigeron philadelphicus*	x					x				x		x								x
flower-of-an-hour*	*Hibiscus trionum**																				x
forget-me-not, common*	*Myosotis scorpioides**			x							x				x	x					x
four o'clock, wild*	*Mirabilis nyctaginea**																				x
foxglove, clammy false	*Aureolaria pedicularia* var. *ambigens*					x				x											
foxglove, false	*Agalinis paupercula*							x						x							
foxglove, pale false - ST	*Agalinis skinneriana* - **ST**							x													
foxglove, purple false	*Agalinis purpurea*							x						x							
foxglove, slender false	*Agalinis tenuifolia*										x	x									
foxglove, yellow false	*Aureolaria grandiflora* var.	x							x												
foxtail, bristly*	*Setaria verticillata**																				x
foxtail, false*	*Crypsis schoenoides**																				x
foxtail, giant*	*Setaria faberi**																				x
foxtail, green*	*Setaria viridis**																				x
foxtail, meadow*	*Alopecurus pratensis**																				x
garlic*	*Allium sativum**																				x
garlic, wild	*Allium canadense*	x					x														x
gaura, biennial	*Gaura biennis*						x														x
gaura, common	*Gaura longiflora*																				x
gentian, closed	*Gentiana andrewsii*						x					x	x		x						

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
gentian, fringed	*Gentianopsis crinita*						x	x						x							
gentian, pale	*Gentiana alba*						x		x												
gentian, prairie	*Gentiana puberulenta*						x														
gentian, small fringed	*Gentianopsis procera*							x				x									
gentian, stiff	*Gentianella quinquefolia* ssp. *occidentalis*						x		x												
geranium, wild	*Geranium maculatum*	x					x		x												
germander	*Teucrium canadense*			x			x				x		x								
ginger, wild	*Asarum canadense*	x		x																	
goat's-beard, common*	*Tragopogon pratensis**																				x
goat's-rue	*Tephrosia virginiana*							x		x											
golden Alexanders	*Zizia aurea*	x		x			x	x	x		x	x									
golden glow	*Rudbeckia laciniata*			x							x										
goldenrod, bog	*Solidago uliginosa*											x									
goldenrod, broad-leaved	*Solidago flexicaulis*	x																			
goldenrod, Canada	*Solidago canadensis*	x					x	x	x	x											x
goldenrod, dune	*Solidago racemosa* var. *gillmanii* (S&W 1994)																			x	
goldenrod, early	*Solidago juncea*	x					x														x
goldenrod, elm-leaved	*Solidago ulmifolia*	x							x												
goldenrod, few-flowered	*Solidago ptarmicoides*						x	x						x							
goldenrod, grass-leaved	*Euthamia graminifolia*						x	x			x		x								
goldenrod, late	*Solidago gigantea*			x			x				x	x	x								x
goldenrod, Missouri	*Solidago missouriensis*						x														x
goldenrod, Ohio	*Solidago ohioensis*											x									
goldenrod, old-field	*Solidago nemoralis*						x														x
goldenrod, Riddell's	*Solidago riddellii*							x					x		x						
goldenrod, showy	*Solidago speciosa*							x		x											
goldenrod, stiff	*Solidago rigida*						x	x													
goldenrod, swamp	*Solidago patula*											x			x						
goldenrod, tall	*Solidago altissima* (S&W 1994)						x	x	x	x											x
goldenrod, viscid grass-leaved	*Euthamia gymnospermoides*							x		x										x	
gooseberry, Missouri	*Ribes missouriense*	x		x																	x
goutweed*	*Aegopodium podagraria**																		x		
grama, side-oats	*Bouteloua curtipendula*						x	x													
grape, fox	*Vitis labrusca*			x						x	x										
grape, riverbank	*Vitis riparia*	x	x	x		x	x	x	x	x			x								x
grass, alkali*	*Puccinellia distans**										x										x
grass, American slough - SE	***Beckmannia syzigachne* - SE**						x														
grass, annual blue*	*Poa annua**																				x
grass, autumn bent	*Agrostis perennans*	x							x												
grass, barnyard*	*Echinochloa crus-galli**										x										x
grass, beach - SE	***Ammophila breviligulata* - SE**																		x	x	

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
grass, bearded wheat - SE	***Agropyron trachycaulum* var. *unilaterale* - SE**						x						x								
grass, blue-joint	*Calamagrostis canadensis*						x				x	x	x								
grass, bog reed	*Calamagrostis inexpansa* var. *brevior*										x										
grass, bottle brush	*Elymus hystrix*	x							x												
grass, brome	*Bromus purgans*	x							x												
grass, Canada blue*	*Poa compressa**	x					x	x	x	x											x
grass, Canada brome	*Bromus ciliatus*										x	x	x								
grass, cheat*	*Bromus tectorum**																				x
grass, common satin	*Muhlenbergia frondosa*	x		x																	x
grass, creeping bent	*Agrostis alba* var. *palustris*										x		x								
grass, creeping love	*Eragrostis hypnoides*										x						x				
grass, crowfoot*	*Eleusine indica**																				x
grass, fall witch	*Leptoloma cognatum*							x		x											x
grass, floating manna	*Glyceria septentrionalis*										x										
grass, fowl manna	*Glyceria striata*			x	x	x					x		x								
grass, grove blue - SE	***Poa alsodes* - SE**	x																			
grass, hairy crab*	*Digitaria sanguinalis**																				x
grass, Indian	*Sorghastrum nutans*						x	x	x												
grass, Italian rye*	*Lolium multiflorum**																				x
grass, June	*Koeleria macrantha*						x	x		x										x	
grass, Kentucky blue*	*Poa pratensis**						x														x
grass, lace	*Eragrostis capillaris*																				x
grass, leafy satin	*Muhlenbergia mexicana*											x								x	
grass, long-haired panic	*Panicum praecocius*							x													
grass, love*	*Eragrostis minor**																				x
grass, lyme*	*Elymus arenarius**	x																	x		
grass, marsh blue	*Poa palustris*				x		x				x			?							
grass, mat panic	*Panicum meridionale*					x	x	x													
grass, needle	*Aristida tuberculosa*							x		x										x	
grass, old witch	*Panicum capillare*							x													x
grass, old-field panic	*Panicum implicatum*						x														x
grass, orchard*	*Dactylis glomerata**																				x
grass, panic	*Dichanthelium acuminatum*	x			x		x														
grass, panic	*Panicum lanuginosum*						x	x													x
grass, panic	*Panicum perlongum*							x		x											
grass, perennial rye*	*Lolium perenne**																				x
grass, pigeon*	*Setaria glauca**																				x
grass, plains three-awn	*Aristida oligantha*							x		x											x
grass, porcupine	*Stipa spartea*						x	x		x											
grass, poverty oat	*Danthonia spicata*	x							x									x			
grass, prairie cord	*Spartina pectinata*						x						x								x
grass, prairie panic	*Panicum leibergii*						x														
grass, prairie switch	*Panicum virgatum*						x	x													
grass, prairie wedge	*Sphenopholis obtusata*						x														

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
grass, purple love	*Eragrostis spectabilis*							x		x											x
grass, quack*	*Agropyron repens**	x					x						x								x
grass, reed canary*	*Phalaris arundinacea**										x		x								x
grass, rice cut	*Leersia oryzoides*										x		x								
grass, round-fruited panic	*Panicum sphaerocarpon*																			?	
grass, salt-marsh cockspur	*Echinochloa walteri*										x										
grass, scratch*	*Muhlenbergia asperifolia**																				x
grass, Scribner's panic	*Panicum oligosanthes* var. *scribnerianum*						x														
grass, slender wedge	*Sphenopholis obtusata* var. *major*						x														
grass, small love	*Eragrostis pectinacea*																				x
grass, smooth crab*	*Digitaria ischaemum**																				x
grass, squirrel-tail*	*Hordeum jubatum**																				x
grass, starved panic	*Panicum depauperatum*							x												x	
grass, stink*	*Eragrostis cilianensis**																				x
grass, sweet	*Hierochloe odorata*						x					x									
grass, tall oat*	*Arrhenatherum elatius**																				x
grass, three-awn	*Aristida intermedia*							x		x				x							
grass, three-awn	*Aristida longespica*							x		x											
grass, tickle	*Agrostis hyemalis*							x													
grass, weak blue - SE	***Poa laguida* - SE**	x																			
grass, white	*Leersia virginica*	x		x																	
grass, white-haired panic	*Panicum villosissimum*						x	x												x	
grass, wiry panic	*Panicum flexile*											x		x	x						
grass, woodland blue*	*Poa nemoralis**	x																			
grass, woodland brome	*Bromus pubescens*	x							x												
grass-of-parnassus	*Parnassia glauca*											x			x						
green-dragon	*Arisaema dracontium*	x		x																	
greenbrier, bristly	*Smilax hispida*	x	x																	x	
ground cherry, clammy	*Physalis heterophylla*	x						x													x
ground cherry, lance-leaved	*Physalis virginiana*		x							x											
ground cherry, smooth	*Physalis subglabrata*																				x
ground cherry, tall*	*Physalis longifolia**	x																			x
groundnut	*Apios americana*			x			x														
hawkweed, Canada	*Hieracium canadense*							x												x	
hawkweed, orange*	*Hieracium aurantiacum**							x													x
hawkweed, rough	*Hieracium scabrum*		x							x											
hawthorn, cock-spur	*Crataegus crus-galli*			x																	x
hawthorn, dotted	*Crataegus punctata*	x																			
hawthorn, downy	*Crataegus mollis*			x																	
hawthorn, fleshy	*Crataegus succulenta* (S&W 1994)	x																			
hawthorn, frosted	*Crataegus pruinosa*	x		x																	
hawthorn, large-seeded	*Crataegus flabellata* (S&W 1994)	x																			x
hazelnut	*Corylus americana*	x					x		x												

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			C
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	Cultural
Common name[3,4]	Scientific name[3,4,5]																				
heartease	*Polygonum lapathifolium*										x										
hedgenettle, rough	*Stachys tenuifolia* var. *hispida*			x			x														
hedgenettle, smooth	*Stachys tenuifolia*			x			x														
hemlock, bulb-bearing water	*Cicuta bulbifera*										x		x								
hemlock, water	*Cicuta maculata*										x		x								x
hemp*	*Cannabis sativa**																				x
hemp, Indian	*Apocynum cannabinum*						x														x
hemp, Indian	*Apocynum sibiricum*						x				x										
hepatica, sharp-leaved	*Hepatica nobilis* var. *acuta*	x																			
hickory, shagbark	*Carya ovata*	x							x												
highbush cranberry, European*	*Viburnum opulus**	x							x												x
hog-peanut, upland	*Amphicarpa bracteata*	x							x												
holly, Michigan	*Ilex verticillata*					x					x										
honeysuckle, amur*	*Lonicera maackii**	x		x																	x
honeysuckle, common fly*	*Lonicera* x *muendeniensis**	x																			
honeysuckle, dwarf	*Diervilla lonicera*	x																			
honeysuckle, Japanese*	*Lonicera japonica**	x																			x
honeysuckle, Morrow's*	*Lonicera morrowi**	x		x																	x
honeysuckle, red	*Lonicera dioica*	x								x											
honeysuckle, showy fly*	*Lonicera* x *bella**	x																			x
honeysuckle, Tartarian*	*Lonicera tatarica**	x							x												x
honeysuckle, yellow	*Lonicera prolifera*	x							x												
horehound, common water	*Lycopus americanus*										x		x	x							
horse-gentian, early	*Triosteum aurantiacum*	x							x												x
horse-gentian, late	*Triosteum perfoliatum*	x					x		x												
horse-nettle	*Solanum carolinense*																				x
horsemint	*Monarda punctata*		x			x		x		x											
horsetail, common	*Equisetum arvense*			x		x	x				x		x								x
horsetail, Joliet	*Equisetum x ferrissii*						x	x													x
horsetail, water	*Equisetum fluviatile*										x		x								
horseweed	*Conyza canadensis*						x											x			x
hound's tongue*	*Cynoglossum oficinale**																				x
huckleberry, black	*Gaylussacia baccata*		x			x															
hyacinth, wild	*Camassia scilloides*						x		x												
Indian-pipe	*Monotropa uniflora*	x																			
iris, yellow*	*Iris pseudacorus**										x										x
ironweed, common	*Vernonia fasciculata*						x						x								
ironwood	*Ostrya virginiana*	x																			
ivy, ground*	*Glechoma hederacea**			x																	x
jack-in-the-pulpit	*Arisaema triphyllum*	x		x																	
Joe-pye-weed, purple	*Eupatorium purpureum*	x																			
Joe-pye-weed, spotted	*Eupatorium maculatum*										x	x	x		x						

Appendix 1. Continued.

Common name[3,4]	Scientific name[3,4,5]	Class[1] / Sub-class[2]																					
		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Juneberry, running*	*Amelanchier stolonifera**																	x			
juniper, common - ST	***Juniperus communis* var. *depressa* - ST**	x						x												x	
juniper, trailing - SE	***Juniperus horizontalis* - SE**							x		x										x	
king devil*	*Hieracium caespitosum**																				x
knotweed, common*	*Polygonum aviculare**																				x
knotweed, erect	*Polygonum erectum*										x										
knotweed, Japanese*	*Polygonum cuspidatum**																				x
knotweed, slender	*Polygonum tenue*							x		x										x	
knotweed, Virginia	*Polygonum virginianum*	x		x																	
knotweed, water	*Polygonum amphibium*										x						x				x
ladies' tresses, Great Plains	*Spiranthes magnicamporum*						x	x													
ladies' tresses, nodding	*Spiranthes cernua*						x	x													
ladies' tresses, slender	*Spiranthes lacera*							x	x	x											
lady's slipper, large yellow	*Cypripedium calceolus* var. *pubescens*	x																			
lady's slipper, small yellow - SE	***Cypripedium calceolus* var. *parviflorum* (historical) - SE**											?									
lady's slipper, white - ST	***Cypripedium candidum* (historical) - ST**						x														
lady's-thumb*	*Polygonum persicaria**																				x
lamb's quarters*	*Chenopodium album**																				x
larch, American	*Larix laricina*																				x
larch, European*	*Larix decidua**																				x
leadplant	*Amorpha canescens*						x	x		x											
leek, wild	*Allium burdickii*	x																			
leek, wild	*Allium tricoccum*	x																			
lettuce, glaucous white	*Prenanthes racemosa*						x														
lettuce, prickly*	*Lactuca serriola**						x														x
lettuce, tall white	*Prenanthes altissima*	x																			
lettuce, western wild	*Lactuca ludoviciana* (extirpated?)						x														
lettuce, wild	*Lactuca canadensis*						x														x
lily, prairie	*Lilium philadelphicum* var. *andinum*						x	x													
lily, Turk's cap	*Lilium michiganense*	x					x		x			x									
lily-of-the-valley*	*Convallaria majalis**	x																			x
lily-of-the-valley, false	*Maianthemum canadense* v	x	x			x				x											
linden, little-leaf*	*Tilia cordata**																				x
lion's-foot	*Prenanthes alba*	x																			
lizard's-tail	*Saururus cernuus*			x							x										
lobelia, bog	*Lobelia kalmii*							x						x							
lobelia, great blue	*Lobelia siphilitica*			x							x		x								x
lobelia, pale spiked	*Lobelia spicata*						x	x	x												
locust, black*	*Robinia pseudoacacia**	x		x																	x
loosestrife*	*Lysimachia vulgaris**										x										x
loosestrife, false	*Ludwigia polycarpa*										x										
loosestrife, fringed	*Lysimachia ciliata*			x																	

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
loosestrife, purple*	*Lythrum salicaria**										x		x								x
loosestrife, tufted	*Lysimachia thyrsiflora*										x										
loosestrife, whorled	*Lysimachia quadrifolia*						x	x					x								
loosestrife, winged	*Lythrum alatum*						x				x										
lupine, wild	*Lupinus perennis*		x					x		x										x	
madder, wild	*Galium obtusum*						x				x		x								
maple, black	*Acer nigrum*	x																			
maple, hedge*	*Acer campestre**																				x
maple, Norway*	*Acer platanoides**	x																			x
maple, red	*Acer rubrum*	x				x															
maple, silver	*Acer saccharinum*			x																	
maple, sugar	*Acer saccharum*	x																			
marigold, marsh	*Caltha palustris*												x		x						
marigold, nodding bur	*Bidens cernua*										x		x								
marigold, tall swamp	*Bidens coronata*										x		x								
matrimony, common*	*Lycium barbarum**																				x
Mayapple	*Podophyllum peltatum*	x		x																	
meadowsweet	*Spiraea alba*						x	x			x		x								
medic, black*	*Medicago lupulina**																				x
mermaid, false	*Floerkea proserpinacoides*	x		x																	
mermaid-weed	*Proserpinaca palustris*																x				
milfoil, various-leaved water	*Myriophyllum heterophyllum*															x	x				
milfoil, whorled water	*Myriophyllum verticillatum* var. *pectinatum*															x	x				
milkweed, butterflyweed	*Asclepias tuberosa* ssp. *interior*						x	x		x											
milkweed, common	*Asclepias syriaca*						x														x
milkweed, oval - SE	***Asclepias ovalifolia* - SE**						x	x	x	x											
milkweed, poke	*Asclepias exaltata*	x																			
milkweed, purple	*Asclepias purpurascens*						x		x												
milkweed, sand	*Asclepias amplexicaulis*						x	x		x											x
milkweed, short green	*Asclepias viridiflora*						x														
milkweed, Sullivant's	*Asclepias sullivantii*						x														
milkweed, swamp	*Asclepias incarnata*						x				x		x								x
milkweed, tall green	*Asclepias hirtella*						x	x	x	x											
milkweed, whorled	*Asclepias verticillata*						x		x												x
milkwort, field	*Polygala sanguinea*						x	x													x
milkwort, purple	*Polygala polygama* var. *obtusata*							x													
milkwort, whorled	*Polygala verticillata*							x		x											
millet, broomcorn*	*Panicum miliaceum**																				x
mint, wild	*Mentha arvensis* var. *villosa*										x		x								
mitterwort	*Mitella diphylla*	x																			
mock orange*	*Philadelphus pubescens**																				x
mock orange, sweet*	*Philadelphus coronarius**																				x
moneywort*	*Lysimachia nummularia**			x																	x
monkeyflower	*Mimulus ringens*										x		x								

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
moonseed	*Menispermum canadense*	x		x																	
motherwort*	*Leonurus cardiaca**																				x
mountain-mint, common	*Pycnanthemum virginianum*						x				x	x	x								x
mountain-mint, hairy	*Pycnanthemum pilosum*	x							x												
mountain-mint, slender	*Pycnanthemum tenuifolium*						x	x	x	x											
mulberry, white*	*Morus alba**	x																			x
mullein, common*	*Verbascum thapsus**						x														x
mustard, black*	*Brassica nigra**																				x
mustard, garlic*	*Alliaria petiolata**	x	x	x	x	x			x												
mustard, hedge*	*Sisymbrium officinale**																				x
mustard, Indian*	*Brassica juncea**																				x
mustard, tumble*	*Sisymbrium altissimum**																				x
naiad	*Najas guadalupensis*																x				
nannyberry	*Viburnum lentago*	x																			
nettle, false	*Boehmeria cylindrica*			x							x		x								
nettle, tall	*Urtica dioica*			x							x		x								
nettle, tall	*Urtica procera* (S&W 1994)			x							x										x
nettle, wood	*Laportea canadensis*	x		x																	
nightshade, bittersweet*	*Solanum dulcamara**			x							x		x								x
nightshade, black	*Solanum ptycanthum*	x																			x
nightshade, enchanter's	*Circaea lutetiana* var. *canadensis*	x		x																	
ninebark	*Physocarpus opulifolius*	x																			
nipplewort*	*Lapsana communis**																				x
nut rush, low	*Scleria verticillata*													x							
nut rush, tall	*Scleria triglomerata*						x	x			x										
nut-sedge, field	*Cyperus esculentus*										x										x
nut-sedge, long-scaled	*Cyperus strigosus*										x										
nut-sedge, red-rooted	*Cyperus erythrorhizos*																				x
nut-sedge, rough sand	*Cyperus schweinitzii*							x		x										x	
nut-sedge, rusty	*Cyperus ferruginescens*										x						x				
nut-sedge, slender sand	*Cyperus filiculmis*							x		x										x	
oak, black	*Quercus velutina*	x	x						x	x										x	
oak, bur	*Quercus macrocarpa*	x		x					x												
oak, Hill's	*Quercus ellipsoidalis*	x				x			x	x											
oak, Jerusalem*	*Chenopodium botrys**																				x
oak, pin	*Quercus palustris*			x		x			x												
oak, red	*Quercus rubra*	x																			
oak, swamp white	*Quercus bicolor*	x		x	x																
oak, white	*Quercus alba*	x							x												
oats, wild*	*Avena sativa**																				x
olive, autumn*	*Elaeagnus umbellatus**						x														x
onion, nodding wild	*Allium cernuum*						x	x				x									x
orange, Osage*	*Maclura pomifera**	x		x																	x
orchid, club-spur - SE	***Platanthera clavellata*- SE**					x		x		x											

Appendix 1. *Continued.*

Common name[3,4]	Scientific name[3,4,5]	Class[1] / Sub-class[2]	Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
			Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
orchid, grass pink - SE	***Calopogon tuberosus* - SE**								x													
orchid, helleborine*	*Epipactis helleborine**		x		x																	
orchid, northern bog	*Platanthera hyperborea* var. *huronensis*												x			x						
orchid, prairie white-fringed - SE, FT	***Platanthera leucophaea* - SE, FT**							x	x			x		x								
orchid, purple-fringed-SE	***Platanthera psycodes*- SE**					x			x													
orchid, snake-mouth - SE	***Pogonia ophioglossoides* - SE (extirpated?)**														?							
orchid, tubercled - SE	***Platanthera flava* var. *herbiola* - SE**						x		x		x											
orchid, white bog	*Platanthera dilatata*												x									
paintbrush, Indian	*Castilleja coccinea*							x	x	x	x										x	
painted cup, downy yellow - SE	***Castilleja sessiliflora* - SE**								x		x										x	
panicum, fall	*Panicum dichotomiflorum*																					x
parsnip, cow	*Heracleum lanatum*				x																	x
parsnip, heart-leaved meado	*Zizia aptera*							x														
parsnip, purple meadow	*Thaspium trifoliatum*				x			x		x												
parsnip, water	*Sium suave*											x		x								
parsnip, wild*	*Pastinaca sativa**							x														x
pea, beach - SE	***Lathyrus japonicus* var. *glaber* (reintroduced) - SE**																			x	?	
pea, partridge	*Cassia fasciculata*							x	x	x	x											x
pea, scurfy	*Psoralea tenuifolia*							x														
pea, veiny	*Lathyrus venosus* var. *intonsus*							x		x												
pellitory	*Parietaria pensylvanica*				x																	x
pennyroyal, American	*Hedeoma pulegioides*		x							x												
pennyroyal, false	*Trichostema brachiatum*							x														x
pepper, mild water	*Polygonum hydropiperoides*				x							x										x
pepper, water*	*Polygonum hydropiper**				x							x					x	x				x
peppergrass, common	*Lepidium virginicum*								x		x											x
peppergrass, small*	*Lepidium densiflorum**																					x
periwinkle, common*	*Vinca minor**							x														x
phlox, cleft	*Phlox bifida*								x		x										x	
phlox, prairie	*Phlox pilosa*			x				x	x	x	x											
phlox, prairie	*Phlox pilosa* ssp. *fulgida*							x														
phlox, smooth	*Phlox glaberrima* ssp. *interior*							x	x			x	x	x								
phlox, woodland	*Phlox divaricata*		x		x																	
pickerel weed	*Pontederia cordata*																x	x				
pigweed, rough*	*Amaranthus retroflexus**																					x
pigweed, winged	*Cycloloma atriplicifolium*								x											x		
pimpernel, yellow	*Taenidia integerrima*		x							x												
pine, Austrian*	*Pinus nigra**																					x
pine, jack - SE	***Pinus banksiana* - SE**										x										x	
pine, pitch*	*Pinus rigida**																					x
pine, red	*Pinus resinosa* (extirpated in wild)		x																			
pine, Scots*	*Pinus sylvestris**								x		x											x

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
pine, white	*Pinus strobus*	x																			x
pineapple weed*	*Matricaria matricarioides**																				x
pink, deptford*	*Dianthus armeria**																				x
pinweed, bushy	*Lechea stricta*							x												x	
pinweed, hairy	*Lechea villosa*							x													x
pinweed, pretty	*Lechea pulchella*					x		x		x											
pinweed, savanna - ST	***Lechea intermedia* - ST**							x													
pinweed, slender-leaved	*Lechea tenuifolia*									x											
plantain, common*	*Plantago major**						x														x
plantain, English*	*Plantago lanceolata**						x														x
plantain, prairie Indian	*Cacalia plantaginea*						x	x		x											x
plantain, red-stalked	*Plantago rugelii*	x					x														x
plantain, robin's	*Erigeron pulchellus*					x		x												x	
plantain, whorled*	*Plantago arenaria**																				x
plum, American	*Prunus americana*	x					x														x
poison-ivy	*Toxicodendron radicans*	x	x	x	x	x	x		x												x
pondweed, common	*Potamogeton natans*																x				
pondweed, fennel-leaved	*Potamogeton pectinatus*																x				
pondweed, flat-stemmed	*Potamogeton zosteriformis*																x				
pondweed, Illinois	*Potamogeton illinoensis*																x				
pondweed, large-leaved	*Potamogeton amplifolius*																x				
pondweed, leafy	*Potamogeton foliosus*																x				
pondweed, Richardson's	*Potamogeton richardsonii*																x				
poplar, balsam - SE	***Populus balsamifera* - SE**																			x	x
poplar, gray*	*Populus* x *canescens**																				x
poplar, Lombardy*	*Populus nigra* var. *italica**																				x
poplar, white*	*Populus alba**																				x
prairie-clover, purple	*Dalea purpurea*						x	x	x	x									x		
prairie-clover, white	*Dalea candida*						x	x	x	x											
prickly-ash	*Zanthoxylum americanum*	x		x																	
privet, common*	*Ligustrum vulgare**	x																			x
puccoon, hairy	*Lithospermum caroliniense*							x		x										x	
puccoon, hoary	*Lithospermum canescens*						x	x													
puccoon, yellow	*Lithospermum incisum*							x		x										x	
puncture-vine*	*Tribulus terrestris**																				x
purpletop, common	*Tridens flavus*																				x
purse, sheperd's*	*Capsella bursa-pastoris**																				x
purslane*	*Portulaca oleracea**																				x
purslane, marsh	*Ludwigia palustris* var. *americana*										x						x				
pussytoes	*Antennaria plantaginifolia*	x					x	x													
ragweed, common	*Ambrosia artemisiifolia*						x						x								x
ragweed, giant	*Ambrosia trifida*																				x
ragweed, western*	*Ambrosia pilostachya* var. *coronopifolia** (S&W 1994)																				x
ragwort, balsam	*Senecio pauperculus*						x	x													x
ragwort, golden	*Senecio aureus*						x				x										x

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
ragwort, prairie	*Senecio plattensis*						x														
raspberry, black	*Rubus occidentalis*	x		x																	
raspberry, cultivated*	*Rubus idaeus**										x										
raspberry, dwarf - ST	***Rubus pubescens* - ST**				x							x									
raspberry, purple flowering - SE	***Rubus odoratus* - SE**	x																			
raspberry, red	*Rubus strigosus*											x			x						
rattlesnake-master	*Eryngium yuccifolium*						x														x
redtop	*Agrostis alba*						x		x	x			x								x
reed, common	*Phragmites australis*										x										x
reed, common wood	*Cinna arundinacea*			x	x				x												
reed, sand	*Calamovilfa longifolia*							x		x										x	
rice, wild	*Zizania aquatica*										x					x					
rocket, Dame's*	*Hesperis matronalis**	x		x																	x
rocket, sea - ST	***Cakile edentula* ssp. *lacustris* - ST**																		x	x	
rocket, yellow*	*Barbarea vulgaris**																				x
rockrose	*Helianthemum bicknellii*							x		x											
rockrose, common	*Helianthemum canadense*							x		x											
rose, Illinois	*Rosa setigera*	x				x	x														
rose, multiflora*	*Rosa multiflora**	x					x														x
rose, pasture	*Rosa blanda*						x				x	x									
rose, pasture	*Rosa carolina*	x	x				x	x	x	x										x	
rose, swamp	*Rosa palustris*										x										
rosinweed	*Silphium integrifolium*						x		x												
rue, early meadow	*Thalictrum dioicum*	x																?			
rue, purple meadow	*Thalictrum dasycarpum*					x	x				x	x									
rue, waxy meadow	*Thalictrum revolutum*	x					x					x							x		x
rue-anemone	*Thalictrum thalictroides*	x							x												
rush, Canadian	*Juncus canadensis*					x					x				x						
rush, chairmaker's	*Scirpus americanus*										x		x								x
rush, Dudley's	*Juncus dudleyi*						x				x		x	x							
rush, Greene's	*Juncus greenei*							x													
rush, inland	*Juncus interior*						x														x
rush, joint	*Juncus nodosus*													x	x						
rush, lake shore	*Juncus balticus* var. *littoralis*													x							
rush, path	*Juncus tenuis*	x									x										
rush, Richardson's - SE	***Juncus alpinus* - SE**													x			x				
rush, sharp-fruited	*Juncus acuminatus*																				
rush, short-headed	*Juncus brachycephalus*													x	x						
rush, toad	*Juncus bufonius*							x			x										x
rush, Torrey's	*Juncus torreyi*										x		x								x
rush, twig	*Cladium mariscoides*											x		x							
rye*	*Secale cereale**																				x
rye, riverbank wild	*Elymus riparius*			x																	
sandbur, mat	*Cenchrus longispinus*							x													x

Appendix 1. Continued.

Common name[3,4]	Scientific name[3,4,5]	Class[1] / Sub-class[2]	Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
			Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
sandwort, blunt-leaved	*Moehringia lateriflora*		x							x												
sandwort, stiff	*Minuartia stricta*								x		x										x	
sandwort, thyme-leaved*	*Arenaria serpyllifolia**																					x
sarsaparilla, wild	*Aralia nudicaulis*			x					x													
scouring rush	*Equisetum hyemale* var. *affine*				x							x										x
scouring rush, smooth	*Equisetum laevigatum*								x		x	x		x							x	
scouring rush, variegated	*Equisetum variegatum*								x													
sedge, awl-fruited oval	*Carex tribuloides*											x										
sedge, Bebb's oval	*Carex bebbii*							x														
sedge, beech wood	*Carex laxiflora*				x																	
sedge, bent bracted	*Carex retroflexa*		x		x																	
sedge, bristly	*Carex comosa*													x								
sedge, broad-leaved woolly	*Carex lanuginosa*											x		x								
sedge, brown-headed fox	*Carex alopecoidea*				x									x								
sedge, chestnut	*Fimbristyis puberula* var. *drummondii*								x													
sedge, common bur	*Carex grayi*				x	x																
sedge, common fox	*Carex stipata*				x							x		x								
sedge, common hop	*Carex lupulina*					x						x										
sedge, common lake	*Carex lacustris*											x		x								x
sedge, common wood	*Carex blanda*		x		x					x												
sedge, common yellow lake - ST	***Carex rostrata* var. *utriculata* (historical?) -**											x										
sedge, Crawford's oval - SE	***Carex crawfordii* - SE**											x										
sedge, crested oval	*Carex cristatella*							x				x		x								x
sedge, crowfoot fox	*Carex crus-corvi*					x						x										
sedge, curly-styled wood	*Carex rosea*		x																			
sedge, dark-scaled	*Carex buxbaumii*							x						x								
sedge, downy green	*Carex swanii*		x				x															
sedge, early fen	*Carex crawei*							x	x				x									
sedge, early oak	*Carex umbellata*								x		x											
sedge, early prairie	*Carex richardsonii*								x		x										x	
sedge, expressway*	*Carex praegracilis**																					x
sedge, false golden - SE	***Carex garberi* - SE**							x							x							
sedge, fen star	*Carex sterilis*												x			x						
sedge, fescue oval	*Carex festucacea*		x		x	x																
sedge, field oval	*Carex molesta*							x														x
sedge, fox	*Carex vulpinoidea*							x				x		x								x
sedge, golden - SE	***Carex aurea* - SE**							x														
sedge, graceful	*Carex gracillima*		x																			
sedge, green yellow - ST	***Carex viridula* - ST**														x			x				
sedge, hairy	*Bulbostylis capillaris*								x		x											x
sedge, hairy	*Carex hirtifolia*		x							x												
sedge, hairy green	*Carex hirsutella*		x							x												
sedge, hairy lake	*Carex atherodes*							x				x		x								

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
sedge, hairy-fruited lake	*Carex trichocarpa*										x										
sedge, James' grass	*Carex jamesii*	x																			x
sedge, knobbed hop	*Carex lupuliformis*				x						x		x								
sedge, large yellow fox	*Carex annectens*						x				x		x								x
sedge, long-bracted tussock	*Carex substricta*																				
sedge, long-scaled tussock	*Carex haydenii*										x		x								
sedge, loose-headed bracted	*Carex sparganioides*	x		x																	
sedge, Mead's	*Carex meadii*						x														
sedge, Muskingum River	*Carex muskingumensis*			x																	
sedge, narrow-leaved cattail	*Carex squarrosa*				x																
sedge, narrow-leaved oval	*Carex tenera*	x					x				x		x								
sedge, narrow-leaved woolly	*Carex lasiocarpa*										x		x								
sedge, pale	*Carex granularis*			x			x		x												
sedge, Pennsylvania	*Carex pensylvanica*	x	x				x		x	x											
sedge, plains oval	*Carex brevior*						x														
sedge, porcupine	*Carex hystericina*											x			x						
sedge, prairie gray	*Carex conoidea*												x								
sedge, prairie star	*Carex interior*											x			x						
sedge, running marsh	*Carex sartwellii*										x		x								
sedge, running prairie	*Carex tetanica*						x														
sedge, running savanna	*Carex foenea*							x		x											
sedge, sand bracted	*Carex muhlenbergii*							x		x											
sedge, shining bur - ST	***Carex intumescens* - ST**			?	x																
sedge, Short's	*Carex shortiana*			x																	
sedge, short-leaved bracted	*Carex cephalophora*	x					x		x												
sedge, slender wood	*Carex gracilescens*	x							x												
sedge, small yellow fox	*Carex annectens* var. *xanthocarpa*						x				x		x								x
sedge, smooth clustered	*Carex aggregata*	x							x												
sedge, spreading oval	*Carex normalis*	x		x			x														
sedge, straight-styled wood	*Carex radiata*			x	x																
sedge, three-seeded bog	*Carex trisperma*													?							
sedge, three-way	*Dulichium arundinaceum*										x										
sedge, tufted lake	*Carex vesicaria*										x										
sedge, tussock	*Carex stricta*										x		x								
sedge, wedge-fruited oval	*Carex suberecta*											x			x						
sedge, wood gray	*Carex grisea*			x																	
self-heal	*Prunella vulgaris* var. *elongata*	x					x														x
self-heal, lawn*	*Prunella vulgaris**	x					x														x
serviceberry	*Amelanchier arborea*	x																			
serviceberry, round-leaved - SE	***Amelanchier sanguinea* - SE**	x																			
shadbush, low	*Amelanchier humilis*																	x			
shadbush, low	*Amelanchier laevis*	x																			

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
shinleaf	*Pyrola elliptica*	x																			
shooting-star	*Dodecatheon meadia*	x					x	x	x												
sida, prickly*	*Sida spinosa**																				x
silverweed	*Potentilla anserina*							x											x	x	
skullcap, mad-dog	*Scutellaria lateriflora*			x							x		x								x
skullcap, marsh	*Scutellaria galericulata*										x		x								
skullcap, small	*Scutellaria leonardii*						x														
skullcap, small	*Scutellaria parvula*						x														
skunk cabbage	*Symplocarpus foetidus*											x			x						
smartweed, common	*Polygonum pensylvanicum*										x		x								
smartweed, creeping*	*Polygonum cespitosum* var. *longisetum**																				x
smartweed, spotted	*Polygonum punctatum*			x		x					x										
snakeroot, black	*Sanicula gregaria*	x				x															
snakeroot, sanicle black	*Sanicula marilandica*	x																			
snakeroot, seneca	*Polygala senega*						x														
snakeroot, white	*Eupatorium rugosum*	x																			x
snapdragon, dwarf*	*Chaenorrhinum minus**																				x
sneezeweed	*Helenium autumnale*										x										
snowberry - SE	***Symphoricarpos albus* - SE (adventive?)**	x																			
Soloman's seal, false	*Smilacina racemosa*	x							x												
Solomon's seal, downy - SE	***Polygonatum pubescens* - SE**	x																			
Solomon's seal, great	*Polygonatum commutatum*	x		x																	
Solomon's seal, starry false	*Smilacina stellata*	x	x			x	x	x	x	x			x								
sorrel, field*	*Rumex acetosella**							x		x											x
sow-thistle, common*	*Sonchus arvensis* var. *glabrescens**																				x
sow-thistle, field*	*Sonchus arvensis**																				x
sow-thistle, spiny*	*Sonchus asper**						x														x
speedwell, marsh - ST	*Veronica scutellata* - **ST**										x										
speedwell, thyme-leaved*	*Veronica serpyllifolia**																				x
speedwell, water	*Veronica catenata*										x					x	x				x
spicebush	*Lindera benzoin*	x				x															
spiderwort, broad-leaved	*Tradescantia subaspera*			x																	
spiderwort, common	*Tradescantia ohiensis*						x	x	x	x											x
spike-rush, blunt	*Eleocharis obtusa*										x										
spike-rush, golden-seeded	*Eleocharis elliptica* var. *compressa*										x										
spike-rush, golden-stemmed	*Eleocharis elliptica*										x			x							
spike-rush, marsh	*Eleocharis smallii*										x										
spike-rush, matted	*Eleocharis intermedia*										x										x
spike-rush, needle	*Eleocharis acicularis*										x										
spike-rush, red-rooted	*Eleocharis erythropoda*						x				x		x	x							
spike-rush, wrinkled-sheathed - SE	***Eleocharis olivacea* - SE**													x							
spikenard, American	*Aralia racemosa*	x																			

Appendix 1. Continued.

Class[1]		Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
Sub-class[2]		Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
Common name[3,4]	Scientific name[3,4,5]																				
spindle-tree, European*	*Euonymus europaeus**	x																			x
spring-beauty	*Claytonia virginica*	x																			
spurge, cypress*	*Euphorbia cyparissias**																				x
spurge, flowering	*Euphorbia corollata*	x					x	x	x	x											
spurge, leafy*	*Euphorbia esula**																				x
spurge, nodding	*Chamaesyce maculata*							x													x
spurge, seaside - SE	***Chamaesyce polygonifolia* - SE**																		x		
spurge, toothed	*Poinsettia dentata*							x		x											x
spurge, wart*	*Euphorbia helioscopia**																				x
squill, Siberian*	*Scilla sibirica**	x																			
St. John's wort, Canadian	*Hypericum canadense*							x			x										
St. John's wort, common*	*Hypericum perforatum**						x														x
St. John's wort, Kalm's-SE	***Hypericum kalmianum* - SE**					x		x												x	
St. John's wort, marsh	*Triadenum fraseri*										x			x							
St. John's wort, marsh	*Triadenum virginicum*													x							
St. John's wort, sand	*Hypericum majus*							x			x			x							
St. John's wort, shrubby	*Hypericum prolificum*									x										x	
St. John's wort, spotted	*Hypericum punctatum*	x																			x
star-grass, yellow	*Hypoxis hirsuta*						x		x												
stickseed	*Hackelia virginiana*	x		x																	
stitchwort	*Stellaria longifolia*			x							x										
stonecrop, ditch	*Penthorum sedoides*										x										x
strawberry, wild	*Fragaria virginiana*	x					x		x	x											x
sumac, shining	*Rhus copallina*						x	x	x	x											x
sumac, smooth	*Rhus glabra*	x					x	x	x	x											x
sumac, staghorn	*Rhus typhina*	x					x														x
sundew, round-leaved-SE	***Drosera rotundifolia* - SE**							x						x							
sundrops, prairie	*Oenothera pilosella*						x														
sundrops, small - ST	***Oenothera perennis* - ST**						x														x
sunflower, bristly	*Helianthus hirsutus*	x							x												
sunflower, false	*Heliopsis helianthoides*						x		x												
sunflower, garden*	*Helianthus annuus**																				x
sunflower, pale	*Helianthus decapetalus*	x																			
sunflower, pale-leaved	*Helianthus strumosus*			x			x														x
sunflower, petioled*	*Helianthus petiolaris**							x													x
sunflower, prairie	*Helianthus rigidus*						x		x												
sunflower, sawtooth	*Helianthus grosseserratus*						x				x		x								x
sunflower, western	*Helianthus occidentalis*							x		x										x	
sunflower, woodland	*Helianthus divaricatus*	x							x												
Susan, black-eyed	*Rudbeckia hirta*						x	x	x	x											
Susan, brown-eyed	*Rudbeckia triloba*			x									x								x
Susan, sweet black-eyed	*Rudbeckia subtomentosa*			x			x	x													
sweet flag	*Acorus americanus*										x		x								
sweet-cicely, smooth	*Osmorhiza longistylis*	x		x																	
tansy, common*	*Tanacetum vulgare**																				x

Appendix 1. Continued.

Common name[3,4]	Scientific name[3,4,5]	Class[1] / Sub-class[2]	Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
			Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
tea, inland New Jersey-SE	***Ceanothus herbaceus* - SE**								x		x										x	
tea, New Jersey	*Ceanothus americanus*							x	x	x	x											
tear-thumb, arrow-leaved	*Polygonum sagittatum*											x										
teasel, common*	*Dipsacus sylvestris**																					x
teasel, cut-leaved*	*Dipsacus laciniatus**							x														x
thimbleweed	*Anemone cylindrica*							x	x	x	x											
thistle, bull*	*Cirsium vulgare**							x														x
thistle, dune - ST, FT	***Cirsium pitcheri* - ST, FT**																				x	
thistle, field*	*Cirsium arvense**							x														x
thistle, musk*	*Carduus nutans**																					x
thistle, pasture	*Cirsium discolor*							x														x
thistle, Russian*	*Salsola iberica**								x											x		x
thistle, swamp	*Cirsium muticum*						x						x									
three-seeded mercury	*Acalypha rhomboidea*				x																	x
tick-trefoil, bracted	*Desmodium cuspidatum*	x																				
tick-trefoil, Illinois	*Desmodium illinoense*							x	x													
tick-trefoil, panicled	*Desmodium paniculatum*	x								x												
tick-trefoil, pointed	*Desmodium glutinosum*	x								x												
tick-trefoil, showy	*Desmodium canadense*							x	x													
timothy*	*Phleum pratense**							x														x
timothy, upland wild*	*Muhlenbergia racemosa**																					x
toadflax, false	*Comandra umbellata*							x	x	x	x											
toothwort	*Dentaria laciniata*	x		x																		
touch-me-not, pale	*Impatiens pallida*	x		x																		
touch-me-not, spotted	*Impatiens capensis*	x		x										x								
tree, wayfaring*	*Viburnum lantana**	x																				x
tree-of-heaven*	*Ailanthus altissima**																					x
trefoil, birdsfoot*	*Lotus corniculatus**																					x
trillium, declined	*Trillium flexipes*	x																				
trillium, large-flowered	*Trillium grandiflorum*	x																				
trillium, red	*Trillium recurvatum*	x								x												
trout lily, white	*Erythronium albidum*	x																				
trout lily, yellow	*Erythronium americanum*	x																				
tumbleweed	*Amaranthus albus*																					x
turtlehead, white	*Chelone glabra*												x			x						
twayblade, green	*Liparis loeselii*													x								
valerian	*Valeriana edulis* var. *ciliata*							x														
velvet leaf*	*Abutilon theophrasti**							x														x
vervain, blue	*Verbena hastata*							x				x		x								x
vervain, creeping	*Verbena bracteata*																					x
vervain, hoary	*Verbena stricta*							x	x													x
vervain, narrow-leaved	*Verbena simplex*							x														
vetch, American	*Vicia americana*							x		x												x
vetch, Canadian milk	*Astragalus canadensis*							x	x	x	x											
vetch, crown*	*Coronilla varia**																					x

Appendix 1. Continued.

Common name[3,4]	Scientific name[3,4,5]	Class[1] / Sub-class[2]	Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
			Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
vetch, wood	*Vicia caroliniana*		x																			
vetchling, marsh	*Lathyrus palustris*							x				x	x	x		x						
vetchling, marsh	*Lathyrus palustris* var. *myrtifolius*							x				x	x	x		x						
vetchling, pale - ST	***Lathyrus ochroleucus* - ST**		x							x												
violet, arrow-leaved	*Viola sagittata*								x		x											
violet, bird's foot	*Viola pedata*										x											
violet, common blue	*Viola pratincola*		x		x																	x
violet, dog - ST	***Viola conspersa* - ST**		x		x	x																
violet, downy yellow	*Viola pubescens*		x																			
violet, hairy white - SE	***Viola incognita* - SE**		x		x																	
violet, northern bog	*Viola nephrophylla*											x	x		?							
violet, prairie	*Viola pedatifida*							x														
violet, woodland blue	*Viola affinis*				x			x														
violet, woolly blue	*Viola sororia*		x		x																	x
Virginia creeper	*Parthenocissus quinquefolia*		x					x														
wall rocket*	*Diplotaxis muralis**																					x
walnut, black	*Juglans nigra*		x		x																	
water plantain	*Alisma plantago-aquatica* var. *americanum*											x		x								
water plantain, common	*Alisma plantago-aquatica* var. *parviflorum*											x		x	x							
water-lily	*Nuphar luteum* ssp. *variegatum*											x					x	x				
water-lily, white	*Nymphaea tuberosa*											x					x	x				
water-lily, yellow	*Nuphar luteum* ssp. *macrophyllum*											x					x	x				
watercress*	*Nasturtium officinale**																x					x
waterhemp, tall	*Amaranthus tuberculatus*											x					x	x				x
waterhorehound, stalked	*Lycopus rubellus*											x										
waterleaf, Virginia	*Hydrophyllum virginianum*		x		x					x												
waterweed	*Elodea canadensis*																x					
waterweed, slender	*Elodea nuttallii*											x										
wheat*	*Triticum aestivum**																					x
wild licorice, smooth	*Galium circaezans*		x																			
wild rye, silky	*Elymus villosus*		x		x																	
wild timothy, marsh	*Muhlenbergia glomerata*												x									
wild-indigo, cream	*Baptisia leucophaea*						x	x	x	x	x											
wild-indigo, white	*Baptisia lactea*							x		x	x											
wild-quinine	*Parthenium integrifolium*							x		x												
wild-rye, Canada	*Elymus canadensis*							x	x	x	x											x
wild-rye, Virginia	*Elymus virginicus*		x		x			x		x												
willow, autumn	*Salix serissima*											x	x									
willow, bay-leaved*	*Salix pentandra**											x					x					
willow, Bebb	*Salix bebbiana*														x						x	
willow, black	*Salix nigra*				x							x					x					x
willow, blue-leaved	*Salix glaucophylloides* var. *glaucophylla*							x	x			x									x	x
willow, bog	*Salix pedicellaris*												x								x	
willow, crack*	*Salix fragilis**											x										x
willow, heart-leaved	*Salix rigida*				x							x										

Appendix 1. Continued.

Common name[3,4]	Scientific name[3,4,5]	Class[1] / Sub-class[2]	Forest					Prairie		Savanna		Wetland					Strm	L/P	Primary			Cultural
			Upland	Sand	Floodplain	Northern Flatwoods	Sand Flatwoods	Prairie	Sand	Savanna	Sand	Marsh	Graminoid Fen	Sedge Meadow	Panne	Seep	Creek/River	Pond	Eroding Bluff	Beach	Foredune	
willow, peach-leaved	*Salix amygdaloides*				x							x					x					x
willow, petioled	*Salix petiolaris*							x	x			x		x								
willow, prairie	*Salix humilis*							x	x	x	x										x	
willow, pussy	*Salix discolor*							x				x		x								
willow, sage	*Salix candida*								x				x		x						x	
willow, sand-dune - SE	***Salix syrticola* - SE**								x			x			x						x	
willow, sandbar	*Salix exigua*				x							x					x			x		x
willow, shining	*Salix lucida*											x		x		x						
willow, silky	*Salix sericea*														x						?	
willow, white*	*Salix alba**											x										x
willow-herb, cinnamon	*Epilobium coloratum*											x		x								
willow-herb, fen	*Epilobium leptophyllum*												x	x								
willow-herb, great	*Epilobium angustifolium*																				x	
willow-herb, northern	*Epilobium ciliatum*											x				x						
wineberry*	*Rubus phoenicolasius**																					x
winged euonymus*	*Euonymus alatus**	x																				x
witchhazel	*Hamamelis virginiana*	x																				
wood rush, common	*Luzula multiflora*	x							x													
wood sorrel, common	*Oxalis dillenii*	x																				x
wood-sorrel, common	*Oxalis stricta*	x																				x
wood-sorrel, violet	*Oxalis violacea*	x						x														
wool grass	*Scirpus cyperinus*											x		x								
wormseed, American*	*Chenopodium ambrosioides**																					x
wormwood, beach	*Artemisia campestris*								x		x										x	
woundwort	*Stachys palustris* var. *homotricha*							x				x		x								
yam, wild	*Dioscorea villosa*	x								x												
yarrow*	*Achillea millefolium**							x													x	x
yew, Canada	*Taxus canadensis*	x																				

[1] Strm = Stream Class, L/P = Land and Pond Class

[2] x = occurrence of species

[3] Bold type indicates an Illinois Endangered (SE), Illinois Threatened (ST), and/or Federally Threatened (FT) species.

[4] An asterisk (*) indicates introduced, non-native species.

[5] "S&W 1994" referes to Swink and Wilhelm (1994). Plants of the Chicago Region.

Appendix 2

Incomplete list of vascular plants known from the Chicago River/Lake Shore Assessment Area (from Appendix 1), sorted by scientific name.

Scientific Name[2, 3]	Common Name[2, 3]
*Abutilon theophrasti**	velvet leaf*
Acalypha rhomboidea	three-seeded mercury
*Acer campestre**	maple, hedge*
Acer negundo	boxelder
Acer nigrum	maple, black
*Acer platanoides**	maple, Norway*
Acer rubrum	maple, red
Acer saccharinum	maple, silver
Acer saccharum	maple, sugar
*Achillea millefolium**	yarrow*
Acorus americanus	sweet flag
Actaea pachypoda	baneberry, white
Actaea rubra	baneberry, red
Adiantum pedatum	fern, maidenhair
*Aegopodium podagraria**	goutweed*
Agalinis paupercula	foxglove, false
Agalinis purpurea	foxglove, purple false
***Agalinis skinneriana* - ST**	**foxglove, pale false-ST**
Agalinis tenuifolia	foxglove, slender false
Agrimonia gryposepala	agrimony, tall
Agrimonia pubescens	agrimony, soft
*Agropyron repens**	grass, quack*
***Agropyron trachycaulum* var. *unilaterale* - SE**	**grass, bearded wheat - SE**
Agrostis alba	redtop
Agrostis alba var. *palustris*	grass, creeping bent
Agrostis hyemalis	grass, tickle
Agrostis perennans	grass, autumn bent
*Ailanthus altissima**	tree-of-heaven*
*Ajuga reptans**	carpet bugle*
Aletris farinosa	colic-root
Alisma plantago-aquatica var. *americanum*	water plantain
Alisma plantago-aquatica var. *parviflorum*	water plantain, common
*Alliaria petiolata**	mustard, garlic*
Allium burdickii	leek, wild
Allium canadense	garlic, wild
Allium cernuum	onion, nodding wild
*Allium sativum**	garlic*
Allium tricoccum	leek, wild
*Alnus glutinosa**	alder, black*
***Alnus incana* ssp. *rugosa*-SE**	**alder, speckled - SE**
*Alopecurus pratensis**	foxtail, meadow*
Amaranthus albus	tumbleweed
*Amaranthus graecizans**	amaranth, prostrate*
*Amaranthus hybridus**	amaranth, green*
*Amaranthus retroflexus**	pigweed, rough*
Amaranthus tuberculatus	waterhemp, tall
Ambrosia artemisiifolia	ragweed, common
Ambrosia pilostachya var. *coronopifolia**	ragweed, western*
Ambrosia trifida	ragweed, giant
Amelanchier arborea	serviceberry
Amelanchier humilis	shadbush, low
Amelanchier laevis	shadbush, low
***Amelanchier sanguinea*-SE**	**serviceberry, round-leaved - SE**
*Amelanchier stolonifera**	Juneberry, running*
***Ammophila breviligulata*-SE**	**grass, beach - SE**
Amorpha canescens	leadplant
Amphicarpa bracteata	hog-peanut, upland
Andropogon gerardii	bluestem, big
Anemone canadensis	anemone, meadow
Anemone caroliniana	anemone, Carolina
Anemone cylindrica	thimbleweed
Anemone quinquefolia	anemone, wood
Anemone virginiana	anemone, tall
Antennaria neglecta	cat's-foot
Antennaria plantaginifolia	pussytoes
*Anthemis cotula**	fennel, dog*
Apios americana	groundnut
Apocynum androsaemifolium	dogbane, spreading
Apocynum cannabinum	hemp, Indian
Apocynum sibiricum	hemp, Indian
Apocynum x medium	dogbane, intermediate
Aquilegia canadensis	columbine
Arabis laevigata	cress, smooth bank
Arabis lyrata	cress, sand
Aralia nudicaulis	sarsaparilla, wild
Aralia racemosa	spikenard, American
*Arctium minus**	burdock, common*
***Arctostaphylos uva-ursi* var. *coactilis* - SE**	**bearberry - SE**

Appendix 2. Continued.

Scientific Name[2, 3]	Common Name[2, 3]
*Arenaria serpyllifolia**	sandwort, thyme-leaved*
Arisaema dracontium	green-dragon
Arisaema triphyllum	jack-in-the-pulpit
Aristida intermedia	grass, three-awn
Aristida longespica	grass, three-awn
Aristida oligantha	grass, plains three-awn
Aristida purpurascens	arrowfeather
Aristida tuberculosa	grass, needle
Aronia melanocarpa	chokeberry, black
Aronia prunifolia	chokeberry, purple
*Arrhenatherum elatius**	grass, tall oat*
Artemisia campestris	wormwood, beach
Asarum canadense	ginger, wild
Asclepias amplexicaulis	milkweed, sand
Asclepias exaltata	milkweed, poke
Asclepias hirtella	milkweed, tall green
Asclepias incarnata	milkweed, swamp
***Asclepias ovalifolia* - SE**	**milkweed, oval - SE**
Asclepias purpurascens	milkweed, purple
Asclepias sullivantii	milkweed, Sullivant's
Asclepias syriaca	milkweed, common
Asclepias tuberosa ssp. *interior*	milkweed, butterflyweed
Asclepias verticillata	milkweed, whorled
Asclepias viridiflora	milkweed, short green
*Asparagus officinalis**	asparagus*
Aster azureus	aster, sky-blue
Aster drummondii	aster, Drummond's
Aster dumosus	aster, rice button
Aster ericoides	aster, heath
***Aster furcatus* - ST**	**aster, forked - ST**
Aster laevis	aster, smooth blue
Aster lateriflorus	aster, side-flowering
Aster macrophyllus	aster, big-leaved
Aster novae-angliae	aster, New England
Aster ontarionis	aster, Ontario
Aster pilosus	aster, hairy
Aster praealtus	aster, willow
Aster puniceus	aster, marsh
Aster puniceus var. *firmus*	aster, shining
Aster sagittifolius	aster, arrow-leaved
Aster sericeus	aster, silky
Aster simplex	aster, panicled
Aster umbellatus	aster, flat-top
Astragalus canadensis	vetch, Canadian milk
Athyrium angustum	fern, lady
Aureolaria grandiflora var. *pulchra*	foxglove, yellow false
Aureolaria pedicularia var. *ambigens*	foxglove, clammy false
*Avena sativa**	oats, wild*
Baptisia lactea	wild-indigo, white
Baptisia leucophaea	wild-indigo, cream
*Barbarea vulgaris**	rocket, yellow*
***Beckmannia syzigachne*-SE**	**grass, American slough-SE**
*Berberis thunbergii**	barberry, Japanese*
*Berberis vulgaris**	barberry, common*
*Berteroa incana**	alyssum, hoary*
***Betula alleghaniensis* (historical?) - SE**	**birch, yellow - SE**
Betula papyrifera	birch, paper
Betula pumila	birch, dwarf
Bidens cernua	marigold, nodding bur
Bidens coronata	marigold, tall swamp
Bidens frondosa	beggar's-ticks, common
Bidens vulgata	beggar's-ticks, tall
Boehmeria cylindrica	nettle, false
Boltonia asteroides	aster, false
Botrychium virginianum	fern, rattlesnake
Bouteloua curtipendula	grama, side-oats
*Brassica juncea**	mustard, Indian*
Brassica kaber	charlock
*Brassica nigra**	mustard, black*
Bromus ciliatus	grass, Canada brome
*Bromus inermis**	brome, awnless*
*Bromus japonicus**	chess, Japanese*
Bromus kalmii	brome, prairie
Bromus pubescens	grass, woodland brome
Bromus purgans	grass, brome
*Bromus tectorum**	grass, cheat*
Bulbostylis capillaris	sedge, hairy
Cacalia plantaginea	plantain, prairie Indian
***Cakile edentula* ssp. *lacustris* - ST**	**rocket, sea - ST**
Calamagrostis canadensis	grass, blue-joint
Calamagrostis inexpansa var. *brevior*	grass, bog reed
Calamintha arkansana	calamint, low
Calamovilfa longifolia	reed, sand
***Calopogon tuberosus* - SE**	**orchid, grass pink - SE**
Caltha palustris	marigold, marsh
Calystegia sepium	bindweed, American
Calystegia spithamaea	bindweed, dwarf
Camassia scilloides	hyacinth, wild
Campanula americana	bellflower, tall
Campanula aparinoides	bellflower, marsh
*Campanula rapunculoides**	bellflwoer, European*
*Cannabis sativa**	hemp*
*Capsella bursa-pastoris**	purse, sheperd's*

Appendix 2. Continued.

Scientific Name[2, 3]	Common Name[2, 3]
Cardamine bulbosa	cress, bulbous
Cardamine douglassii	cress, purple spring
Cardamine pensylvanica	cress, Pennsylvania bitter
***Cardamine pratensis* var. *palustris* (historical?)-SE**	**cuckoo-flower - SE**
*Carduus nutans**	thistle, musk*
Carex aggregata	sedge, smooth clustered
Carex alopecoidea	sedge, brown-headed fox
Carex annectens	sedge, large yellow fox
Carex annectens var. *xanthocarpa*	sedge, small yellow fox
Carex atherodes	sedge, hairy lake
***Carex aurea* - SE**	**sedge, golden - SE**
Carex bebbii	sedge, Bebb's oval
Carex blanda	sedge, common wood
Carex brevior	sedge, plains oval
Carex buxbaumii	sedge, dark-scaled
Carex cephalophora	sedge, short-leaved bracted
Carex comosa	sedge, bristly
Carex conoidea	sedge, prairie gray
Carex crawei	sedge, early fen
***Carex crawfordii* -SE**	**sedge, Crawford's oval - SE**
Carex cristatella	sedge, crested oval
Carex crus-corvi	sedge, crowfoot fox
Carex festucacea	sedge, fescue oval
Carex foenea	sedge, running savanna
***Carex garberi* -SE**	**sedge, false golden - SE**
Carex gracilescens	sedge, slender wood
Carex gracillima	sedge, graceful
Carex granularis	sedge, pale
Carex grayi	sedge, common bur
Carex grisea	sedge, wood gray
Carex haydenii	sedge, long-scaled tussock
Carex hirsutella	sedge, hairy green
Carex hirtifolia	sedge, hairy
Carex hystericina	sedge, porcupine
Carex interior	sedge, prairie star
***Carex intumescens* -ST**	**sedge, shining bur - ST**
Carex jamesii	sedge, James' grass
Carex lacustris	sedge, common lake
Carex lanuginosa	sedge, broad-leaved woolly
Carex lasiocarpa	sedge, narrow-leaved woolly
Carex laxiflora	sedge, beech wood
Carex lupuliformis	sedge, knobbed hop
Carex lupulina	sedge, common hop
Carex meadii	sedge, Mead's
Carex molesta	sedge, field oval
Carex muhlenbergii	sedge, sand bracted
Carex muskingumensis	sedge, Muskingum River
Carex normalis	sedge, spreading oval
Carex pensylvanica	sedge, Pennsylvania
*Carex praegracilis**	sedge, expressway*
Carex radiata	sedge, straight-styled wood
Carex retroflexa	sedge, bent bracted
Carex richardsonii	sedge, early prairie
Carex rosea	sedge, curly-styled wood
***Carex rostrata* var. *utriculata* (historical?)-ST**	**sedge, common yellow lake - ST**
Carex sartwellii	sedge, running marsh
Carex shortiana	sedge, Short's
Carex sparganioides	sedge, loose-headed bracted
Carex squarrosa	sedge, narrow-leaved cattail
Carex sterilis	sedge, fen star
Carex stipata	sedge, common fox
Carex stricta	sedge, tussock
Carex suberecta	sedge, wedge-fruited oval
Carex substricta	sedge, long-bracted tussock
Carex swanii	sedge, downy green
Carex tenera	sedge, narrow-leaved oval
Carex tetanica	sedge, running prairie
Carex tribuloides	sedge, awl-fruited oval
Carex trichocarpa	sedge, hairy-fruited lake
Carex trisperma	sedge, three-seeded bog
Carex umbellata	sedge, early oak
Carex vesicaria	sedge, tufted lake
***Carex viridula* - ST**	**sedge, green yellow - ST**
Carex vulpinoidea	sedge, fox
Carpinus caroliniana	beech, blue
*Carum carvi**	caraway*
Carya ovata	hickory, shagbark
Cassia fasciculata	pea, partridge
Castilleja coccinea	paintbrush, Indian
***Castilleja sessiliflora* -SE**	**painted cup, downy yellow - SE**
Caulophyllum thalictroides	cohosh, blue
Ceanothus americanus	tea, New Jersey
***Ceanothus herbaceus* - SE**	**tea, inland New Jersey-SE**
*Celastrus orbiculatus**	bittersweet, round-leaved*

Appendix 2. Continued.

Scientific Name[2, 3]	Common Name[2, 3]
Celastrus scandens	bittersweet, climbing
Cenchrus longispinus	sandbur, mat
*Centaurium pulchellum**	centuary*
Cephalanthus occidentalis	buttonbush
*Cerastium vulgatum**	chickweed, common mouse-ear*
Ceratophyllum demersum	coontail
*Chaenorrhinum minus**	snapdragon, dwarf*
Chamaesyce maculata	spurge, nodding
***Chamaesyce polygonifolia*-SE**	**spurge, seaside - SE**
Chelone glabra	turtlehead, white
*Chenopodium album**	lamb's quarters*
*Chenopodium ambrosioides**	wormseed, American*
*Chenopodium botrys**	oak, Jerusalem*
*Cichorium intybus**	chicory*
Cicuta bulbifera	hemlock, bulb-bearing water
Cicuta maculata	hemlock, water
Cinna arundinacea	reed, common wood
Circaea lutetiana var. *canadensis*	nightshade, enchanter's
*Cirsium arvense**	thistle, field*
Cirsium discolor	thistle, pasture
Cirsium muticum	thistle, swamp
***Cirsium pitcheri* - ST, FT**	**thistle, dune - ST, FT**
*Cirsium vulgare**	thistle, bull*
Cladium mariscoides	rush, twig
Claytonia virginica	spring-beauty
Clematis virginiana	bower, Virgin's
Comandra umbellata	toadflax, false
*Commelina communis**	dayflower, common*
*Convallaria majalis**	lily-of-the-valley*
*Convolvulus arvensis**	bindweed, field*
Convolvulus sepium	bindweed, hedge
Conyza canadensis	horseweed
Conyza ramosissima	fleabane, dwarf
Coreopsis lanceolata	coreopsis, sand
Coreopsis palmata	coreopsis, prairie
Coreopsis tripteris	coreopsis, tall
Corispermum hyssopifolium	bugseed, common
Cornus alternifolia	dogwood, alternate-leaved
Cornus drummondii	dogwood, rough-leaved
Cornus obliqua	dogwood, pale
Cornus racemosa	dogwood, gray
Cornus rugosa	dogwood, round-leaved
Cornus stolonifera	dogwood, red-osier
*Coronilla varia**	vetch, crown*
Corylus americana	hazelnut
*Cotoneaster acutifolus**	cotoneaster, Peking*
Crataegus crus-galli	hawthorn, cock-spur
Crataegus flabellata	hawthorn, large-seeded
Crataegus mollis	hawthorn, downy
Crataegus pruinosa	hawthorn, frosted
Crataegus punctata	hawthorn, dotted
Crataegus succulenta	hawthorn, fleshy
*Crypsis schoenoides**	foxtail, false*
Cryptotaenia canadensis	dittany
Cuscuta gronovii	dodder, common
Cycloloma atriplicifolium	pigweed, winged
*Cynoglossum oficinale**	hound's tongue*
Cyperus erythrorhizos	nut-sedge, red-rooted
Cyperus esculentus	nut-sedge, field
Cyperus ferruginescens	nut-sedge, rusty
Cyperus filiculmis	nut-sedge, slender sand
Cyperus houghtonii	flat-sedge, smooth
Cyperus rivularis	flat-sedge, brook
Cyperus schweinitzii	nut-sedge, rough sand
Cyperus strigosus	nut-sedge, long-scaled
***Cypripedium calceolus* var. *parviflorum* (historical)-SE**	**lady's slipper, small yellow - SE**
Cypripedium calceolus var. *pubescens*	lady's slipper, large yellow
***Cypripedium candidum* (historical) - ST**	**lady's slipper, white-ST**
Cystopteris bulbifera	fern, bladder
*Dactylis glomerata**	grass, orchard*
Dalea candida	prairie-clover, white
Dalea purpurea	prairie-clover, purple
Danthonia spicata	grass, poverty oat
*Daucus carota**	carrot, wild*
Dentaria laciniata	toothwort
Desmodium canadense	tick-trefoil, showy
Desmodium cuspidatum	tick-trefoil, bracted
Desmodium glutinosum	tick-trefoil, pointed
Desmodium illinoense	tick-trefoil, Illinois
Desmodium paniculatum	tick-trefoil, panicled
*Dianthus armeria**	pink, deptford*
Dichanthelium acuminatum	grass, panic
Diervilla lonicera	honeysuckle, dwarf
*Digitaria ischaemum**	grass, smooth crab*
*Digitaria sanguinalis**	grass, hairy crab*
Diodia teres	buttonweed
Dioscorea villosa	yam, wild
*Diplotaxis muralis**	wall rocket*
*Dipsacus laciniatus**	teasel, cut-leaved*
*Dipsacus sylvestris**	teasel, common*
Dodecatheon meadia	shooting-star
Draba reptans	cress, common whitlow
***Drosera rotundifolia* - SE**	**sundew, round-leaved-SE**

Appendix 2. Continued.

Scientific Name[2, 3]	Common Name[2, 3]
Dryopteris carthusiana	fern, spinulose shield
Dulichium arundinaceum	sedge, three-way
Echinacea pallida	coneflower, pale purple
*Echinochloa crus-galli**	grass, barnyard*
Echinochloa walteri	grass, salt-marsh cockspur
Echinocystis lobata	cucumber, wild
*Elaeagnus umbellatus**	olive, autumn*
Eleocharis acicularis	spike-rush, needle
Eleocharis elliptica	spike-rush, golden-stemmed
Eleocharis elliptica var. *compressa*	spike-rush, golden-seeded
Eleocharis erythropoda	spike-rush, red-rooted
Eleocharis intermedia	spike-rush, matted
Eleocharis obtusa	spike-rush, blunt
***Eleocharis olivacea* - SE**	**spike-rush, wrinkled-sheathed - SE**
Eleocharis smallii	spike-rush, marsh
*Eleusine indica**	grass, crowfoot*
Ellisia nyctelea	Aunt Lucy
Elodea canadensis	waterweed
Elodea nuttallii	waterweed, slender
*Elymus arenarius**	grass, lyme*
Elymus canadensis	wild-rye, Canada
Elymus hystrix	grass, bottle brush
Elymus riparius	rye, riverbank wild
Elymus villosus	wild rye, silky
Elymus virginicus	wild-rye, Virginia
Epilobium angustifolium	willow-herb, great
Epilobium ciliatum	willow-herb, northern
Epilobium coloratum	willow-herb, cinnamon
Epilobium leptophyllum	willow-herb, fen
*Epipactis helleborine**	orchid, helleborine*
Equisetum arvense	horsetail, common
Equisetum fluviatile	horsetail, water
Equisetum hyemale var. *affine*	scouring rush
Equisetum laevigatum	scouring rush, smooth
Equisetum variegatum	scouring rush, variegated
Equisetum x ferrissii	horsetail, Joliet
Eragrostis capillaris	grass, lace
*Eragrostis cilianensis**	grass, stink*
Eragrostis hypnoides	grass, creeping love
*Eragrostis minor**	grass, love*
Eragrostis pectinacea	grass, small love
Eragrostis spectabilis	grass, purple love
Erechtites hieracifolia	fireweed
Erigeron annuus	fleabane, annual
Erigeron philadelphicus	fleabane, marsh
Erigeron pulchellus	plantain, robin's
Erigeron strigosus	fleabane, daisy
Eriophorum angustifolium	cotton grass, narrow-leaved
Eriophorum tenellum	cotton grass
Eryngium yuccifolium	rattlesnake-master
Erythronium albidum	trout lily, white
Erythronium americanum	trout lily, yellow
*Euonymus alatus**	winged euonymus*
*Euonymus europaeus**	spindle-tree, European*
Euonymus obovatus	bush, running strawberry
Eupatorium altissimum	boneset, tall
Eupatorium maculatum	Joe-pye-weed, spotted
Eupatorium perfoliatum	boneset, common
Eupatorium purpureum	Joe-pye-weed, purple
Eupatorium rugosum	snakeroot, white
Euphorbia corollata	spurge, flowering
*Euphorbia cyparissias**	spurge, cypress*
*Euphorbia esula**	spurge, leafy*
*Euphorbia helioscopia**	spurge, wart*
Euthamia graminifolia	goldenrod, grass-leaved
Euthamia gymnospermoides	goldenrod, viscid grass-leaved
Fagus grandifolia	beech, American
*Festuca duriuscula**	fescue, sheep*
*Festuca elatior**	fescue, tall*
Festuca obtusa	fescue, nodding
*Festuca pratensis**	fescue, meadow*
*Festuca rubra**	fescue, red*
Fimbristyis puberula var. *drummondii*	sedge, chestnut
Floerkea proserpinacoides	mermaid, false
Fragaria virginiana	strawberry, wild
Fraxinus americana	ash, white
Fraxinus nigra	ash, black
Fraxinus pennsylvanica	ash, green
Froelichia floridana var. *campestris*	cottonweed, large
*Froelichia gracilis**	cottonweed, small*
*Galinsoga quadriradiata**	daisy, Peruvian*
Galium aparine	bedstraw, annual
Galium boreale	bedstraw, northern
Galium circaezans	wild licorice, smooth
Galium concinnum	bedstraw, shining
Galium obtusum	madder, wild
Galium tinctorium	bedstraw, stiff
Galium trifidum	bedstraw, small
Galium triflorum	bedstraw, sweet-scented
Gaura biennis	gaura, biennial
Gaura longiflora	gaura, common
Gaylussacia baccata	huckleberry, black

Appendix 2. Continued.

Scientific Name[2, 3]	Common Name[2, 3]
Gentiana alba	gentian, pale
Gentiana andrewsii	gentian, closed
Gentiana puberulenta	gentian, prairie
Gentianella quinquefolia ssp. *occidentalis*	gentian, stiff
Gentianopsis crinita	gentian, fringed
Gentianopsis procera	gentian, small fringed
***Geranium bicknellii* -SE**	**cranesbill, northern-SE**
Geranium carolinianum	cranesbill, Carolina
Geranium maculatum	geranium, wild
Geum aleppicum	avens, yellow
Geum canadense	avens, white
Geum laciniatum	avens, rough
Geum triflorum	avens, prairie
*Glechoma hederacea**	ivy, ground*
Glyceria septentrionalis	grass, floating manna
Glyceria striata	grass, fowl manna
Gnaphalium obtusifolium	balsam, old field
Hackelia virginiana	stickseed
Hamamelis virginiana	witchhazel
Hedeoma pulegioides	pennyroyal, American
Helenium autumnale	sneezeweed
Helianthemum bicknellii	rockrose
Helianthemum canadense	rockrose, common
*Helianthus annuus**	sunflower, garden*
Helianthus decapetalus	sunflower, pale
Helianthus divaricatus	sunflower, woodland
Helianthus grosseserratus	sunflower, sawtooth
Helianthus hirsutus	sunflower, bristly
Helianthus occidentalis	sunflower, western
*Helianthus petiolaris**	sunflower, petioled*
Helianthus rigidus	sunflower, prairie
Helianthus strumosus	sunflower, pale-leaved
Heliopsis helianthoides	sunflower, false
*Hemerocallis fulva**	day lily, orange*
Hepatica nobilis var. *acuta*	hepatica, sharp-leaved
Heracleum lanatum	parsnip, cow
*Hesperis matronalis**	rocket, Dame's*
Heuchera americana var. *hirsuticaulis*	alumroot, tall
Heuchera richardsonii var. *grayana*	alumroot
*Hibiscus trionum**	flower-of-an-hour*
*Hieracium aurantiacum**	hawkweed, orange*
*Hieracium caespitosum**	king devil*
Hieracium canadense	hawkweed, Canada
Hieracium scabrum	hawkweed, rough
Hierochloe odorata	grass, sweet
*Hordeum jubatum**	grass, squirrel-tail*
Hydrophyllum virginianum	waterleaf, Virginia
Hypericum canadense	St. John's wort, Canadian
***Hypericum kalmianum* -SE**	**St. John's wort, Kalm's - SE**
Hypericum majus	St. John's wort, sand
*Hypericum perforatum**	St. John's wort, common*
Hypericum prolificum	St. John's wort, shrubby
Hypericum punctatum	St. John's wort, spotted
Hypoxis hirsuta	star-grass, yellow
Ilex verticillata	holly, Michigan
Impatiens capensis	touch-me-not, spotted
Impatiens pallida	touch-me-not, pale
*Iris pseudacorus**	iris, yellow*
Iris shrevei	blue-flag
Juglans cinerea	butternut
Juglans nÅgra	walnut, black
Juncus acuminatus	rush, sharp-fruited
***Juncus alpinus* - SE**	**rush, Richardson's - SE**
Juncus balticus var. *littoralis*	rush, lake shore
Juncus brachycephalus	rush, short-headed
Juncus bufonius	rush, toad
Juncus canadensis	rush, Canadian
Juncus dudleyi	rush, Dudley's
*Juncus gerardii**	black grass*
Juncus greenei	rush, Greene's
Juncus interior	rush, inland
Juncus nodosus	rush, joint
Juncus tenuis	rush, path
Juncus torreyi	rush, Torrey's
***Juniperus communis* var. *depressa* - ST**	**juniper, common - ST**
***Juniperus horizontalis* -SE**	**juniper, trailing - SE**
Juniperus virginiana	cedar, Eastern red
*Kochia scoparia**	burning bush*
Koeleria macrantha	grass, June
Krigia biflora	dandelion, false
Lactuca canadensis	lettuce, wild
Lactuca ludoviciana (extirpated?)	lettuce, western wild
*Lactuca serriola**	lettuce, prickly*
Laportea canadensis	nettle, wood
*Lapsana communis**	nipplewort*
*Larix decidua**	larch, European*
Larix laricina	larch, American
***Lathyrus japonicus* var. *glaber* (reintroduced)-SE**	**pea, beach - SE**
***Lathyrus ochroleucus* - ST**	**vetchling, pale - ST**
Lathyrus palustris	vetchling, marsh
Lathyrus palustris var. *myrtifolius*	vetchling, marsh

Appendix 2. Continued.

Scientific Name[2, 3]	Common Name[2, 3]	Scientific Name[2, 3]	Common Name[2, 3]
Lathyrus venosus var. *intonsus*	pea, veiny	*Lonicera tatarica**	honeysuckle, Tartarian*
		Lonicera x *bella**	honeysuckle, showy fly*
***Lechea intermedia* - ST**	**pinweed, savanna - ST**	*Lonicera* x *muendeniensis**	honeysuckle, common fly*
Lechea pulchella	pinweed, pretty	*Lotus corniculatus**	trefoil, birdsfoot*
Lechea stricta	pinweed, bushy	*Ludwigia palustris* var. *americana*	purslane, marsh
Lechea tenuifolia	pinweed, slender-leaved		
Lechea villosa	pinweed, hairy	*Ludwigia polycarpa*	loosestrife, false
Leersia oryzoides	grass, rice cut	*Lupinus perennis*	lupine, wild
Leersia virginica	grass, white	*Luzula multiflora*	wood rush, common
Lemna minor	duckweed, small	*Lychnis alba**	campion, white*
Lemna trisulca	duckweed, forked	*Lycium barbarum**	matrimony, common*
*Leonurus cardiaca**	motherwort*	*Lycopus americanus*	horehound, common water
*Lepidium campestre**	cress, field*	*Lycopus rubellus*	waterhorehound, stalked
*Lepidium densiflorum**	peppergrass, small*	*Lycopus uniflorus*	bugleweed, northern
Lepidium virginicum	peppergrass, common	*Lycopus virginicus*	bugleweed
Leptoloma cognatum	grass, fall witch	*Lysimachia ciliata*	loosestrife, fringed
Lespedeza capitata	bush-clover, round-headed	*Lysimachia nummularia**	moneywort*
		Lysimachia quadrifolia	loosestrife, whorled
*Lespedeza cuneata**	bush-clover, silky*	*Lysimachia thyrsiflora*	loosestrife, tufted
Lespedeza hirta	bush-clover, hairy	*Lysimachia vulgaris**	loosestrife*
*Leucanthemum vulgare**	daisy, ox-eye*	*Lythrum alatum*	loosestrife, winged
Liatris aspera	blazing star, rough	*Lythrum salicaria**	loosestrife, purple*
Liatris cylindracea	blazing star, cylindrical	*Maclura pomifera**	orange, Osage*
Liatris pycnostachya	blazing star, prairie	*Maianthemum canadense* var. *interius*	lily-of-the-valley, false
Liatris scariosa var. *nieuwlnadii*	blazing star, savanna		
		Malus ioensis	crab, Iowa
Liatris spicata	blazing star, marsh	*Malus pumila**	apple*
*Ligustrum vulgare**	privet, common*	*Matricaria matricarioides**	pineapple weed*
Lilium michiganense	lily, Turk's cap	*Matteuccia struthiopteris*	fern, ostrich
Lilium philadelphicum var. *andinum*	lily, prairie	*Medicago lupulina**	medic, black*
		*Medicago sativa**	alfalfa*
*Linaria vulgaris**	butter-and-eggs*	*Melilotus alba**	clover, white sweet*
Lindera benzoin	spicebush	*Melilotus officinalis**	clover, yellow sweet*
Linum medium var. *texanum*	flax, small yellow	*Menispermum canadense*	moonseed
Linum virginianum	flax, slender yellow	*Mentha arvensis* var. *villosa*	mint, wild
Liparis loeselii	twayblade, green	*Menyanthes trifoliata* var. *minor*	buckbean
Lithospermum canescens	puccoon, hoary		
Lithospermum caroliniense	puccoon, hairy	*Mertensia virginica*	bluebells
Lithospermum incisum	puccoon, yellow	*Mimulus ringens*	monkeyflower
Lobelia cardinalis	cardinal flower	*Minuartia stricta*	sandwort, stiff
Lobelia kalmii	lobelia, bog	*Mirabilis nyctaginea**	four o'clock, wild*
Lobelia siphilitica	lobelia, great blue	*Mitella diphylla*	mitterwort
Lobelia spicata	lobelia, pale spiked	*Moehringia lateriflora*	sandwort, blunt-leaved
*Lolium multiflorum**	grass, Italian rye*	*Monarda fistulosa*	bergamot, wild
*Lolium perenne**	grass, perennial rye*	*Monarda punctata*	horsemint
Lonicera dioica	honeysuckle, red	*Monotropa uniflora*	Indian-pipe
*Lonicera japonica**	honeysuckle, Japanese*	*Morus alba**	mulberry, white*
*Lonicera maackii**	honeysuckle, amur*	*Muhlenbergia asperifolia**	grass, scratch*
*Lonicera morrowi**	honeysuckle, Morrow's*	*Muhlenbergia frondosa*	grass, common satin
Lonicera prolifera	honeysuckle, yellow	*Muhlenbergia glomerata*	wild timothy, marsh

Appendix 2. Continued.

Scientific Name[2, 3]	Common Name[2, 3]	Scientific Name[2, 3]	Common Name[2, 3]
Muhlenbergia mexicana	grass, leafy satin	*Panicum perlongum*	grass, panic
*Muhlenbergia racemosa**	timothy, upland wild*	*Panicum praecocius*	grass, long-haired panic
*Myosotis scorpioides**	forget-me-not, common*	*Panicum sphaerocarpon*	grass, round-fruited panic
*Myosoton aquaticum**	chickweed, giant*	*Panicum villosissimum*	grass, white-haired panic
Myriophyllum heterophyllum	milfoil, various-leaved water	*Panicum virgatum*	grass, prairie switch
		Parietaria pensylvanica	pellitory
Myriophyllum verticillatum var. *pectinatum*	milfoil, whorled water	*Parnassia glauca*	grass-of-parnassus
		Parthenium integrifolium	wild-quinine
Najas guadalupensis	naiad	*Parthenocissus inserta*	creeper, thicket
*Nasturtium officinale**	watercress*	*Parthenocissus quinquefolia*	Virginia creeper
*Nepeta cataria**	catnip*	*Pastinaca sativa**	parsnip, wild*
Nuphar luteum ssp. *macrophyllum*	water-lily, yellow	*Pedicularis canadensis*	betony, wood
		Pedicularis lanceolata	betony, swamp
Nuphar luteum ssp. *variegatum*	water-lily	*Penstemon calycosus*	beard tongue, smooth
		Penstemon digitalis	beard-tongue, foxglove
Nymphaea tuberosa	water-lily, white	*Penstemon pallidus*	beard-tongue, pale
Oenothera biennis	evening-primrose, common	*Penthorum sedoides*	stonecrop, ditch
		*Petasites hybridus**	butterbur*
Oenothera laciniata	evening-primrose, ragged	*Phalaris arundinacea**	grass, reed canary*
		*Philadelphus coronarius**	mock orange, sweet*
***Oenothera perennis* - ST**	**sundrops, small - ST**	*Philadelphus pubescens**	mock orange*
Oenothera pilosella	sundrops, prairie	*Phleum pratense**	timothy*
Oenothera rhombipetala	evening-primrose, sand	*Phlox bifida*	phlox, cleft
Onoclea sensibilis	fern, sensitive	*Phlox divaricata*	phlox, woodland
Ophioglossum vulgatum var. *pseudopodum*	fern, adder's tongue	*Phlox glaberrima* ssp. *interior*	phlox, smooth
Opuntia humifusa	cactus, prickly pear	*Phlox pilosa*	phlox, prairie
***Orobanche fasciculata* - SE**	**broomrape, clustered-SE**	*Phlox pilosa* ssp. *fulgida*	phlox, prairie
Orobanche uniflora	broomrape, one-flowered	*Phragmites australis*	reed, common
***Oryzopsis racemosa* - ST**	**rice grass, black-seeded**	*Physalis heterophylla*	ground cherry, clammy
Osmorhiza longistylis	sweet-cicely, smooth	*Physalis longifolia**	ground cherry, tall*
Osmunda claytoniana	fern, interrupted	*Physalis subglabrata*	ground cherry, smooth
Osmunda regalis var. *spectabilis*	fern, royal	*Physalis virginiana*	ground cherry, lance-leaved
Ostrya virginiana	ironwood	*Physocarpus opulifolius*	ninebark
Oxalis dillenii	wood sorrel, common	*Physostegia virginiana*	dragonhead, false
Oxalis stricta	wood-sorrel, common	*Pilea pumila*	clearweed
Oxalis violacea	wood-sorrel, violet	***Pinus banksiana* - SE**	**pine, jack - SE**
Oxypolis rigidior	cowbane	*Pinus nigra**	pine, Austrian*
Panicum capillare	grass, old witch	*Pinus resinosa*	pine, red
Panicum depauperatum	grass, starved panic	*Pinus rigida**	pine, pitch*
Panicum dichotomiflorum	panicum, fall	*Pinus strobus*	pine, white
Panicum flexile	grass, wiry panic	*Pinus sylvestris**	pine, Scots*
Panicum implicatum	grass, old-field panic	*Plantago arenaria**	plantain, whorled*
Panicum lanuginosum	grass, panic	*Plantago lanceolata**	plantain, English*
Panicum leibergii	grass, prairie panic	*Plantago major**	plantain, common*
Panicum meridionale	grass, mat panic	*Plantago rugelii*	plantain, red-stalked
*Panicum miliaceum**	millet, broomcorn*	***Platanthera clavellata* - SE**	**orchid, club-spur - SE**
Panicum oligosanthes var. *scribnerianum*	grass, Scribner's panic	*Platanthera dilatata*	orchid, white bog
		Platanthera flava	**orchid, tubercled - SE**

Appendix 2. Continued.

Scientific Name[2, 3]	Common Name[2, 3]
var. *herbiola* - **SE**	
Platanthera hyperborea var. *huronensis*	orchid, northern bog
***Platanthera leucophaea* - SE, FT**	**orchid, prairie white-fringed - SE, FT**
***Platanthera psycodes* - SE**	**orchid, purple-fringed - SE**
***Poa alsodes* - SE**	**grass, grove blue - SE**
*Poa annua**	grass, annual blue*
*Poa compressa**	grass, Canada blue*
***Poa laguida* - SE**	**grass, weak blue - SE**
*Poa nemoralis**	grass, woodland blue*
Poa palustris	grass, marsh blue
*Poa pratensis**	grass, Kentucky blue*
Podophyllum peltatum	Mayapple
***Pogonia ophioglossoides* - SE (extirpated?)**	**orchid, snake-mouth - SE**
Poinsettia dentata	spurge, toothed
Polanisia dodecandra	clammyweed
Polygala polygama var. *obtusata*	milkwort, purple
Polygala sanguinea	milkwort, field
Polygala senega	snakeroot, seneca
Polygala verticillata	milkwort, whorled
Polygonatum commutatum	Solomon's seal, great
***Polygonatum pubescens* - SE**	**Solomon's seal, downy - SE**
Polygonum amphibium	knotweed, water
*Polygonum aviculare**	knotweed, common*
Polygonum cespitosum var. *longisetum**	smartweed, creeping*
*Polygonum convolvulus**	bindweed, black*
*Polygonum cuspidatum**	knotweed, Japanese*
Polygonum erectum	knotweed, erect
*Polygonum hydropiper**	pepper, water*
Polygonum hydropiperoides	pepper, mild water
Polygonum lapathifolium	heartease
Polygonum pensylvanicum	smartweed, common
*Polygonum persicaria**	lady's-thumb*
Polygonum punctatum	smartweed, spotted
Polygonum sagittatum	tear-thumb, arrow-leaved
Polygonum scandens	buckwheat, climbing false
Polygonum tenue	knotweed, slender
Polygonum virginianum	knotweed, Virginia
Pontederia cordata	pickerel weed
*Populus alba**	poplar, white*
***Populus balsamifera* - SE**	**poplar, balsam - SE**
Populus deltoides	cottonwood, Eastern
Populus grandidentata	aspen, large-toothed
Populus nigra var. *italica**	poplar, Lombardy*
Populus tremuloides	aspen, quaking
*Populus x canescens**	poplar, gray*
*Portulaca oleracea**	purslane*
Potamogeton amplifolius	pondweed, large-leaved
Potamogeton foliosus	pondweed, leafy
Potamogeton illinoensis	pondweed, Illinois
Potamogeton natans	pondweed, common
Potamogeton pectinatus	pondweed, fennel-leaved
Potamogeton richardsonii	pondweed, Richardson's
Potamogeton zosteriformis	pondweed, flat-stemmed
Potentilla anserina	silverweed
Potentilla arguta	cinquefoil, prairie
Potentilla fruticosa	cinquefoil, shrubby
Potentilla norvegica	cinquefoil, common
Potentilla palustris	cinquefoil, marsh
*Potentilla recta**	cinquefoil, sulfur*
Potentilla simplex	cinquefoil, common
Prenanthes alba	lion's-foot
Prenanthes altissima	lettuce, tall white
Prenanthes racemosa	lettuce, glaucous white
Proserpinaca palustris	mermaid-weed
Prunella vulgaris var. *elongata*	self-heal
*Prunella vulgaris**	self-heal, lawn*
Prunus americana	plum, American
*Prunus armeniaca**	apricot*
*Prunus padus**	cherry, European bird*
Prunus serotina	cherry, wild black
Prunus susquehanae	cherry, sand
Prunus tomentosa	cherry, Nanking**
Prunus virginiana	cherry, choke
Psoralea tenuifolia	pea, scurfy
Ptelea trifoliata	ash, wafer
Pteridium aquilinum	fern, bracken
*Puccinellia distans**	grass, alkali*
Pycnanthemum pilosum	mountain-mint, hairy
Pycnanthemum tenuifolium	mountain-mint, slender
Pycnanthemum virginianum	mountain-mint, common
Pyrola elliptica	shinleaf
Quercus alba	oak, white
Quercus bicolor	oak, swamp white
Quercus ellipsoidalis	oak, Hill's
Quercus macrocarpa	oak, bur
Quercus palustris	oak, pin
Quercus rubra	oak, red
Quercus velutina	oak, black
Ranunculus abortivus	buttercup, small-flowered
*Ranunculus acris**	buttercup, tall*
***Ranunculus cymbalaria*-SE**	**crowfoot, seaside-SE**

Appendix 2. Continued.

Scientific Name[2, 3]	Common Name[2, 3]	Scientific Name[2, 3]	Common Name[2, 3]
*Ranunculus ficaria**	celandine, lesser*	*Sagittaria latifolia*	arrowleaf, common
Ranunculus flabellaris	crowfoot, yellow water	*Sagittaria rigida*	arrowleaf
Ranunculus hispidus	buttercup, rough	*Salix alba**	willow, white*
Ranunculus longirostris	crowfoot, white water	*Salix amygdaloides*	willow, peach-leaved
Ranunculus pensylvanicus	buttercup, bristly	*Salix bebbiana*	willow, Bebb
Ranunculus sceleratus	crowfoot, cursed	*Salix candida*	willow, sage
Ranunculus septentrionalis	buttercup, swamp	*Salix discolor*	willow, pussy
Ratibida pinnata	coneflower, yellow	*Salix exigua*	willow, sandbar
Rhamnus alnifolia	buckthorn, alder	*Salix fragilis**	willow, crack*
*Rhamnus cathartica**	buckthorn, European*	*Salix glaucophylloides* var. *glaucophylla*	willow, blue-leaved
*Rhamnus frangula**	buckthorn, glossy*		
Rhus copallina	sumac, shining	*Salix humilis*	willow, prairie
Rhus glabra	sumac, smooth	*Salix lucida*	willow, shining
Rhus typhina	sumac, staghorn	*Salix nigra*	willow, black
***Rhynchospora alba* - ST**	**beak rush, white - ST**	*Salix pedicellaris*	willow, bog
Rhynchospora capillacea	beak rush, hair	*Salix pentandra**	willow, bay-leaved*
Ribes americanum	currant, wild black	*Salix petiolaris*	willow, petioled
Ribes missouriense	gooseberry, Missouri	*Salix rigida*	willow, heart-leaved
*Ribes rubrum**	currant, red*	*Salix sericea*	willow, silky
*Robinia pseudoacacia**	locust, black*	*Salix serissima*	willow, autumn
Rorippa islandica var. *hispida*	cress, hairy marsh yellow	***Salix syrticola* - SE**	**willow, sand-dune - SE**
		*Salsola iberica**	thistle, Russian*
Rorippa palustris var. *fernaldiana*	cress, common yellow	*Sambucus canadensis*	elderberry
		Sanguinaria canadensis	bloodroot
*Rorippa sylvestris**	cress, creeping yellow*	*Sanicula gregaria*	snakeroot, black
Rosa blanda	rose, pasture	*Sanicula marilandica*	snakeroot, sanicle black
Rosa carolina	rose, pasture	*Saponaria officinalis**	bouncing-bet*
*Rosa multiflora**	rose, multiflora*	*Saururus cernuus*	lizard's-tail
Rosa palustris	rose, swamp	*Schizachyrium scoparium*	bluestem, little
Rosa setigera	rose, Illinois	*Scilla sibirica**	squill, Siberian*
Rubus allegheniensis	blackberry, common	*Scirpus acutus*	bulrush, hard-stemmed
Rubus flagellaris	dewberry, common	*Scirpus americanus*	rush, chairmaker's
*Rubus idaeus**	raspberry, cultivated*	*Scirpus atrovirens*	bulrush, dark green
Rubus occidentalis	raspberry, black	*Scirpus cyperinus*	wool grass
***Rubus odoratus* - SE**	**raspberry, purple flowering-SE**	*Scirpus fluviatilis*	bulrush, river
		Scirpus pendulus	bulrush, red
*Rubus phoenicolasius**	wineberry*	*Scirpus tabernaemontanii*	bulrush, great
***Rubus pubescens* - ST**	**raspberry, dwarf - ST**	*Scleria triglomerata*	nut rush, tall
Rubus strigosus	raspberry, red	*Scleria verticillata*	nut rush, low
Rudbeckia hirta	Susan, black-eyed	*Scrophularia lanceolata*	figwort, early
Rudbeckia laciniata	golden glow	*Scrophularia marilandica*	figwort, late
Rudbeckia subtomentosa	Susan, sweet black-eyed	*Scutellaria galericulata*	skullcap, marsh
Rudbeckia triloba	Susan, brown-eyed	*Scutellaria lateriflora*	skullcap, mad-dog
*Rumex acetosella**	sorrel, field*	*Scutellaria leonardii*	skullcap, small
Rumex altissimus	dock, pale	*Scutellaria parvula*	skullcap, small
*Rumex crispus**	dock, curly*	*Secale cereale**	rye*
Rumex mexicanus	dock, Mexican	*Selaginella apoda*	club moss, marsh
Rumex orbiculatus	dock, great water	*Senecio aureus*	ragwort, golden
Rumex verticillatus	dock, swamp	*Senecio pauperculus*	ragwort, balsam
Sagittaria graminea	arrowleaf, grass-leaved	*Senecio plattensis*	ragwort, prairie

Appendix 2. Continued.

Scientific Name[2, 3]	Common Name[2, 3]	Scientific Name[2, 3]	Common Name[2, 3]
*Setaria faberi**	foxtail, giant*	*Sonchus arvensis**	sow-thistle, field*
*Setaria glauca**	grass, pigeon*	*Sonchus asper**	sow-thistle, spiny*
*Setaria verticillata**	foxtail, bristly*	*Sorghastrum nutans*	grass, Indian
*Setaria viridis**	foxtail, green*	*Sparganium eurycarpum*	burreed, common
***Shepherdia canadensis*-SE**	**buffalo-berry, Canadian - SE**	*Spartina pectinata*	grass, prairie cord
		Sphenopholis obtusata	grass, prairie wedge
Sicyos angulatus	cucumber, bur	*Sphenopholis obtusata* var. *major*	grass, slender wedge
*Sida spinosa**	sida, prickly*		
Silene antirrhina	catchfly, sleepy	*Spiraea alba*	meadowsweet
*Silene armeria**	catchfly, sweet William*	*Spiranthes cernua*	ladies' tresses, nodding
*Silene cucubalus**	campion, bladder*	*Spiranthes lacera*	ladies' tresses, slender
Silene stellata	campion, starry	*Spiranthes magnicamporum*	ladies' tresses, Great Plains
Silphium integrifolium	rosinweed		
Silphium laciniatum	compass-plant	*Sporobolus asper*	dropseed, rough
Silphium terebinthinaceum	dock, prairie	*Sporobolus cryptandrus*	dropseed, sand
*Sisymbrium altissimum**	mustard, tumble*	*Sporobolus heterolepis*	dropseed, prairie
*Sisymbrium officinale**	mustard, hedge*	*Stachys palustris* var. *homotricha*	woundwort
Sisyrinchium albidum	blue-eyed grass, common		
***Sisyrinchium montanum* - SE**	**blue-eyed grass, mountain - SE**	*Stachys tenuifolia*	hedgenettle, smooth
		Stachys tenuifolia var. *hispida*	hedgenettle, rough
Sium suave	parsnip, water		
Smilacina racemosa	Soloman's seal, false	*Staphylea trifolia*	bladdernut
Smilacina stellata	Solomon's seal, starry false	*Stellaria longifolia*	stitchwort
		*Stellaria media**	chickweed, common*
Smilax ecirrhata	carrion-flower, upright	*Stipa spartea*	grass, porcupine
Smilax hispida	greenbrier, bristly	***Symphoricarpos albus* - SE**	**snowberry - SE**
Smilax illinoensis	carrion-flower, Illinois	*Symplocarpus foetidus*	skunk cabbage
Smilax lasioneura	carrion-flower, common	*Taenidia integerrima*	pimpernel, yellow
Solanum carolinense	horse-nettle	*Tanacetum vulgare**	tansy, common*
*Solanum dulcamara**	nightshade, bittersweet*	*Taraxacum laevigatum**	dandelion, red-seeded*
Solanum ptycanthum	nightshade, black	*Taraxacum officinale**	dandelion, common*
Solidago altissima	goldenrod, tall	*Taxus canadensis*	yew, Canada
Solidago canadensis	goldenrod, Canada	*Tephrosia virginiana*	goat's-rue
Solidago flexicaulis	goldenrod, broad-leaved	*Teucrium canadense*	germander
Solidago gigantea	goldenrod, late	*Thalictrum dasycarpum*	rue, purple meadow
Solidago juncea	goldenrod, early	*Thalictrum dioicum*	rue, early meadow
Solidago missouriensis	goldenrod, Missouri	*Thalictrum revolutum*	rue, waxy meadow
Solidago nemoralis	goldenrod, old-field	*Thalictrum thalictroides*	rue-anemone
Solidago ohioensis	goldenrod, Ohio	*Thaspium trifoliatum*	parsnip, purple meadow
Solidago patula	goldenrod, swamp	*Thelypteris palustris* var. *pubescens*	fern, marsh shield
Solidago ptarmicoides	goldenrod, few-flowered		
Solidago racemosa var. *gillmanii*	goldenrod, dune	*Thlaspi arvense**	cress, field penny*
		***Thuja occidentalis* - ST**	**arbor vitae - ST**
Solidago riddellii	goldenrod, Riddell's	*Tilia americana*	basswood
Solidago rigida	goldenrod, stiff	*Tilia cordata**	linden, little-leaf*
Solidago speciosa	goldenrod, showy	***Tofieldia glutinosa* - ST**	**asphodel, false - ST**
Solidago uliginosa	goldenrod, bog	*Toxicodendron radicans*	poison-ivy
Solidago ulmifolia	goldenrod, elm-leaved	*Tradescantia ohiensis*	spiderwort, common
Sonchus arvensis var. *glabrescens**	sow-thistle, common*	*Tradescantia subaspera*	spiderwort, broad-leaved
		*Tragopogon pratensis**	goat's-beard, common*

Appendix 2. Continued.

Scientific Name[2, 3]	Common Name[2, 3]	Scientific Name[2, 3]	Common Name[2, 3]
Triadenum fraseri	St. John's wort, marsh	*Verbena simplex*	vervain, narrow-leaved
Triadenum virginicum	St. John's wort, marsh	*Verbena stricta*	vervain, hoary
*Tribulus terrestris**	puncture-vine*	*Vernonia fasciculata*	ironweed, common
Trichostema brachiatum	pennyroyal, false	*Veronica catenata*	speedwell, water
Tridens flavus	purpletop, common	***Veronica scutellata* - ST**	**speedwell, marsh - ST**
*Trifolium hybridum**	clover, alsike*	*Veronica serpyllifolia**	speedwell, thyme-leaved*
*Trifolium pratense**	clover, red*		
*Trifolium repens**	clover, white*	*Veronicastrum virginicum*	Culver's-root
***Triglochin maritima* - ST**	**bog arrow-grass, common - ST**	*Viburnum acerifolium*	arrowwood, maple-leaved
***Triglochin palustris* - ST**	**bog arrow-grass, slender - ST**	*Viburnum dentatum**	arrowwood, smooth*
		*Viburnum lantana**	tree, wayfaring*
Trillium flexipes	trillium, declined	*Viburnum lentago*	nannyberry
Trillium grandiflorum	trillium, large-flowered	*Viburnum opulus**	highbush cranberry, European*
Trillium recurvatum	trillium, red		
Triosteum aurantiacum	horse-gentian, early	*Viburnum prunifolium*	black haw
Triosteum perfoliatum	horse-gentian, late	*Viburnum rafinesquianum*	arrow-wood, downy
*Triticum aestivum**	wheat*	*Vicia americana*	vetch, American
*Tussilago farfara**	coltsfoot*	*Vicia caroliniana*	vetch, wood
*Typha angustifolia**	cattail, narrow-leaved*	*Vinca minor**	periwinkle, common*
Typha latifolia	cattail, common	*Viola affinis*	violet, woodland blue
Ulmus americana	elm, American	***Viola conspersa* - ST**	**violet, dog - ST**
*Ulmus pumila**	elm, Siberian*	***Viola incognita* - SE**	**violet, hairy white - SE**
Ulmus rubra	elm, slippery	*Viola nephrophylla*	violet, northern bog
Urtica dioica	nettle, tall	***Viola pedata***	violet, bird's foot
Urtica procera	nettle, tall	*Viola pedatifida*	violet, prairie
***Utricularia cornuta* - SE**	**bladderwort, horned-SE**	*Viola pratincola*	violet, common blue
		Viola pubescens	violet, downy yellow
Utricularia gibba	bladderwort, humped	*Viola sagittata*	violet, arrow-leaved
***Utricularia intermedia*-SE**	**bladderwort, flat-leaved-SE**	*Viola sororia*	violet, woolly blue
		Vitis labrusca	grape, fox
***Utricularia minor* - SE**	**bladderwort, small-SE**	*Vitis riparia*	grape, riverbank
Utricularia vulgaris	bladderwort, common	*Vulpia octoflora*	fescue, six weeks
Uvularia grandiflora	bellwort	*Xanthium strumarium*	cocklebur
Vaccinium angustifolium	blueberry, low-bush	*Zanthoxylum americanum*	prickly-ash
Valeriana edulis var. *ciliata*	valerian	*Zizania aquatica*	rice, wild
*Verbascum thapsus**	mullein, common*	*Zizia aptera*	parsnip, heart-leaved meadow
Verbena bracteata	vervain, creeping		
Verbena hastata	vervain, blue	*Zizia aurea*	golden Alexanders

[1] Bold type indicates an Illinois endangered (SE), Illinois threatened (ST), and/or Federally threatened (FT) species.

[2] Asterisk (*) indicates introduced, non-native species