Volume 3

Living Resources

KASKASKIA RIVER AREA ASSESSMENT

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

KASKASKIA RIVER AREA ASSESSMENT

VOLUME 3: LIVING RESOURCES

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About This Report

The *Kaskaskia River Area Assessment* examines almost 5,800 square miles that extend from Campaign County southwest to Randolph County. Because significant natural community and species diversity has been found in the watershed, a portion of the assessment area has been designated a state "Resource Rich Area".[1]

This report is part of a series of reports on areas of Illinois where a public-private partnership has been formed to protect natural resources. These assessments provide information on the natural and human resources of the areas as a basis for managing and improving their ecosystems. The determination of resource rich areas and development of ecosystem-based information and management programs in Illinois are the result of three processes — the Critical Trends Assessment Program, the Conservation Congress, and the 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.[2] 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

[1] See *Inventory of Resource Rich Areas in Illinois: An Evaluation of Ecological Resources*.
[2] See *The Changing Illinois Environment: Critical Trends*, summary report and volumes 1-7.

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.

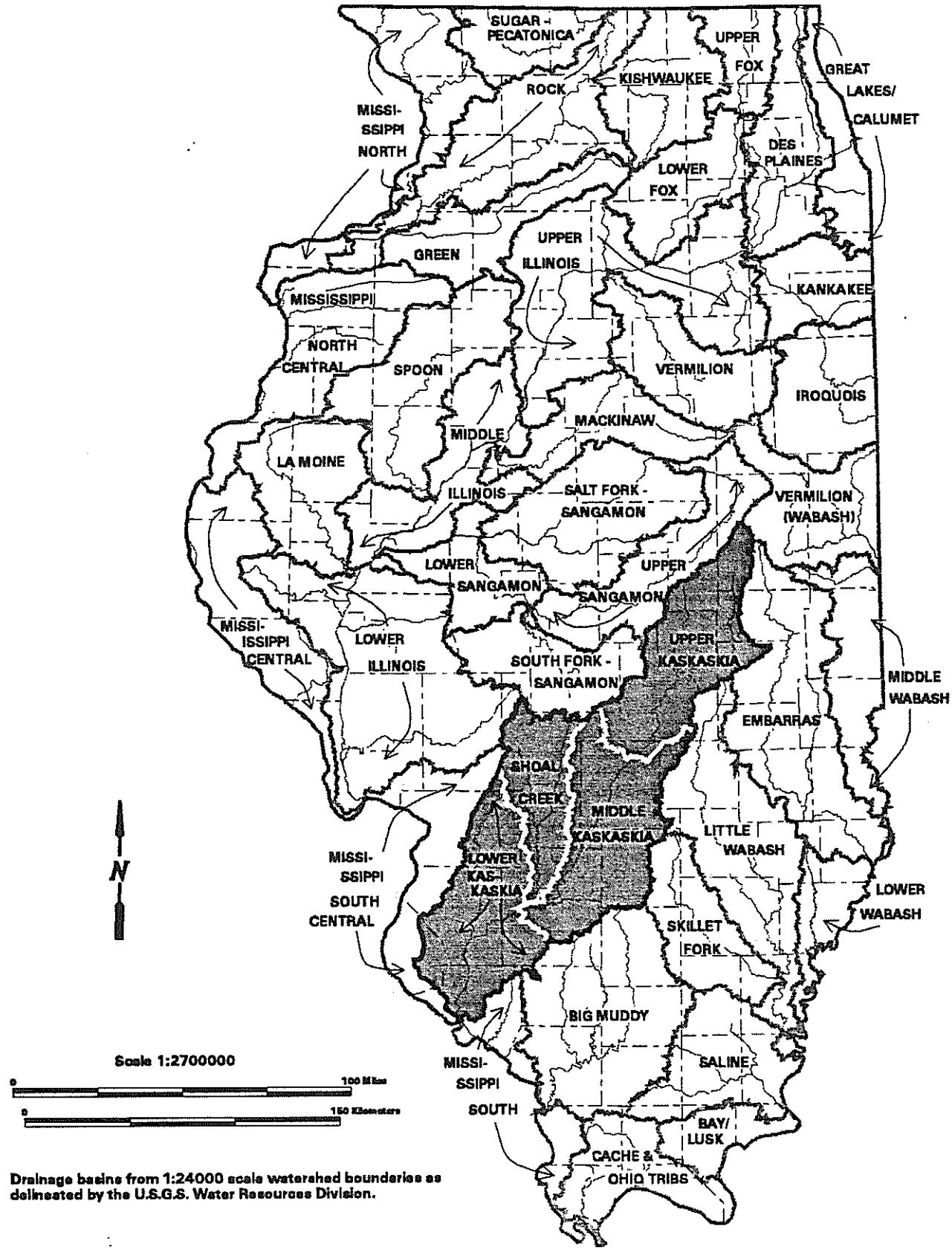
From the three initiatives was born Conservation 2000, a six-year program to begin reversing ecosystem degradation, primarily through the Ecosystems Program, a cooperative process of public-private partnerships that are intended to merge natural resource stewardship with economic and recreational development. To achieve this goal, the program provides financial incentives and technical assistance to private landowners. The Rock River and Cache River were designated as the first Ecosystem Partnership areas.

At the same time, CTAP identified 30 Resource Rich Areas (RRAs) throughout the state. In RRAs and 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.

The Kaskaskia River Area Assessment

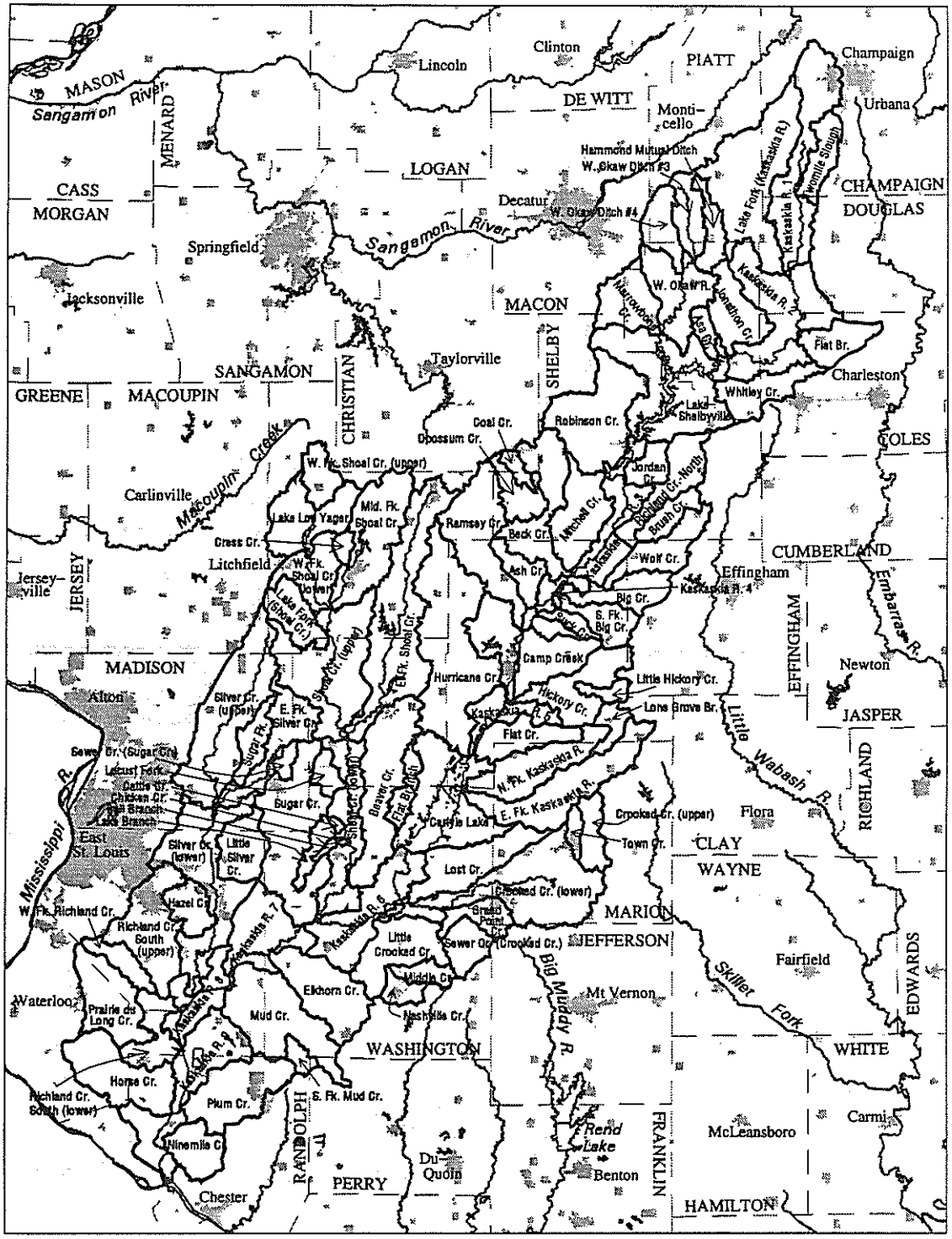
The Kaskaskia River begins as a cropland ditch in Champaign County and runs south for approximately 270 miles before it empties into the Mississippi River in Randolph County in southwestern Illinois. The area discussed in this assessment report coincides with the boundaries of the entire Kaskaskia River basin as determined by the Illinois Environmental Protection Agency. This area includes parts of seventeen counties in Illinois, covering approximately 5,747 mile^2 (3,677,787 acres). Ten subbasins through which the river passes, totaling 324,105 acres, were designated "Resource Rich Areas" because they contain significant natural community diversity.

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, focusing on Bond, Clinton, Fayette, Marion, Montgomery, Moultrie, Shelby and Washington counties; 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 Kaskaskia River Assessment Area



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Subbasins in the Kaskaskia River Assessment Area. Subbasin boundaries depicted are those determined by the Illinois Environmental Protection Agency.

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Table of Contents

Introduction
- Physiographic Characteristics 1
- Climate Patterns 6
- Vegetation History 6
- Current Land Cover 7
- Biologically Significant Features of Natural Communities 16

Natural Vegetation Communities
- Comparison of Biodiversity in the KRAA to Statewide Patterns 31
- Illinois Threatened and Endangered Species 33
- Disturbance, Habitat Quality, and Restoration Potential 36
- Natural Areas and Nature Preserves 37
- Terrestrial Natural Community Descriptions 39
- Forest 40
- Prairie 50
- Savanna 55
- Wetland 60
- Lake and Pond 63
- Primary 64
- Cultural 66
- Summary and Recommendations 67

Birds
- Introduction 73
- Forest 87
- Wetland 89
- Savanna 90
- Prairie/Grassland 91
- Lakes, Ponds, and Impoundments 92
- Creeks and Rivers 93
- Cultural Habitats: Cropland 94
- Cultural Habitats: Successional Fields 95
- Cultural Habitats: Developed Land 96
- Management Recommendations 98

Mammals
- Introduction 99
- Forest 102
- Prairie/Grassland 105
- Wetland 106

Amphibians and Reptile
Introduction 109
Forest 111
Wetland 112
Prairie/Grassland 113
Lakes, Ponds, and Impoundments 113
Creeks and Rivers 114
Cultural Habitats 114
Overall Habitat Quality and Current Management Concerns 115
Aquatic Biota
Introduction 117
Statewide Comparison of Aquatic Biota 118
Common Species 118
Threatened and Endangered Species 137
Unique Habitats 139
Non-native Species 140
Information Gaps 141
Water Quality 142
Biologically Significant Streams 143
Environmental Problems 145
Potential Management Strategies for Aquatic Species 147
References 149
Appendix 1. Incomplete list of vascular plant species known from the KAAA 163
Appendix 2. Plant species, listed by scientific name 189

List of Figures

Figure 1. Major drainage basins of Illinois 3
Figure 2. Subbasins in the Kaskaskia River Assessment Area 4
Figure 3. Natural divisions in the Kaskaskia River Assessment Area 5
Figure 4. Cropland 10
Figure 5. Grasslands 11
Figure 6. Forest 12
Figure 7 Wetlands 13
Figure 8. Urban land 14
Figure 9. Open water 15
Figure 10. Public land 17
Figure 11. Natural areas, nature preserves, and biologically significant stream segments 26

List of Tables

Introduction
Table 1. Natural division acreage 2
Table 2. Current land cover 7
Table 3. Wetland acres 9
Table 4. Public land 16
Table 5. Natural areas 18
Table 6. Category 1 natural communities 24
Table 7. Nature preserves 24
Table 8. Biologically significant streams 27
Table 9. Threatened and endangered species 28

Natural Vegetation Communities
Table 10. Illinois threatened and endangered plant species in the KRAA 34
Table 11. Terrestrial natural communities 41
Table 12. Invasive and exotic plant species and eradication methods 71

Birds
Table 13. List of bird species in the Kaskaskia River Assessment Area 74

Mammals
Table 14. List of mammal species in the Kaskaskia River Assessment Area 100

Amphibians and Reptiles
Table 15. List of amphibian and reptile species in the KRAA 109

Aquatic Biota
Table 16. Freshwater fishes 119
Table 17. Freshwater fishes, by habitat 123
Table 18. Freshwater mussels 126
Table 19. Freshwater mussels, by habitat 128
Table 20. Freshwater crustaceans 129
Table 21. Freshwater crustaceans, by habitat 130
Table 22. Aquatic macroinvertebrates 131

Introduction

Physiographic Characteristics

The Kaskaskia River Assessment Area (KRAA) is an approximately 5,746.5 mile^2 (3,677,787 acre) contiguous area that includes the entire drainage basin of the Kaskaskia River. This basin extends from the headwaters in Champaign County (a cropland ditch) to where the Kaskaskia River enters the Mississippi River in Randolph County in southwestern Illinois (Figure 1). This large watershed, covering 10.2% of the total land area of Illinois, is divided into numerous subbasins (Figure 2). The KRAA crosses several physiographic divisions, each with distinct surface and bedrock geology. Most of the Assessment Area occurs within the Till Plains Section of the Central Lowland Province (Leighton et al. 1948). The Till Plains Section is divided into different areas depending on glacial history. The headwaters of the KRAA occurs within the Bloomington Ridged Plain, an area characterized by Wisconsinan glaciation. The lower two-thirds of the basin occur in the Springfield Plain and Mt. Vernon Hill Country, areas characterized by surface deposits of the older Illinoian glacial period. The lowest reach of the basin occurs at the juncture of the Shawnee Hills Section of the Interior Low Plateaus Province and the Salem Plateau Section of the Ozark Plateaus Province (Leighton et al. 1948). Elevation within the basin ranges from a minimum of 361 ft. above sea level at the confluence of the Kaskaskia River with the Mississippi River, to a maximum of 850 ft. above sea level at the headwaters northwest of Champaign.

Natural Divisions (Schwegman et al. 1973) within the KRAA include the Grand Prairie Division in the headwaters region, the Southern Till Plain Division throughout the central portion, and the Ozark Division at the lower reach of the river (Figure 3). About 77% of the Assessment Area occurs within the Southern Till Plains Division (Table 1), including portions of the Effingham Plain Section (81%) and Mt. Vernon Hill Country Section (19%). About 21% of the KRAA occurs in the Grand Prairie Division, including portions of the Grand Prairie and Springfield sections (Table 1). The remainder of the Assessment Area occurs in small portions of several other natural divisions including the Ozark Division (1.3%), Western Forest-Prairie Division (0.39%), the Lower Mississippi River Bottomlands Division (0.08%), and the Middle Mississippi River Border Division (0.004%).

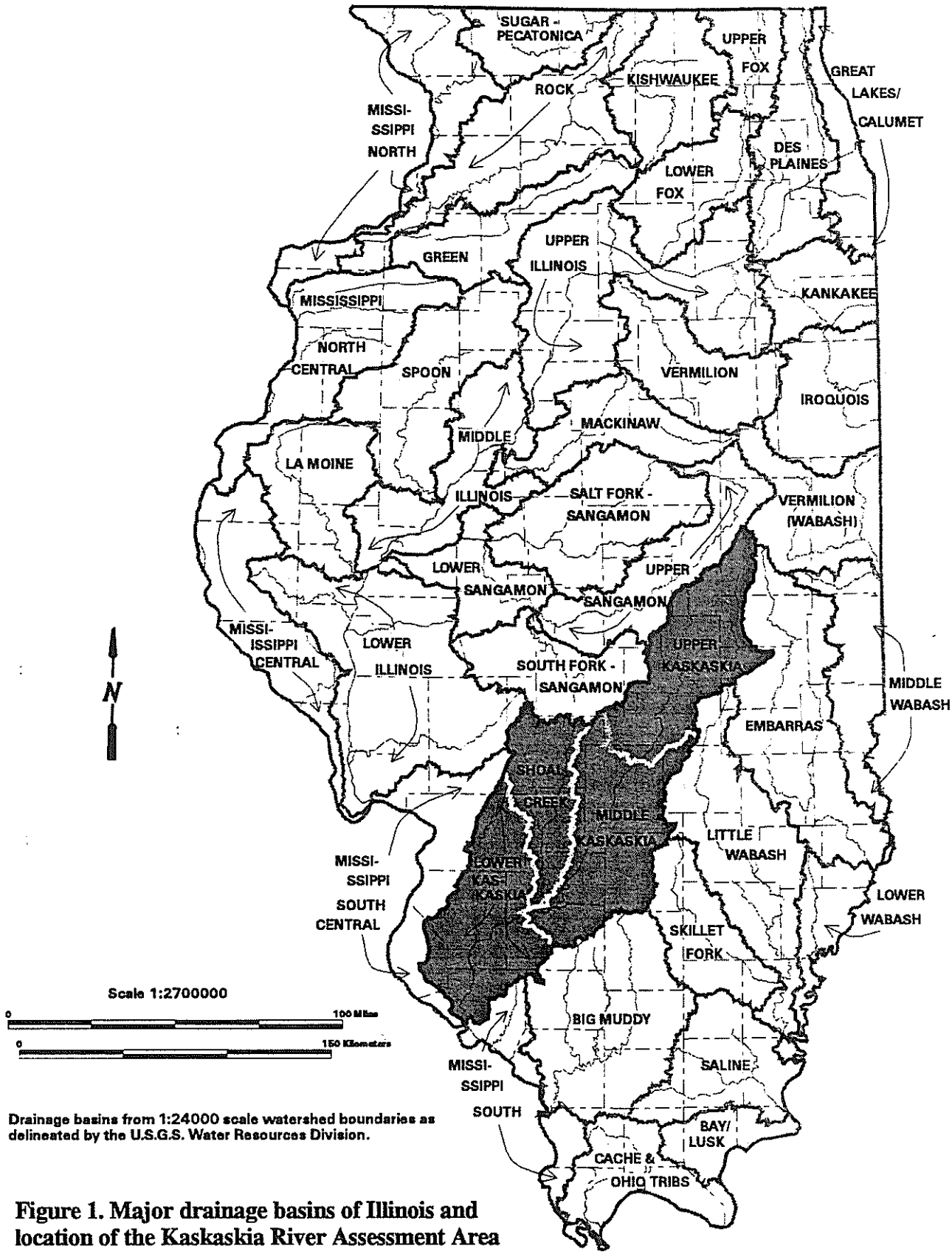
Soils in the KRAA primarily are developed in loess deposits and loess and underlying glacial till (Fehrenbacher et al. 1982) with local areas bordering the major streams where soils are formed in alluvium and/or lacustrine deposits. Soils can be further distinguished as those developed under grassland (e.g., prairie), forest, or transitional (savanna) vegetation. Soils in the region of the Grand Prairie Natural Division mostly were developed under prairie vegetation while forest and prairie soils predominate in the

remainder of the Assessment Area. These soils tend to range from slightly acid to neutral and lack claypan development. Many soils formed under prairie vegetation are somewhat to poorly drained silt loams and silty-clay loams. Drainage is improved to moderately well drained on slopes of moraines. Soils formed in loess under forest vegetation include well-drained to moderately well-drained silt loams. Soils formed in alluvial deposits tend to be poorly drained. Throughout the Illinoian till plain are soils characterized by the presence of claypans (Fehrenbacher et al. 1982). Flatwoods are a particular forest type occurring on level sites that are defined by the presence of claypans (Taft et al. 1995). Claypan soils are common in the KRAA in the Southern Till Plain Natural Division. Such sites can be seasonally wet and dry as dormant-season moisture often is perched above the claypan. These sites can become very dry during the growing season as the claypan limits soil-moisture recharge from subsurface moisture and evapo-transpirational forces diminish available moisture in the surface rooting zones. Many soils in the Southern Till Plain Division tend to be highly leached and acidic, including claypan soils. A glacial slack-water lake formed in the region between Clinton, Washington, and St. Clair counties following Wisconsinan glaciation resulted in a local occurrence of lacustrine deposits. In places, sand makes up a large proportion of the surface horizons. Where claypans are present, such sites become particularly dry during the growing season and support some of the most interesting flatwoods communities (Taft et al. 1995).

Table 1. Natural divisions occurring in the Kaskaskia River Assessment Area.

Division & Section	Acres[1]	% of KRAA
Southern Till Plain/Effingham Plain Section	2,284,735.07	62.12
Grand Prairie/Grand Prairie Section	740,109.12	20.12
Southern Till Plain/Mt. Vernon Hill Country Section	547,460.40	14.89
Ozark/Northern Section	44,120.65	1.20
Grand Prairie/Springfield Section	41,791.11	1.14
Western Forest-prairie/Carlinville Section	14,310.24	0.39
Lower Mississippi River Bottomlands/Northern Section	2,916.70	0.08
Ozark/Central Section	2,176.36	0.06
Middle Mississippi River Border/Glaciated Section	164.95	0.05
Major Water Bodies/Mississippi River Section	1.71	<0.01
Total:	**3,677,786.31**	**100.05**

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



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

Figure 1. Major drainage basins of Illinois and location of the Kaskaskia River Assessment Area

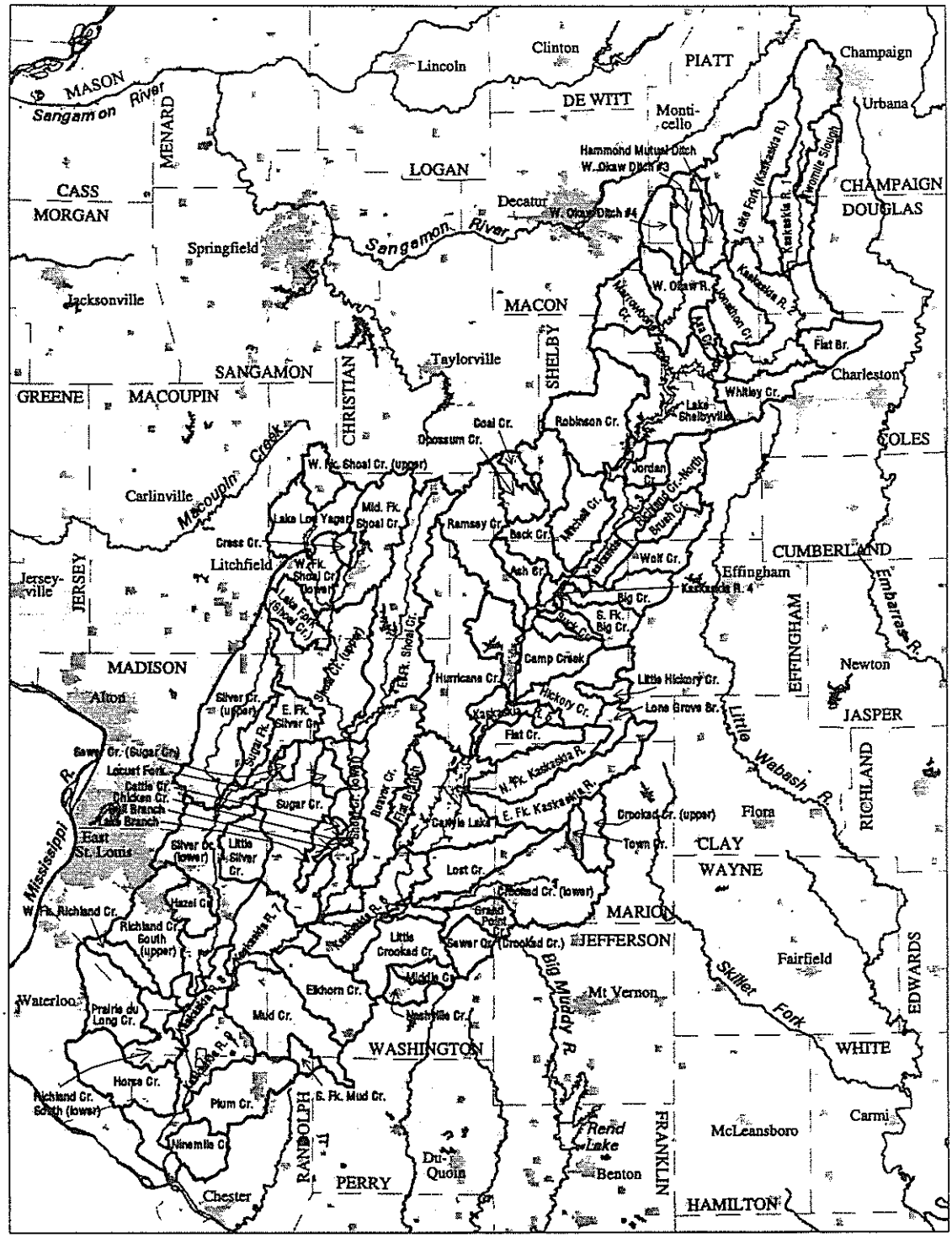


Figure 2. Subbasins in the Kaskaskia River Assessment Area. Subbasin boundaries depicted are those determined by the Illinois Environmental Protection Agency.

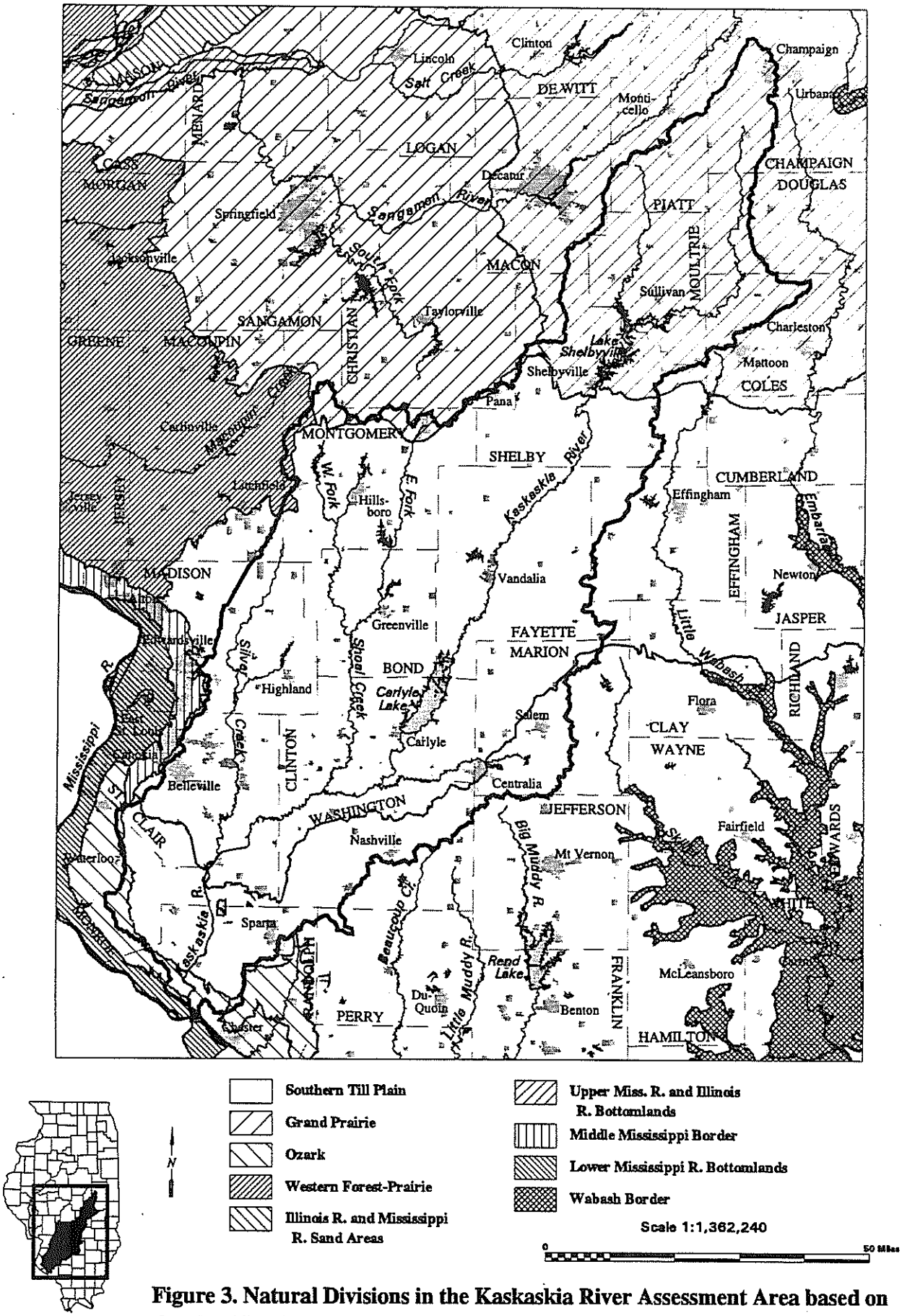


Figure 3. Natural Divisions in the Kaskaskia River Assessment Area based on the classification developed by Schwegman (1973).

Climate Patterns[1]

The climate in the Kaskaskia River Area Assessment is typical of many continental locations, in that there are rather wide temperature fluctuations. The average high temperature (°F) in the summer is in the 80s and 90s with average lows in the 60s. Winter highs are generally in the 30s and 40s with lows in the 20s. Record temperature extremes range from a low of -25° F to a high of 115° F. There is an average of just over six months without frost each year.

Precipitation is highest during March through July (averages of 3.36 to 4.44 inches per month) and lowest in January (1.90 inches) and February (2.59 inches), with a yearly average of 41.67 inches in the south and 40.20 inches in the north.

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, 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 in Illinois from about 1820 to 1840. Based on the GLO data, the KRAA was approximately 68% prairie and 32% forest, woodland, and savanna (Anderson 1970, GIS database). The distribution of prairie and forest in the Assessment Area differed among the natural divisions. The portion of the KRAA in the Grand Prairie Natural Division had a much greater proportion of prairie compared with other regions in the Assessment Area. The region of the Southern Till Plain in Illinois was about 60% forest (including savanna) at the time of the GLO surveys (Telford 1926) and this portion of the KRAA had a much higher proportion of forest/savanna compared with the Grand Prairie Division. Savannas, typically, were spatially dynamic and their total area and distribution on the presettlement landscape varied over time depending on several factors including local conditions of climate, and fire frequency and intensity (Taft 1997a). Fire generally is 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).

The estimate for the amount of presettlement wetlands in the KRAA is derived from county-level data. Because the data is at the county-level scale, the total cannot be determined with accuracy. Certain counties entirely or largely within the Assessment Area (e.g., Moultrie, Shelby, Fayette, Montgomery, Bond, Clinton, St. Clair) were evaluated for their estimated total presettlement wetland area (Havera et al. 1994). These counties

[1] Information in this section has been taken from the Kaskaskia River Area Assessment, Volume 2 (Illinois Department of Natural Resources 1999). See that volume for a more detailed discussion of climate patterns and long term trends.

comprise about 70% of the Assessment Area. Total presettlement wetlands in these counties were about 19% of the total area with county-level estimates ranging widely from only about 7% wetland in Bond and Shelby counties to 40% wetland for Moultrie County. Assuming the entire KRAA had a similar proportion of wetland compared with the presettlement estimated totals for these counties (i.e., about 19%), there were approximately 713,491 acres of wetland in the Assessment Area. Predominant wetland natural community types (following classification in White and Madany 1978) probably included wet prairie, marsh, floodplain forest, ponds, and shrub swamp.

Current Land Cover

Presently, the landscape of the KRAA is mostly cropland (Figure 4), comprising about 63.6% of the area (Table 2). The characterization of the land cover of the KRAA is based on information from the Land Cover of Illinois database, which was derived from Landsat Thematic satellite imagery acquired between 1991 and 1995. Cropland is a dominant cover type throughout the KRAA, with reduced abundance only from riparian drainages and dissected uplands. The next most abundant cover type is grassland with about 19.1% of the total cover (Figure 5). The grasslands are widespread throughout the KRAA but are less common in the Grand Prairie Division where cropland is particularly dominant. Only about 11.2 acres of high-quality prairie, located at six sites, remain in the KRAA among these grassland acres. This is about 0.001% of the remaining grassland cover and 0.0005% of the original extent of prairie in the Assessment Area. Prairie communities remaining in an undegraded condition include dry-mesic prairie, mesic prairie, wet-mesic prairie, and glacial-drift hill prairie. An unknown area of somewhat to greatly disturbed prairie also remains in the KRAA, particularly in railroad rights-of-way and some have potential for restoration.

Table 2. Current Land Cover for the Kaskaskia River Assessment Area[1].

Land Cover	Acres	Percent
Cropland	2,339,799	63.6
Grassland	702,731	19.1
Upland forest	330,227	9.0
Bottomland forest	135,772	3.7
Urban/Built-up	92,449	2.5
Water	46,194	1.3
Nonforested wetlands	30,585	0.8
Total:	**3,677,760**	**100.0**

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

Forest cover makes up about 12.7% of the KRAA with upland forest comprising about 9% and bottomland forest about 3.7% of the Assessment Area. Forests are located primarily along the major drainages, with particularly large concentrations along the Kaskaskia River between Washington, Clinton, and St. Clair counties, and in dissected uplands near the southwestern portion of the Assessment Area (Figure 6). Twenty-one separate sites totaling about 1,328 acres (0.28% of remaining forest and 0.11% of estimated original forest cover) contain forest natural communities that are in a nearly undegraded condition and are considered high-quality natural areas. Many of these sites contain more than one forest community type. Forest natural areas include dry-mesic upland forest, mesic upland forest, wet-mesic floodplain forest, wet floodplain forest, and flatwoods. Additional forest remnants are present in the KRAA that have considerable potential for ecological restoration.

The Illinois Wetlands Inventory (IWI) provides detailed information about the wetlands in the area. IWI data for the Kaskaskia River area were derived from high-altitude photography taken in 1980 and 1981. IWI data are the most recent comprehensive wetlands data available for the state.

Current estimated wetland area in the KRAA is about 165,699 acres, or 4.5% of the Assessment Area; compared to 3.5% of the total area of the state (Suloway and Hubbell 1994)(Figure 7). Seventy-three percent of the wetland area is bottomland forest, compared to the statewide percentage of 60.5%. Wetlands are concentrated along the major streams; a small percentage of the wetland land cover occurs as ponds in the southwestern portion of the Assessment Area. Many of these ponds may be associated with karst topography characteristic of that region. About 694 acres of wetlands at 15 sites (0.4% of remaining wetland acreage and 0.1% of original estimate) are high-quality natural areas. Most acreage of wetland natural areas (about 88%) is among bottomland forests. Other wetland natural areas include marsh, pond, shrub swamp, wet and wet-mesic prairie, and seep natural communities (Table 3).

The remaining land cover in the KRAA (4.6%) mostly can be divided among urban land and open water (Figures 8 and 9).

Open water wetlands account for 10.3% of the wetland acreage in the Assessment Area (compared to 11.4% for the state). Less than six percent of the wetland acreage is shallow marsh/wet meadow (compared to 13.1% of the state's wetlands) followed by shrub-scrub (3.1%), deep marsh (3.0%), shallow lake (2.2%), intermittent riverine (1.2%), lake shore (0.9%), swamp (0.5%), perennial riverine (0.2%), and emergent lake (0.0%).

The mean size of contiguous forested wetlands is 25.6 acres (range <0.1 to 3,016 acres); there are 4,617 separate forested wetlands in the Kaskaskia River Assessment Area. The eight largest forested wetland tracts (2,000 acres or larger) are located along the Kaskaskia River upstream from Fayetteville and below Carlyle Lake, at the upper end of Carlyle Lake, and along Shoal Creek. All of the eighteen tracts which are greater than 1,000 acres are located within about a thirty mile radius of Germantown.

Emergent wetlands range in size from less than 0.1 acre to 934 acres, with a mean size of 2.8 acres. There are 4,969 separate emergent wetlands in the KRAA. The largest emergent wetland is located along the Kaskaskia River just above Carlyle Lake. The next four largest emergent wetlands (166 to 224 acres) are located on Carlyle Lake and Lake Shelbyville.

Table 3. Wetlands habitat of the Kaskaskia River Assessment Area[1].

Category	Acreage	% of Wetland Area	% of Assessment Area
Palustrine Wetlands			
Shrub-Scrub Wetlands	5,135.39	3.1	0.1
Forested Wetlands			
Bottomland Forest	120,927.83	73.0	3.3
Swamp	850.29	0.5	0.0
Emergent Wetlands			
Shallow Marsh/Wet Meadow	9,333.57	5.6	0.3
Deep Marsh	4,988.19	3.0	0.1
Open Water Wetlands	17,028.09	10.3	0.5
Subtotal Palustrine	**158,263.36**	**95.5**	**4.3**
Lacustrine Wetlands			
Shallow Lake	3,644.25	2.2	0.1
Lake Shore	1,444.06	0.9	0.0
Emergent Lake	3.48	0.0	0.0
Subtotal Lacustrine	**5,091.79**	**3.1**	**0.1**
Riverine Wetlands			
Perennial Riverine	338.94	0.2	0.0
Intermittent Riverine	2,005.20	1.2	0.1
Subtotal Riverine	**2,344.14**	**1.4**	**0.1**
Total Wetlands:	**165,699.29**	**100.0**	**4.5**

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

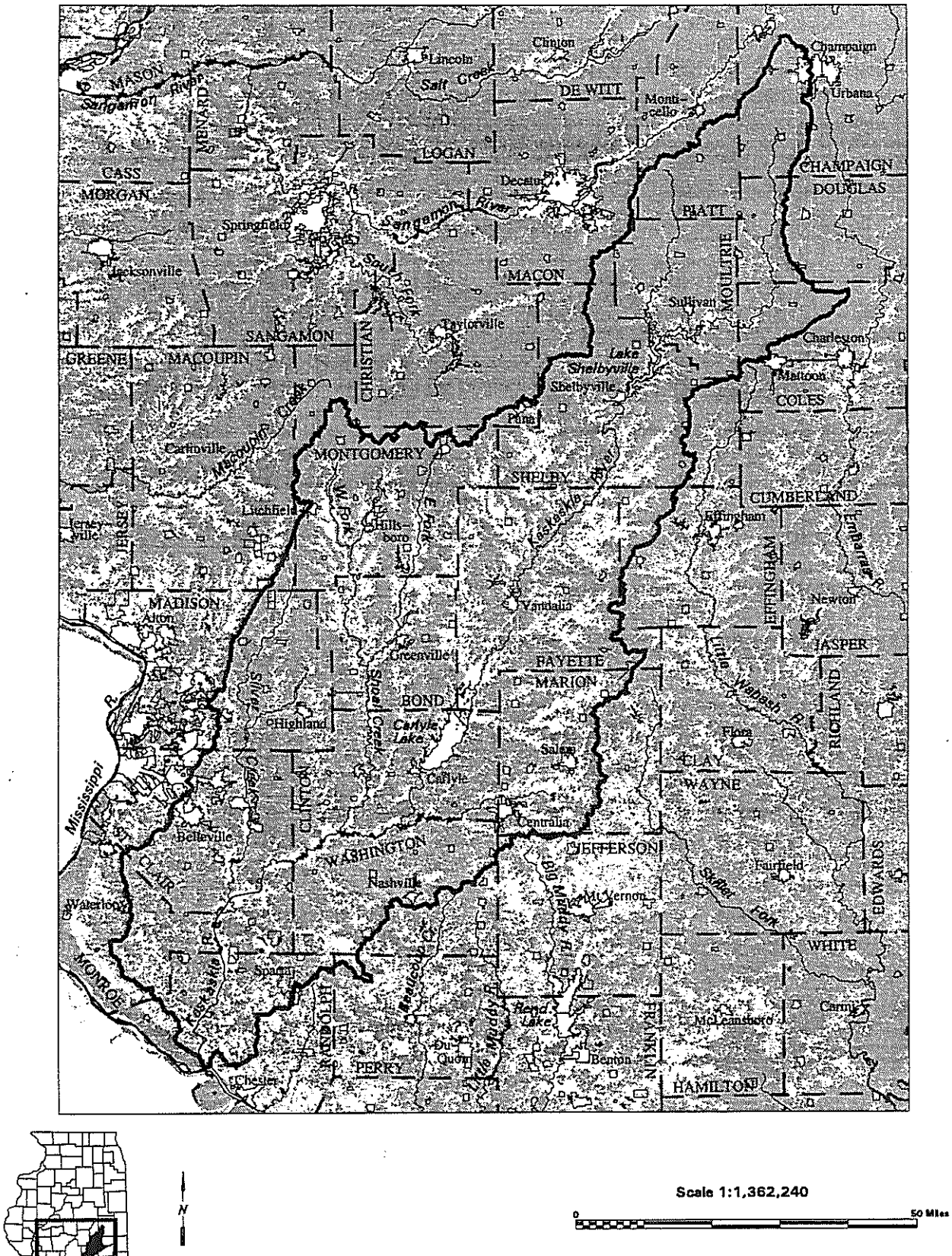


Figure 4. Cropland in the Kaskaskia River Assessment Area. Cropland depicted on this map includes row crops and small grains from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

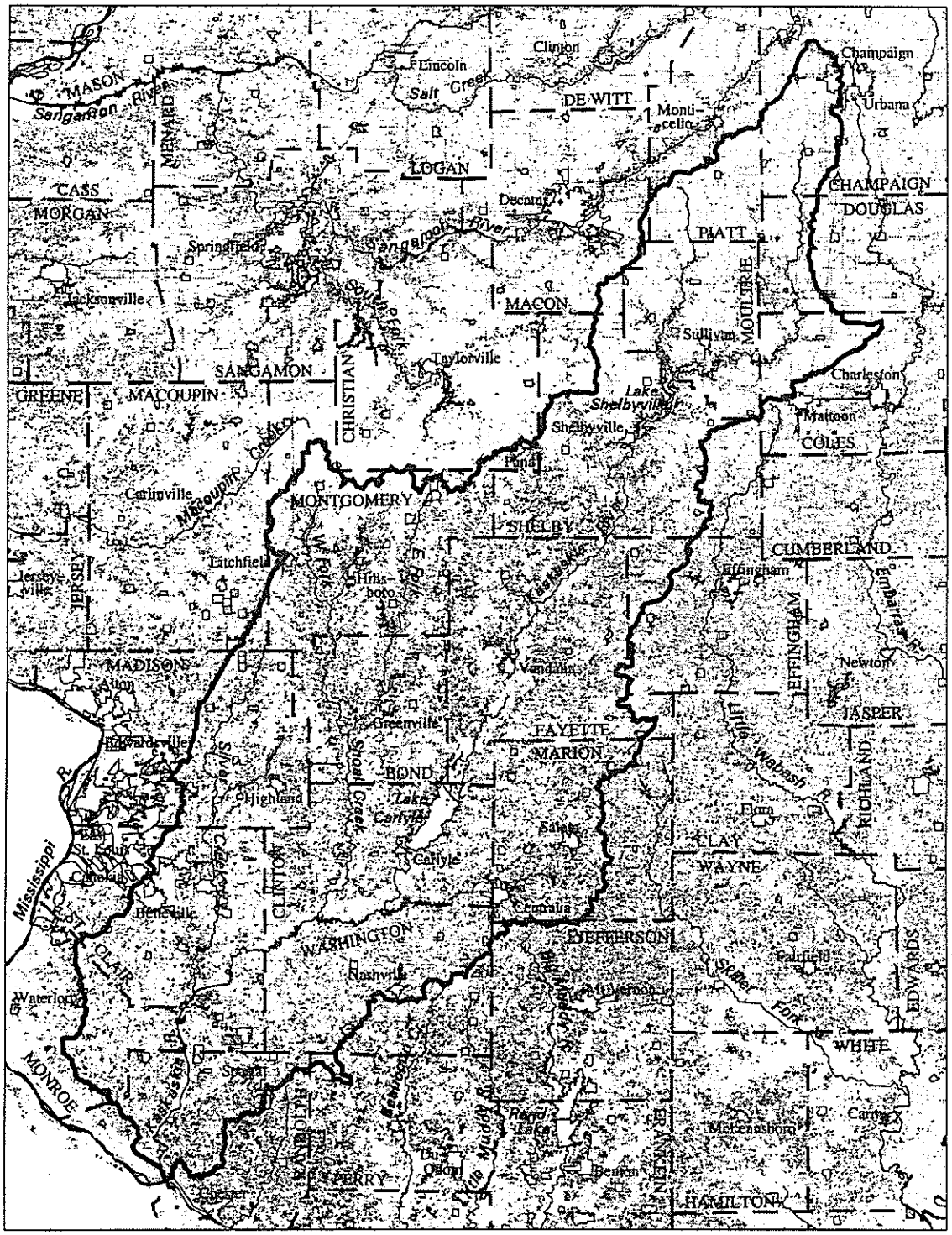


Figure 5. Grasslands in the Kaskaskia River Assessment Area. Grasslands depicted on this map are nonurban grasslands from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

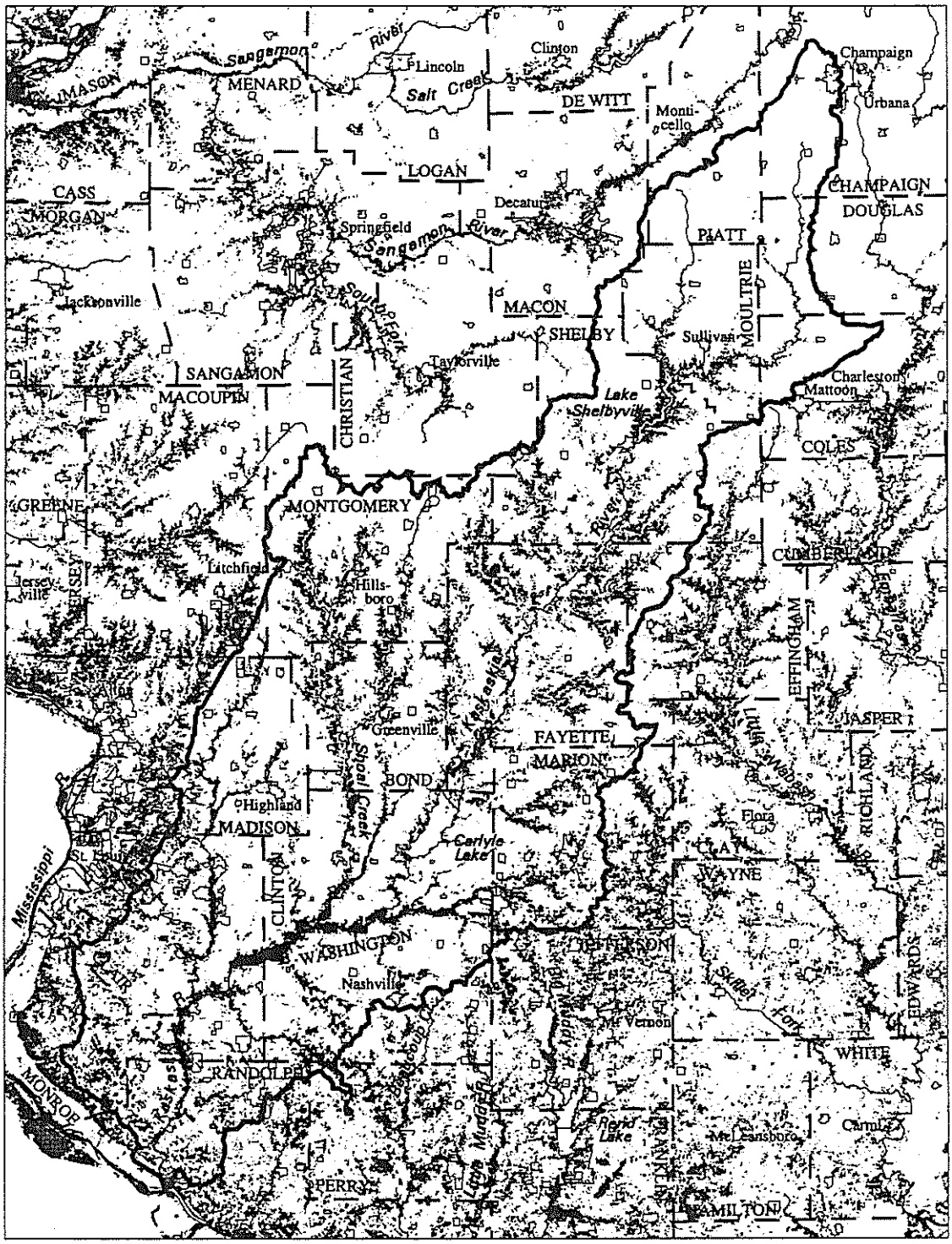


Figure 6. Forest in the Kaskaskia River Assessment Area. Forest depicted on this map includes upland and bottomland forest from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

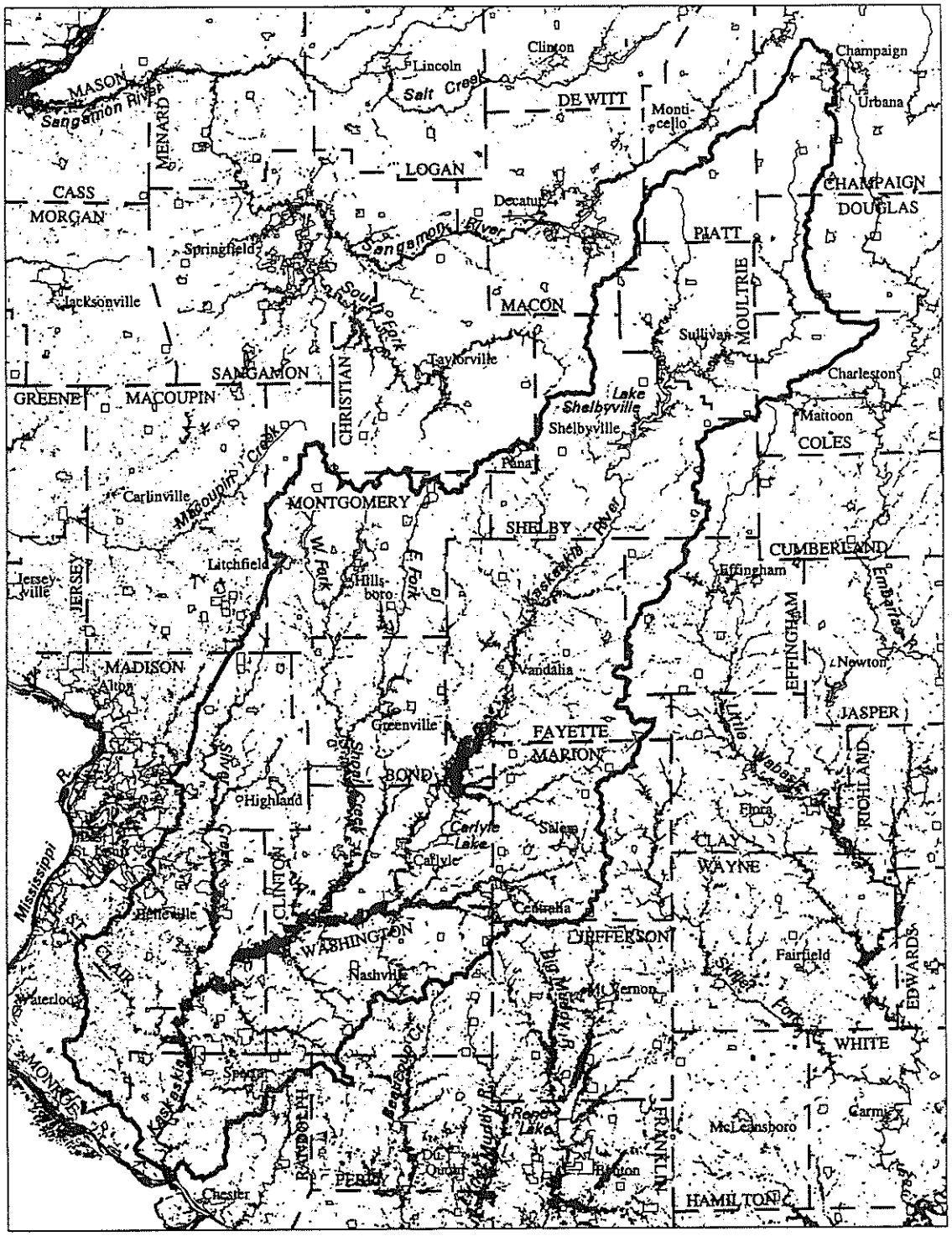


Figure 7. Wetlands in the Kaskaskia River Assessment Area. Wetlands depicted on this map include nonforested wetlands and bottomland forest from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

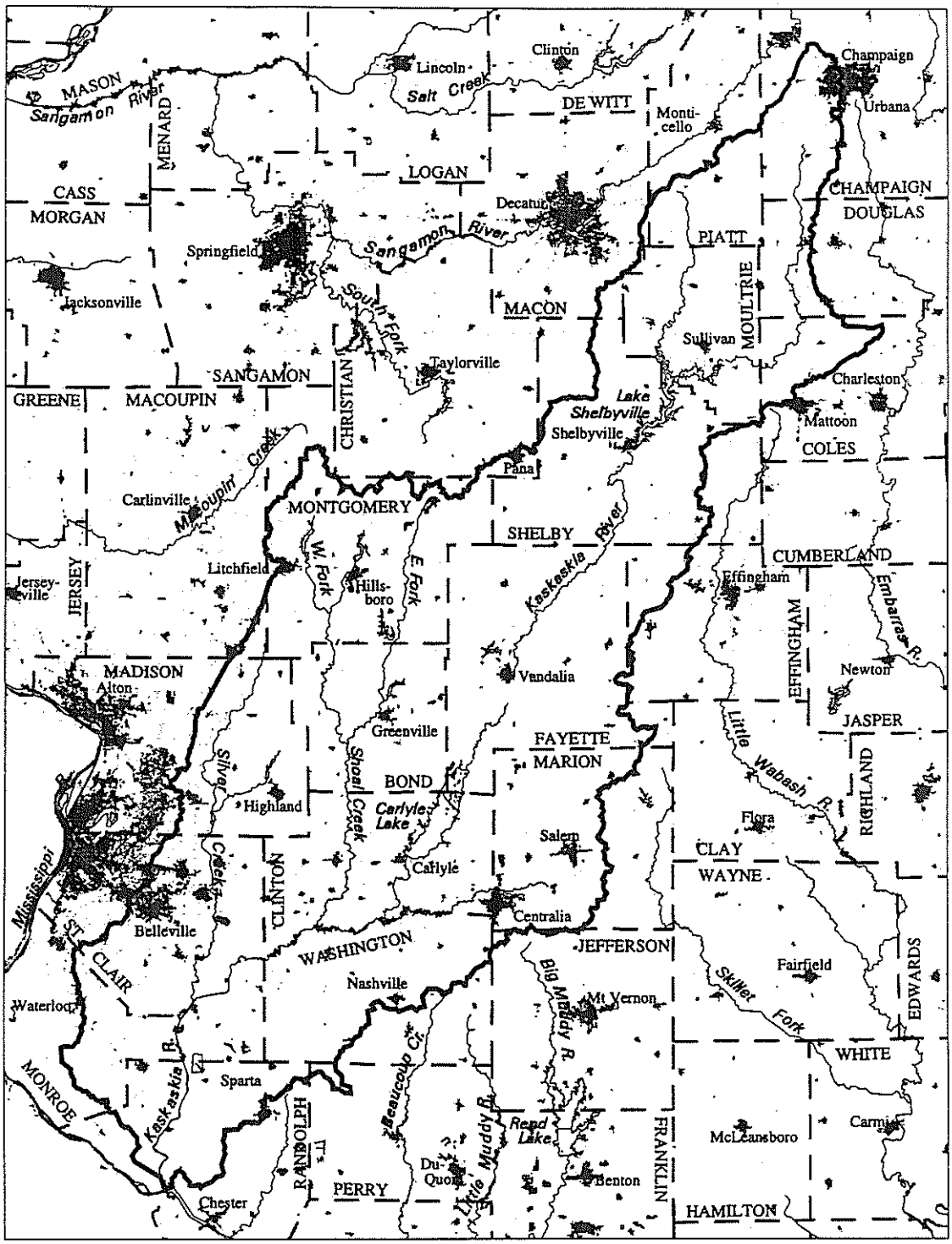


Figure 8. Urban land in the Kaskaskia River Assessment Area. Urban land depicted on this map includes urban/built-up land and urban grassland from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

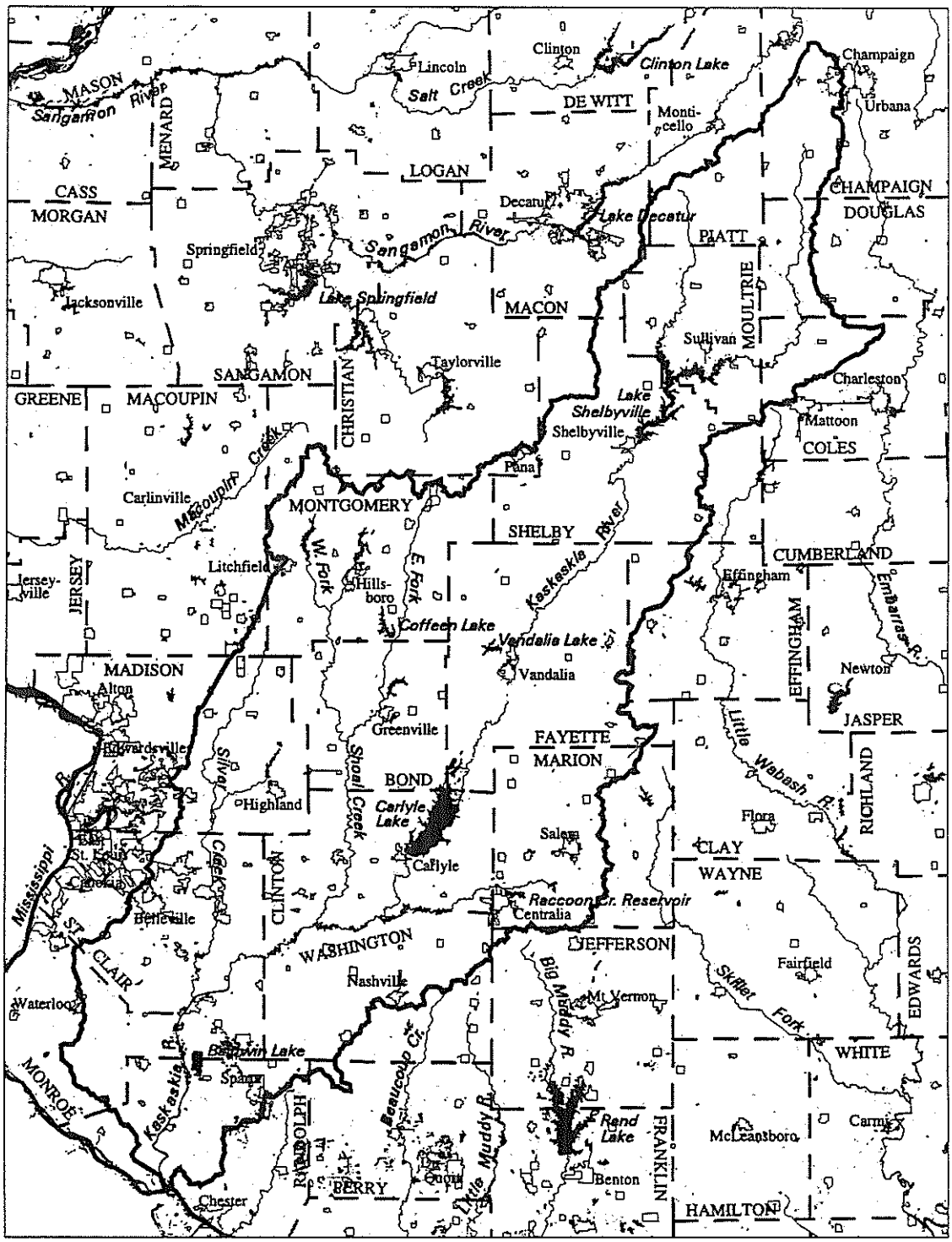


Figure 9. Open water in the Kaskaskia River Assessment Area from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

Biologically Significant Features of Natural Communities

Although over 80% of the land in the KRAA is used for agricultural purposes, 87,409 acres (2.38% of the KRAA) has been set aside by the federal, state, or county government as parks, fish and wildlife areas, and forests (Table 4, Figure 10). These areas give some level of protection to the natural communities in the area, and in some cases they are the only refuge for certain endangered species or natural communities. However, these areas do not always offer adequate protection, and they are not all situated in the most biologically important areas.

Table 4. Public land in the Kaskaskia River Assessment Area[1].

Name	Acres
State Land	
Carlyle Reservoir State Fish and Wildlife Area	16,912
Eagle Creek State Park	2,251
Eldon Hazlet State Park	2,791
Hidden Springs State Forest	1,059
Kaskaskia State Fish and Wildlife Area	16,233
Ramsey Lake State Park	1,876
Shelbyville Lake State Fish and Wildlife Area	6,408
South Shore State Park	885
Wolf Creek State Park	2,036
Total State Land	**50,451**
Federal Land	
Eldon Hazlet State Park - Carlyle Lake	2,791
Lake Carlyle	33,197
South Shore State Park - Carlyle Lake	885
Total Federal Land	**36,873**
County Land	
St. Clair County Park	85
Total County Land	**85**

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

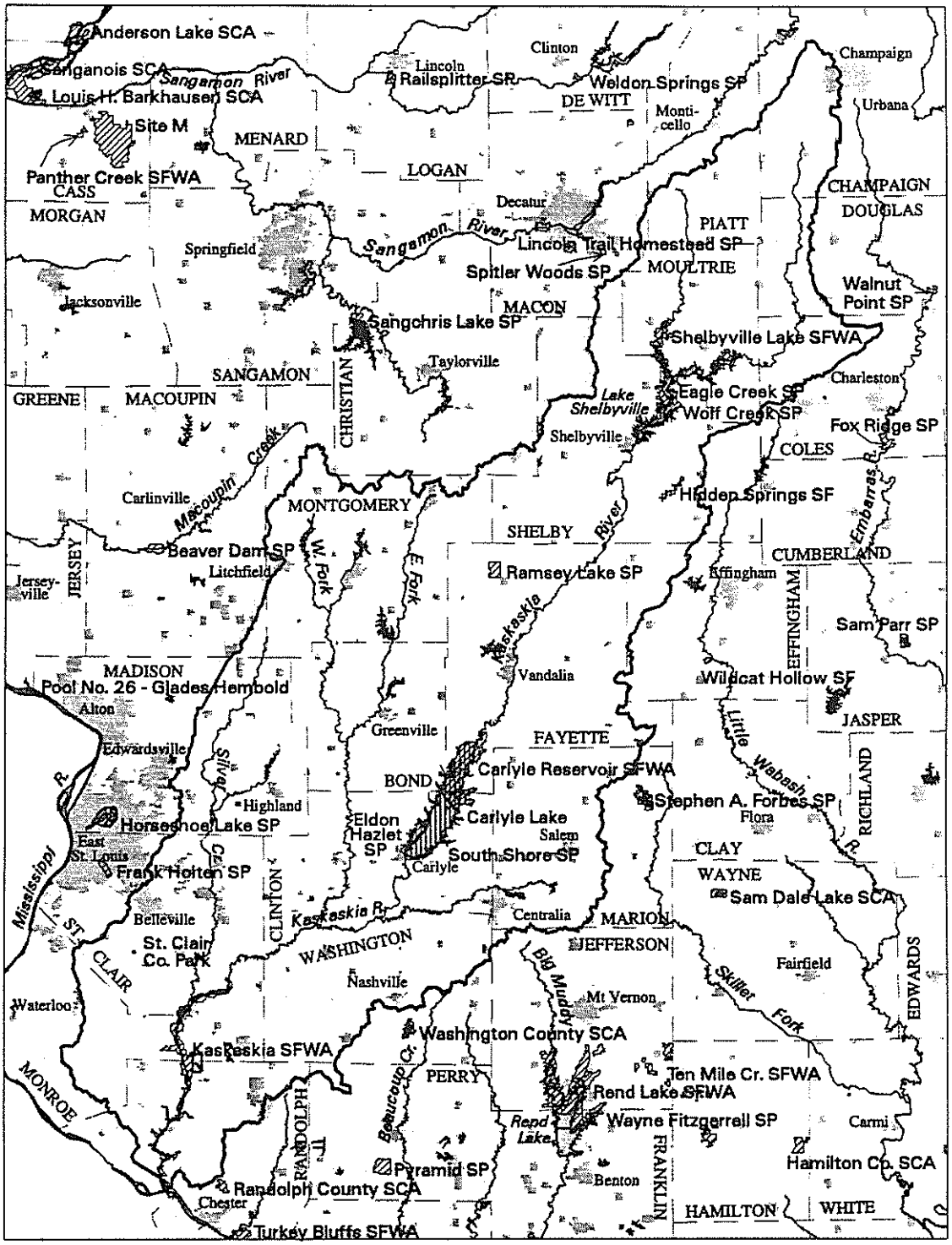


Figure 10. Public land in the Kaskaskia River Assessment Area. State land is limited to parks (SP), conservation areas (SCA), forests (SF), and fish and wildlife areas (SFWA) and county land to forest preserves and similar land.

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 also 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. Increasingly, it is recognized that large habitat remnants, although perhaps mostly Grade C quality, have unique contributions to conservation efforts. Five forest remnants that exceed 500 acres in size occur in the KRAA, including both Grade C and better-quality habitats. These large forest blocks are a particularly unique and biologically valuable aspect of the Assessment Area.

The estimates and comparisons of natural areas within the KRAA 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 underestimated.

Sixty natural areas occur within the KRAA and six more occur within a one-mile buffer zone of the Assessment Area (Table 5). Of the natural areas within the Assessment Area boundary, 43 are high-quality natural communities (Category I [at least ten of these also have T&E species]), seven are T&E sites only (Category II), four are significant geological areas (Category IV), and six are outstanding aquatic areas (Category VII).

Table 5. Natural areas in the Kaskaskia River Assessment Area and surrounding region[1].

NA#[2]	County	Acres[3, 4, 5]	Name
5	Coles	1.31	Water Works Hill Prairie
6	Coles	4.55	Stoddard Hill Prairie
8	Coles	2.20	Five-Mile Hill Prairie
10	Coles	13.15	Stevens Hill Prairie
13	Christian	18.75	Berry's Woods
15	Macon	48.76	Bois Du Sangamon
18	Piatt	185.70	Lodge Park

Table 5. Continued.

NA#[2]	County	Acres[3, 4, 5]	Name
20	De Witt	59.32	Mettler Woods
24	**St. Clair**	**41.75**	**Julius J. Knobeloch Woods**
25	**St. Clair**	**41.00**	**Silver Creek Marsh**
26	**St. Clair**	**21.51**	**Baer Brothers Woodlot**
29	**St. Clair**	**89.98**	**Freeburg Rod and Gun Club**
30	Macoupin	25.43	Chaney Woods
32	**Fayette**	**149.03**	**Sonneman Woods**
34	Jefferson	8.19	Capp Pond
37	Clay	92.08	Flag Pond
44	Sangamon	248.11	Carpenter Park
46	Macon	163.38	Spitler Woods
51	Champaign	57.49	Trelease Woods
52	Champaign	64.26	Brownfield Woods
77	**Moultrie**	**33.99**	**Sullivan Woods**
84	Macon	77.81	Long Point Slough (East)
85	Macon	125.47	Calamus Lake
91	Perry	92.22	Timpner Pond
93	Perry	26.95	Lake Pinckneyville Woods
94	Perry	141.74	Pin Oak Flatwoods
95	Perry	55.88	Behre Bluff
97	Randolph	48.00	Behnken Tract
99	Randolph	82.76	Prairie Du Rocher-south
111	Cass	48.76	Panther Creek Conservation Area
112	Cass	15.77	Shick Shack Sand Pond
124	Mason	30.56	Matanzas Sand Prairie
149	Greene	30.69	Providence Woods
151	**Fayette**	**159.57**	**Fish Lake Woods**
163	**Fayette**	**87.98**	**Dean Hills**
167	Jackson	606.60	Campbell Lake
178	Logan	180.97	Elkhart Hill
181	Macoupin	107.31	Hagaman Marsh
182	Macoupin	31.57	Solomon Creek Woods
183	Macoupin	39.73	Goode's Memorial Woods
184	Madison	97.36	Bohm Woods
186	Marion	22.74	Miller Shrub Swamp
187	**Marion**	**19.42**	**Sandy Branch Woods**
190	Mason	52.59	Barton - Sommer Woodland
191	Mason	18.42	Tomlin Timber
193	Mason	21.91	W. B. Wallace Woods
194	Mason	164.98	Long Branch Sand Prairie
195	Mason	416.44	Revis Prairie
196	Mason	154.43	Matanzas Prairie
198	Monroe	45.49	Rahe's Woods
199	Monroe	90.00	Monroe City Hill Prairie
200	Monroe	722.78	Potato Hill Hill Prairie

Table 5. Continued.

NA#[2]	County	Acres[3, 4, 5]	Name
201	Monroe	456.00	Columbia Hill Prairie
202	Monroe	89.00	Miles Prairie
236	**St. Clair**	**26.39**	**Marissa Woods Nature Preserve**
237	St. Clair	13.00	Dupo Prairie
238	St. Clair	19.00	Sugar Loaf Hill Prairie
239	**St. Clair**	**219.64**	**Freeburg Woods**
242	**St. Clair**	**179.32**	**Jackson Slough Woods**
304	Madison	230.34	Levee Lake
307	**St. Clair**	**58.00**	**Lively Branch Woods**
308	**St. Clair**	**114.00**	**Wagon Lake**
319	Cass	2.14	Chandlerville Cemetery Prairie
320	**Clinton**	**51.29**	**Eversgerd Flatwoods**
321	**Fayette**	**9.51**	**Bauman Pond**
332	Macoupin	137.93	Bullard Lake Club
347	Randolph	180.00	Piney Creek Ravine
354	Coles	5.00	Hillside Marsh
355	**Effingham**	**398.68**	**Rock Cave**
361	Mason	201.10	Knuppel Woods
362	Mason	41.46	Barkhausen Woods
363	Mason	37.93	Duck Soup Woods
365	Menard	11.09	Witter's Bobtown Hill Prairie
389	**Coles**	**0.77**	**Humboldt Railroad Prairie**
418	**Clinton**	**147.00**	**Lost Creek Prairie**
429	**Bond**	**10.54**	**Sorento Geological Area**
442	Macoupin	27.04	Scottville Geological Area
443	Madison	6.24	Alton Geological Area
450	Cumberland	27.68	Jewett Geological Area
488	Randolph	1.74	Coles Mill Geological Area
519	Cass	16.69	Cottonwood Geological Area
544	Effingham	12.04	Effingham North Geological Area
546	**Fayette**	**63.39**	**Ramsey Marsh**
547	**Fayette**	**6.85**	**Mulberry Grove Geological Area**
548	**Fayette**	**51.79**	**Vandalia Geological Area**
549	**Fayette**	**5.38**	**Ramsey Lake Railroad Prairie**
551	Franklin	347.77	Freeman Coal Company Forest
601	Jasper	30,123.68	Jasper County Prairie Chicken Habitat
679	Clay	80.97	Hanging Rock
725	Macoupin	23.53	Carlinville Geological Area
726	Macoupin	9.06	Carlinville Railroad Prairie
727	Macoupin	3.11	Denby Prairie
728	Madison	233.19	Olin Tract
729	**Marion**	**1.28**	**Salem Leckrone Airport Railroad Prairie**
730	**Marion**	**2.98**	**Alma Railroad Prairie**
732	Mason	1,593.12	Sand Prairie--Scrub Oak
737	Mason	17.32	Bath Lake Springs

Table 5. Continued.

NA#[2]	County	Acres[3, 4, 5]	Name
748	Menard	92.21	Lounsberry Hill Prairie
750	**Montgomery**	**2.01**	**Roberts Cemetery Savanna**
751	**Montgomery**	**4.08**	**Irving Railroad Prairie**
752	**Montgomery**	**103.30**	**Shoal Creek Barrens**
754	**Marion**	**6,163.58**	**Marion County Prairie Chicken Habitat**
756	Monroe	73.00	Camp Vandeventer
757	**Monroe**	**27.59**	**Bradley Branch Woods**
758	Monroe	154.24	Saltpeter Cave Area
759	*Monroe*	*80.00*	*Renault Geological Area*
760	Monroe	223.40	Chalfin Bridge Hill Prairie
761	Monroe	232.00	Renault Herpetological Area
762	**Monroe**	***9,880.00**	**Fogelpole Cave**
785	Monroe	503.63	Madonnaville Cave
786	**Monroe**	***4,140.00**	**Dry Run Cave System**
826	Randolph	1.24	Castle Rock
828	Randolph	75.50	Rockcastle Creek Area
830	Randolph	2.93	Modoc Northwest Geological Area
832	**St. Clair**	**81.00**	**Wirth Island**
833	**St. Clair**	**195.00**	**New Athens Woods**
834	**St. Clair**	**131.08**	**Silver Creek Woods**
835	*St. Clair*	*173.00*	*Stemler Cave Woods*
837	**St. Clair**	**2.58**	**Floraville Geological Area**
838	St. Clair	824.00	Falling Spring
865	**Washington**	**49.00**	**West End Sportsman's Club Woods**
866	**Washington**	**182.00**	**Sipple Slough Woods**
867	Washington	36.72	Posen Woods
868	**Washington**	**19.50**	**Bohbrink Woods**
869	**Washington**	**79.57**	**Williams Creek Woods**
870	**Washington**	**72.31**	**Johnson Woods**
871	Wayne	40.22	Dry Fork Woods
938	Randolph	444.00	Demint Prairie/Prairie Du Rocher Herpetological Area
939	*St. Clair*	*3,260.00*	*Stemler Cave Area*
950	Jasper	[80.50]	Embarras River
962	Jersey	97.10	Principia Hill Prairies West
970	Jersey	493.32	Principia Hill Prairies East
991	Effingham	6.43	Twelve Mile Prairie (Tract No. 1)
996	**Marion**	**11.85**	**Twelve Mile Prairie (tract No. 6)**
1016	**Monroe**	***2,950.00**	**Illinois Caverns Cave System**
1017	**Monroe**	***1,100.00**	**Renault Cave System**
1029	*Fayette*	*1.76*	*Twelve Mile Prairie (Tract No. 3)*
1030	**Fayette**	**17.85**	**Twelve Mile Prairie (Tract No. 4)**
1031	**Marion**	**29.10**	**Twelve Mile Prairie (Tract No. 5)**
1032	Effingham	19.46	Twelve Mile Prairie (Tract No. 2)
1043	Piatt	1,764.89	Robert Allerton Park
1044	Clay	3.09	Xenia Railroad Prairie

Table 5. Continued.

NA#[2]	County	Acres[3, 4, 5]	Name
1045	Monroe	1405.00	Fults Hill Prairie--kidd Lake Marsh
1048	Wayne	6.40	Mt. Erie Springs
1084	Mason	22.78	Snicarte Sand Area
1086	Macon	22.64	Elwin Camassia Site
1087	Cass	61.23	Bluff Springs Sand Pond
1117	Champaign	1.57	Mahomet Site
1119	Coles	[41.80]	Embarras River - Camargo
1123	Fulton	1.48	Anderson Lake Site
1130	**Moultrie**	**3.71**	**Coneflower Hill Prairie**
1135	**Shelby**	**1.89**	**Harmon Cemetery Site**
1156	White	[132.00]	Little Wabash River
1286	Schuyler	11.74	Sanganois Landing
1299	**Bond**	**0.00**	**Mulberry Grove Railroad Prairie**
1302	Madison	32.87	Poag Railroad Prairie
1303	Madison	1.60	Chouteau Catchfly Site
1305	Madison	104.86	Eagle Park Marsh
1306	Monroe	0.00	Pautler Cave
1307	**Randolph**	**[21.80]**	**Mississippi River - Mudds Landing**
1309	**Randolph**	**0.00**	**Leemon Site**
1310	*Randolph*	*0.00*	*Reily Lake Area*
1311	**Randolph**	**0.00**	**Sparta Site**
1312	St. Clair	20.00	East St. Louis (Alorton) Heron Colony
1313	St. Clair	38.42	Fairmont City Site
1314	Clay	3,730.53	Clay County Prairie Chicken Habitat
1315	**Fayette**	**0.00**	**Carlyle Lake Site**
1316	**Fayette**	**0.00**	**Wolf Creek Sedge Site**
1317	Franklin	0.00	Rend Lake Slider Site
1319	Jefferson	118.70	Texico Woods
1329	White	33.32	Norris City Reservoir
1333	Cass	4.55	Bluff Springs Hill Prairie
1334	Cass	171.85	Cox Creek Hill Prairie
1335	Greene	15.21	Roodhouse Site
1336	Macoupin	0.75	Etter Cemetery
1337	Macoupin	0.50	Gillespie Railroad Prairie
1346	Mason	0.00	Snicarte Bulrush Area
1348	Menard	23.59	Oakford Spiderwort Site
1349	Morgan	3.69	Bull Cemetery
1350	Morgan	1.01	Gunn Cemetery
1351	Morgan	0.20	Murrayville Railroad Prairie
1426	Cass	1.77	Hagener Sand Pond
1428	Champaign	0.85	Sangamon Phlox Site
1430	*Coles*	*[14.90]*	*Riley Creek*
1432	De Witt	[68.18]	Salt Creek
1434	Effingham	6.68	Lake Sara Flatwoods
1435	**Fayette**	**[17.20]**	**Ramsey Creek**

Table 5. Continued.

NA#[2]	County	Acres[3, 4, 5]	Name
1436	Greene	0.80	Rhodes Cemetery
1437	Greene	0.40	Sheppard Cemetery
1448	Macoupin	4.74	Woodburn Large Ground Plum Site
1449	Piatt	[145.40]	Sangamon River
1452	Morgan	0.89	Harts Prairie Cemetery
1453	**Moultrie**	**[16.00]**	**West Okaw River**
1459	**Shelby**	**[18.00]**	**Kaskaskia River**
1482	Shelby	[17.60]	West Branch
1514	**Clinton**	**[31.80]**	**Kaskaskia River - Carlyle**
1515	**Douglas**	**[14.70]**	**Kaskaskia River - Chicken Bristle**
1517	Gallatin	[7.80]	North Fork Saline River
1521	Logan	[14.60]	Sugar Creek
1522	Menard	[14.70]	Sangamon River - Petersburg
1524	Sangamon	[6.90]	South Fork Sangmon River
Total acres in the KRAA:		**9168.04**	
Total cave acres in the KRAA:		**18,070.00**	

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

[2] The number of the natural area (NA#) refers to the number designated in the Natural Heritage Database (Illinois Department of Natural Resources 1998) and in Figure 11.

[3] Values within brackets indicate Stream natural areas; which do not have acreage. The reported number is an approximate distance in miles and is not included in the total natural area acreage.

[4] Acreage of 0.00 indicates that no figures are currently available.

[5] * = These are not surface acres and have been subtracted from the total.

Among the 43 Category I sites identified within the KRAA are about 58 remnants of natural communities comprising 19 different natural communities types, including terrestrial and aquatic cave communities. The high-quality portions of these natural areas (i.e., the Category I acreage), not including the acreage for the cave systems or cliff communities, total about 1,420 acres, or about 0.04% of the KRAA (Table 6). This compares to 0.07% of Category I acreage for the entire state (White 1978). Area of all natural areas except caves, including buffer zones (sometimes extensive), totals about 9,427.5 acres, or about 0.26% of the Assessment Area.

Nature preserves are areas of land or water in public or private ownership that are formally dedicated to receive maximum protection of significant natural features. The central goal of the nature preserve system, currently with over 290 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 largely 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 are eight nature preserves completely within the KRAA (Table 7) and two that partially are within the boundary totaling about 498 acres (about 0.01% of the KRAA). Nature preserves are widely scattered throughout the KRAA with preserves in St. Clair, Effingham, Fayette, Montgomery, Monroe, and Marion counties (Table 7, Figure 11).

Table 6. Category I natural communities in the Kaskaskia River Assessment Area.[1,2]

	Acres of category I in the KRAA			Acres of category I in Illinois			% of Illinois Category I in the KRAA		
Community type[3]	Grade A	Grade B	KRAA Total	Grade A	Grade B	IL Total	Grade A	Grade B	% of IL Total
dry-mesic upland forest	121.0	64.5	185.5	986.0	2084	3070.0	12.27	3.10	6.04
mesic upland forest	20.0	55.0	75.0	1058.0	1473	2531.0	1.89	3.73	2.96
wet-mesic floodplain forest	22.0	28.0	50.0	497.0	2617	3114.0	4.43	1.07	1.61
wet & wet-mesic floodplain forest	322.0	242.0	564.0	336.0	2522	2858.0	95.83	9.60	19.73
southern flatwoods	206.0	247.0	453.0	323.0	311	634.0	63.78	79.42	71.45
dry-mesic prairie	0.0	3.0	3.0	9.4	50	59.4	0.00	6.00	5.05
mesic prairie	0.3	3.3	3.6	54.0	220	274.0	0.56	1.50	1.31
wet-mesic prairie	0.0	1.0	1.0	26.0	99	125.0	0.00	1.01	0.80
glacial drift hill prairie	0.0	3.6	3.6	14.0	20	34.0	0.00	18.00	10.59
mesic savanna	0.0	1.0	1.0	0.0	2	2.0	0.00	50.00	50.00
dry barrens	0.0	2.0	2.0	12.0	24	36.0	0.00	8.33	5.56
marsh	0.0	1.0	1.0	310.0	1920	2230.0	0.00	0.05	0.04
seep	0.0	0.5	0.5	31.0	63	94.0	0.00	0.79	0.53
shrub swamp	60.0	17.0	77.0	281.0	17	298.0	21.35	100.00	25.84
pond	60.0	17.0	77.0	204.0	919	1123.0	29.41	1.85	6.86
sandstone cliff community	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
terrestrial cave community	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
aquatic cave community	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Totals:	**705.3**	**604.9**	**1420.2**	**4141.4**	**12341**	**16482.4**			

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

[2] N/A = not applicable. As vertical features, cliffs have no acreage. As a subsurface feature, cave acreage is not counted.

[3] Shrub swamp and pond communities are the same sites considered as both community types. The total sum does not double-count this acreage.

Table 7. Nature preserves in the Kaskaskia River Assessment Area and surrounding region[1].

NP#[2]	Corr - NA[3]	County	Acres[4,5]	Name
22	732	Mason	1,464.76	Sand Prairie-Scrub Oak
30	1045	Monroe	527.50	Fults Hill Prairie
38	601	Jasper	407.00	Jasper Co. Prairie Chicken Sanctuary

Table 7. Continued.

NP#[2]	Corr - NA[3]	County	Acres[4, 5]	Name
39	***754***	***Marion***	***55.62****	***Marion Co. Prairie Chicken Sanctuary***
45	195	Mason	53.00	Revis Hill Prairie Nature Preserve
59	867	Washington	40.00	Posen Woods
65	347	Randolph	195.00	Piney Creek Ravine
69	44	Sangamon	341.00	Carpenter Park
78	15	Macon	40.00	Bois Du Sangamon
87	184	Madison	15.50	William & Emma Bohm Memorial
89	46	Macon	144.60	Spitler Woods
101	**24**	**St. Clair**	**35.10**	**Julius J. Knobeloch Woods**
102	**236**	**St. Clair**	**25.00**	**Marissa Woods**
108	**355**	**Effingham**	**75.70**	**Rock Cave**
127	**163**	**Fayette**	**77.93**	**Dean Hills**
131	196	Mason	37.38	Matanzas Prairie
133	112	Cass	47.81	Shick Shack Sand Pond
140	***835***	***St. Clair***	***48.57****	***Stemler Cave Woods***
144	365	Menard	6.42	Witter's Bobtown Hill Prairie
147	727	Macoupin	5.06	Denby Prairie
152	**750**	**Montgomery**	**1.67**	**Roberts Cemetery Prairie**
154	191	Mason	18.32	Tomlin Timber
176	194	Mason	92.39	Long Branch Sand Prairie
177	**762**	**Monroe**	**27.3**	**Fogelpole Cave**
184	186	Marion	29.62	Miller Shrub Swamp
189	**786**	**Monroe**	**105.00**	**Armin Krueger Speleological Area**
192	728	Madison	228.24	John M. Olin
208	85	Macon	127.49	Calamus Lake
234	-	Madison	17.31	Oblate Father's Woods
236	-	Madison	32.81	Mississippi Sanctuary
246	190	Mason	54.55	Barton-Sommer's Woodland
252	184	Madison	7.43	E. Dora Bohm Memorial
266	**549**	**Fayette**	**10.94**	**Ramsey Railrod Prairie**
268	183	Macoupin	40.84	Goode's Woods
269	*939*	*St. Clair*	*3.53*	*Pruitt Sinkholes*
270	939	St. Clair	1.00	Stemler Cave
277	761	Monroe	19.50	Brickey-Gonterman Memorial Hill Prairie
Total acres in the KRAA:			**462.83**	

[1] Bold type designates nature preserves within the KRAA and italics indicates natural preserve boundary is within one mile of the KRAA boundry. Bold italics indicates that only a portion of the nature preserve is within the KRAA

[2] The nature preserve number (NP#) refers to the number designated in the Natural Heritage database (Illinois Department of Natural Resources 1998) and in Figure 11.

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

[4] Acreage of 0.00 indicates that no figures are currently available.

[5] * = Acreage given is the portion of the preserve located within the KRAA.

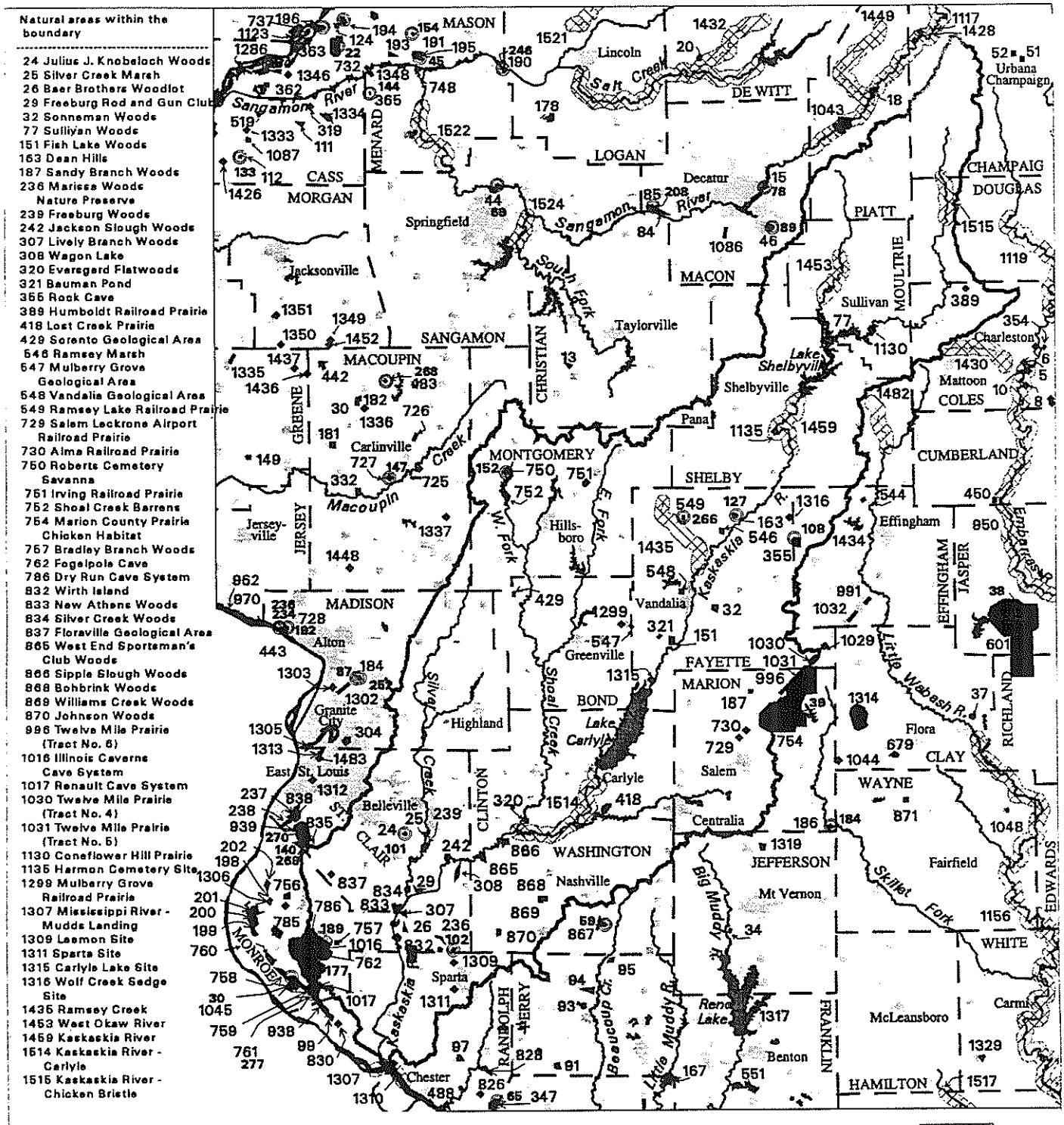


Figure 11. Natural areas, nature preserves and biologically significant stream segments in the Kaskaskia River Assessment Area.

Biological Stream Categorization and Biologically Significant Streams

Illinois streams have also 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. 1996) 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.

Table 8. Biologically significant steam segments in the Kaskaskia River Assessment Area.

Site Description[1]	Length (Miles)
Tributary to Horse Creek	0.99
West Okaw River, mouth to Stringtown bridge	13.31
Ramsey Creek, mouth to Caesar Creek	15.20
Kaskaskia River, Champaign/Douglas line to Rte 36	7.64
Kaskaskia River, Rte 16 to Howe Creek	18.03
Kaskaskia River, Rte 50 to Shoal Creek	30.85
Total Miles:	**86.02**

[1] Additional information is provided in the chapter on Aquatic Biota.

Threatened and Endangered Species

At least 59 species of plants and animals considered to be threatened or endangered by the Illinois Endangered Species Protection Board (IESPB) occur in the KRAA (Table 9). This number includes 1 that is federally threatened and 3 that are federally endangered. Only 3.63% of the state's 331 threatened or endangered plants are known to occur in the KRAA. For other taxa, the percentage of the state's threatened or endangered species that occur in the area are as follows: birds (85.3%), mammals (25.0%), reptiles (13.3%), fishes (16.1%), mussels (29.6%), and crustaceans (11.1%). Additional information about threatened or endangered species is given in their respective chapters.

Table 9. Threatened and endangered species occurring in the Kaskaskia River Assessment Area.[1]

Common name	Scientific name	Status[2, 3]
Plants:		
Blazing star	*Liatris scariosa* var. *nieuwlandii*	ST
Buffalo clover	*Trifolium reflexum*	SE
Drooping sedge	*Carex prasina*	ST
Ear-leaved foxglove	*Tomanthera auriculata*	ST
False hellebore	*Veratrum woodii*	ST
Fibrous-rooted sedge	*Carex communis*	ST
Green trillium	*Trillium viride*	SE
Large-seeded mercury	*Acalypha deamii*	DL
Mock bishop's weed	*Ptilimnium nuttallii*	SE
Prairie rose gentian	*Sabatia campestris*	SE
Violet collinsia	*Collinsia violacea*	SE
Water-pennywort	*Hydrocotyle ranunculoides*	SE
Tubercled orchid	*Platanthera flava* var. *herbiola*	SE
Birds:		
Pied-billed Grebe	*Podilymbus podiceps*	ST
Double-crested Cormorant	*Phalarocorax auritus*	DL
American Bittern	*Botaurus lentiginosus*	SE
Least Bittern	*Ixobrychus exilis*	DL
Great Egret	*Ardea albus*	ST
Snowy Egret	*Egretta thula*	SE
Little Blue Heron	*Egretta caerulea*	SE
Black-crowned Night-Heron	*Nycticorax nycticorax*	SE
Yellow-crowned Night-Heron	*Nycticorax violaceus*	SE
Osprey	*Pandion haliaetus*	SE
Mississippi Kite	*Ictinia mississippiensis*	SE
Bald Eagle	*Haliaeetus leucocephalus*	FT, ST
Northern Harrier	*Circus cyaneus*	SE
Sharp-shinned Hawk	*Accipiter striatus*	DL*
Peregrine Falcon	*Falco peregrinus*	SE*
Yellow Rail	*Coturnicops noveboracensis*	DL*
King Rail	*Rallus elegans*	SE
Common Moorhen	*Gallinula chloropus*	ST
Upland Sandpiper	*Bartramia longicauda*	SE
Wilson's Phalarope	*Phalaropus tricolor*	SE*
Common Tern	*Sterna hirundo*	SE*
Forster's Tern	*Sterna forsteri*	SE*
Least Tern	*Sterna antillarum*	FE, SE*
Black Tern	*Chilidonias niger*	SE*
Barn Owl	*Tyto alba*	SE
Long-eared Owl	*Asio otus*	DL*
Short-eared Owl	*Asio flammeus*	SE*
Brown Creeper	*Certhia americana*	ST
Bewick's Wren	*Thryomanes bewickii*	SE

Table 9. Continued.

Common name	Scientific name	Status[2, 3]
Marsh Wren	*Cistothorus palustris*	ST
Veery	*Catharus fuscescens*	DL*
Loggerhead Shrike	*Lanius ludovicianus*	ST
Swainson's Warbler	*Limnothlypis swainsonii*	SE*
Henslow's Sparrow	*Ammodramus henslowii*	SE
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	SE*
Mammals:		
Indiana bat	*Myotis sodalis*	FE, SE
river otter	*Lontra canadensis*	ST
bobcat	*Lynx rufus*	DL
Amphibians and Reptiles:		
Reptiles		
Kirtland's snake	*Clonophis kirtlandii*	ST
massasauga	*Sistrurus catenatus*	SE
Aquatic Biota:		
Fish		
bigeye chub	*Hybopsis amblops*	SE
pallid shiner	*Hybopsis amnis*	SE
bigeye shiner	*Notropis boops*	SE
river redhorse	*Moxostoma carinatum*	ST
western sand darter	*Ammocrypta clara*	SE
Mussels		
spectaclecase	*Cumberlandia monodonta*	SE
slippershell mussel	*Alasmidonta viridis*	SE
spike	*Elliptio dilatata*	ST
ebonyshell	*Fusconaia ebena*	ST
sheepnose	*Plethobasus cyphyus*	SE
butterfly	*Ellipsaria lineolata*	ST
snuffbox	*Epioblasma triquetra*	SE
little spectaclecase	*Villosa lienosa*	SE
Crustaceans		
--	*Gammarus acherondytes*	FE, SE

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

[2] DL = recently delisted from the State of Illinois T & E list; SE = state endangered; ST = state threatened; FE = federally endangered; FT = federally threatened

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

Natural Vegetation Communities

The description of the vegetation for the Kaskaskia River Assessment Area (KRAA) is organized into six sections: 1) Comparison of Biodiversity 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 KRAA to Statewide Patterns

About 1,420 acres of undegraded habitats remain in the KRAA among a total of 36 natural areas for which acreage data are available. Not included with these figures are significant caves (6 sites) or cliffs (1 site) recognized as natural areas. Including these areas, there are a total of 43 sites that are distinguished as high-quality natural communities. The acreage total for the high-quality portions of the 36 natural areas is 0.04% of the Assessment Area, which is close to the figure of 0.07% for statewide percentage of undegraded land identified by the Illinois Natural Areas Inventory (White 1978). In general, it is difficult to provide precise estimates for some trend data on changes in acreages in the KRAA at the level of the community class (e.g., forest, prairie, savanna, wetland) because the region historically was characterized by a complex mixture of dynamic habitat types. Nevertheless, with the data available, comparisons among community classes are outlined below.

Prairie - About 0.01% (2,300 acres) of the presettlement 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. The approximately 11.2 acres of undegraded prairie remaining within the Assessment Area is about 0.0005% of the original extent of about 2,487,348 acres. Much of the acreage of relatively undisturbed prairie in the State is from agriculturally less suitable lands such as sand deposits (~47%) or steep loess hills (~16%). When these habitat characteristics generally are lacking in a region, such as the KRAA, the proportion of prairie remaining typically is very low. In this case, habitat loss and degradation in the KRAA appear to exceed statewide trends.

Forest - About 30% of the presettlement area of forest remains statewide (Iverson et al. 1989), though only about 0.28% of this and 0.08% of presettlement forest area remains in a high-quality condition. About 12.7% (466,000 acres) of the KRAA currently is forest (GIS database) compared with an estimated 32.3% (1,188,713 acres) of the land cover for presettlement forest in the KRAA. Based on these estimates, about 39% of the presettlement total area of forest is present in the KRAA. Forests of the KRAA include some of the largest contiguous forest blocks remaining in Illinois. These are associated with the bottomlands along the Kaskaskia River. Included also among these acres are numerous significant remnants of southern flatwoods, a unique forest community that is a

special feature of the KRAA. Many flatwoods of the region have some savanna-like characteristics (Taft et al. 1995). About 1,328 acres of forest habitat remain in an essentially undegraded condition (0.28% of existing forest area and about 0.11% of the original forest cover). Since forest-savanna-prairie boundaries varied considerably over time, interpretation of these estimates requires some caution. Nevertheless, based on these figures, postsettlement trends of forest habitat destruction and degradation appear to be similar, or slightly less severe, in the KRAA compared with statewide trends.

Savanna - Savannas have declined in area throughout Illinois and the Midwest, perhaps more than any other community class (Taft 1997a), and the KRAA is no exception to this trend. Only two small areas of savanna-like habitat (about 3 acres of dry barrens and mesic savanna) remain in the KRAA in an undegraded condition, although many flatwoods (included among forest types here) have, or formerly had, savanna characteristics. Areas of former savanna that have restoration potential are present in the Assessment Area (particularly among some flatwoods).

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), representing about 0.65% of the remaining and 0.07% of the presettlement wetland area (Havera et al. 1994). The approximately 165,699 acres (4.5%) of the KRAA remaining as wetland is approximately 23% of presettlement extent, indicating that wetland loss in the Assessment Area may be less than statewide trends. The 692 acres remaining in a relatively undegraded condition (about 0.41% of remaining wetlands and 0.1% of presettlement extent) indicate that rates of wetland degradation among remaining wetlands appear to be slightly greater in the KRAA compared with statewide trends. The proportion of presettlement wetland in an undegraded condition appears to be slightly greater in the KRAA compared with the statewide levels.

The species richness of vascular plants within the KRAA at the time of European settlement is unknown. About 1,152 plant taxa have been reported from within the Assessment Area (Appendix 1); about 204 of these (17.7%) are not native to the Assessment Area and most of these adventive species are not native to North America. This should be considered an incomplete listing of species as it probably underestimates species richness of both native and, particularly, non-native taxa in the KRAA. 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 43% of the native vascular plants from Illinois occur in the KRAA.

The extraordinary loss of habitat in the KRAA 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 extirpation. Richness of native species has probably declined in the KRAA 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 six prairie plant taxa have been extirpated from the state (modified from the five taxa reported in Taft 1995). However, numerous prairie species now occur at low population levels in Illinois, and about 103 are listed as threatened or endangered (Herkert 1991, Taft 1995).

Illinois Threatened and Endangered Species

Twelve plant species presently listed by the Illinois Endangered Species Protection Board (IESPB) as threatened or endangered (T&E) have been reported from within the KRAA (Table 10). Based on Herkert (1991,1994), and recent revisions to the list of T&E species that resulted in some deletions and changes in listing status (Illinois Endangered Species Protection Board 1999), there are 5 threatened and 7 endangered plant species. One of the endangered species, water-pennywort (*Hydrocotyle ranunculoides*), may be extirpated from the KRAA due to recent destruction of its habitat (Illinois Department of Natural Resources 1998). No species are reported from within the KRAA that are listed by the U.S. Fish and Wildlife Agency as federally threatened or endangered. Outside of the KRAA, but within the region shown in Figure 1, are records for 18 T&E species including three that have populations both within and nearby the KRAA (Table 10). Most of the 15 additional taxa are restricted in Illinois to localized glade/hill prairie habitats along the bluffs facing the Mississippi River. One exception is the decurrent false aster (*Boltonia decurrens*), a federally and state-listed threatened species known from open habitats in floodplains. This species is a short-lived, water-dispersed perennial capable of appearing in new localities following flooding. Many new populations appeared in the East St. Louis area following extensive flooding during 1993 (Taft 1997b).

The habitats supporting the most T&E species in the KRAA are open woodland habitats including sites with savanna or barrens characteristics (Table 10). Despite the widespread loss of prairie habitats in the Assessment Area, only a few prairie species are among these T&E taxa. This mostly is due to the fact that most prairie species originally from the KRAA are widespread species and occur elsewhere in Illinois in greater numbers. From a more regional perspective of the KRAA, many prairie species would have to be considered "threatened" or "endangered". One taxon of floodplain forest habitats known from the KRAA, large-seeded mercury (*Acalypha deamii*), recently was delisted by the IESPB because it was determined to be more common in Illinois than previously believed. This species is included in Table 10 as an additional notice of the status change and because it is still quite rare in the KRAA.

Table 10. Plant species listed by the Illinois Endangered Species Protection Board as threatened or endangered in Illinois that occur in or near the Kaskaskia River Assessment Area.

Common Name	Scientific Name	Status[1]	Habitat[2]	Range in U.S. & Vicinity of KRAA	EOR in[3]	EOR near[4]
Blazing star	*Liatris scariosa* var. *nieuwlandii*	ST	Silt-loam savannas	NE & NC U.S. Scattered in IL, from Chicago area SW to Calhoun co.	3	4
Bradley's spleenwort	*Asplenium bradleyi*	ST	Sandstone cliffs and chert	E U.S. Known from 4 cos. in S IL where it reaches its N range limit. outcrops	-	2
Buffalo clover	*Trifolium reflexum*	SE	Dry-mesic savannas, flatwoods, & prairies	E & C U.S., & adj. Canada. Known from 4 cos. in the SW/4 of IL.	4	-
Crested coralroot orchid	*Hexalectris spicata*	SE	Dry calcareous woods and prairie openings; limestone glades	S U.S. & N Mexico. IL: known from Monroe, Randolph, & Hardin cos.	-	3
Decurrent false aster	*Boltonia decurrens*	ST FT	Alluvial prairies & marshland	Floodplains of IL and Mississippi Rivers in IL & MO. Occurs along IL river in eleven counties in IL.	-	5
Drooping sedge	*Carex prasina*	ST	Rich, lowland forest; forested seeps, sandstone undercuts	NE U.S. and adj. Canada. In IL, known from Fayette, Adams, Lawrence, Brown, & Jo Daviess cos.	1	-
Dwarf bedstraw	*Galium virgatum*	SE	Dry barrens, glades, & rocky woods	SC U.S. IL pop. on limestone ledge above Mississippi Riv. in Monroe co.	-	2
Ear-leaved foxglove	*Tomanthera auriculata*	ST	Disturbed prairies & savannas	OH to MN, south to KS & MO. Scattered in IL from Chicago area S to Bond co.	6	2
Eastern blue-eyed grass	*Sisyrinchium atlanticum*	SE	Mesic prairies	E U.S., NE to IL. Known in IL from Macoupin, Iroquois, & Du Page cos.	-	1
False hellebore	*Veratrum woodii*	ST	Mesic upland & ravine forests.	Central midwestern U.S. Known from eleven cos. in central IL.	6	4
Fibrous-rooted sedge	*Carex communis*	ST	Open, often rocky forest	NE U.S. & adj. Canada. A few populations occur throughout IL.	3	-
Green trillium	*Trillium viride*	SE	Various wooded habitats; mesic upland forest in the KRAA	Counties near and bordering Mississippi River in Missouri and Illinois (incl. St. Clair Co.)	1	-
Large-seeded mercury	*Acalypha deamii*	DL	Floodplain forests	S. Ohio to Arkansas. Scattered in S/2 of IL, from Vermilion to Massac cos.	1	-
Missouri orange coneflower	*Rudbeckia missouriensis*	SE	Limestone glades	SC U.S. Known from 2 cos. in southern IL along Mississippi River.	-	8
Mock bishop's weed	*Ptilimnium nuttallii*	SE	Floodplains; disturbed site	SC U.S. Known from Randolph Co. in IL.	1	-

Table 10. Continued.

Common Name	Scientific Name	Status[1]	Habitat[2]	Range in U.S. & Vicinity of KRAA	EOR in[3]	EOR near[4]
Prairie rose gentian	*Sabatia campestris*	SE	Mesic prairies; including some degraded sites.	SC U.S. Known from 4 cos in the S/3 of IL.	4	1
Prairie spiderwort	*Tradescantia bracteata*	SE	Dry, mesic silt & sand prairies	NC U.S., near E range limit in IL. Known from six cos. in W IL.	-	1
Sangamon phlox	*Phlox pilosa* ssp. *sangamonensis*	SE	Forest openings, blufftops & prairies along Sangamon River	Sangamon River valley of C IL. Two populations known in Champaign co., IL.	-	2
Slender heliotrope	*Heliotropium tenellum*	SE	Limestone glades and hill prairies	SC U.S. Known from 2 cos. in southern IL along Mississippi R.	-	2
Spring ladies' tresses	*Spiranthes vernalis*	SE	Acidic prairies	Eastern U.S. Known from Pope & Madison cos. in Il.	-	1
Spurge	*Euphorbia spathulata*	SE	Dry limestone bluffs (in IL on Mississippi R.)	W & C U.S. & adj. Mexico. One IL pop. exists in Monroe co.	-	1
Tubercled orchid	*Platanthera flava* var. *herbiola*	SE	Moist sand prairie, thickets, flatwoods	NE U.S. & adj. Canada; in IL known from 7 cos., incl. Washington	1	-
Violet collinsia	*Collinsia violacea*	SE	Dry-mesic upland forest/barrens	S sections of WC U.S., E to IL. In IL, known from Shelby co.	2	-
Water-pennywort	*Hydrocotyle ranunculoides*	SE	Swamps, marshes, & shores	S U.S., N along Pacific coast. In IL, known from Clinton & Whiteside cos.; possibly extirpated from the KRAA	1	-
Whitlow grass	*Draba cuneifolia*	SE	Rock ledges of bluffs (in IL on Mississippi R.)	S U.S. & adj. Mexico. One IL pop. exists in Monroe co.	-	1
Wild hyacinth	*Camassia angusta*	SE	Rich mesic prairies	SC U.S. NE to IL. Known in IL only from Macon co.	-	1
Wooly buckthorn	*Bumelia lanuginosa*	SE	Hill prairies, limestone ledges & rocky wooded bluffs of Mississippi R.	SC U.S. In IL, known from a stretch of the Mississippi River in Monroe co.	-	4

[1] SE = state endangered, ST = state threatened, FT = federally threatened, DL = delisted in 1998.
[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 Kaskaskia River Assessment Area. Information from the Illinois Natural Heritage Database (Illinois Department of Natural Resources 1998).
[4] EOR near = Element Occurrence Record. The number of populations known to occur outside the Kaskaskia River Assessment Area but within the area mapped in Figure 2. Information from the Illinois Natural Heritage Database (Illinois Department of Natural Resources 1998).

Disturbance, Habitat Quality, and Restoration Potential

While habitat loss has been extensive within the KRAA, 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 those that can be *restored* to original condition through management efforts and 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 over grazing; however, multiple factors often are interacting.

Fragmentation is a process describing landscape patterns where habitat remnants become isolated by land-cover 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 (Gehlhausen et al., in press). 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 1996, 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) invasions 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 KRAA, including exotic species control measures, are offered in the Summary and Conclusions section following descriptions of Natural 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 also 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. Increasingly, it is recognized that large habitat remnants, although perhaps mostly Grade C quality, have unique contributions to conservation efforts. Five forest remnants that exceed 500 acres in size occur in the KRAA, including both Grade C and better-quality habitats. These large forest blocks are a particularly unique and biologically valuable aspect of the Assessment Area.

The estimates and comparisons of natural areas within the KRAA 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.

Sixty natural areas occur within the KRAA and six more occur within a one-mile buffer zone of the Assessment Area (Table 5). Of the natural areas within the Assessment Area boundary, 43 are high-quality natural communities (Category I [at least ten of these also have T&E species]), seven are T&E sites only (Category II), four are significant geological areas (Category IV), and six are outstanding aquatic areas (Category VII).

Among the 43 Category I sites identified within the KRAA are about 58 remnants of natural communities comprising 19 different natural communities types, including terrestrial and aquatic cave communities. The high-quality portions of these natural areas (i.e., the Category I acreage), not including the acreage for the cave systems or cliff communities, total about 1,420 acres, or about 0.04% of the KRAA (Table 6). This compares to 0.07% of Category I acreage for the entire state (White 1978). Area of all natural areas except caves, including buffer zones (sometimes extensive), totals about 9168.04 acres, or about 0.25% of the Assessment Area.

Comparison of the area of Category I natural communities in relation to the total remaining in Illinois for each community type is described in the following report section Terrestrial Natural Community Descriptions. Other remnant natural communities are present in the Assessment Area that with time and/or proper vegetation management, may qualify for the INAI. An additional 142 natural areas occur outside the KRAA boundary but within the region mapped (Table 5, Figure 11).

Nature preserves are areas of land or water in public or private ownership that are formally dedicated to receive maximum protection of significant natural features. The central goal of the nature preserve system, currently with over 290 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 largely 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 are eight nature preserves completely within the KRAA (Table 7) and two that partially are within the boundary totaling about 498 acres (about 0.01% of the KRAA). Nature preserves are widely spread throughout the KRAA with preserves in St. Clair, Effingham, Fayette, Montgomery, Monroe, and Marion counties (Table 7, Figure 11). The brief descriptions below are summaries from McFall and Karnes (1995) and an unpublished INPC nature preserve dedication proposal (Faulkner and Esker 1996).

Julius J. Knobeloch Woods Nature Preserve (St. Clair County) - This preserve includes bottomland and upland forest. It occurs just six mile from Belleville providing an educational opportunity for the nearby urban population.

Marissa Woods Nature Preserve (St. Clair County) - This preserve is mostly southern flatwoods (about 20 acres) with a smaller 5 acre dry-mesic upland forest. Portions are relatively undisturbed. The forest is typical of formerly more open woodland changing to a more closed forest with fire absence.

Rock Cave Nature Preserve (Effingham County) - This preserve includes numerous habitats. Particularly unique features include sandstone outcrops and occurrence of scattered American beech trees in mesic forest ravines. A rich spring wildflower display

can be found as well as ferns and other plants adapted to sandstone cliffs. Other community types include upland forest and a perennial stream.

Dean Hills Nature Preserve (Fayette County) - This preserve is characterized by high-quality upland forest communities on rugged topography formed by natural erosion of a kame, a local deposit of glacial drift. Seep springs are present as well as a sand and gravel-bottom stream.

Roberts Cemetery Savanna Nature Preserve (Montgomery County) - Prescribed burning maintains this extremely rare example of a mesic savanna in a pioneer cemetery. A rich prairie understory persists with scattered post, blackjack, and shingle oaks.

Fogelpole Cave Nature Preserve (Monroe County) - This preserve is dedicated to protect one of the largest and least disturbed cave systems in Illinois. The cave occurs within an Ozarkian karst region of Monroe County characterized on the surface by many sinkholes. Several bat and invertebrate species use the cave.

Armin Krueger Speleological Nature Preserve (Monroe County) - This privately owned nature preserve protects a small portion of a high-quality terrestrial and aquatic cave system. Entrance is by permission only.

Ramsey Railroad Prairie Nature Preserve (Fayette County) - This is an approximately 11 acre remnant of dry-mesic and mesic prairie within abandoned railroad right-of-way and protects one of the few remaining high-quality prairie areas in the Southern Till Plain Natural Division.

Marion County Prairie Chicken Sanctuary Nature Preserve* (Marion County) - This preserve straddles the boundary of the KRAA with 55.62 acres of the 160 acre total within the Assessment Area. This preserve is dedicated to preserving habitat for several grassland bird species, particularly the greater prairie chicken, a species in severe decline in Illinois and listed as an Illinois endangered species.

Stemler Cave Woods Nature Preserve (St. Clair County) - This preserve also occurs on the boundary of the KRAA with about 49 acres of the 116 acre total within the Assessment Area. This nature preserve protects an old-growth forest located on a sinkhole plain. Forest community types include dry to dry-mesic upland forest. Sinkholes provide variable habitat conditions. The entrance to the Stemler Cave Nature Preserve is within this forest but it does not fall within the boundary of the KRAA.

Terrestrial Natural Community Descriptions

The natural communities within the KRAA (Table 11) were determined by examining data from several sources. These include general descriptions of the vegetation (Engelmann

* As of 1999 the name was officially changed to Prairie Ridge - Marion County State Natural Area

1863), published descriptions of existing community types (Taft et al. 1995), unpublished field data from botanical surveys (e.g., technical reports, dedication proposals for Illinois Nature Preserves - Illinois Nature Preserves Commission; Division of Natural Heritage - Illinois Department of Natural Resources; collection data on material in the herbarium of the Illinois Natural History Survey), and plant communities inferred to have occurred prior to European settlement and large-scale alteration of the landscape. Unfortunately, published descriptions of vegetation in the region are limited in number. Specific data sources from unpublished reports used for the following accounts include a variety of sources such as technical reports (Gardner and Taft 1984, Taft 1999a), database records on community types found in INAI natural areas, and dedication proposals for nature preserves (Solecki 1989, Faulkner and Esker 1996). Individual biologists and others that contributed species lists for selected sites in the KRAA used in the following community descriptions include: Jack Brooks, John Schwegman, Bill McClain, Bill Handel, Don McFall, Ken Schaal, Paul Shildneck, Henry Eilers, Gary Colin, Jem Kenney, Randy Nyboer, Robert Evers, and the author. Finally, the herbarium database at the Illinois Natural History Survey was searched for records of vascular plants from the Assessment Area. This provided a working species list from which community descriptions were derived, with the aid of the unpublished sources listed above.

Community classification used in the descriptions below follows White and Madany (1978). Botanical nomenclature follows Mohlenbrock (1986). Scientific names corresponding to the common names used in this text, as well as habitats of occurrence, are in the summary species list for the KRAA (Appendix 1). Appendix 2 includes this species list sorted by Latin name.

Forest

Forests in the KRAA belong mostly to the Prairie Peninsula Section in the Northern Division of the Oak-Hickory Forest Region (Braun 1950). A small portion of the Assessment Area near the mouth of the Kaskaskia River, at the edge of the Ozark region, is mapped by Braun (1950) as part of the Interior Highlands Section in the Southern Division of the Oak-Hickory Forest Region. Due to some protection from presettlement prairie fires, forests in the KRAA primarily were concentrated on the slopes, ravines, and the extensive floodplains of the Kaskaskia River and tributaries (Figure 6). Forest subclasses in Illinois include Upland Forest, Floodplain Forest, Sand Forest, and Flatwoods and all but Sand Forest occur in the KRAA. Upland forests are distinguished from floodplain forests by topographic position; upland forests do not normally flood. Flatwoods are level woodlands with a claypan (argillic horizon[s]) and thus are distinguished by edaphic characteristics. Flatwoods, like upland forests, do not normally flood; however, they are poorly drained and seasonally can support a perched water table. Community types within each subclass are described briefly below. About 1,328 acres of forest habitat within the KRAA (0.28% of existing forest area) are recognized by the Illinois Natural Areas Inventory (INAI) as statewide-significant, Category I natural areas (i.e., remain in a state of high ecological integrity). Some of the remaining forest stands have considerable

Table 11. Terrestrial natural communities known or believed to have occurred formerly in the Kaskaskia River Assessment Area.[1]

FOREST	**WETLAND**	**LAKE & POND**
Upland forest	**Marsh**	**Pond**
dry upland forest	marsh	pond
dry-mesic upland forest	**Swamp**	
mesic upland forest	shrub swamp	**CULTURAL**
Floodplain forest	**Seep**	cropland
mesic floodplain forest	seep	pastureland
wet-mesic floodplain forest		successional field
wet floodplain forest	**PRIMARY**	developed land (urban)
Flatwoods	**Cliff**	tree plantation
southern flatwoods	sandstone cliff	artificial pond
		artificial lake
PRAIRIE	**SAVANNA**	prairie restoration
Prairie	**Savanna**	wetland reconstruction
dry-mesic prairie	dry-mesic savanna	
mesic prairie	mesic savanna	**CAVE**
wet-mesic prairie	**Barren**	**Cave**
wet prairie	dry barren	terrestrial cave
Hill prairie		aquatic cave
glacial drift hill prairie		

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

restoration potential so the proportion of high-quality forest in the KRAA possibly could increase in time with appropriate protection and management.

Common ecological problems associated with forest communities include habitat degradation, fragmentation, exotic species invasions, fire absence (particularly in dry to dry-mesic upland forests and flatwoods), and altered hydrology and increased siltation in floodplains. A typical source of habitat degradation in forests is overgrazing, not only by domestic livestock but also by white-tailed deer which have increased substantially in numbers recently in many parts of Illinois (Anderson 1997). This grazing 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 KRAA. In contrast, species that increase with grazing are often abundant in grazed forests. Some of these include thorn-bearing taxa (e.g., red haw, honey locust, Missouri gooseberry, and blackberries), exotic species (e.g., Osage orange, multiflora rose, and garlic mustard), and certain weedy native species. In many cases, abundance of exotic species appears to be directly proportionate to the historic grazing intensity. Recovery of these sites following cessation of grazing appears to be slow. Forests in Illinois near large urban areas, 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 regional biodiversity. 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 KRAA is estimated to be about 330,227 acres, or about 9% of the total Assessment Area (Table 2). Upland forest communities can be classified further by 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). *Dry, dry-mesic,* and *mesic upland forest* communities are known to occur in the KRAA. About 284 acres of upland forest in the KRAA have been identified as statewide-significant natural areas (Table 6). Most upland forest sites have a history of logging and cattle grazing. Nevertheless, some remnants have considerable restoration potential. Fire absence in upland forests can cause compositional and structural changes that lead to loss of floristic diversity and lowered sustainability of the community type.

Dry upland forest - Dry upland forests occur typically on ridge crests and upper slopes with dry exposures (south and southwest-facing aspects) and are most common in, and possibly restricted to, the far southwestern portion of the Assessment Area. Detailed descriptive information is not available for remnants of dry upland forest in the Assessment Area. One site within the KRAA in St. Clair County with twenty-three acres of high-quality dry upland forest habitat was recognized as a natural area by the INAI. This site recently was destroyed for development; it was about 3.5% of the total Category I dry upland forest in Illinois. The following description is a general account of the composition of dry upland forest based on examples of this community type located in southwestern Illinois. The species listed all are known from the Assessment Area (exceptions noted).

The typical dominant **canopy** species in dry upland forests are post oak and black oak. Occasional to common species include white oak, blackjack oak, chinquapin oak, shagbark hickory, pignut hickory, and black hickory. **Subcanopy trees** include shadbush, flowering dogwood, hop hornbeam, redbud, and Eastern red cedar. **Shrubs** include rough-leaved dogwood, aromatic sumac, smooth sumac, pasture rose, rusty nannyberry, hazelnut, and dewberry. Farkleberry, a shrub typical of dry forests and glades further south in Illinois, also may be present but unrecorded from the KRAA. Common **woody vines** include Virginia creeper and catbrier. Characteristic **groundcover** species include several sedges (*e.g., Carex pensylvanica, C. artitecta, C. cephalophora, C. glaucodea, C. hirsutella, C. rosea*), pussytoes, poverty oat grass, hog peanut, tall anemone, horsetail milkweed, ebony spleenwort, blue aster, spreading aster, Canada brome, pale Indian plantain, dittany, mullein foxglove, shooting star, woodland sunflower, tall alumroot, hairy hawkweed, creeping bush clover, slender bush clover, monarda, small passion flower, purple oxalis, common cinquefoil, hairy mountain mint, and yellow crownbeard. Several **prairie/**

savanna species can be present in forest openings including cylindric blazing star, big bluestem, little bluestem, Indian grass, yellow stargrass, common spiderwort, and flowering spurge. This community type in pre-European settlement times probably locally graded into savanna/barrens habitats. Canopy composition of this community type is relatively stable since mesophytic species like sugar maple are limited by the dry soil-moisture conditions. However, structural characteristics of the community can change with long fire-free intervals as oak and hickory species tolerant of dry conditions typically increase in density.

No species listed as threatened or endangered by the IESPB are known to occur in dry upland forest within the KRAA. However, at least two taxa known from somewhat similar community types (e.g., blazing star - *Liatris scariosa* var. *nieuwlandii* and buffalo clover - *Trifolium reflexum*) possibly could be present in dry forest within the Assessment Area. These taxa are relatively intolerant of shade and may be localized to forest openings. The primary ecological problems in dry upland forest are fire absence and damage from grazing. Relatively few exotic species pose severe problems in dry forests compared with other forest communities.

Dry-Mesic Upland Forest - This community is intermediate in available soil moisture between dry upland and mesic upland forests and is probably the most common forest community type in Illinois. Dry-mesic upland forest is found on mid-to-upper slopes and ridges of dissected terrain. There is no estimate of what proportion of upland forest in the Assessment Area is this community type. The community type is distributed throughout the Assessment Area. About 185 acres of high-quality (Grades A and B) dry-mesic upland forest, among nine sites, are known to occur in the KRAA. This is about 6% of the total undegraded dry-mesic upland forest known for the state (Table 6).

Common to occasional **canopy** species in the KRAA include post oak, black oak, white oak, northern red oak, chinquapin oak, mockernut hickory, shagbark hickory, black walnut, white ash, and slippery elm. Common to occasional **subcanopy** species include slippery elm, shingle oak, black cherry, persimmon, and sassafras. Common **shrubs** include red bud, flowering dogwood, rough-leaved dogwood, and black haw. **Vines** include Virginia creeper, poison ivy, and bristly catbrier. The **groundcover** stratum for this community type includes a great variety of taxa. Typical dominant species can include numerous graminoid species such as several sedges (e.g., *Carex cephalophora, C. glaucodea, C. hirsutella, C. muhlenbergii, C. artitecta,* and *C. pensylvanica*) and grasses (Canada brome grass, large-fruited panic grass, poverty oat grass, long-awned wood grass, nodding fescue, and prairie wedge grass). Common forbs include pussytoes, Virginia snakeroot, horsetail milkweed, blue aster, spreading aster, woodland agrimony, smooth rock cress, tall anemone, pale Indian plantain, enchanter's nightshade, shining bedstraw, toothwort, spring beauty, shooting star, white snakeroot, American columbo, hairy bedstraw, woodland sunflower, small passion flower, false Solomon's seal, elm- leaved goldenrod, Virginia spiderwort, and early horse gentian. Ferns can be occasional including ebony spleenwort, rattlesnake fern, bronze fern, fragile fern, and Christmas fern.

Threatened or endangered species known from dry-mesic forest habitats in the KRAA include violet collinsia *(Collinsia violacea)* and fibrous-rooted sedge *(Carex communis)*. Violet collinsia occurs in only two close-by colonies in Illinois, both in the KRAA, where they are found mostly in dry-mesic upland forest near the Kaskaskia River in Shelby County (Table 10). These colonies are disjunct from the primary range of this species which is west of Illinois. How they became established at these localities within the Assessment Area is an interesting phytogeographic riddle. Possibly, these colonies are relicts of a post-Pleistocene temporary extension eastward for this species.

The major ecological problems associated with dry-mesic upland forests are degradation from grazing, habitat fragmentation, fire absence, and exotic species invasion. Fire absence can lead towards an increased importance of sugar maple in the subcanopy stratum and potentially lesser importance of oaks in the canopy. Where oaks have been removed by selective logging, black cherry, shagbark hickory, slippery elm, and possibly sugar maple are among the species that gain prominence in the canopy. Exotic species in dry-mesic upland forest include several woody plants (e.g., tree-of-heaven, round-leaved bittersweet, Japanese honeysuckle, amur honeysuckle, winged wahoo, and autumn olive). Typically, these species are most frequent and abundant near urban areas.

Mesic Upland Forest - This community type occurs in ravines, high terraces, lower slopes, and northern aspects of dissected terrain. Mesic upland forests occur locally throughout the Assessment Area. About 75 acres of high-quality (Grades A and B) mesic upland forest, located among three sites, are known to occur in the KRAA. This is about 3% of the total undegraded mesic upland forest known for the state (Table 6).

Common to occasional **canopy** species include red oak, white oak, sugar maple, shagbark hickory, mockernut hickory, bitternut hickory, slippery elm, American elm, hackberry, white ash, black walnut, and basswood. In at least one site in Effingham County, there is a population of American beech in a mesic forest ravine, a somewhat disjunct population for this species. Beech is known in Illinois primarily from forests to the south and east of Effingham County. **Subcanopy** species include many of the canopy species and Ohio buckeye, paw paw, blue beech, red mulberry, flowering dogwood, sassafras, and redbud. **Shrubs** include black haw, wahoo, choke cherry, Missouri gooseberry, prickly ash, common blackberry, black raspberry, and bladdernut. The **groundcover** stratum can be diverse including many ferns, graminoid species, and spring ephemerals. Ferns include maidenhair fern, lady fern, fragile fern, broad beech fern, and Christmas fern. Graminoid species include long-awned wood grass, nodding fescue, blunt-scaled wood sedge, common wood sedge, James' grass sedge, and beech wood sedge. Some of the characteristic forbs are doll's eyes, woodland agrimony, wild columbine, Jack-in-the-pulpit, goat's-beard, wild ginger, enchanter's nightshade, Dutchman's breeches, white snakeroot, false mermaid, sweet-scented bedstraw, wild geranium, white avens, goldenseal, great waterleaf, Virginia waterleaf, false rue anemone, blue lettuce, Michigan lily, sweet cicely, anise-root, ginseng, Soloman's seal, Virginia knotweed, blue phlox, Mayapple, Jacob's ladder, hooked buttercup, bloodroot, false Soloman's seal, early meadow rue, rue anemone, red trillium, and common blue violet.

Threatened and endangered species known from mesic upland forest habitats in the KRAA include false hellebore *(Veratrum woodii)* and green trillium *(Trillium viride)*, the latter taxon was only recently discovered in the KRAA (Table 10). This species occurs in a variety of forested habitats and the distribution range mostly is limited to counties near or adjacent to the Mississippi River in Illinois and Missouri (Case and Case 1997). Ecological problems in mesic upland forest habitats include fragmentation, grazing, and exotic species invasion. Typical exotic species include the woody plants Japanese barberry, amur honeysuckle, multiflora rose, burning bush, privet, and Japanese honeysuckle. The non-native herb garlic mustard that has infested many forests, particularly in northern Illinois, has not yet extensively invaded forests in the KRAA. However, considering the success of garlic mustard in other portions of Illinois, it is only a matter of time before it is abundant throughout the Assessment Area. Any new colonies discovered should be eliminated promptly. See the Summary and Recommendations section for exotic-species control information. In contrast to dry-mesic and dry upland forest, mesic sites are less dependent on a periodic fire regime for the maintenance of compositional and structural stability.

Floodplain Forest - Floodplain forests are forests of bottomlands and 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 area of floodplain forest in the KRAA is estimated to be about 135,772 acres (Table 2), or about 3.7% 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. Wet-mesic floodplain forests are intermediate. Diversity of species composition tends to increase from wet to mesic floodplain forest; however, these communities merge gradually as individual species respond to environmental variables making precise distinction often difficult. The floodplain community can be somewhat heterogeneous with differences in drainage, permeability, elevation, and slope producing complexes of all three community types within a single area. Examples of such patterns can be found in floodplain forests located along the Kaskaskia River where it forms the border between Clinton, Washington, and St. Clair counties. Here are found some of the finest floodplain forests remaining in Illinois. Some of these forests are characterized by pockets of wet floodplain forest within a general matrix of wet-mesic floodplain forest; shrub swamps occur locally in overflow channels and mesic floodplain forests occur on elevated zones. About 614 acres of floodplain forest habitat, including wet and wet-mesic communities, are considered statewide-significant and essentially undegraded natural areas (Table 6).

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. Compositional changes favoring more flood and silt-tolerant tree species like silver maple appear to have occurred since settlement along many Illinois streams (e.g., King and Johnson 1977, Nelson et al. 1994). Siltation from agricultural lands into the floodplain of the Kaskaskia River and tributaries also may have promoted similar changes in floodplain vegetation within the KRAA. Floodplain forests in the KRAA include some stands, young and mature ages, that are dominated by silver maple. However, in contrast to many floodplain forests in glaciated portions of Illinois, some floodplain forests in the KRAA demonstrate a remarkable resistance to this general trend and many oak and hickory species, presumably typical of the presettlement stands, still form the chief composition of the canopy stratum. A description of the composition of floodplain forests for the KRAA follows.

Mesic Floodplain Forest - This community type often occurs along the gradient from mesic upland to wet-mesic floodplain forest and the boundaries among the communities is not distinct. There is no estimate for the proportion of floodplain forest habitat in the Assessment Area that is mesic floodplain forest. No areas within the KRAA are recognized as essentially undisturbed natural areas.

Common to occasional **canopy** species include sugar maple, bitternut hickory, kingnut hickory, shagbark hickory, pecan, hackberry, green ash, white ash, black walnut, bur oak, swamp white oak, yellow chestnut oak, Northern red oak, basswood, American elm, and slippery elm. Common **subcanopy** species include Ohio buckeye, persimmon, red mulberry, and redbud. **Shrubs and woody vines** include bladdernut, Missouri gooseberry, wahoo, spicebush, coralberry, gray dogwood, Virginia creeper, poison ivy, winter grape, riverbank grape, and frost grape. Common **herbaceous** species include three-seeded mercury, Jack-in-the-pulpit, green dragon, bulb bittercress, beech wood sedge, wood gray sedge, chervil, spring beauty, dwarf larkspur, silky wild rye, false mermaid, white avens, bluebells, common satin grass, leafy satin grass, woodland blue grass, Mayapple, Jacob's-ladder, Virginia knotweed, smooth ruellia, late figwort, yellow meadow parsnip, red trillium, Missouri violet, common blue violet, downy yellow violet, and golden Alexander.

No threatened or endangered species are known from this community type in the KRAA. The state threatened drooping sedge (*Carex prasina*), typically associated with seeps and spring runs in forests (Table 10), could be present with this association within mesic floodplain forest. Ecological problems are similar to those listed above generally for floodplain forests. Exotic species can include creeping Charlie, dame's rocket, moneywort, amur honeysuckle, Osage orange, and white mulberry.

Wet-Mesic Floodplain Forest - This is perhaps the most common floodplain forest community type in the KRAA although there are no data on the proportion of floodplain forest that is this community type. A total of 614 acres of wet to wet-mesic floodplain forest within the KRAA, among ten sites, is recognized as high-quality, undegraded natural area, about 21% of the total for Illinois (Table 6). The community composition and structure is described briefly below. Because of the considerable size of the Assessment

Area, some taxa (e.g., overcup oak, sugarberry, swamp holly) found in the southern portion of the KRAA do not have natural ranges that extend into the northern section of the area.

Common to occasional **canopy** species include silver maple, bitternut hickory, kingnut hickory, green ash, honey locust, swamp white oak, bur oak, overcup oak, pin oak, slippery elm, American elm, and sycamore. Common to occasional **subcanopy** species include box elder, river birch, sugarberry, hackberry, persimmon, downy hawthorn, and green hawthorn. Typical **shrubs and woody vines** include trumpet creeper, pale dogwood, swamp privet, swamp holly, spice bush, moonseed, elderberry, bristly catbrier, poison ivy, and riverbank grape. **Herbaceous** species include wild garlic, swamp agrimony, green dragon, Ontario aster, panicled aster, false nettle, American bellflower, false nettle, several sedges (e.g., *Carex davisii, C. granularis, C. grayi, C. grisea, C. muskingumensis, C. oligocarpa, C. sparganioides, C. squarrosa, C. stipata, C. tribuloides, C. typhina*), chervil, sea oats, common wood reed, blue-eyed Mary, dayflower, honewort, common dodder, Virginia wild rye, annual bedstraw, white avens, fowl manna grass, violet cress, spotted touch-me-not, wood nettle, fringed loosestrife, rice cut grass, white grass, cardinal flower, short-leaved satin grass, sweet cicely, anise root, blue phlox, garden phlox, woodland blue grass, mild water pepper, common smartweed, clearweed, swamp buttercup, goldenglow, pale dock, smooth buttonweed, Illinois horse-gentian, broad-leaved spiderwort, and wingstem.

An endangered species known from the KRAA that occurs in a roadside ditch under a powerline right-of-way is mock bishop's weed (*Ptilimnium nuttallii*); possibly, this species formerly occurred in a floodplain habitat within the Assessment Area. The closely related taxon *P. costatum* is present in floodplain forest habitat within the KRAA. Large-seeded mercury (*Acalypha deamii*) is a floodplain forest species known from the Assessment Area that recently has been delisted by the IESPB because it was determined to be more common than previously believed. Ecological problems are similar to those described generally for floodplain forests. A non-native species that has infested all floodplain forest communities is moneywort; this sprawling herb is abundant in many places. Other common exotic species of wet-mesic floodplain forests include creeping Charlie and Osage orange. Reed canary grass can be abundant in open areas.

Wet Floodplain Forest - This forest community develops in the floodplain zone with the the greatest flooding frequency and duration. While the community type often occurs bordering streams, it also can be present beyond the stream bank where local depressions and low elevation zones are present. Wet floodplain forests are widespread in the Assessment Area. Large remnants persist in conjunction with wet-mesic and mesic floodplain communities along the lower Kaskaskia River (e.g., between Washington and St. Clair counties). A total of 564 acres of wet to wet-mesic floodplain forest within the KRAA, among nine sites, is recognized as high-quality, undegraded natural area, about 20% of the total for Illinois (Table 6). For many high-quality remnants of floodplain forest, the acreage figures combine area for both wet and wet-mesic floodplain forest. Only a single site identified by the INAI was considered exclusively wet-mesic floodplain forest (thus the differences in total area and numbers of natural areas for these two natural communities). The community composition and structure is described briefly below.

Typical **canopy** species include silver maple, green ash, kingnut hickory, cottonwood, pumpkin ash, pin oak, and occasional bur, swamp white, and overcup oaks. Common **subcanopy** species include box elder, black willow, and sandbar willow. Common **shrubs and vines** include swamp holly, pale dogwood, swamp privet, poison ivy, and trumpet creeper. **Groundcover** species includes giant ragweed, Ontario aster, panicled aster, wood nettle, several sedges (e.g., *Carex grayi, C. grisea, C. lupuliformis, C. lupulina, C. lurida, C. muskingumensis, C. oligocarpa, C. squarrosa, C. typhina*), chervil, dayflower, Virginia wild rye, tall scouring rush, fireweed, annual bedstraw, spotted touch-me-not, arrow arum, rice cut grass, mild water pepper, woodland bluegrass, swamp buttercup, butterweed, and marsh St. John's wort.

Mock bishop's weed (*Ptilimnium nuttallii*), listed as endangered by the IESPB, may also occur in wet floodplain forests. Presently it is known from a single locality. The large-seeded mercury (*Acalypha deamii*) recently has been delisted by the IESPB because it was determined to be more common than previously believed. This taxon has been reported from floodplain forest habitats within the KRAA. Ecological problems are as described generally for floodplain forests. A common exotic species in wet floodplain forests is moneywort. This is a dominant species in many stands of floodplain forest in the KRAA.

Low lying or frequently flooded areas characterized by sparse vegetation such as mud flats and other areas of moist open ground can support a distinct group of species. These areas are localized throughout the KRAA in wet floodplain forests. Some typical species include sandbar willow, bluestar, three-seeded mercury, long-leaved ammannia, terrestrial starwort, bittercress, clammy hedge hyssop, obe-wan-conobea, ditch stonecrop, and brookweed. Gravel bars also can contain some of these species as well as cocklebur, giant ragweed, tamarisk waterhemp, and water willow (in stream).

Flatwoods - Flatwoods are open oak-dominated woodlands of level uplands and terraces that occur on soils with impermeable subsoil horizons such as argillic horizons, or claypans (White and Madany 1978, Taft et al. 1995). Claypans are subsurface soil horizons distinguished from overlying horizons by a sharp increase in clay content. Some flatwoods in Illinois occur on lacustrine deposits while most sites occur on glacial till with soils formed mostly in loess. These poorly drained and slowly permeable soils result in seasonally wet and dry conditions. During the dormant season, soil moisture perched above the slowly permeable horizon (e.g., claypan) can result in local ponding, particularly in microdepressions, typical of many flatwoods. In the early part of the growing season, certain wetland species can be locally common associated with the depressions, which can be just a few centimeters lower than surrounding land. However, due to rates of evapotranspiration during the summer months, the surface soils throughout flatwoods can become very dry as subsurface moisture can not recharge the shallow rooting zones due to restrictions imposed by the claypan. Consequently, these woodlands typically are dominated in the canopy by tree species of dry uplands with a groundcover including a mixture of upland and bottomland species (Taft et al. 1995).

In Illinois, three different flatwoods community types are distinguished based on bioregional and edaphic factors. These include *southern flatwoods* (used as the primary basis for the general description above), *sand flatwoods,* and *northern flatwoods*. *Southern flatwoods* are restricted to the Illinoian till plain and coastal plain regions of Illinois and are the type found in the KRAA. *Sand flatwoods* mostly are restricted in Illinois to the Chicago lake plain; local occurrences also are known from some of the major sand regions where lacustrine deposits are present. *Northern flatwoods* are a community type restricted in Illinois to the moraines in the Chicago region. Research in southern flatwoods indicates that local patterns in available water-holding capacity, including soil textural differences, depth to the claypan, and cation availability in the soil are important variables explaining tree species composition, diversity, and density patterns in southern flatwoods. These factors, in turn, influence patterns of groundcover species diversity. Maintenance of groundcover diversity in flatwoods communities appears to be dependent, in part, on periodic fire (Taft et al. 1995). General ecological problems in flatwoods are related to fragmentation, grazing, and fire absence. Exotic species have not yet become a serious problem at most sites.

Southern Flatwoods - Some of the finest southern flatwoods remaining in Illinois, and the Midwestern United States, occur in the KRAA. About 453 acres of southern flatwoods are present in the KRAA that are of statewide significance, essentially undegraded natural areas. This total is about 71% of all high-quality southern flatwoods in Illinois (Table 6) and more areas are present in the Assessment Area that may qualify for addition to the total. Southern flatwoods, sometimes termed post oak flatwoods due to the usual dominance of post oak, are considered one of the most endangered natural communities in the Midwest. At least two sites in the KRAA, each recognized as a natural area, occur on soils derived from both lacustrine and loess deposits and are characterized by considerable amounts of sand (about 50%) in the surface horizons. These sites could be considered sand flatwoods, one of the rarest natural communities in Illinois. These latter sites are unique in that they appear to be compositionally and structurally stable, despite long-fire free periods.

A unique flora can be found in many flatwoods remnants. The microdepressions often are characterized by an assemblage of herbaceous species from such disparate habitats as wetlands and glades, separated temporally by the distinct wet and dry seasons. Some flatwoods provide habitat for many savanna and open woodland species because the relatively harsh environmental conditions retard (though do not stop) changes often associated with fire absence.

The most dominant **canopy** species typically is post oak followed by blackjack oak. Occasional species include swamp white oak, white oak, black oak, pin oak, shagbark hickory, black hickory, and mockernut hickory. **Subcanopy** species include shingle oak, sassafras, shagbark hickory, Texas hickory, and black cherry. **Shrubs** include swamp holly and prairie rose; common **woody vines** include Virginia creeper and creeping dewberry. Common **groundcover** species include numerous graminoid species, prairie and open-woodland forbs, and species specific to zones associated with microdepressions. Typical grass species include common wood reed, autumn bent grass, poverty oat grass, and panic

grass. Sedges are numerous including several *Carex* species (e.g., *Carex artitecta, C. bushii, C. caroliniana, C. festucacea, C. glaucodea,* and *C. hirsutella*). Forbs include slender three-seeded mercury, three-seeded mercury, Virginia snakeroot, white wild indigo, flowering spurge, American pennyroyal, woodland sunflower, downy sunflower, false dandelion, prairie blazing-star, wild bergamot, wild quinine, small passion flower, Mayapple, Indian physic, common cinquefoil, slender mountain mint, and Virginia spiderwort. In and around microdepressions is an interesting assemblage of wetland and glade species. Within the depressions is the virtually ubiquitous taxon for flatwoods, the slender spike rush. Common to occasional other associates include Wolf's spike rush, black quillwort, false aster, path rush, seedbox, and the mosses *Sphagnum* sp. and *Climaceum americanum.* A few species typical of sandstone glades can be found bordering the microdepressions including rushfoil, narrow-leaved pinweed, and low forked chickweed.

Two endangered species are known from flatwoods within the KRAA, buffalo clover (*Trifolium reflexum*) and tubercled orchid (*Platanthera flava* var. *herbiola*). Buffalo clover is rare in most states within its range. This is a native clover species that typically occurred in savanna-like habitats. It is known from two flatwoods sites in the Assessment Area where it is most common in the "lawns" of two cabins where mowing once a year, following the fruiting period for the species (i.e., June), appears to mimic the effects of fire by reducing competition and leaf-litter accumulation. The tubercled orchid, recently discovered in the KRAA, is known from a single forest that has similarities to both flatwoods and floodplain forest (Table 10). Ecological problems associated with flatwoods include fire absence, fragmentation, and habitat degradation from grazing and other disturbances. Exotic species invasion is less a problem compared with many other habitats, presumably due to the seasonally harsh environments that, like dry upland forest, support only a few non-native species. The primary exotic species in southern flatwoods is Japanese honeysuckle.

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, the prairie subclasses, like the Upland Forest and Floodplain Forest subclasses, are further distinguished into natural communities by soil-moisture regime (dry, dry-mesic, mesic, wet-mesic, and wet). About 68% (2,487,348 acres) of the KRAA was tallgrass prairie, mostly silt-loam prairie of various soil-moisture conditions, at the time of European settlement (Iverson et al. 1989, IGIS database). However, only about 11.2 acres of high-quality prairie remain in the Assessment Area (Table 6), including a recently discovered 2 acre glacial drift hill prairie. This is about 0.0005% of the original extent of prairie in the KRAA; in other words, about 99.9995% of the original prairie has been destroyed. An unknown portion of this figure includes degraded prairie and some of this may have restoration potential; nevertheless, the destruction of prairie within the KRAA has been extraordinarily thorough.

Based on remnant prairies and inferring from edaphic conditions prevalent prior to extensive agricultural and other development, the following community types are/were present in the KRAA: (silt loam) Prairie (including *dry-mesic, mesic, wet-mesic*, and *wet prairie* community types) and Hill Prairie (including *glacial drift hill prairie*). The bluffs facing the Mississippi River where numerous loess hill prairies occur, are in the Mississippi River drainage and just outside the drainage for the Kaskaskia River and the KRAA.

Common ecological problems associated with prairies, in general, include fragmentation, exotic species invasions, fire absence, woody plant encroachment, and other sources of habitat degradation such as soil disturbances. 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 invasion and woody encroachment pose some of the most severe threats to the integrity of existing high-quality prairie remnants in the KRAA. 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.

Unfortunately, due to the near-complete elimination of prairie vegetation from within the KRAA, few examples remain to document the characteristic species that were associated with undegraded natural communities for all soil-moisture conditions that presently or formerly occurred in the region. The following community accounts are based largely on descriptions of the few remaining prairies in the Assessment Area.

Prairie - About 7.6 acres of high-quality silt-loam prairie remains in the KRAA including dry-mesic, mesic, and wet-mesic soil-moisture classes (Table 6). Species of silt-loam prairies respond in somewhat predictable, although individual, ways along soil-moisture and other environmental gradients; consequently, the community types can merge gradually without sharp, distinct boundaries. Sometimes, only slight differences in elevation can influence the community composition. The characteristic species of each Prairie community type are described below.

Dry-Mesic Prairie - Dry-mesic prairie occurred in the KRAA on well-drained and somewhat permeable soils with moderate water-holding capacity. A total of 3 acres of high-quality (Grade B) dry-mesic prairie are known from a single site within the KRAA (Table 6), all within railroad rights-of-way. Degraded remnants with potential for rehabilitation may be present in the KRAA, possibly within railroad rights-of-way. The following is a general description, using species known to be present in dry-mesic prairies in the Assessment Area.

Common to occasional **grass** species include big bluestem, poverty oat grass, June grass, panic grass, little bluestem, northern prairie dropseed, and Indian grass. **Sedges** include Bicknell's sedge and sand bracted sedge. Typical **forbs** include cat's foot, pussytoes, spreading dogbane, butterflyweed, horsetail milkweed, green milkweed, sky-blue aster, heath aster, spreading aster, Canadian milk vetch, cream wild indigo, false toadflax, prairie coreopsis, white prairie clover, purple prairie clover, showy tick-trefoil, shooting star, pale purple coneflower, flowering spurge, wild strawberry, tall alumroot, yellow stargrass, violet bushclover, rough blazing star, hoary puccoon, spiked lobelia, false garlic, wild quinine, pale beardtongue, field milkwort, whorled milkwort, slender mountain mint, black-eyed Susan, small skullcap, rosinweed, blue-eyed grass, Missouri goldenrod, Canadian goldenrod, old field goldenrod, showy goldenrod, wild petunia, nodding ladies' tresses, yellow pimpernel, goat's rue, Virginia spiderwort, and Venus' looking-glass. **Shrubs** can be locally common including leadplant, New Jersey tea, rough-leaved dogwood, aromatic sumac, smooth sumac, pasture rose, and prairie willow.

Two species listed as threatened by the IESPB, ear-leaved foxglove (*Tomanthera auriculata*) and Hill's thistle (*Cirsium hillii*), have been reported from within the KRAA. Ear-leaved foxglove can occur in a variety of habitats including prairies on relatively dry sites (Table 10). This species is known historically from six sites within the Assessment Area, mostly prairies in railroad rights-of-way. Following more recent surveys of these populations, only one, or possibly two, of these appear to support an extant population. Hill's thistle, a species of dry prairies and savannas, is known from a historical collection within the KRAA. Herbarium records indicate that this species was observed at two or three different locations in prairie within railroad rights-of-way near Witt in northeastern Montgomery County, just at the headwaters of the East Fork of Shoal Creek.

Typical ecological problems in remnants of dry-mesic prairie include fire absence (and consequential woody plant encroachment), habitat degradation from soil disturbances and overgrazing, and exotic species invasion. Common exotic species include: milfoil, autumn olive, oxeye daisy, white sweet clover, yellow sweet clover, parsnip, Canada blue grass, Kentucky bluegrass, and wooly mullein. 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). Three high-quality mesic tallgrass prairie remnants totaling 3.6 acres, all within railroad rights-of-way, remain in the KRAA (Table 6). Undegraded mesic tallgrass prairie is a

natural community with among the highest levels of species diversity, measured as species density (species/unit area [e.g., quadrats]), in North America. High-quality prairie is characterized by species density ranging from 15 to 30 species in a half-meter-square sampling quadrat. Typically, as many as 100 to 130 species of vascular plants can be found in small (e.g., 5 acre) remnants.

Common **grass** species include: big bluestem, nodding wild rye, switch grass, little bluestem, northern prairie dropseed, and Indian grass. Common to occasional **sedges** include Bicknell's sedge, plains oval sedge, dark-scaled sedge, Mead's sedge, and spreading oval sedge. **Forbs** typical of mesic prairie include wild garlic, tall green milkweed, prairie milkweed, butterflyweed, green milkweed, heath aster, smooth blue aster, New England aster, Canadian milk vetch, white wild indigo, cream wild indigo, wild hyacinth, false toadflax, tall coreopsis, white prairie clover, purple prairie clover, Illinois tick trefoil, pale purple coneflower, flowering spurge, rattlesnake master, downy gentian, downy sunflower, prairie alumroot, round-headed bushclover, prairie blazing star, Michigan lily, hoary puccoon, lance-leaved loosestrife, wild bergamot, wild quinine, prairie phlox, obedient plant, prairie parsley, rough white lettuce, yellow coneflower, compass plant, prairie dock, rigid goldenrod, showy goldenrod, common spiderwort, Missouri ironweed, Culver's root, prairie violet, and golden Alexanders. Common **shrubs** include leadplant, New Jersey tea, hazelnut, smooth sumac, pasture rose, and prairie willow.

One Illinois endangered species is known from mesic prairie habitat in the Assessment Area. This species, prairie rose gentian (*Sabatia campestris*), is an annual found in Illinois primarily within KRAA where it is associated with somewhat degraded prairies. Presently, it is known from four populations within the Assessment Area, all within railroad prairies. The species is erratic in appearance and may be dependent on occasional disturbance such as fire.

Typical ecological problems in remnants are similar to dry-mesic prairie. Common exotic species include: white sweet clover, yellow sweet clover, wild parsnip, Queen- Anne's lace, Canada blue grass, Kentucky bluegrass, smooth brome, and wild asparagus. Many other exotic species can be present, including woody plants. Evidence observed in central Illinois of leaf burn and mortality of plants at the edges of prairies bordering cropland and sprayed railroad rights-of-way suggests that herbicide drift can be a problem, at least to species at the edges of prairie remnants, and may be an unrealized confounding factor throughout prairie remnants where they occur adjacent to cropland and sprayed rights-of-way. Off-road vehicle use of railroad rights-of-way, and other trespass, is becoming an increasingly damaging problem for these prairie remnants.

Wet-Mesic Prairie - This prairie community occurs in an intermediate zone between mesic prairie and wet prairie on somewhat poorly drained sites. Inundation periods are more brief than in wet prairie but longer than mesic prairie. A single one-acre high-quality remnant of wet-mesic prairie is known from the KRAA. Similar to the other prairie remnants, this site is in a railroad right-of-way. Wet-mesic prairie and wet prairie in Illinois sometimes merge with sedge meadow and marsh forming diverse wetland/prairie complexes. Distinction

among wet-mesic and wet prairie can be somewhat arbitrary. Local areas of wet-mesic prairie sometimes occur in low-lying areas within railroad rights-of-way .

Common **grass** species are big bluestem, blue-joint grass, Eastern gama grass, prairie cord grass, and common reed. **Sedges** can be numerous and abundant. Common to occasional species include large yellow sedge, dark-scaled sedge, crested oval sedge, wooly sedge, long-awned bracted sedge, awned graceful sedge, awl-fruited oval sedge, brown fox sedge, great spike rush, dark green rush, and red bulrush. Characteristic **forbs** include swamp agrimony, Indian hemp, swamp milkweed, water hemlock, grass-leaved goldenrod, closed gentian, sawtooth sunflower, inland rush, Torrey's rush, purple loosestrife, prairie sundrops, smooth phlox, obedient plant, water knotweed, common smartweed, smartweed, common mountain mint, cup plant, stout blue-eyed grass, late goldenrod, purple meadow rue, waxy meadow rue, and blue vervain. **Shrubs** may be relatively uncommon but can include pale dogwood and sandbar willow.

No threatened or endangered species in the KRAA are known from this natural community. Ecological problems in wet-mesic prairie are associated primarily with enhanced drainage from tile and soil disturbances. Fire absence can result in woody plant encroachment. Exotic species include redtop, yellow rocket, Kentucky bluegrass, and reed canary grass.

Wet Prairie - Wet prairies occur on poorly drained and slowly permeable soils. However, no undegraded remnants of wet prairie are known to remain in the KRAA. Wet prairie formerly was prevalent in portions of the upper reaches of the Kaskaskia River basin but drainage and habitat destruction have eliminated them. Since wet prairie virtually has been eliminated from the area and no descriptive information is available specifically from the KRAA, the following is a generalized description based on wet prairies in central Illinois.

The characteristic **grass** species for the community type is prairie cord grass; another typical grass is blue-joint grass. **Sedges** are often common and include yellow sedge, wooly sedge, crested oval sedge, awl-fruited oval sedge, brown fox sedge, great spike rush, dark green rush, and red bulrush. Common **forbs** include swamp milkweed, common boneset, sawtooth sunflower, smooth phlox, blue flag, common water horehound, monkey flower, water smartweed, late goldenrod, hairy hedge nettle, American germander, waxy meadow rue, and blue vervain. **Shrubs** include swamp rose, pale dogwood, and sandbar willow.

No threatened and endangered species are known from wet prairie within the KRAA boundary. Ecological problems include altered hydrology affecting the soil moisture and flooding regime. Fire was an occasional occurrence even in wet prairie and fire absence could result in conversion of floodplain prairies to thickets and forests. Exotic species include reed canary grass, a species that can become dominant when flooding duration and siltation increases.

Hill Prairie - Hill prairies typically occur on slopes with exposure to the south, southwest, or west. Soil moisture conditions are usually very dry on these well-drained sites. For

classification, hill prairies are distinguished not by soil moisture type but by substrate. In Illinois *loess, glacial drift, gravel, and sand hill prairies* have been recognized (White and Madany 1978). There are remnants of glacial drift hill prairie within the Assessment Area but they are not common. Hill prairies often occur as openings within a generally forested landscape. During long periods of fire absence, hill prairies often decline in area and many in Illinois have been eliminated or severely reduced in size due to encroachment of forest (McClain 1983, Robertson and Schwartz 1994).

Glacial Drift Hill Prairie - Two high-quality glacial drift hill prairies are known from the KRAA totaling about 3.6 acres, about 11% of the high-quality glacial drift hill prairie remaining in Illinois (Table 6). These prairies occur on exposures of glacial drift; most hill prairies in Illinois occur on loess deposits. Exposures of glacial drift largely are limited to the Grand Prairie Natural Division and occur on steep slopes where loess accumulation was slight, absent, or has been lost through natural erosional processes.

Characteristic **grasses** include big bluestem, little bluestem, and Indian grass. Common to occasional **forbs** include pussytoes, smooth false foxglove, butterflyweed, green milkweed, sky blue aster, spreading aster, false boneset, dwarf bindweed, prairie coreopsis, purple prairie clover, showy tick-trefoil, shooting star, pale purple coneflower, rattlesnake master, flowering spurge, rose vervain, fringed puccoon, rough blazing star, spiked lobelia, monarda, hairy mountain mint, wild quinine, pale beardtongue, prairie phlox, rosinweed, blue-eyed grass, nodding ladies' tresses, small skullcap, yellow pimpernel, goat's rue, Virginia spiderwort, golden Alexanders. **Shrubs** in glacial drift hill prairies include New Jersey tea, aromatic sumac, smooth sumac, pasture rose, and rough dogwood.

No threatened or endangered species are known from glacial drift hill prairie in the KRAA. Ecological problems are woody encroachment due to periods of fire absence, exotic species invasion, grazing, and horse traffic. Common exotic species include white sweet clover, Kentucky bluegrass, Canadian blue grass. A common seed source for some of these species in hill prairies is horse manure. Horse trails also can be a serious degradation factor, particularly on steep slopes prone to erosion and compaction. It is possible that there remain a few small hill prairie remnants, undiscovered and unmanaged, that could be restored. Some may occur associated with south-to-southwest facing slopes along the Kaskaskia River or impoundments such as Lake Shelbyville, where a two-acre hill prairie recently was discovered (Eric Smith, IDNR, personal communication). Prompt management including prescribed fire and brush cutting can enhance many such sites.

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 habitats (Anderson 1983, Taft 1997a). Savannas are characterized by scattered, open-grown trees, with or without shrubs, and a continuous herbaceous groundcover 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. In the dissected terrain of streams such as the Kaskaskia River, savannas often occurred associated with a mixture of vegetation types including prairie, woodland, forest, and wetland communities. 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 livestock grazing. Typically, the groundcover at pastured sites is floristically degraded and characterized by an abundance of non-native species.

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 and savanna structure within an otherwise forested landscape). Savanna subclasses are further distinguished to community type by soil-moisture characteristics. Based on inferred edaphic characteristics in the KRAA 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 Barrens - *dry-mesic barrens*, *dry barrens* (Table 9). These communities sometimes merge gradually with other community types (e.g., dry-mesic upland forest, flatwoods, prairie). Floristically, savannas contain species of both prairies and open woodlands, though numerous taxa 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 - Savannas essentially are prairies with scattered trees. They are spatially and temporally dynamic with community structure and composition changing in one location over time. Percent tree cover can range up to about 50%, though classifications vary. In general, as shade increases, abundance of prairie grasses such as big bluestem, Indian grass, little bluestem, and northern dropseed declines and woodland species such as several panic grasses increase in abundance. Soils generally are derived from loess, glacial till, or sometimes lacustrine deposits, they often have a silt-loam texture and can be relatively deep.

Fragmentation, fire absence, 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 single one-acre site remains in the KRAA of high-quality mesic savanna (Roberts Cemetery Savanna Nature Preserve). In addition, some degraded remnants may be present that have restoration potential. Other sites may only be capable of some level of rehabilitation because species have been extirpated by past disturbance or other changes in ecological conditions (e.g., shading). The following community descriptions are generalized depictions of the (former) undegraded condition for savanna habitats in the Kaskaskia basin.

Dry-mesic savanna - Historically, savanna/open woodland communities probably occurred locally throughout the Assessment Area merging with barrens communities on well-drained upland sites exposed to periodic fire. In the absence of fire, these areas eventually develop into closed woodlands (e.g., dry-mesic upland forest). No remnants of habitats classified as this community type are known to exist in an undegraded condition in the KRAA. However, somewhat degraded remnants of savanna-like communities persist in the Assessment Area on ridges and steep slopes. One area where savanna-barrens-open woodland habitats persist is on ridges and slopes of exposed glacial drift among dissected terrain adjacent to Lake Shelbyville. Some sites have restoration potential and habitat management by IDNR is underway. Dry-mesic savanna and dry- mesic barrens have many similarities and a distinction may not always be clear. One natural area, considered a dry barrens, occurs in the Assessment Area that has floristic similarities to dry-mesic savanna (see next subclass discussion).

Tree species that could be found in dry-mesic savanna include white oak, black oak, blackjack oak, post oak, and bur oak. **Subcanopy** stratum characteristics are dependent on the recent fire history and may include many of the previous species in stages of recruitment together with shingle oak, shagbark hickory, and sassafras. **Shrubs** include leadplant, prairie willow, New Jersey tea, gray dogwood, hazelnut, pasture rose, and smooth sumac. **Groundcover** species include a rich assortment of graminoid and forb species from prairie, savanna, and open woodland habitats. Graminoid species (grasses and sedges) that could be expected include: big bluestem, little bluestem, Indian grass, woodland brome, poverty oat grass, hairy panic grass, bottlebrush grass, Virginia wild rye, porcupine grass, and the sedges *Carex aggregata, C. artitecta, C. bicknellii, C. bushii, C. cephalophora, C. meadii,* and *C. pensylvanica*. Characteristic forb species may include pussytoes, hog peanut, tall anemone, spreading dogbane, butterfly weed, spreading aster, prairie aster, Canadian milk vetch, smooth false foxglove, yellow false foxglove, white wild indigo, cream wild indigo, tall thistle, dwarf bindweed, pale Indian plantain, wild hyacinth, partridge pea, purple prairie clover, mullein foxglove, shooting star, pale purple coneflower, tall boneset, yellow stargrass, rough blazing star, American columbo, woodland sunflower, false sunflower, slender bush clover, prairie blazing star, wild bergamot, beebalm, wild quinine, pale beard tongue, Indian physic, Sampson's snakeroot, prairie phlox, whorled milkwort, hairy mountain mint, starry campion, goat's rue, hairy mountain mint, tall goldenrod, yellow pimpernel, Virginia spiderwort, yellow crownbeard, and Culver's root.

Two species listed as endangered and two listed as threatened by the IESPB and known from the KRAA can occur in habitats such as dry-mesic savanna (Table 10). These species are the state endangered violet collinsia (*Collinsia violacea*) and buffalo clover (*Trifolium reflexum*), and the threatened blazing-star (*Liatris scariosa* var. *niewlandii*) and ear-leaved foxglove (*Tomanthera auriculata*). The violet collinsia occurs mostly in dry-mesic upland forest. A few individuals also occur in an adjacent pioneer cemetery with scattered open-grown oaks and near a recent occurrence of a single individual buffalo clover. This area probably was a dry-mesic savanna. Another much larger population of buffalo clover occurs in dry to dry-mesic barrens habitat. While very rare in Illinois, both species possibly could be found in open woodland or savanna-like habitat throughout the Assessment Area. Blazing star is known from at least three populations in the Assessment Area (Table 10), and at least two occurrences are in savanna remnants. Ear-leaved foxglove is known from savanna-like habitats in Illinois; however, in the KRAA it only has been observed in railroad prairies.

Ecological problems in dry-mesic savanna include fire absence and consequential woody encroachment resulting in loss of groundcover species diversity and cover. Grazing damage may be persistent and exotic species may be abundant. Typical exotics include orchard grass, smooth brome, Queen Anne's lace, meadow fescue, Canada bluegrass, and Kentucky bluegrass.

Mesic savanna - Mesic savannas typically were associated with prairie groves on level to slightly rolling terrain. This community type is particularly dependent on recurrent fires. Without periodic fire, the soil-moisture conditions allow rapid development of woody vegetation. Consequentially, due to several factors (e.g., fire absence, habitat loss, and overgrazing) undegraded remnants, though probably once common in the Assessment Area, are among the rarest plant communities in the Midwest. A single high-quality remnant (Grade B mesic savanna), one acre in size, is known to occur in the KRAA.

Similar to the previous community type, the compositional characteristics for mesic savannas in the KRAA are incompletely known, particularly regarding the species rich groundcover stratum. The most characteristic **tree** species of mesic savannas is bur oak; white oak, post oak, shagbark hickory, and mockernut hickory may be common to occasional at some sites. **Shrubs** are similar to dry-mesic savanna. **Groundcover** species includes greater importance of mesic prairie species compared with dry-mesic savanna. Graminoid species include big bluestem, Indian grass, little bluestem, stout wood reed, porcupine grass, nodding wild rye, Virginia wild rye, plains oval sedge, long-scaled green sedge, Mead's sedge, and Short's sedge. Common to occasional forbs to expect include purple milkweed, Canadian milk vetch, cream wild indigo, tall coreopsis, wild hyacinth, American bellflower, white prairie clover, purple prairie clover, purple coneflower, white trout lily, biennial gaura, false sunflower, false dandelion, prairie blazing star, hoary puccoon, Michigan lily, thicket parsley, foxglove beardtongue, prairie phlox, obedient plant, green-fringed orchid, great Soloman's seal, French grass, starry campion, false Soloman's seal, purple meadow rue, American germander, meadow parsnip, showy goldenrod, common spiderwort, Culver's root, and golden Alexanders.

One species, blazing star (*Liatris scariosa* var. *niewlandii*), listed as threatened by the IESPB, occurs in a mesic savanna within the KRAA. Ecological problems associated with mesic savannas are similar to dry-mesic savanna. In general, one of the greatest conservation challenges in the Midwest is how to sustain dynamic savanna habitats within a highly fragmented landscape, particularly when the remnants are small, isolated natural areas bounded by cropland or other highly developed land use.

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). Conditions within the Kaskaskia basin probably also supported wet to wet- mesic savannas. 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. No noteworthy remnants have been reported from the KRAA.

Species composition of **trees** in wet to wet-mesic savannas in the KRAA may have included bur oak, swamp white oak, and pin oak. This community was probably 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, stout wood reed, big bluestem, prairie cord grass, blue joint grass, Eastern gama grass, sawtooth sunflower, Jerusalem artichoke, and goldenglow. The floristic composition of these natural communities probably will remain poorly understood.

Barrens - Barrens are a type of savanna characterized by local inclusion of prairie species within a mostly forested landscape. They are distinct from savannas mostly because they occur associated with shallow soils where bedrock is near the surface and typically is locally exposed. Barrens are often found on south-to-west facing slopes. Similar to savannas, in the absence of fire barrens decline in size and diversity as woody plants encroach and shade out the prairie/savanna species. Some barrens demonstrate slightly greater inertia to change compared with savannas because of the generally dry, nutrient-poor habitat conditions. The natural communities *dry, dry-mesic*, and *mesic barrens* are recognized in Illinois (White and Madany 1978) on a variety of substrates. Soils can be derived from shallow loess, glacial drift, and bedrock including sandstone, limestone, or shale. In the KRAA, one high-quality dry barrens is known. This site, in Montgomery County, is approximately 2 acres in size and is associated with small sandstone outcroppings. Remnants of *dry-mesic barrens* (floristically very similar to dry-mesic savanna) also may be present.

Dry barrens - One high-quality dry barrens in Montgomery County, known as Shoal Creek Barrens, is about 2 acres in size and has been the focus of considerable restoration effort by local conservationists. This site occurs adjacent to a reservoir (Lake Lou Yeager) within a region of upland forest and local areas of prairie vegetation. The barrens occurs on a narrow rocky ridge and slope where sandstone is near or at the surface. Characteristic species composition is described below with emphasis on the vegetation in the natural area.

Dominant **canopy** species include blackjack oak, post oak, and black oak. Occasional trees include white oak, shellbark hickory, shagbark hickory, and mockernut hickory. **Subcanopy** species include sassafras, shadbush, flowering dogwood, persimmon, Eastern red cedar, hop hornbeam, and slippery elm. **Shrubs and woody vines** include New Jersey tea, smooth sumac, pasture rose, leadplant, prairie willow, Virginia creeper, poison ivy, and trumpet creeper. Similar to other savanna community types, the **groundcover** in dry barrens includes a rich assortment of open woodland and prairie species. Common **graminoid** species include big bluestem, little bluestem, Indian grass, poverty oat grass, and June grass. Common to occasional **forbs** include pussytoes, blue aster, sky-blue aster, slender false foxglove, cream wild indigo, dittany, false boneset, prairie coreopsis, pale purple coneflower, nodding wild rye, flowering spurge, woodland sunflower, bristly sunflower, slender bush clover, cylindrical blazing star, rough blazing star, white prairie clover, slender mountain mint, prairie dock, rough goldenrod, and goat's rue. A few ferns can be present include ebony spleenwort, rattlesnake fern, and fragile fern. Mosses and lichens can be locally abundant including *Leucobryum glaucum, Polytrichum commune, Cladonia furcatus*, and *C. crisatatella.*

Two species listed by the IESPB occur in dry barrens habitat (Table 10). These are the state endangered buffalo clover (*Trifolium reflexum*) and state threatened blazing star (*Liatris scariosa* var. *niewlandii*). Ecological problems are similar as with other savanna communities. Foremost is fire absence and consequentially encroachment of woody plants. Generally, the canopy composition of dry barrens is compositionally stable since the habitat is too severe for successful invasion of mesophytes (Taft 1999b). However, sugar maple once was common at the natural area though recent management including prescribed fire and cutting may have reduced its abundance.

Dry-Mesic Barrens - There are no high-quality dry-mesic barrens known from the Assessment Area and no other sites have been described (although portions of the known dry barrens may include dry-mesic barrens). See description for dry-mesic savanna for characteristic species composition. Dry-mesic savanna and dry-mesic barrens probably were floristically very similar. However, with so few remnants for comparison, there is little knowledge of the degree of regional variation within these natural communities.

Wetland

There are about 165,699 acres of wetland remaining within the KRAA, or about 4.5% of the total area (Table 2). Wetland community types in the KRAA, following natural community classification of White and Madany (1978), include *floodplain forests* (about 73% of total), *marsh* (8.6%), *shrub swamp* (3.1%). Lakes (open-water bodies greater than 20 acres) and ponds are discussed in a following section of the report. Floodplain forests, also wetland communities, were described previously under the Forest community class. Wetlands in the KRAA are concentrated along streams in the Assessment Area and in the karst region in the southwestern portion of the Assessment Area (Figure 7). About 694 acres of wetland (0.4% of wetland total) are recognized as high-quality and undegraded

natural communities; however about 89% of this is floodplain forest habitat. Most of the remaining high-quality wetland is among a pond/shrub swamp complex at a single site (Table 6). Portions of some of the high-quality flatwoods (i.e., microdepressions) also may qualify as jurisdictional wetlands, increasing somewhat the total proportion of high-quality wetland in the KRAA. Typical ecological problems for wetlands include altered hydrology resulting in increased or reduced flooding, increased siltation from cultivated uplands, runoff from urban pavement and roadway deicing salts, grazing, and invasion of non-native species. Among the non-forested wetlands in the KRAA include *marsh*, *shrub swamp*, and *seep* (Table 3). These natural communities are discussed below.

Marsh - Marshes are palustrine wetlands characterized by having water at or near the surface during most of the growing season, dominance by herbaceous vegetation, 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 KRAA. Community structure and organization is controlled largely by water depth. Shallow-water zones are dominated by emergent, rooted herbaceous vegetation. In deeper-water zones, floating aquatics become more abundant and open water is 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 often co-occur with sedge meadow, wet prairie, and sometimes seep, 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 or southern lake sedge suggesting sedge meadow, marsh marigold 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 must be done with caution. Only 1 acre of marsh is recognized by the INAI as high-quality, undegraded natural area (Table 6). Little floristic information is available for marshes specifically from within the KRAA. The following description is a general summary for marsh vegetation in the region of the Assessment Area; species listed all occur in the KRAA.

Characteristic **graminoid** species (sedges and grasses) include blue-joint grass, southern lake sedge, wooly sedge, knobbed hop sedge, common hop sedge, red-rooted spike rush, marsh spike rush, fowl manna grass, rice cut grass, dark green rush, red bulrush, and great bulrush. Common to occasional **forbs** include sweetflag, common water plantain, swamp milkweed, nodding bur marigold, purple-stemmed tickseed, false nettle, sawtooth sunflower, spotted touch-me-not, blue flag, cardinal flower, common water horehound, purple loosestrife, arrow arum, common smartweed, smartweed, pale dock, swamp dock, common arrowhead, lizard's tail, water parsnip, branched burreed, common burreed, and common cattail. Common **fern** and **fern allies** include common horsetail, scouring rush, and sensitive fern. **Shrubs** can include buttonbush, pale dogwood, halberd-leaved rose

mallow, peach-leaved willow, swamp holly, and sandbar willow. Black willow, silver maple, green ash, and cottonwood are common trees often associated with marshes in the KRAA. Species of **open-water zones** can include small duckweed, great duckweed, coontail, humped bladderwort, Mexican azolla (an aquatic fern), and the rare featherfoil.

One state endangered plant, water-pennywort (*Hydrocotyle ranunculoides*), formerly occurred in the Assessment Area within a marshlike habitat. According to records, this site, and presumably this population, has been destroyed (unpublished IDNR data).

Ecological problems in marshes 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 red reed, river bulrush, and common cattail. Compared with upland habitats, relatively few exotic species are present in wetland communities (Havera et al. 1994). However, these relatively few taxa can be serious pests that can greatly lower the diversity of a wetland site.

Swamp - The swamp community 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 swamps occur in the Assessment Area. 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 wetland with at least 50% cover of shrubs (White and Madany 1978). In the KRAA, shrub swamps are common locally in old oxbow lakes and in overflow channels and depressions in floodplains. These wetlands particularly are common in the lower reach of the Kaskaskia River where shrub swamps often are associated with large stands of floodplain forest. Three sites totaling 77 acres in the KRAA are high-quality natural areas. This is about 26% of the total undegraded shrub swamp recorded from the state (Table 6). One St. Clair County site (Wagon Lake) includes 60 acres of Grade A shrub swamp. This area also is considered to be in the *pond* natural community (see below).

Typically, species composition includes many taxa from the marsh or sedge meadow community types. However, **shrubs** are dominant including: buttonbush, pale dogwood, swamp privet, swamp holly, and halberd-leaved rose mallow. **Trees** around the margins typically include silver maple, green ash, river birch, and black willow. Trumpet creeper is a common woody vine in this zone. **Herbaceous** species include arrow arum, fogfruit, panicled aster, swamp beggar's ticks, water knotweed, spatterdock, branched burreed, cardinal flower, common hop sedge, common arrowhead, lizard's tail, ditch stonecrop, pale dock, swamp dock, smooth buttonweed, false nettle, and marsh St. John's wort.

No threatened or endangered species are reported from shrub swamp within the KRAA. Ecological problems are similar to the marsh community type.

Seep - 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. Only *seep* is reported from the KRAA, but only one somewhat degraded site, about 0.5 acres in size, has been recognized by the INAI as a natural area (Table 6). Seeps often occur as small areas within other community types such as marsh, forest, or wet to wet-mesic prairie. It is possible that there are calcareous seeps present associated with the karst terrain and limestone bedrock in the southwestern portion of the KRAA. However, most springs in that region are in the Mississippi drainage.

Seep - Seeps are uncommon in the KRAA and little descriptive floristic information is available specific to the Assessment Area. The following description is a generalized account for seeps in central Illinois. **Herbaceous** species include sweet flag, false foxglove, marsh marigold, bulb bittercress, porcupine sedge, Maryland senna, white turtlehead, common horsetail, common boneset, short-headed rush, spotted touch-me-not, narrow-leaved loosestrife, slender panic grass, marsh clubmoss, and rough-leaved goldenrod. Characteristic **woody** plants include false indigo bush, pale dogwood, and spicebush. Black ash, a typical species of forested seeps in northern Illinois, has been reported from the Assessment Area, but probably is rare.

One species listed as threatened by the IESPB known primarily from seep communities in Illinois, drooping sedge (*Carex prasina*), occurs in within the KRAA where it is reported from a single station (Illinois Department of Natural Resources 1998). Ecological problems associated with seeps include degradation by grazing and alterations to the watershed that influence the quantity and quality of groundwater discharge, foot-traffic damage in the sensitive, high-saturated, seep soils, and exotic species invasion. Exotic species include creeping Charlie, self heal, and moneywort.

Lake and Pond

Lake and pond are open-water habitats. In the KRAA, open-water areas are scattered throughout the Assessment Area but they are not common and mostly of artificial origin.

Lake and Pond are the two subclasses of the Lake and Pond community class recognized in Illinois. Lakes are greater than 20 acres in size. 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* is the natural community type present in the KRAA in this community class; all lakes that are present are artificial impoundments. No endangered or threatened species are known from ponds or lakes in the KRAA. Ecological problems with ponds and lakes include drainage, degradation from direct and indirect livestock use, leaking septic systems and other sewage inputs, and siltation and runoff from cultivated uplands.

Pond - Natural ponds are usually shallow enough to allow rooted aquatic plants to grow throughout. Within the KRAA are 1,668 acres of natural ponds. One site, a 60 acre pond/ shrub swamp, has been recognized by the INAI as a high-quality natural area (Table 6). 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 karst topography. No detailed floristic data are available on natural ponds from within the KRAA. **Emergent** species known from pond habitats include American lotus, fragrant waterlily, spatterdock, water knotweed, water parsnip, arrow arum, branched burreed, and common arrowhead. Pickerelweed has been reported from the Assessment Area, but is becoming quite rare in Illinois. **Floating aquatic** species known from the KRAA include Mexican azolla, large water starwort, coontail, slender waterweed, small duckweed, marsh purslane, various-leaved water milfoil, lesser naiad, large-leaved pondweed, leafy pondweed, American pondweed, featherfoil (rare), mermaid-weed, wheelwort, humped bladderwort, watermeal, and glade duckweed. **Shrubs** can be present around the pond margins. See description of shrub swamp for a listing of these species. **Herbaceous shore** vegetation is similar to marsh. A few species may be specific to mud flats bordering ponds including brook flat sedge, creeping love grass, clammy hedge hyssop, common rush, and slender false pimpernel.

Lake (artificial impoundments) - 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.

Primary

Primary communities are associated with outcroppings of bedrock and in Illinois include Glade and Cliff subclasses (White and Madany 1978). Sandstone cliffs are known from the KRAA; small limestone cliffs possibly may be present in the southwestern portion of the Assessment Area. Small glades may occur but none have been reported from the region. These community subclasses are described briefly below.

Glades - Glades are local areas in forest, prairie, or mixed vegetation where bedrock is at the surface. Vegetation is often sparse with large areas of bedrock exposed. Glades are usually fairly level but are found on dry to xeric exposures with south or west-facing aspects. There are *sandstone, limestone*, and *shale glade* communities in Illinois (White and Madany 1978). No glades are reported from the KRAA. Glades are present nearby the southwestern extent of the Assessment Area associated with the Mississippi River bluffs. Small limestone glades may occur in the karst region (far southwestern portion) of the Assessment Area.

Limestone glade - Descriptions of limestone glade communities often combine species of glades and hill prairies since making a distinction can be somewhat arbitrary. Weathering is often extensive on limestone, thus growing conditions for plants are relatively more favorable, compared for example with sandstone glades, as fissures in the bedrock are common and a soil medium often is present. The following description is based on species that are characteristic of limestone glade habitats in southwestern Illinois.

Typical **woody** species include shadbush, leadplant, black hickory, New Jersey tea, redbud, rough-leaved dogwood, flowering dogwood, blue ash, red cedar, Virginia creeper, wafer ash, chinquapin oak, post oak, black oak, aromatic sumac, smooth sumac, and pasture rose. **Grass** species include big bluestem, side-oats grama, poverty oat grass, Canada wild rye, June grass, three-flowered melic grass, little bluestem, and Indian grass. **Forbs** and other monocots include rough false foxglove, cliff onion, cat's foot, pussytoes, columbine, tower mustard, green milkweed, aromatic aster, silky aster, sand coreopsis, croton, purple prairie clover, pale purple coneflower, narrow-leaved rough pennyroyal, bluets, prairie alumroot, grooved yellow flax, false aloe, monarda, prickly-pear cactus, purple oxalis, pale beard tongue, cleft phlox, small skullcap, prairie groundsel, Drummond's goldenrod, Venus' looking glass, and hoary vervain. A few **fern** species are characteristic of limestone outcroppings and occur on some glades. These include ebony spleenwort, baby lip fern, berry bladder fern (shaded situations), and purple cliffbrake fern.

Ecological problems associated with glades include degradation of the plant community associated with domestic stock grazing, exotic species invasion, woody plant encroachment, and quarrying. Typical exotic species include Kentucky bluegrass, Japanese honeysuckle, white sweet clover, and woolly mullein; however, many others can be present.

Cliff - Cliffs are vertical exposures of bedrock and can range from a few feet to about 300 feet high in Illinois. The following cliff community types are recognized in Illinois: *sandstone cliff, sandstone overhang, limestone cliff, dolomite cliff*, and *eroding bluff community* (White and Madany 1978). The floristic characteristics of cliff communities often differs greatly depending on the degree of exposure to the sun. Shaded cliff communities often have greater vegetation cover with distinct species composition compared with more exposed cliffs. Sandstone cliffs are known from a limited region in the KRAA in Effingham County; however, other outcroppings of sandstone may occur locally elsewhere in the Assessment Area. Small limestone cliffs, while not reported from

within the Assessment Area, may occur along Kaskaskia River tributaries such as those in the Prairie du Long Creek and Horse Creek subbasins near the mouth of the Kaskaskia (Figure 2).

Sandstone cliff - Sandstone cliffs occur in the KRAA but are uncommon. One high-quality sandstone cliff community known and this area, Rock Cave, is protected as an Illinois nature preserve. No acreage figures are determined for vertical cliff exposures. The sandstone is Pennsylvanian-aged and occurs with some thin coal strata. There is an overhang bluff, or rock shelter, in the preserve. Species reported from the sandstone cliff community include interrupted fern, Christmas fern, and wild hydrangea. Ecological problems sometimes include recreational climbing activities that can denude vegetated portions of outcroppings. Other problems can include sudden changes in exposure levels caused by tree removal in bordering forest.

Limestone Cliff - The following floristic description is based on species known from cliff habitats nearby the Assessment Area; many of these species also may occur in the KRAA if limestone cliffs are present. Shaded cliff communities can support an abundance of ferns including several species: berry bladder fern, walking fern, common woodsia, maidenhair fern, and Christmas fern. Other species associated with shaded portions of limestone cliffs include columbine, prairie alumroot, leafcup, wild hydrangea, and wafer ash. On more exposed cliff faces, baby lip fern, ebony spleenwort, and purple cliffbrake fern are characteristic species. Other species may include shadbush, Drummond's goldenrod, red cedar, and aromatic sumac. Ecological problems mostly are disturbances from quarrying.

Cultural

This class describes communities formed entirely by human activities and disturbances and includes cropland, pastureland, successional fields, developed land (e.g., urban), tree plantations, artificial lakes and ponds, and prairie reconstructions (White and Madany 1978). Cultural land, mostly cropland, non-native grassland, and urban land, is the major community class in the KRAA comprising about 85% of the total land area (Table 2). While highly degraded, cultural lands provide habitat for one species listed as endangered by the IESPB (mock bishop's weed [*Ptilimnium nuttallii*]). This species, and possibly others (e.g., ear-leaved foxglove, prairie rose gentian), is known from a degraded site in the KRAA (Table 10). Nevertheless, cultural areas impose some of the most challenging ecological problems for natural habitats in the KRAA (see discussion below). Exceptions include the prairie reconstruction, termed prairie restoration by the INAI (White and Madany 1978). Wetland reconstructions also occur locally in Illinois with the intent of creating a wetland similar to structure and function of natural communities. A valuable guide has been prepared as a comprehensive aid in wetland reconstruction (Admiraal et al. 1997). 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 KRAA is unknown. None are known or reported to occur in the Assessment Area that have developed into communities that mimic undegraded tallgrass prairie in species richness or structure. Reconstructed prairies require considerable time (>10 years) to develop into systems that structurally and compositionally begin to resemble natural communities. A general strategy for reconstructions is to plant species covering the phenological spectrum of the prairie including spring, summer, and fall-blooming taxa with a variety of functional and taxonomic groups (grasses, sedges, legumes and other forbs). Using seed stock from local sources is strongly recommended; using stock originating from sources more distant than a few hundred miles is strongly discouraged. A valuable guide to prairie reconstructions is available from the Illinois Department of Natural Resources (McClain 1997).

Summary and Recommendations

Trends in the Kaskaskia River Assessment Area among all natural communities combined indicate that the total proportion remaining in an undegraded, high-quality condition is about 0.04% of the area, just slightly lower than the statewide estimate of 0.07%. In other words, about 99.96% of the area of the KRAA has been altered, at least somewhat, by human activities. However, there is variation in degree of habitat loss and degradation among community classes. For forests, cover of forest is about 39% of the presettlement total. This is slightly greater than the statewide figure where approximately 30% of the presettlement total cover of forest remains. Considering habitat quality, about 0.11% of the presettlement forest area in the KRAA is high-quality natural area while statewide the figure is slightly lower at 0.08%. About 0.28% of the forest cover remaining in the KRAA is in a high-quality condition and recognized as natural area, the same as statewide estimates. For prairie, a much lower proportion of prairie remains in a high-quality condition (0.0005%) compared with statewide trends (0.01%). For savanna communities, comparing trends within the Assessment Area to statewide trends is difficult due to the uncertainty of the original extent and the natural temporal variation in this extent. However, with very little remaining in the KRAA, it is assumed that the trends are no better than statewide for this endangered community class. Trends among wetlands appear to be more positive in terms of total extent; about 23% of the presettlement extent is estimated to remain in the KRAA compared with about 11% statewide. Habitat degradation of wetlands in the Assessment Area has proceeded at a pace somewhat similar to statewide trends. About 0.64% of remaining wetlands statewide are in a high-quality condition, while about 0.42% of the remaining KRAA wetlands are high-quality natural areas.

These comparisons of trends within the KRAA to statewide are made with the best available data and should be used with some caution. While comparison of trends in the

KRAA and statewide appear to differ somewhat among community classes, what is clear is that habitat loss and degradation have been extensive in the KRAA. Additional survey efforts in the KRAA 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 KRAA, there remain many knowledge gaps such as the distribution and abundance patterns for rare species, long-term ecological trends among many remnant natural communities, and detailed floristic information on many community types. For example, since remnants of any community type tend to have floristic differences (no two natural areas are the same), and very few undegraded remnants remain of each indigenous 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 are limited include many prairie, savanna, wetland, and primary communities.

Throughout the natural community descriptions for the KRAA 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, habitat degradation, exotic species invasion, siltation, 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 KRAA 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 KRAA, 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. For example, since so few areas of high-quality savanna, upland forest, prairie, or (non-forested) wetland communities are known from the KRAA, identification of the degraded remnants with restoration potential is central to any recovery effort for these community types. 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 which can serve as focus areas for establishing large preserve complexes or macrosites. Trends in total area of each community class among qualitative units would serve as an aid in measuring success in restoration efforts (see below).

3. Protection

The natural communities with the greatest integrity need to be protected from further anthropogenic degradation (e.g., damaging levels of grazing, off-road vehicle impacts, siltation). Inventory and mapping in the basin 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) are 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 KRAA (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 KRAA 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, in some areas of Illinois, 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 degraded 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. Some community-level management activities address more than one ecological problem. For example, garlic mustard abundance possibly can be reversed with appropriately timed applications of fire (Nuzzo 1991, Schwartz and Heim 1996). Other serious exotic pests such as purple loosestrife, more common in the northeastern Illinois counties, 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 12 (modified from Solecki 1997).

Fire is an ecological force that historically influenced many aspects of natural communities in the KRAA. Many community types require fire for maintenance of community characteristics and diversity. Fire absence has resulted in changes in forest structure, composition, and levels of species diversity. Invasion of mesophytic species such as sugar maple into oak-hickory forests is a statewide phenomenon related to fire absence also occurring in portions of the KRAA. 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. Nevertheless, 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. Consideration needs to be given to the whole natural community. Spatially heterogenous 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 (Swink and Wilhelm 1994, Taft et al. 1997) methods may provide a framework useful in measuring progress of each restoration activity.

Table 12. List of invasive exotic species known or suspected to occur in the Kaskaskia River 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
Amur bush honeysuckle	*Lonicera maackii*	X					
autumn olive	*Elaeagnus umbellatus*	X					
awnless brome grass	*Bromus inermis*		X				
black locust	*Robinia pseudoacacia*	Garlon-4					
Canadian bluegrass	*Poa compressa*			X			
common burdock	*Arctium minus*		X		X	X	
creeping Charlie	*Glechoma hederacea*		X		X		
cut-leaved teasel	*Dipsacus laciniatus*		X		X	X	
garlic mustard	*Alliaria petiolata*		X	X	X		
Kentucky bluegrass	*Poa pratensis*			X			
motherwort	*Leonurus cardiaca*		?		X	X	
moneywort	*Lysimachia nummularia*		X				
multiflora rose	*Rosa multiflora*	X					
Osage orange	*Maclura pomifera*	X					
purple loosestrife	*Lythrum salicaria*		X		X		X
Queen Anne's lace*	*Daucus carota**		X		X		
reed canary grass	*Phalaris arundinacea*		X	X	X		
tall fescue	*Festuca pratensis*		X	X		X	
tree-of-heaven	*Ailanthus altissima*	X			X		
white mulberry	*Morus alba*	X					
white sweet clover	*Melilotus alba*			X	X		
wild aspargus	*Asparagus officinale*	X				X	
wild parsnip*	*Pastinaca sativa**		X		X	X*	
yarrow	*Achillea millefolium*		X		X		
yellow sweet clover	*Melilotus officinale*			X	X		

[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 1998), The Illinois Breeding Bird Atlas (Illinois Department of Natural Resources, in prep), Avian Ecological Investigations (Illinois Department of Natural Resources, unpublished reports), and the results of extensive field work by personnel from the Illinois Natural History Survey (much of it ongoing and not yet published).

The Kaskaskia River Assessment Area (KRAA) has one of the most extensive forest tracts in Illinois, especially of floodplain forest. As such, it has large populations of many characteristic floodplain species and relatively high nesting success. It contains some of the largest breeding populations in the State of such species as Red-shouldered Hawk, Yellow-billed Cuckoo, Red-headed Woodpecker, Cerulean Warbler, and American Redstart. Nesting success in the interior of forest tracts appears to be quite high, especially for Illinois (S.K. Robinson, unpublished data). It provides an excellent opportunity to work with private landowners to help conserve viable forest bird populations.

The KRAA has a fairly typical species list for areas adjacent to the Mississippi River in Illinois. At least 287 of the 299 species that regularly occur in the State (exclusive of vagrants) can be found in the area (Table 13). Of these 287 species, 139 breed or formerly bred there (Table 13). Of these, 35 are either locally extinct, or are rare during the breeding season (species with a "r" in Table 13), which suggest that habitat loss has been a major problem in the region. Other species that are globally extinct (Passenger Pigeon - *Ectopistes migratorius*, Ivory-billed Woodpecker - *Campephilus principalis* and Carolina Parakeet - *Conuropsis carolinensis*) formerly occurred in the area as did the locally extirpated Swallow-tailed Kite, Greater Prairie-Chicken, Ruffed Grouse, Bewick's Wren, and Bachmans' Sparrow. In addition, there are several species for which there is well substantiated historical breeding evidence, that are now absent or only occur as migrants (Trumpeter Swan, Osprey, Least Tern, Black Tern, Yellow-bellied Sapsucker, Swainson's Warbler and Yellow-headed Blackbird). Although some could occur as breeding species again with habitat restoration and/or reintroduction, this clearly shows the extent of habitat loss in the region. There are a few locally extirpated species that have become reestablished in the region fairly recently, including the Double-crested Cormorant, Bald Eagle and Wild Turkey.

Most forest patches are small and narrow, away from the Mississippi and Kaskaskia Rivers, and are unlikely to have successful breeding populations of most species (Brawn and Robinson 1996). However, there is a very large (30,000 acre) area of forested land,

almost totally under private ownership, along the Kaskaskia River, in St. Clair, Washington, and Monroe counties. These areas have considerable potential as local "source" areas for some bird species in the region. This could also be an important area for the restoration of wetland habitats, especially along the Kaskaskia River where many oxbow lakes (sloughs) still exist. The KRAA would be a prime area for conservation easements and set-asides to be used to reduce forest fragmentation within the corridor.

The bird species that live in the KRAA 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 13). The following sections describe the bird communities typically found in the major habitat types of the KRAA, as well as the habitat-specific environmental problems and management solutions for bird communities in each habitat.

Table 13. Bird species that regularly occur in the Kaskaskia River 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** [(r)]		**L W**
Horned Grebe *Podiceps auritus*			L
Eared Grebe *Podiceps nigricollis*			L
Western Grebe *Aechmophorus occidentalis*			L
American White Pelican *Pelecanus erythrorhynchos*			L
Double-crested Cormorant - DL ***Phalarocorax auritus***	**W** [(r)]		**L**
American Bittern - SE ***Botaurus lentiginosus***	**W** [(r)]		**W**
Least Bittern - SE ***Ixobrychus exilis***	**W** [(r)]		**W**
Great Blue Heron *Ardea herodias*	L W Fs F	L W	L W
Great Egret - DL ***Ardea albus***	**W**		**L W**
Snowy Egret - SE ***Egretta thula***	**W** [(r)]		**W**

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Little Blue Heron - SE *Egretta caerulea*	**W** (r)		**L W**
Cattle Egret *Bubulcus ibis*	W Fs (r)		C G W
Green Heron *Butorides virescens*	L W Fs		L W Fs
Black-crowned Night-Heron - SE *Nycticorax nycticorax*	**L W Fs** (r)		**Fs W**
Yellow-crowned Night-Heron - SE **Nycticorax violaceus**	**W Fs** (r)		**Fs**
Tundra Swan *Cygnus columbianus*			L W
Trumpeter Swan *Cygnus buccinator*			L W
Mute Swan *Cygnus olor*			L W
Greater White-fronted Goose *Anser albifrons*		L W C	L W C
Snow Goose *Chen caerulescens*		L W C	L W C
Ross' Goose *Chen rossii*		L W C	L W C
Canada Goose *Branta canadensis*	L W C	L W C R	L W C R
Wood Duck *Aix sponsa*	Fs W		Fs W L
Green-winged Teal *Anas crecca*			W L
American Black Duck *Anas rubripes*		W L	W L Fs C
Mallard *Anas platyrhynchos*	W C L Fs G	W C L Fs	W C L Fs
Northern Pintail *Anas acuta*			W C L
Blue-winged Teal *Anas discors*	W G		W L
Northern Shoveler *Anas clypeata*	W (r)	W L	W L
Gadwall *Anas strepera*		W L	W L
American Wigeon *Anas americana*			W L
Canvasback *Aythya valisineria*		W L	W L
Redhead *Aythya americana*		W L	W L

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Ring-necked Duck *Aythya collaris*		W L	W L
Greater Scaup *Aythya marila*		W L	W L
Lesser Scaup *Aythya affinis*		W L	W L
Oldsquaw *Clangula hyemalis*			L
Surf Scoter *Melanitta perspicillata*			L
White-winged Scoter *Melanitta fusca*		L	L
Common Goldeneye *Bucephala clangula*		L	L
Bufflehead *Bucephala albeola*		L	W L
Hooded Merganser *Lophodytes cucullatus*	Fs		W Fs L
Common Merganser *Mergus merganser*		L	L
Red-breasted Merganser *Mergus serrator*			W L
Ruddy Duck *Oxyura jamaicensis*	W (r)		W L
Turkey Vulture *Cathartes aura*	F G C Fs Sav	F G C Fs Sav	F G C S Sav Fs
Osprey - SE ***Pandion haliaetus***			**L**
Mississippi Kite – SE ***Ictinia mississippiensis***	**Fs** (r)		**F Fs**
Bald Eagle - ST, FT ***Haliaeetus leucocephalus***	**Fs L** (r)	**Fs L**	**Fs L**
Northern Harrier - SE ***Circus cyaneus***	**G W** (r)	**G C W**	**G C W**
Sharp-shinned Hawk - DL ***Accipiter striatus***		**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**
Broad-winged Hawk *Buteo platypterus*	F (r)		F
Red-tailed Hawk *Buteo jamaicensis*	F C G R S	F C G R S	F C G R S

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
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***			**All**
Wild Turkey *Meleagris gallopavo*	F S Sav Fs	F S Sav Fs C	F S Sav Fs C
Northern Bobwhite *Colinus virginianus*	S G C Sav	S G C Sav	S G C Sav
Yellow Rail - DL ***Coturnicops noveboracensis***			**G W**
King Rail - SE ***Rallus elegans***	**G W** [(r)]		**G W**
Virginia Rail *Rallus limicola*	W [(r)]		W G
Sora *Porzana carolina*	W [(r)]		W G
Common Moorhen - ST ***Gallinula chloropus***	**W** [(r)]		**W**
American Coot *Fulica americana*	W [(r)]	L	W L
Black-bellied Plover *Pluvialis squatarola*			L W
American Golden-Plover *Pluvialis dominica*			W L C G
Semipalmated Plover *Charadrius semipalmatus*			W
Killdeer *Charadrius vociferus*	W R G C		W R G C
Black-necked Stilt *Himantopus mexicanus*	W [(r)]		W
American Avocet` *Recurvirostra americana*			W
Greater Yellowlegs *Tringa melanoleuca*			W
Lesser Yellowlegs *Tringa flavipes*			W
Solitary Sandpiper *Tringa solitaria*			W
Willet *Catoptrophorus semipalmatus*			W

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Spotted Sandpiper *Actitis macularia*	L		W
Upland Sandpiper - SE ***Bartramia longicauda***	**G** [(r)]		**G**
Hudsonian Godwit *Limosa haemastica*			W
Ruddy Turnstone *Arenaria interpres*			W
Sanderling *Calidris alba*			W
Semipalmated Sandpiper *Calidris pusilla*			W
Western Sandpiper *Calidris mauri*			W
Least Sandpiper *Calidris minutilla*			W
White-rumped Sandpiper *Calidris fuscicollis*			W
Baird's Sandpiper *Calidris bairdii*			W G
Pectoral Sandpiper *Calidris melanotos*			C W G
Dunlin *Calidris alpina*			W
Stilt Sandpiper *Calidris himantopus*			W
Buff-breasted Sandpiper *Tryngites subruficollis*			W G
Short-billed Dowitcher *Limnodromus griseus*			W
Long-billed Dowitcher *Limnodromus scolopaceus*			W
Common Snipe *Gallinago gallinago*			W G
American Woodcock *Scolopax minor*	F Fs S		F Fs S
Wilson's Phalarope - SE ***Phalaropus tricolor***			**L W**
Red-necked Phalarope Phalaropus lobatus			L W
Laughing Gull *Larus atracilla*			L
Franklin's Gull *Larus pipixcan*			L W C
Bonaparte's Gull *Larus philadelphia*			L W C

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Ring-billed Gull *Larus delawarensis*		L W C	L W C
Herring Gull *Larus argentatus*		L	W L C
Thayer's Gull *Larus thayeri*		L	
Iceland Gull *Larus glaucoides*		L	
Lesser Black-backed Gull *Larus fuscus*		L	L
Glaucous Gull *Larus hyperboreus*		L	
Great Black-backed Gull *Larus marinus*		L	
Black-legged Kittiwake *Rissa tridactyla*			L
Caspian Tern *Sterna caspia*			L
Common Tern - SE ***Sterna hirundo***			**L**
Forster's Tern - SE ***Sterna forsteri***			**L W**
Least Tern – SE , FE ***Sterna antillarum***			**L**
Black Tern - SE ***Chlidonias niger***			**L W**
Rock Dove* *Columba livia*	R C	R C	R C
Mourning Dove *Zenaida macroura*	R C S	R C S	R C S
Black-billed Cuckoo *Coccyzus erythropthalmus*	S [(r)]		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** [(r)]	**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
Barred Owl *Strix varia*	F Fs	F Fs	F Fs
Long-eared Owl - DL ***Asio otus***		**F S**	**F S**
Short-eared Owl - SE ***Asio flammeus***		**G**	**G**

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Northern Saw-whet Owl *Aegolius acadicus*		F S	F S
Common Nighthawk *Chordeiles minor*	R Sav		R G C
Chuck-wills-widow *Caprimulgus carolinensis*			F
Whip-poor-will *Caprimulgus vociferus*	F Sav		F Sav
Chimney Swift *Chaetura pelagica*	R F S Fs Sav		All
Ruby-throated Hummingbird *Archilochus colubris*	F S R Fs Sav		F S R 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 Sav R	F Fs R S Sav	F Fs R S Sav
Northern Flicker *Colaptes auratus*	S F R Sav Fs	S F R Sav Fs	S F R Sav Fs
Pileated Woodpecker *Dryocopus pileatus*	F Fs Sav	F Fs Sav R	F Fs Sav R
Olive-sided Flycatcher *Contopus cooperi*			F Fs R S Sav
Eastern Wood-Pewee *Contopus virens*	F Fs R Sav		F Fs R Sav
Yellow-bellied Flycatcher *Empidonax flaviventris*			F S Fs
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 S R Fs Sav
Eastern Phoebe *Sayornis phoebe*	R Fs		R Fs
Great Crested Flycatcher *Myiarchus crinitus*	F Fs Sav		F Fs S R Sav

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Western Kingbird *Tyrannus verticalis*			S G A F C Sav
Eastern Kingbird *Tyrannus tyrannus*	S G C Sav		S G A F C Sav
Horned Lark *Eremophila alpestris*	C G	C G	C G
Purple Martin *Progne subis*	L R W G		L W G
Tree Swallow *Tachycineta bicolor*	L W Fs G		L W Fs G
Northern Rough-winged Swallow *Stelgidopteryx serripennis*	L W Fs G		L W G
Bank Swallow *Riparia riparia*	L W G		L W G
Cliff Swallow *Petrochelidon pyrrhonota*	L W G [(r)]		L W G
Barn Swallow *Hirundo rustica*	C R W L G S		C R W L G S
Blue Jay *Cyanocitta cristata*	R F Fs S C Sav	R F Fs S C Sav0	R F Fs S C Sav
American Crow *Corvus brachyrhynchos*	All	All	All
Fish Crow *Corvus ossifra*	F Fs L		F Fs L
Carolina Chickadee *Poecile carolinensis*	F Fs S R Sav	F Fs S R Sav	F Fs S R Sav
Black-capped Chickadee *Poecile atricapillus*	F Fs S R Sav	F Fs S R Sav	F Fs S R Sav
Tufted Titmouse *Baeolophus bicolor*	F R Fs Sav	F R Fs Sav	F R Fs Sav
Red-breasted Nuthatch *Sitta canadensis*		R	F R
White-breasted Nuthatch *Sitta carolinensis*	F R Fs Sav	F R Fs Sav	F R Fs Sav
Brown Creeper - ST ***Certhia americana***	**Fs** [(r)]	**F Fs R**	**F Fs R**
Carolina Wren Thryothorus ludovicianus	R F Fs S Sav	R F Fs S Sav	R F Fs S Sav
Bewick's Wren – SE ***Thryomanes bewickii***	**R F S Sav** [(r)]		**R F S Sav**
House Wren *Troglodytes aedon*	R F S Sav		R F S Sav
Winter Wren *Troglodytes troglodytes*		F Fs W	F Fs W
Sedge Wren *Cistothorus platensis*	W G		W G

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Marsh Wren - ST *Cistothorus palustris*	W [(r)]		W
Golden-crowned Kinglet *Regulus satrapa*		F Fs R Sav	F Fs R Sav
Ruby-crowned Kinglet *Regulus calendula*			F S Sav
Blue-gray Gnatcatcher *Polioptila caerulea*	F Fs S Sav		F Fs S Sav
Eastern Bluebird *Sialia sialis*	C G R S Sav	S F R C Sav	S F C G R Sav
Veery - DL ***Catharus fuscescens***			**F Fs R Sav**
Gray-cheeked Thrush *Catharus minimus*			F Fs R Sav
Swainson's Thrush *Catharus ustulatus*			F S R Fs Sav
Hermit Thrush *Catharus guttatus*		S F R Fs Sav	S F R Fs Sav
Wood Thrush *Hylocichla mustelina*	F Fs		F R Fs Sav
American Robin *Turdus migratorius*	R S F Fs Sav	R S F Fs Sav	R S F Fs C G Sav
Gray Catbird *Dumetella carolinensis*	S Fs R Sav		S Fs R Sav
Northern Mockingbird *Mimus polyglottos*	R S	R S	R S
Brown Thrasher *Toxostoma rufum*	S R C G Sav		S R C Sav
American Pipit *Anthus rubescens*			C W
Cedar Waxwing *Bombycilla cedrorum*	R S F Fs Sav	R S F Fs Sav	R S F Fs Sav
Loggerhead Shrike - ST ***Lanius ludovicianus***	**G S C** [(r)]	**G S C**	**G S C**
European Starling* *Sturnus vulgaris*	R C F Fs Sav	R C F Fs Sav	R C F Fs Sav
White-eyed Vireo *Vireo griseus*	S Fs Sav		S Fs Sav
Bell's Vireo *Vireo bellii*	S G		S G
Blue-headed Vireo *Vireo solitarius*			F Fs Sav
Yellow-throated Vireo *Vireo flavifrons*	F Fs		F Fs R
Warbling Vireo *Vireo gilvus*	S R Fs Sav		S R F Fs Sav

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Philadelphia Vireo *Vireo philadelphicus*			S F R Sav
Red-eyed Vireo *Vireo olivaceus*	F Fs Sav		F Fs S R Sav
Blue-winged Warbler *Vermivora pinus*	S [(r)]		S F R Sav Fs
Golden-winged Warbler *Vermivora chrysoptera*			F S Fs R Sav
Tennessee Warbler *Vermivora peregrina*			F R S Fs Sav
Orange-crowned Warbler *Vermivora celata*			S F R Sav Fs
Nashville Warbler *Vermivora ruficapilla*			S F R Sav Fs
Northern Parula *Parula americana*	F Fs		F Fs R Sav
Yellow Warbler *Dendroica petechia*	S W		S W R Sav Fs
Chestnut-sided Warbler *Dendroica pensylvanica*			S F Fs R Sav
Magnolia Warbler *Dendroica magnolia*			F S R Fs Sav
Cape May Warbler *Dendroica tigrina*			R F Fs Sav
Black-throated Blue Warbler *Dendroica caerulescens*			F R Fs Sav
Yellow-rumped Warbler *Dendroica coronata*		F Fs Sav	F S R Fs Sav
Black-throated Green Warbler *Dendroica virens*			F R Fs Sav
Blackburnian Warbler *Dendroica fusca*			F Fs R Sav
Yellow-throated Warbler *Dendroica dominica*	Fs		F Fs
Pine Warbler *Dendroica pinus*			F Fs Sav R
Prairie Warbler *Dendroica discolor*	S [(r)]		S
Palm Warbler *Dendroica palmarum*			Fs S F R W G Sav C
Bay-breasted Warbler *Dendroica castanea*			F R Fs S Sav
Blackpoll Warbler *Dendroica striata*			F Fs R S Sav
Cerulean Warbler *Dendroica cerulea*	F Fs		F Fs R Sav

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Black-and-white Warbler *Mniotilta varia*	F (r)		F R Fs Sav S
American Redstart *Setophaga ruticilla*	Fs		F Fs S R Sav
Prothonotary Warbler *Protonotaria citrea*	Fs		Fs
Worm-eating Warbler Helmitheros vermivorus	F (r)		F
Swainson's Warbler - SE ***Limnothlypis swainsonii***			**F Fs**
Ovenbird *Seiurus aurocapillus*	F		F R S Sav
Northern Waterthrush *Seiurus noveboracensis*			Fs R
Louisiana Waterthrush *Seiurus motacilla*	F		F Fs
Kentucky Warbler *Oporornis formosus*	F		F Sav Fs
Connecticut Warbler *Oporornis agilis*			S F Fs Sav R
Mourning Warbler *Oporornis philadelphia*			S F Fs Sav R
Common Yellowthroat *Geothlypis trichas*	G C W S R Sav		G C W S R Sav
Hooded Warbler *Wilsonia citrina*	F (r)		F R
Wilson's Warbler *Wilsonia pusilla*			S F Fs 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		F Sav R
Scarlet Tanager *Piranga olivacea*	F Fs Sav		F Fs Sav R
Northern Cardinal *Cardinalis cardinalis*	R F Fs S C Sav	R F Fs S C Sav	R F Fs S C Sav
Rose-breasted Grosbeak *Pheucticus ludovicianus*	F Fs Sav S		F Fs R S Sav
Blue Grosbeak *Guiraca caerulea*	Sav S		Sav S
Indigo Bunting *Passerina cyanea*	F Fs S Sav		F Fs S C Sav
Dickcissel *Spiza americana*	G C		G C

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Eastern Towhee *Pipilo erythrophthalmus*	S F	S F	S F Fs R
American Tree Sparrow *Spizella arborea*		S G C R W Sav	S G C R W Sav
Chipping Sparrow *Spizella passerina*	R F Sav		R F Sav G S
Clay-colored Sparrow *Spizella pallida*			S
Field Sparrow *Spizella pusilla*	S G C Sav	S G W Sav	S G C W Sav
Vesper Sparrow *Pooecetes gramineus*	S C G		C G
Lark Sparrow *Chondestes grammacus*	S C G		S C G
Savannah Sparrow *Passerculus sandwichensis*		G	G C W
Grasshopper Sparrow *Ammodramus savannarum*	G		G
Henslow's Sparrow - SE ***Ammodramus henslowii***	**G** [(r)]		**G**
Le Conte's Sparrow *Ammodramus leconteii*			G W
Nelson's Sharp-tailed Sparrow *Ammodramus nelsoni*			W
Fox Sparrow *Passerella iliaca*		S Fs F	S Fs F R Sav
Song Sparrow *Melospiza melodia*	R S W C G	R S W C G	R S W C G
Lincoln's Sparrow *Melospiza lincolnii*			S W Fs R
Swamp Sparrow *Melospiza georgiana*		W Fs S G	S W Fs G
White-throated Sparrow *Zonotrichia albicollis*		R S F Fs Sav	R S F Fs Sav
Harris' Sparrow *Zonotrichia querula*			S C R
White-crowned Sparrow *Zonotrichia leucophrys*		S R G	S R G
Dark-eyed Junco *Junco hyemalis*		R S F Fs G Sav C	R S F Fs G Sav C
Lapland Longspur *Calcarius lapponicus*		C G	C G
Smith's Longspur *Calcarius pictus*			C G
Snow Bunting *Plectrophenax nivalis*		C G	

Table 13. Continued.

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Bobolink *Dolichonyx oryzivorus*			G W
Red-winged Blackbird *Agelaius phoeniceus*	W C R G S Sav	C G F Fs	W C R G S Sav
Eastern Meadowlark *Sturnella magna*	G C	G C	G C
Western Meadowlark *Sturnella neglecta*		G C	G C
Yellow-headed Blackbird - SE ***Xanthocephalus xanthocephalus***			**W**
Rusty Blackbird *Euphagus carolinus*		C F Fs	R C Fs W
Brewer's Blackbird *Euphagus cyanocephalus*			C G
Common Grackle *Quiscalus quiscula*	R W Fs F	C R F Fs	R F Fs C Sav
Brown-headed Cowbird *Molothrus ater*	All	C R F Fs	All
Orchard Oriole *Icterus spurius*	S R W Sav		S R W F Fs Sav
Baltimore Oriole *Icterus galbula*	R F Fs S Sav		F Fs R S Sav
Purple Finch *Carpodacus purpureus*		F Fs R	F Fs R S Sav
House Finch* *Carpodacus mexicanus*	R S	R S	F Fs R S Sav
Red Crossbill *Loxia curvirostra*		F R	F R
White-winged Crossbill *Loxia leucoptera*		F R	F R
Common Redpoll *Carduelis flammea*		G S R F	
Pine Siskin *Carduelis pinus*	R S F (r)	R S F	R S F
American Goldfinch *Carduelis tristis*	S R G	S R G F Fs Sav	S R G F Fs Sav
Evening Grosbeak *Coccothraustes vespertinus*		R F Fs	R F Fs
House Sparrow* *Passer domesticus*	R C	R C	R C
Eurasian Tree Sparrow *Passer montanus*	R C S	R C S	R C S

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

Most of the remaining forest habitat is found along the Kaskaskia River and some of the smaller tributaries, both in the extensive bottomland areas along both rivers and in the fairly extensive tracts of upland forest, especially post oak flatwoods, to be found just back from the floodplain (Figure 6).

Regularly Occurring Species

Typical Species - Typical breeding species of floodplain forest habitats in the KRAA include: Ruby-throated Hummingbird, Wild Turkey (successfully reintroduced), Yellow-billed Cuckoo, Great Horned Owl, Barred Owl, Whip-poor-will, Red-headed Woodpecker, Red-bellied Woodpecker, Downy Woodpecker, Hairy Woodpecker, Northern Flicker, Pileated Woodpecker, Eastern Wood-Pewee, Acadian Flycatcher, Great Crested Flycatcher, Blue Jay, American and Fish Crows, Carolina Chickadee, Tufted Titmouse, White-breasted Nuthatch, Carolina Wren, Blue-gray Gnatcatcher, Wood Thrush, Gray Catbird, White-eyed Vireo, Yellow-throated Vireo, Red-eyed Vireo, Northern Parula, Yellow-throated Warbler, Cerulean Warbler, American Redstart, Prothonotary Warbler, Worm-eating Warbler, Ovenbird, Louisiana Waterthrush, Kentucky Warbler, Summer Tanager, Northern Cardinal, Indigo Bunting, Brown-headed Cowbird and Baltimore Oriole (mostly in more open forests). Post oak flatwoods have many of these same species as well as Ovenbirds, Summer and Scarlet Tanagers, and a few Cooper's Hawks.

Threatened and Endangered Species - Several state threatened (ST) and endangered (SE) species occur in forests in the area. **Red-shouldered Hawks** (ST) nest in the heavily forested bottomlands along the Kaskaskia River and its tributaries. **Bald Eagles** (ST, FT) nest in a few locations along the River. **Brown Creepers** (ST) and **Yellow Crowned Night Herons** (SE) occur rarely in forested wetlands (see below).

Exotic Species - European Starlings were introduced into the U.S. in 1890-1891 and spread to Illinois by 1922 (Bohlen and Zimmerman 1989). They are now one of the most

abundant species in Illinois and may be detrimental to native species because they compete with residents for nesting cavities, especially in smaller woodlots.

There are few stands of pine in this area. Pines are not native to the KRAA, and pine plantations have unusual bird communities. In addition to more generalized forest species, pine plantations in central and northern Illinois occasionally attract breeding Long-eared Owls (SE) (but mainly in winter), Northern Saw-whet Owls (mainly in winter), Solitary Vireos, Red Crossbills (very erratic), Pine Siskins, Yellow-bellied Sapsuckers, Red-breasted Nuthatches, Pine Warblers, Yellow-throated Warblers, and Black-throated Green Warblers, and some of these species may occasionally try to nest in the KRAA. Chipping Sparrows are often the most abundant species nesting in pine plantations. In winter, pines attract Northern Saw-whet Owls, winter finches (e.g., crossbills, Pine Siskins), Yellow-bellied Sapsuckers, Red-breasted Nuthatches and Golden-crowned Kinglets.

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 partly to problems with reproduction in highly fragmented landscapes. The primary factors controlling productivity of birds in the KRAA 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-compete 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 large size (up to 7,000 acres) and width (up to 2 miles wide) of the forests along the Kaskaskia, it is not surprising that nesting success is well above average in many parts of the KRAA. Parasitism levels in some areas are less than 10% for species such as the Acadian Flycatcher. Nest predation rates are more variable, but can be quite low (<40%) in some years and in some sites. The top conservation priority in this region is maintaining and restoring the widest forested parts of the corridor. Nesting success is much lower near agricultural openings than it is in the forest interior. Using easements and CRP to keep row crops out of the widest sections of forest could help maintain some of Illinois' most successfully nesting bird populations. Another priority is to maintain some old stands of trees, especially Bur Oaks, that are heavily used by the State's largest population of Cerulean Warblers. Low-volume single-tree selection maintains high populations of forest birds compared with clearcutting which leads to near monocultures of Silver Maple.

The north-south orientation of the wooded Kaskaskia River floodplain may lead to intensive use by migrating forest songbirds.

Wetland

Although historically there had been considerably more wetland in the KRAA (oxbow lakes and shallow marsh), wetland habitats represent one of the more significant avian habitats in the KRAA, especially along Jackson slough (Figure 7).

Regularly Occurring Species

Typical Species - Typical wetland species include the Great Blue Heron, Little Blue Heron, Great Egret, Green Heron, Canada Goose, Wood Duck, Mallard, Hooded Merganser, Red-shouldered Hawk, Killdeer, American Woodcock, Belted Kingfisher, Red-headed Woodpecker (forested), Northern Flicker (forested), Pileated Woodpecker (forested), Acadian Flycatcher (forested), Willow Flycatcher (shrubby), Purple Martin, Tree Swallow, Northern Rough-winged Swallow, Barn Swallow, Blue-gray Gnatcatcher (forested), Gray Catbird (shrubby), Warbling Vireo (forested), Yellow Warbler (shrubby), Prothonotary Warbler (forested), Cerulean Warbler (forested), American Redstart (forested), Common Yellowthroat, Song Sparrow, Red-winged Blackbird, Common Grackle, and Baltimore Oriole. Oxbow lakes contain populations of Wood Ducks, Hooded Mergansers, Yellow Warblers, Warbling Vireos, and Gray Catbirds

Threatened and Endangered Species - Several federally threatened (FT) and endangered (FE) and state threatened (ST) and endangered (SE) species occur in the wetland habitats of the KRAA, but most are rare or absent in most years. There are breeding records for **Pied-billed Grebe** (ST), **Least Bittern** (SE), **Little Blue Heron** (SE), **Yellow-crowned Night-Heron** (SE), **Mississippi Kite** (SE), **Bald Eagle** (ST, FT), **Red-shouldered Hawk** (ST), **King Rail** (SE), **Common Moorhen** (ST), and **Brown Creeper** (ST). Of the species on this list, only the Red-shouldered Hawk has a significant area-wide population.

Exotic Species - The only non-native wetland species is the Cattle Egret which is commonly found as a breeding species, especially near Horseshoe Lake and Frank Holten State Parks.

Population Dynamics and Management

Currently, the main problem for birds inhabiting forested wetlands is loss of oxbow lakes and maintenance of wide forested corridors. Maintenance of the large forested core and reforesting openings within the forested corridor should be the highest conservation priority. Oxbow lakes may need to be dredged occasionally to keep them from filling in too soon. New oxbows seldom form, so such active management may be necessary.

Savanna

Savanna habitats were once widespread in the Midwest, but because of habitat destruction and the absence of fire they are now rare in the KRAA (see chapter on Natural Vegetation Communities).

Regularly Occurring Species

Typical Species - Savannas share many bird species with post oak flatwoods. Perhaps the most typical species of savannas would be: Whip-poor-will, Red-headed Woodpecker, Great Crested Flycatcher, Eastern Wood-Pewee, Blue Jay, Eastern Bluebird, Indigo Bunting, American Goldfinch, Field Sparrow, and Summer Tanager. Other forest species remain common in savannas, including the Great Horned Owl, Northern Flicker, Red-bellied and Downy Woodpecker, Hairy Woodpecker, Carolina Chickadee, White-breasted Nuthatch, Brown-headed Cowbird, Scarlet Tanager, and Northern Cardinal. The open, parklike structure of some savannas also attracts some species that are more characteristic of grassland habitats, such as the Red-tailed Hawk and Northern Bobwhite. For some of these species, Illinois may contain a significant portion of their global population. Flatwoods in the KRAA also attract Kentucky Warblers and Ovenbirds.

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

Exotic Species - European Starlings are now one of the most abundant species in Illinois, and they are detrimental to native savanna species because they compete with resident birds (especially woodpeckers) for nesting cavities.

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 (J.D. Brawn, unpublished data). 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 is underway in adjacent watersheds (J.D. Brawn, unpublished data). This study should be fully applicable to savannas in the KRAA. In general, nesting success of birds appears to be very high in savannas.

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 KRAA (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 uncommon in the KRAA. There are only about 702,731 acres of grassland in the basin or 19.1% of the land area (Table 2, Figure 5). Nonetheless, although patches of available grassland habitat in the KRAA 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 - Species in these habitats include a subset of those found on larger grasslands throughout the State: Red-tailed Hawk, American Kestrel, Northern Bobwhite, Killdeer, Eastern Kingbird, Willow Flycatcher (shrubs), Horned Lark (recently burned), Barn Swallow, Brown Thrasher (shrubs), Sedge Wren, Bell's Vireo (shrubs), Common Yellowthroat, Eastern Meadowlarks, Red-winged Blackbird, Dickcissel, Lark Sparrow (sand areas), Song Sparrow, Grasshopper Sparrow, Field Sparrow, and American Goldfinch. See Table 13 for a more complete list of grassland species found in the Kaskaskia region.

Threatened and Endangered Species - Currently, only one species of threatened or endangered species breed with any regularity in grasslands of the KRAA, the **Loggerhead Shrike** (ST). However, the **Northern Harrier** (SE), **Henslow's Sparrow** (SE), **Upland Sandpiper** (SE), and **Barn Owl** (SE) have been known to occasionally nest in the area. The **Short-eared Owl** (SE) can be found during migration and winter and may occasionally try to breed. The Greater Prairie-Chicken (SE) was historically known to breed in the area.

Exotic Species - Only one introduced species is found in the grasslands of the KRAA. European Starlings feed in grasslands following grazing, mowing, or burning.

Population Dynamics and Management

Certain species, such as the Upland Sandpiper, 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 is highly area-sensitive and will require larger grasslands than exist currently to maintain a regular breeding population. Large CRP (Conservation Reserve Program) fields attract small numbers of breeding Northern Harriers, Short-eared Owls, Henslow's Sparrows, Sedge Wrens, and Bobolinks. Records of Henslow's Sparrows are

few; 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. Upland Sandpipers (SE) occasionally nest in some 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 to maintain a continuous and thriving population in the area. Other rare or locally extirpated species that would be likely to increase rapidly if grasslands were restored include Barn Owl, Sedge Wren, Loggerhead Shrike (ST) and Henslow's Sparrow (SE). Because of the short supply of available grassland, prairie restoration and enhancement will be needed to attract grassland birds.

Removal of woody vegetation may also be beneficial. Shrubland species that would be lost are of little or no 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, Bewick's Wren (SE), Blue-winged Warbler, Prairie Warbler, Yellow-breasted Chat, Blue Grosbeak) 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 and wintering birds use grasslands as stopover habitat, especially Smith's and Lapland Longspurs, Snow Buntings, LeConte's Sparrows, American and Sprague's Pipits, Loggerhead and Northern Shrikes, various rails, bitterns, American Golden Plovers, Pectoral and Buff-breasted Sandpipers, Short-eared and Snowy Owls, and Rough-legged Hawks.

Lakes, Ponds, and Impoundments

There are several natural ponds in the KRAA (see chapter on Aquatic Biota), as well as a number of impoundments (Figure 9).

Regularly Occurring Species

Typical Species - Double-crested Cormorants have begun to recolonize much of their former range. Ospreys forage over lakes and ponds in migration. Belted Kingfishers forage and occasionally nest in steep banks along the edges of lakes and ponds. Spotted Sandpipers may occasionally breed around lakes, ponds, and impoundments. Common Grackles, Red-winged Blackbirds, Yellow Warblers, Common Yellowthroats and Song Sparrows nest along ponds, especially those with gradual shorelines and some emergent vegetation (e.g., *Typha) along* the edge. Eastern Phoebes, Barn Swallows, Purple Martins, and Tree Swallows forage over and along the edges of open-water habitats as long as nest

sites are available and Cliff Swallows are particularly found nesting only where there are bridges, dams, or other large human-made structures to attach their mud nests to. Green Herons often nest along ponds lined with dense, woody vegetation.

Exotic Species - The Mute Swan is the only non-native species that would be likely to occur in the area. Although they are rare in Illinois, some may visit local ponds and could eventually establish a breeding population.

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 often forage over open water 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.

A comparative study of the use of various ponds, lakes, and impoundments 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 and Ospreys.

Creeks and Rivers

Although the Kaskaskia River has been highly altered by human activities, it still has many 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), Hooded Merganser (forested; rare), Cooper's Hawk (forested corridors), Great Blue Heron, Great Egret, Black-crowned and Yellow-crowned Night-Heron, Green Heron (forested), Osprey (migration), Killdeer, Great Horned Owl (forested), Barred Owl (forested), Belted Kingfisher, Eastern Phoebe (especially near bridges), Willow Flycatcher (shrubby corridors), Barn Swallow, Northern Rough-winged Swallow, Bank Swallow, Cliff Swallow (especially near bridges), House and Carolina Wrens (in woody debris), Cedar Waxwing, Warbling Vireo (woody corridors, especially cottonwoods and willows), Prothonotary Warbler (forested), Yellow Warbler (shrubby corridors), Common Yellowthroat (grassy and shrubby streamsides), Common Grackle, Red-winged Blackbird, Baltimore Oriole (woody corridors), Indigo Bunting, Song Sparrow (shrubby streamsides).

Threatened and Endangered Species - There are several species of threatened or endangered species which use this type of habitat to breed in, in the region with areas along the Kaskaskia River being the most notable. These include the **Bald Eagle** (ST, FT), **Snowy Egret** (SE), **Little Blue Heron** (SE), **Black-crowned Night-Heron** (SE), **Yellow-crowned Night-Heron** (SE), **Mississippi Kite** (SE), **Red-shouldered Hawk** (ST), and **Brown Creeper** (ST). Most of these birds are restricted to the larger tracts of forested riverbottoms along or adjacent to the Kaskaskia River.

Populations 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. Birds of open water are not very common in the KRAA and should be a low conservation priority.

Cultural Habitats: Cropland

The majority of the remaining habitat in the KRAA is in the form of cropland (2,339,799 acres or 63.6%)(Table 2, Figure 4).

Regularly Occurring Species

Typical Species - Cropland bird communities in the KRAA have about the same bird species that are common statewide in this structurally simple habitat: Mallard, Red-tailed Hawk, American Kestrel, Northern Bobwhite, Killdeer, Rock Dove, Mourning Dove, Great Horned Owl, Eastern Phoebe (farmsteads), Horned Lark, Barn Swallow, American Crow, Eastern Bluebird (where nest boxes are provided), **Loggerhead Shrike** (ST), European Starlings, House Sparrow, Eurasian Tree Sparrows, Common Grackle, Brown-headed Cowbird, Red-winged Blackbird, Dickcissel (grassy strips and fallow cropland), Grasshopper Sparrow (grassy strips and fallow cropland) and Field Sparrow.

Threatened and Endangered Species - Some species characteristic of recently burned and heavily grazed, dry grasslands have adapted to croplands, including the Horned Lark and **Loggerhead Shrike** (ST). The shrike, however, also requires spiny hedgerows for nesting; it is now rare in the area.

Exotic Species - Introduced species thrive in the agricultural habitats of the KRAA. In fact, three of the most common species in the cropland of the KRAA, Rock Dove, European Starling, and House Sparrow were all introduced from Europe or Asia.

Intensively farmed areas offer little in the way of stopover habitat except around farmsteads and wet fields in the spring for gulls, shorebirds and longspurs.

Population Dynamics and Management

Warner (1994) documented the low populations and extremely low nesting success of birds in Ford County, an area of very intensive agriculture. On the other hand, increasing grassy cover along roadsides, drainage ditches, and around farmsteads can substantially increase grassland bird habitat. Within an agricultural landscape, the CRP can also benefit cropland birds by providing nesting cover and attracting such species as Dickcissels, Henslow's, Grasshopper, and Savannah Sparrows.

Cultural Habitat: Successional Fields

Successional habitats, such as abandoned fields and pastures, are relatively uncommon in the KRAA. Some regenerating recent clearcuts function as shrublands, as do the belts of early successional vegetation along the inside of meander loops. Such habitats usually have dense, protective cover and are often rich in fruit producing plants, and therefore offer rich habitat for breeding and migrating birds.

Regularly Occurring Species

Typical Species - Northern Bobwhite (mainly in old fields), American Woodcock (wet areas), Mourning Dove, Yellow-billed Cuckoo, Ruby-throated Hummingbird, Northern Flicker, Downy Woodpecker, Eastern Kingbird, Willow Flycatcher (wet thickets), Blue Jay, Black-capped and Carolina Chickadees, House Wren (river edge), Carolina Wren, Gray Catbird, Brown Thrasher, Northern Mockingbird, American Robin, Eastern Bluebird, Cedar Waxwing, Bell's Vireo, White-eyed Vireo, Blue-winged Warbler, Prairie Warbler (uncommon), Yellow Warbler, Common Yellowthroat, American Redstart (clearcuts, river edge), Yellow-breasted Chat (clearcuts), Red-winged Blackbird, Northern Cardinal, Blue Grosbeak, Indigo Bunting, House Finch, American Goldfinch, Eastern Towhee, Field Sparrow, and Song Sparrow.

Exotic Species - Most species found in successional habitats are native, although 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., in press). 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 (S.K. Robinson, J.D. Brawn, and E.J. Heske, unpublished data). The results of this study suggest that shrubland birds nest successfully even in small habitat patches.

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, Long-eared Owls, 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 are well represented in the KRAA, as the St. Louis metropolitan area spreads into the region. (Table 2, Figure 8). 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 species include the Red-tailed Hawk (in more sparsely inhabited areas), American Kestrel (especially farmsteads), Killdeer, Rock Dove, Mourning Dove, Eastern Screech-Owl, Great Horned Owl, Common Nighthawk, Chimney Swift, Ruby-throated Hummingbird, Northern Flicker, Red-bellied and Downy Woodpeckers (urban forests), Eastern Wood-Pewee, Eastern Phoebe, Barn Swallow, Purple Martin, Blue Jay, American Crow, Black-capped and Carolina Chickadees, Tufted Titmouse, White-breasted Nuthatch, House Wren, Carolina Wren, Gray Catbird, Brown Thrasher, Northern Mockingbird (especially around farmsteads), American Robin, Eastern Bluebird (farmsteads), European Starling, Warbling Vireo, Common Yellowthroat, House Sparrow, Eurasian Tree 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, Carolina Chickadee, Tufted Titmouse, Eastern Wood-Pewee), pine plantings (e.g. Pine Siskins), 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. Wood Duck [chimneys] American Kestrel, Killdeer [roofs, roads], Common Nighthawk [roofs], Chimney Swift [chimneys], 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 - There are no threatened or endangered species found in residential or urban areas other than the **Loggerhead Shrike**, which often forages in mowed grass of rural farmsteads. Barn Owls were formerly a common breeding species in this habitat but have been mostly extirpated in the area as well as most of the rest of the State.

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.

Migrating birds make heavy use of shade trees in developed areas and, when available, also use shrubs. Typical migrants of urban forests 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), Eastern Towhee (feeders), Dark-eyed Junco (feeders), American Tree Sparrow, White-crowned Sparrow, and White-throated Sparrow.

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 House Finch, 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.

Management Recommendations

The KRAA contains the largest area of bottomland forest in the State, as well as several rich wetland bird communities and a major migration corridor. Wetland and forest conservation should clearly be of the highest priority in the KRAA because of high nesting success in the widest forested corridors. Grassland restoration, especially around existing forests, 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.

Developed areas, especially urban forest and parks, can be managed to improve habitat by encouraging oaks and leaving shrubby areas for migrants.

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 [IDNR], Division of Natural Heritage) was checked for recent records (as of August 1998) of threatened and endangered species. Taxonomy follows Wilson and Reeder (1993).

Mammal species known or likely to occur in the Kaskaskia River Assessment Area (KRAA) are listed in Table 14. The 49 species in this table represent 83% of the 59 mammal species that currently occur in Illinois (Hoffmeister 1989). Nine species of bats are included in the table, but the silver-haired bat is likely to be present only during spring and autumn migration periods. Of the eight mammal species listed as endangered or 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 state threatened river otter (*Lontra canadensis*) are widely distributed (Herkert 1992). Both of these species have been reported from the KRAA (Illinois Department of Natural Resources 1998), and the Kaskaskia River was also one of three river drainages in Illinois selected for a series of river otter releases in 1994-96 (Bluett 1997). The formerly state threatened bobcat (*Lynx rufus*) has been reported from almost all counties included in the KRAA, and appears to be increasing in Illinois, particularly in the southernmost counties (Woolf 1996). The population status of many mammal species in the KRAA is unknown; in these cases, designations in Table 14 are projections based on their status in other parts of Illinois.

More than half (63.6%) of the KRAA consists of cropland, with a small additional amount (2.5%) consisting of urban and developed areas. Many mammals are generalists that use a variety of habitat types and have adapted to living in areas that have been altered by humans. Larger mammals that now commonly occur in agricultural and urban areas include the Virginia opossum, eastern cottontail, fox and gray squirrels, coyote, red fox, raccoon, striped skunk, and white-tailed deer. Several species of small mammals, including the eastern mole, northern and southern short-tailed shrews, deer mouse, meadow and prairie voles, and thirteen-lined ground squirrel can occupy hayfields, pastures, and fencerows in agricultural areas and other maintained areas such as roadsides, cemeteries, and lawns. Big brown and little brown bats commonly roost in buildings and other small mammals (such as the white-footed mouse) sometimes enter buildings in search of food and shelter. Forested habitats occupy only 12.7% of the KRAA, but include some large tracts of bottomland forest along the Kaskaskia River. Although most of the upland forest habitat is highly fragmented, the integrity of much of the riparian forest could make this

area extremely valuable as a wildlife dispersal corridor for gray foxes and bobcat. Similarly, only 19.1% of the KRAA is grassland, but many areas with the highest concentrations of grassland also include the greatest amounts of upland forest, increasing the value of both habitats for wildlife.

The KRAA is of particular biogeographic interest for mammals because it crosses the boundaries of the geographic ranges of many species in Illinois (Hoffmeister 1989). For example, it includes the northern range limits of the southern short-tailed shrew, southeastern shrew, and possibly the swamp rabbit. The KRAA includes historical locations for the swamp rabbit, although the species' range might have decreased so that it now only occurs farther south; the southern portion of the KRAA should be investigated to determine if this species is present. Two other species of mammal, the state threatened golden mouse (*Ochrotomys nuttallii*) and state threatened marsh rice rat (*Oryzomys palustris*), have been reported from counties immediately south of the KRAA and the range limits of these species should be confirmed. The KRAA also includes the southern range limits of the northern short-tailed shrew, thirteen-lined ground squirrel, Franklin's ground squirrel, western harvest mouse, meadow vole, and least weasel in Illinois. Another species, the plains pocket gopher, has a range whose southern boundary in Illinois seems to follow the northern boundary of the KRAA closely but includes records in St. Clair County in the southwestern KRAA (Hoffmeister 1989); the presence of this species in the KRAA should be investigated.

The Norway rat and house mouse are the only exotic, 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 could not be eliminated easily from natural habitats and their presence is not a matter of great concern. 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). There is also the potential for unvaccinated cats and dogs (*Canis familiaris*) to transmit diseases to wild mammals or humans (Coleman and Temple 1996).

Table 14. List of mammal species known or likely to occur in the Kaskaskia River Assessment Area.[1]

Common name[2]	Order *Scientific name*	Habitat[3]	Population status[4,5]
Marsupials	Didelphimorphia		
Virginia opossum	*Didelphis virginiana*	F, W, G	C
Insectivores	Insectivora		
southeastern shrew	*Sorex longirostris*	F, G (mostly)	C

Table 14. Continued.

Common name[2]	Order *Scientific name*	Habitat[3]	Population status[4,5]
northern short-tailed shrew	*Blarina brevicauda*	F, G, W	C
southern short-tailed shrew	*Blarina carolinensis*	F, G	C
least shrew	*Cryptotis parva*	G	C?
eastern mole	*Scalopus aquaticus*	F, G	C
Bats	Chiroptera		
little brown bat	*Myotis lucifugus*	F, caves, buildings	C
Indiana bat - FE, SE	***Myotis sodalis***	**F, caves**	**R**
northern long-eared bat	*Myotis septentrionalis*	F, caves, buildings	U?
silver-haired bat	*Lasionycteris noctivagans*	F, caves (hibernation)	U?
eastern pipistrelle	*Pipistrellus subflavus*	F, caves	C
big brown bat	*Eptesicus fuscus*	F, caves, buildings	C
red bat	*Lasiurus borealis*	F	C
hoary bat	*Lasiurus cinereus*	F	U?
evening bat	*Nycticeius humeralis*	F, buildings	U?
Rabbits	Lagomorpha		
eastern cottontail	*Sylvilagus floridanus*	G, F (edges)	C
swamp rabbit	*Sylvilagus aquaticus*	W	R?
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	U, C (urban)
fox squirrel	*Sciurus niger*	F	C
southern flying squirrel	*Glaucomys volans*	F	C
plains pocket gopher	*Geomys bursarius*	G	R?
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	U?
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	U?
raccoon	*Procyon lotor*	F, W, G	C
least weasel	*Mustela nivalis*	G	U?
long-tailed weasel	*Mustela frenata*	F, W, G	C

Table 14. Continued.

Common name[2]	Order *Scientific name*	Habitat[3]	Population status[4,5]
mink	*Mustela vison*	W, G, F	C
badger	*Taxidea taxus*	G	U?
striped skunk	*Mephitis mephitis*	F, G, W	C
river otter - ST	***Lontra canadensis***	**W**	**U?**
bobcat - DL	***Lynx rufus***	**F**	**R?**
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 (1998).
[2] Bold type indicates an Illinois endangered (SE), an Illinois threatened (ST) or recently delisted (DL) species by the Illinois Endangered Species Protection Board (1999).
* = introduced species.
[3] Habitats: W = wetland, G = grassland, F = forest.
[4] Population status: C = common, U = uncommon, R = rare, ? = status uncertain
[5] Subjective estimate based on personal experience of E.J. Heske and J.E. Hofmann in Illinois.

Forest

Typical Species

Mammal species known or likely to occur in the KRAA that are restricted to forested habitats are the hoary bat, eastern chipmunk, southern flying squirrel, woodland vole, gray fox, and bobcat. Species that are primarily associated with forests but also utilize other types of habitat include the Virginia opossum, red bat, Indiana 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 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. Additional habitat generalists that would typically occur in forests in the KRAA are listed in Table 14.

Most species of mammals associated with forests are not restricted to a specific type of forest (i.e. upland or bottomland forest). Species that hibernate (e.g. woodchucks, eastern chipmunks) or are primarily fossorial (e.g. eastern moles, woodland voles) need sites with well-drained, uninundated soils. The gray fox requires extensive forest cover and has become less common in parts of Illinois (Hoffmeister 1989). The total amount of forest in the KRAA is small, and there are no confirmed records of gray fox for this area. However, sizeable forest tracts remain along the Kaskaskia River and Shoal Creek, and may support gray foxes. The bobcat has also recently increased in numbers in Illinois, particularly in the counties immediately south of the KRAA (Woolf 1996), and a few records of bobcat have been reported for almost every county in the KRAA (Woolf 1996, Illinois Department of Natural Resources 1998). Gray squirrels require extensive tracts of mature forest with a dense understory, whereas fox squirrels can occupy open forests, woodlots, and fencerows

(Hoffmeister 1989). Consequently, gray squirrel numbers also have declined in Illinois. Nixon et al. (1978) considered gray squirrels common in much of the KRAA, particularly in riparian forests, parts of Randolph, Monroe, Marion, Bond, Madison, Montgomery, and Shelby counties that still contained extensive upland forest, and urban areas such as Belleville, Centralia, Salem, and Vandalia. Gray squirrels are scarce and fox squirrels predominate in most areas away from the rivers, and in which agriculture is the dominant land use. 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. Raccoons and opossums are most abundant in forest tracts in proximity to water (Hoffmeister 1989).

Threatened and Endangered Species

Small numbers of Indiana bats were captured in 1986 (2 lactating females) and 1987 (2 lactating females and 3 juveniles) along Shoal Creek in Bond County. Fogelpole Cave in Monroe County is an important Illinois hibernaculum for Indiana bats (Illinois Department of Natural Resources 1998). There are recent summer records of this species from only one location in the KRAA - the East Fork of Shoal Creek in Bond County (Gardner et al. 1996, Illinois Department of Natural Resources 1998). Captures of two lactating females during 1986 and two lactating females and three juveniles during 1987 indicate the presence of a maternity colony at this location. Although the bobcat has recently been delisted in Illinois, the status and distribution of this species remains of concern and habitat requirements are included below.

Habitat Requirements and Distribution of Listed Forest Species

Indiana bat - Indiana bats congregate in a limited number of caves and abandoned mines for hibernation, but are more widely dispersed during the summer (Barbour and Davis 1969). Indiana bat maternity colonies roost primarily beneath slabs of exfoliating bark on dead trees, but have also been found beneath the "shaggy" bark of certain live hickories (*Carya*) and in tree cavities (Cope et al. 1973; Humphrey et al. 1977; Gardner et al. 1991; Kurta et al. 1993a, 1993b, 1996; Callahan et al. 1997). Males and nonreproductive females may roost in caves or mines as well as trees during the summer. Roost trees used by this species have been located in both upland and floodplain forests; most are relatively large with a diameter at breast height of at least 30 cm (Gardner et al. 1991; Kurta 1993a, 1996; Callahan et al. 1997). Tree species that have been used by Indiana bat maternity colonies in Illinois are slippery elm[1], northern red oak, shagbark hickory, silver maple, cottonwood, post oak, bitternut hickory, white oak, American elm, sycamore, sweet pignut hickory, and green ash (Gardner et al. 1991, Kurta et al. 1993a, Illinois Natural History Survey, unpublished data). Indiana bats forage both in and along the edges of the canopy of floodplain and upland forests (Humphrey et al. 1977, LaVal et al. 1977, Brack 1983, Clark et al. 1987, Gardner et al. 1991). There are recent summer records for the Indiana bat in 23

[1] Corresponding scientific names are listed in Appendix 1.

counties in the southern two-thirds of Illinois (Gardner et al. 1996, Illinois Department of Natural Resources 1998). Indiana bats hibernate in several caves and abandoned mines in Illinois; the most significant of these hibernacula are abandoned mines in La Salle and Alexander counties and caves in Jackson and Monroe counties (Illinois Department of Natural Resources 1998).

Bobcat - Optimal habitat for bobcats in the Midwest would be rough or rolling terrain where large tracts of second-growth forest with dense underbrush were interspersed with open areas (e.g. clearings or successional fields), streams, and rock outcrops (Schwartz and Schwartz 1981, McCord and Cardoza 1982). Bobcats also inhabit floodplain forests along major rivers and swamps (Hoffmeister 1989). Rollings (1945) thought that key factors in bobcat habitat selection were prey abundance, protection from severe weather, the presence of suitable den sites, dense cover, and a lack of human disturbance. Small caves, rock crevices, rock piles, logs, stumps, hollow trees, dense thickets, and brush piles are used as resting sites and natal dens (Jackson 1961, Schwartz and Schwartz 1981, McCord and Cardoza 1982). Bobcats change resting sites frequently, except for females with young who occupy dens in inaccessible areas. Bobcats travel extensively while hunting and require large tracts of suitable habitat (Rollings 1945, McCord and Cardoza, 1982). Males in Missouri had annual home ranges of 46 to 72 km^2 and female ranges covered 13 to 31 km^2 (Schwartz and Schwartz 1981). The Illinois Natural Heritage Database (Illinois Department of Natural Resources 1998) contains bobcat records for at least 27 Illinois counties, mostly in southern Illinois (including 4 records in the KRAA), while hunters and trappers have reported bobcat sightings in 91 counties (Woolf 1996).

Information Gaps

Data on the distribution and population status of several forest-dwelling species in the KRAA are not available. Surveys should be conducted to determine the status of the gray fox in the KRAA. Although Woolf (1996) reported recent records of the bobcat (formerly a state threatened species) in all but one county in the KRAA, the numbers were small and whether the KRAA supports permanent residents or only transitory bobcats should be determined. Additional bat surveys should be conducted to evaluate the summer distribution of Indiana bats in the KRAA, as well as bat species for which there are few records. Flying squirrels and eastern chipmunks appear to be absent from small, isolated patches of forest in east-central Illinois (Rosenblatt et al. 1999), including some sites in the northern KRAA. The woodland vole has been reported from forest tracts in the KRAA (e.g., north of Vandalia in Fayette County and Hidden Springs State Forest in Shelby County, Hoffmeister 1989), but the current status of this species in regions with small, isolated forest remnants is also unknown. Because forest habitat in the KRAA is fragmented, it would be valuable to assess the ability of forest species to maintain viable populations and to disperse between forested tracts, especially in an agricultural landscape. The distribution of flying squirrels, chipmunks, and woodland voles, in particular, should be determined. The northern limit of the golden mouse has been reported as the counties (Perry and Jackson) immediately south of the KRAA (Feldhamer and Paine 1978,

Hoffmeister 1989). The southern KRAA should be surveyed to confirm the absence of this species and better delineate its northern range boundary.

Prairie/Grassland

Typical Species

Mammal species occurring in the KRAA that are restricted to grassland habitats are the least shrew, thirteen-lined and Franklin's ground squirrels, plains pocket gopher, western harvest mouse, deer mouse, prairie and meadow voles, and badger. Other species strongly associated with grassland habitats include the southeastern shrew, northern and southern short-tailed shrews, eastern cottontail, woodchuck, southern bog lemming, meadow jumping mouse, least weasel, and red fox. Additional habitat generalists of the KRAA that use grasslands are listed in Table 14.

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, crop field edges, old fields, and prairie restorations provide suitable habitat for many of these species. The 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, which is a forest species, can be found in grasslands if scattered trees or shrubs are present.

Several species associated with grasslands occur in only part of the KRAA. The western harvest mouse and least weasel may only occur in the extreme northern parts of the KRAA, such as in Piatt and Champaign counties (Hoffmeister 1989). Franklin's ground squirrel also may only occur in the northern half of the KRAA, in Champaign, Piatt, Coles, Shelby, Cumberland, and Fayette counties (Hofmeister 1989, Lewis and Rongstad 1992). The meadow vole has been extending its geographic range southward in Illinois (Getz et al. 1978); the current southern limits of the range of this species and that of the thirteen-lined ground squirrel in the KRAA are not known, but may occur somewhere near the center of the KRAA, such as Bond or Fayette County. Hoffmeister (1989) also noted that a line through central Fayette County seemed to mark the boundary between the geographic ranges of the northern and southern short-tailed shrews. Plains pocket gophers may only occur in the southwestern part of the KRAA, but their presence in other areas along the northern border of the KRAA should be determined.

Threatened and Endangered Species

None of the mammal species primarily associated with grasslands in the KRAA 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 KRAA. Franklin's ground squirrel is known historically from locations in the KRAA (e.g., west of Champaign, Champaign County, and north of Mattoon, Douglas County; Hoffmeister 1989), but this species is thought to have declined in the eastern portion of its range, including Illinois (Lewis and Rongstad 1992). In a recent survey only one Franklin's ground squirrel was caught at 15 sites in Champaign, Piatt, and Vermilion counties (Hofmann 1998). The status of Franklin's ground squirrel in the KRAA should be studied further. There are no published records of the meadow jumping mouse for the KRAA, and the presence of this species in the KRAA should be confirmed. The status of the badger in Illinois was investigated by Warner and Ver Steeg (1995) who documented its presence in each of the counties in the KRAA, but its population status in the KRAA should be determined more precisely. Although the red fox is not strictly a grassland species, it is most 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 KRAA should be evaluated. The KRAA contains several prairie remnants and restorations in areas that are dominated by row crop agriculture. The persistence of grassland small mammal populations in these prairies and the ability of small mammals to travel between such habitat islands should be investigated. As noted above, the southern limits to the ranges of several species (thirteen-lined and Franklin's ground squirrels, western harvest mouse, meadow vole, least weasel) should be determined. It would also be interesting to investigate factors that determine the limits of the ranges of the northern and southern short-tailed shrews, and assess the ecological relationships between these species where they come in contact. Finally, it would be interesting to evaluate factors determining the southern boundary of the plains pocket gopher, and whether this species occurs anywhere in the northern KRAA.

Wetland

Typical Species

Mammal species in the KRAA that require wetlands or aquatic habitats (lakes, ponds, streams, and rivers) are the beaver, muskrat, mink, and river otter. Beavers, muskrats, and river otters are highly specialized for aquatic life and need open water, whereas mink are more terrestrial but typically occur in proximity to water. Swamp rabbits, which occupy forested wetlands, have been reported from a few sites in the southern KRAA (Sparta, Randolph County, east of Salem, Marion County, and an unidentified site in Washington County; Hoffmeister 1989). Raccoons and opossums are most abundant in areas near water. Bats occurring in the KRAA could utilize wetlands as well as aquatic habitats for foraging. The 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 sites where standing water is not present. Additional habitat generalists that use wetlands opportunistically are listed in Table 14.

Threatened and Endangered Species

River otters were observed in Monroe County in 1990 and Clinton County in 1994 prior to otter releases in the Kaskaskia River basin, and in Moultrie County (1998) and Clinton County (1998) after the releases (Illinois Department of Natural Resources 1998). The IDNR released 72 river otters at three sites in the KRAA (Lake Shelbyville - 24, Carlyle Lake - 25, Shoal Creek - 23) during 1995-96 (Bluett 1997).

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 the Cache and Big Muddy river systems 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). Increased numbers of sightings of river otters and sightings of young otters (indicating successful reproduction by released otters) have prompted the Illinois Endangered Species Board to change the status of river otters from state endangered to state threatened. River otters appear to be established in the KRAA.

Information Gaps

Aquatic habitat in the KRAA should be monitored regularly for river otters to track the success of the recent introductions. The presence of beavers is considered favorable for otters, but the impact of beaver populations on the physical structure of riparian systems in the KRAA should be evaluated. The swamp rabbit is rarely found far from water and is an inhabitant of cypress swamps, bottomland forests, and canebrakes (Chapman and Feldhamer 1981). The swamp rabbit has become rare in Illinois, and there are recent records from only eight southern counties (Kjolhaug et al. 1987). The current status of this species in the KRAA should be determined, particularly in extensive bottomland forest tracts along the Kaskaskia River. Many wetlands in the KRAA are small and isolated in an agricultural landscape; it would be interesting to determine if these wetlands are used by small mammal species other than those occupying surrounding habitat types and assess the ability of these mammals to move between wetlands. Although the current range of the marsh rice rat in Illinois is south of the KRAA (Hoffmeister 1989, Hofmann et al. 1990), wetland habitats in the southern KRAA should be surveyed to confirm the absence of this species and delineate more precisely its northern range boundary.

Enhancement and Restoration Potential

The preservation of upland and floodplain forests could enhance the suitability of the Kaskaskia River Assessment Area as habitat for a variety of forest-dwelling species, including the bobcat, gray fox, and Indiana bat. The extensive bottomland forest along stretches of the Kaskaskia River may be valuable both as habitat for these species and as a dispersal corridor. Forested wetlands, including this bottomland forest, may also prove important for swamp rabbits if it is found that they still occur in the southern KRAA. Retaining large snags with exfoliating bark would provide potentially suitable roost trees for Indiana bats. Preservation and restoration of riparian forests also is necessary if the KRAA is to maintain high quality habitat for the river otter. Reduction of silt and chemical runoff into aquatic habitats and wetlands would enhance their ability to support river otter and mink.

Preservation of native prairie remnants and other types of grassland habitats would provide habitat for the badger and red fox. If they prove to be rare in the Assessment Area, Franklin's ground squirrels could be introduced into suitable grasslands on state or county property. Vegetation along abandoned railroad rights-of-way in the KRAA should be preserved or restored to provide habitat and dispersal or travel corridors for mammals.

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 Kaskaskia River Assessment Area (KRAA), but a herpetological survey of three sites in Clinton, St. Clair, and Washington Counties was conducted in 1997 and 1998 (Wilson 1998). The KRAA contains portions of four of Smith's (1961) eleven Herpetofaunal Divisions for the state; Grand Prairie and Woodlands of the Grand Prairie, Southern Division Woodlands, and Lower Mississippi Border.

Amphibian and reptile species that are known or likely to occur in the KRAA are listed in Table 15. The 19 amphibian species and 36 reptile species in Table 15 represent 48% of the amphibian species and 60% of the reptile species of the State. The state endangered eastern massasauga *(Sistrurus catenatus)* and the state threatened Kirtland's snake *(Clonophis kirtlandii)* are known to exist within the borders of the KRAA.

There have been no reports of exotic reptile species in the KRAA.

When referring to the habitat designations in Table 15, 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 eastern garter 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 15 might suggest. For example, the smooth soft-shell turtle is listed as occurring in rivers and creeks, but it is only found in systems with clear water and sandy substrates.

Table 15. Amphibian and reptile species known or likely to occur in the Kaskaskia River Assessment Area with an indication of habitat preference and relative abundance.

Common Name[1, 2]	Scientific Name	Habitat[3]	Abundance[4]
Amphibians			
spotted salamander	*Ambystoma maculatum*	F,W	U
marbled salamander	*Ambystoma opacum*	F,W	U

Table 15. Continued.

Common Name[1, 2]	Scientific Name	Habitat[3]	Abundance[4]
smallmouth salamander	*Ambystoma texanum*	F,W,P	C/U
tiger salamander	*Ambystoma tigrinum*	F,W,P	U
slimy salamander	*Plethodon glutinosus*	F	U
mudpuppy	*Necturus maculosus*	R,L	?
siren	*Siren intermedia*	W,R,L	?
central newt	*Notophthalmus viridescens*	F,W	U
American toad	*Bufo americanus*	U	C
Fowler's toad	*Bufo fowleri*	F,W,P	C
cricket frog	*Acris crepitans*	W,L,R	C
gray treefrog complex	*Hyla versicolor- chrysoscelis*	F,W	C
spring peeper	*Pseudacris crucifer*	F,W	C
western chorus frog	*Pseudacris triseriata*	U	C
crawfish frog	*Rana areolata*	P	U
plains leopard frog	*Rana blairi*	F,W,P,L,R	U
bullfrog	*Rana catesbeiana*	W,L,R	C
green frog	*Rana clamitans*	F,W,R	U
southern leopard frog	*Rana sphenocephala*	F,W,L,R	C
Reptiles			
snapping turtle	*Chelydra serpentina*	W,L,R	C
painted turtle	*Chrysemys picta*	W,L,R	C
false map turtle	*Graptemys pseudpgeographica*	L,R	C
eastern box turtle	*Terrapene carolina*	F	C
western box turtle	*Terrapene ornata*	P	U/R
red-eared slider	*Trachemys scripta*	W,L,R	C
musk turtle	*Sternotherus odoratus*	W,L,R	?
smooth softshell turtle	*Apalone mutica*	R	U
spiny softshell turtle	*Apalone spinifera*	W,L,R	C
fence lizard	*Sceloporus undulatus*	F	C
five-lined skink	*Eumeces fasciatus*	F	C
broadhead skink	*Eumeces laticeps*	F	C
ground skink	*Scincella lateralis*	F	U
Kirtland's snake - ST	***Clonophis kirtlandii***	**W,P**	**?**
racer	*Coluber constrictor*	U	U
ringneck snake	*Diadophis punctatus*	F	U
black rat snake	*Elaphe obsoleta*	F,W,P	C
fox snake	*Elaphe vulpina*	W,P,C	U
eastern hognose snake	*Heterodon platirhinos*	F,W,P	U
prairie kingsnake	*Lampropeltis calligaster*	F,P	C
speckled kingsnake	*Lampropeltis getula*	F	U
eastern milk snake	*Lampropeltis triangulum*	F,W,P	U
plainbelly water snake	*Nerodia erythrogaster*	W,L,R	C
diamondback water snake	*Nerodia rhombifer*	W,L,R	U/C
northern water snake	*Nerodia sipedon*	W,R,L	C
rough green snake	*Opheodrys aestivus*	F	C
Graham's crayfish snake	*Regina grahamii*	W,L,P	U

Table 15. Continued.

Common Name[1, 2]	Scientific Name	Habitat[3]	Abundance[4]
brown snake	*Storeria dekayi*	F	U
redbelly snake	*Storeria occipitomaculata*	F	U
western ribbon snake	*Thamnophis proximus*	F,W,L,R	C
plains garter snake	*Thamnophis radix*	U	U
eastern garter snake	*Thamnophis sirtalis*	U	C
earth snake	*Virginia valeriae*	F	?
copperhead	*Agkistrodon contortrix*	F	U
timber rattlesnake	*Crotalus horridus*	F	R
massasauga - SE	***Sistrurus catenatus***	**F,W,R,P**	**R**

[1] Nomenclature follows Collins (1990) unless noted.
[2] Bold type indicates an Illinois endangered (SE) or 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 Assessment Area that are typical of forested habitats include the spring peeper and both species of gray treefrog. As outlined above, some amphibians also require aquatic habitats for breeding. The gray treefrogs and spring peeper breed in forested wetlands and upland forested ponds. Among the reptiles of the KRAA, the brown snake is typical of forested areas.

Enhancement and Restoration Potential

Maintaining small, temporary, fishless ponds in forests in the Assessment Area would benefit many of the reptiles and amphibians of the KRAA 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 KRAA and the state. The spotted salamander, spring peeper, American toad, gray treefrog, and northern leopard frog are among the amphibians that breed in this habitat. The musk turtle, rat snake, brown snake, red-bellied snake, and northern water snake would benefit from restoration or creation of woodland ponds.

Wetland

Typical Species

Amphibian species of the KRAA that are typical of wetland habitats include the green frog and southern 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 KRAA, the painted turtle and common garter snake are typical of wetlands. These species reach their greatest abundance in wetland habitats.

Threatened and Endangered Species

Two of the listed species in Table 15, Kirtland's Snake, and the Massasauga are typical of wetland areas in the Assessment Area. Kirtland's Snakes were originally found in the KRAA near wetlands where the surrounding landscape was native prairie. The current status of Kirtland's snake in the KRAA is not known. The most recent verified report for the Assessment Area is from near Carlyle, Clinton County, in 1988. Massasaugas were also found in prairie wetlands and bottomland forest in the KRAA prior to European settlement, but today this species is known only from the south end of Carlyle Lake in Clinton County.

Habitat Requirements

Kirtland's Snake - Wet prairies with abundant cover are preferred, especially those that are seasonally flooded and adjacent to upland habitats. They also utilize crayfish burrows as shelter although they have been taken in vacant lots in some urban areas where crayfish burrows have been completely destroyed. In these situations they rely on boards and other surface debris for cover. They are also associated with the grassy areas around spillways and dams of impoundments.

Massasauga - This venomous snake prefers wet prairie areas with heavy grass cover or floodplain forest adjacent to open fields. The activity period in central Illinois is probably mid-April to October. In some parts of their range, massasaugas move from moist prairie conditions to drier habitats in the spring. Massasaugas are often found in association with crayfish burrows which they use for shelter and hibernation. They may also overwinter in mammal burrows, old tree stumps, and rock crevices. They apparently do not hibernate with other snake species.

Enhancement and Restoration Potential

Maintaining even small, temporary wetlands in the KRAA 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.

Information Gaps

One of the most pressing questions concerning wetland amphibians and reptiles in the Assessment Area is whether Kirtland's snake still exists in this area. This reptile can be common in the appropriate habitat, but because of its secretive and subterranean habits, surveying for it is difficult. An effort should be made to determine if this species still exists in the Assessment Area, so that appropriate management action can be taken.

Prairie/Grassland

Typical Species

Of the amphibian species listed in Table 15, the tiger salamander and western chorus frog are typical of prairie habitats in the Assessment Area. 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 Assessment Area. 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 KRAA that are typical of prairie habitats include the fox snake and prairie king snake. Both of these snakes can tolerate disturbed habitats such as mowed right-of-way, pasture, oldfield, and agricultural edge.

Enhancement and Restoration Potential

Restoring native prairie, especially wet prairie, in the KRAA would benefit a variety of amphibians and reptiles especially the tiger salamander, the massasauga, and Kirtland's snake (if present in the Assessment Area).

Lakes, Ponds, and Impoundments

Typical Species

Of the amphibian species listed in Table 15, the bullfrog and cricket frog are typical of lakes, ponds, and impoundments in the KRAA. Both of these species have developed strategies for coexisting with fish and are usually more widely distributed than other amphibians. Among the reptiles of the KRAA 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 Assessment Area would benefit a variety of amphibians and reptiles.

Creeks and Rivers

Typical Species

The cricket frog and green frog are typical of creeks and small rivers in the KRAA, while the mudpuppy is a typical inhabitant of the Kaskaskia River. Among the reptiles of the Assessment Area, the northern water snake is typical of creeks and small rivers while the snapping turtle, map turtles, soft-shell turtles, and diamondback water snake are typical of the Kaskaskia River.

Enhancement and Restoration Potential

Restoring the riparian zone and associated floodplain forests and wetlands along the Kaskaskia River and its tributaries would benefit a variety of amphibians and reptiles. These habitats have been adversely affected by siltation and agricultural runnoff.

Cultural Habitats

Typical Species

Of the amphibian species listed in Table 15, the American toad, western chorus frog, and bullfrog are typical of cultural habitats in the Assessment Area. 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 Assessment Area, the plains garter snake, common garter snake, brown snake, and northern water snake are typical of cultural habitats.

Enhancement and Restoration Potential

The American toad, western chorus frog, and bullfrog do well in patches of cattail marsh under 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 grass around these habitats.

Overall Habitat Quality and Current Management Concerns

Overall, opportunities for amphibians and reptiles in the Kaskaskia River Assessment Area are fair. Compared to presettlement, the present landscape of the Assessment Area lacks a significant amount of wet prairie and the backwater sloughs along the Kaskaskia River have been destroyed or degraded.

The most critical management concerns for the Kaskaskia River Assessment Area Partnership are restoration of the riparian zone and backwater sloughs along the Kaskaskia River. Intact riparian zones may act as dispersal corridors for many amphibians and reptiles, thus reducing the effects of habitat fragmentation.

Aquatic Biota

Introduction

The Kaskaskia River Assessment Area (KRAA) includes the entire Kaskaskia River basin which drains 5800 square miles in the southern half of Illinois (Figure 1). Seventeen counties and several natural divisions are encompassed (Figures 2 and 3). The natural divisions include Grand Prairie, Western Forest-prairie, Middle Mississippi River Border, Southern Till Plain, Ozark, and Lower Mississippi River Bottomlands (Schwegman 1973). The comparatively flat northeastern part of the basin, composed of Wisconsinan glacial till, is well suited to agriculture. Here the soils are predominantly brown silt loam or black clay loam. Illinoisan and earlier glacial drifts are found in the rough and hilly southwestern part of the basin. Soils are chocolate to light gray in color and are made up of loams, silts, and loess (Luce 1933). Coal underlies the greater portion of the basin.

The Kaskaskia River rises just northwest of Champaign-Urbana in the Champaign morainic system. It flows southwest for 270 miles and empties into the Mississippi River in Randolph County near Chester. The river has an extremely crooked channel; the straight line distance from the source to the mouth is only 180 miles. Major tributaries to the Kaskaskia are Richland, Silver, and Shoal creeks from the north and Crooked Creek from the south. The width of the river ranges from a narrow drainage ditch in Champaign County to 500 feet in Randolph County (Page et al. 1992). In 1881, the Mississippi River broke through a bend two miles above the old town of Kaskaskia. The diverted water of the Mississippi soon cut a channel into the Kaskaskia River and appropriated the lower seven miles of its bed (Luce 1933).

The substrate of the Kaskaskia is composed primarily of sand, gravel and mud. The river has many pools and runs, but few riffles. When riffles occur in Douglas, Coles, Moultrie, and Shelby counties, the substrate is coarse pebbles and glacial boulders of various sizes. During periods of low water in St. Clair and Randolph counties, the bottom is often covered with a fine layer of silt as much as a foot deep that overlays a bed of hard packed sand and gravel. Aquatic vegetation is scare throughout the drainage. The only rock exposure of any extent along the stream is found 20 miles above Shelbyville. In this 15-20 mile section the banks are largely limestone or sandstone (Page et al. 1992).

The river has a heavy silt load due to farming operations throughout the watershed. The color of the water depends on the nature of the soil. Two of the largest human-made reservoirs in Illinois, Lake Shelbyville and Carlyle Lake, are found on the river. The reservoirs have transformed long stretches of the river that formerly consisted of pool and riffle habitats into standing-water habitats. The impoundments have had major impacts on the native stream biota, including the loss of flowing water habitats in the impounded

regions, and the prevention of migrations that, in many species of fishes, are necessary for reproduction. The lock and dam near the confluence with the Mississippi, coupled with the conversion of the lower-most 50 miles of the river into a 36 mile navigation channel, have converted the lower river into a low-velocity waterbody with many characteristics of an impoundment (Illinois Environmental Protection Agency 1996). Pollution by agriculture, oil fields, coal mines, and a chemical plant is a problem in the basin.

Statewide Comparison of Aquatic Biota

The KRAA supports a large diversity of aquatic species. Known from the Kaskaskia River drainage are 112 species of fishes, 42 species of mussels, and 27 species of malacostracans (large crustaceans). Some species have disappeared from the drainage 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.

Based on existing information, the aquatic macroinvertebrate populations of the KRAA appear to be as diverse as those of many other watersheds in Illinois. While most of these species are considered to be relatively common in Illinois, several are uncommon to rare in the state, particularly those associated with spring and cave habitats (Webb et al. 1993, 1995, 1996, 1998a, 1998b); additional surveys are necessary to more accurately document their distributional patterns of all aquatic macroinvertebrates within the KRAA.

The Assessment Area also supports a large diversity of smaller aquatic macroinvertebrates. Several extensive surveys of water quality and of aquatic macroinvertebrate populations have been conducted within the Kaskaskia River basin. These include pre- and post-impoundment studies of the Kaskaskia River upstream and downstream of both Lake Shelbyville (Brigham 1973, 1974, 1975, 1976; Brigham et al. 1970, 1972; Clement et al. 1979; Dufford et al. 1977; Dufford et al. 1978; Larimore et al. 1971) and Carlyle Lake (Brigham 1974; Dufford 1975; Dufford et al. 1976, 1977, 1978; Clement et al. 1979). Another multi-year study focused on the aquatic biota associated with Coffeen Lake and its tributaries (Tranquilli and Larimore 1979, 1980, 1981). More recently, an intensive study focused on the water quality of and aquatic macroinvertebrates associated with 10 springs in St. Clair and Monroe counties (Webb et al. 1997, 1998); many of the species collected by Webb et al. represent new records for the Kaskaskia River basin.

Common Species

One hundred twelve species of fishes are known from the Kaskaskia River Assessment Area (Tables 16 and 17). Common fishes throughout the drainage are the central stoneroller, red shiner, silverjaw minnow, bluntnose minnow, sand shiner, white sucker, creek chub,yellow bullhead, blackstripe topminnow, green sunfish, bluegill, largemouth bass, johnny darter, gizzard shad, carp, bigmouth shiner, channel catfish, tadpole madtom, freshwater drum, and longear sunfish.

The headwaters are dominated by the creek chubs, bigmouth shiners, silverjaw minnows, and central stonerollers; the creeks by red shiners, sand shiners, bluntnose minnows, longear sunfish, and johnny darters; and the larger river habitats by gizzard shad, carp, smallmouth buffalo, bullhead minnows, bluegills, largemouth bass, and freshwater drum.

Forty-two species of freshwater mussels have been reported from the Assessment Area (Tables 18 and 19). Common species include the plain pocketbook, pimpleback, threeridge, Wabash pigtoe, and fragile papershell (Cummings and Mayer 1997, INHS Mollusk Collection data). Of the 41 native mussel species known from the Assessment Area, only 14 have been collected alive in the past 20 years. The mussels of the Kaskaskia River were surveyed in 1956 and again in 1978-79 (Matteson unpublished, Suloway et al. 1981).

Twenty-seven species of crayfishes, isopods, and amphipods are found in the basin (Tables 20 and 21). The most common crayfish is the virile crayfish, which usually is found over rocky substrates or around woody debris or vegetation. The most common isopod is *Caecidotea intermedia*, which lives in rocky areas and on woody debris. The most common amphipod is *Hyalella azteca*, which is found on vegetation, usually filamentous algae growing on rocks or logs.

Although many surveys for macroinvertebrates occurring in the Kaskaskia River basin have been conducted, data resulting from many of those surveys are not readily available in reports or published papers. Specimens collected from the Kaskaskia River basin, if deposited in the INHS Collections, most likely remain unidentified and have yet to be included in any electronic database.

Table 22 lists aquatic macroinvertebrate taxa known or thought likely to occur in the Kaskaskia River Assessment Area in central Illinois. Records for species included in this table have been obtained from the following sources: Malloch (1915a, b), Frison (1935), Ross (1944, 1947), Burks (1953), Ross and Horsfall (1965), Wooldridge (1967), Lauck (1959), Pechuman et al. (1983), Wetzel (1992), Taylor (1996), DeWalt and Webb (1998), Webb (1993),Webb et al. (1996, 1998a, 1998b), the Illinois Natural History Survey Insect and Annelida collections; the Field Museum of Natural History (Chicago); museum records of Eastern Illinois University (Charleston) and Southern Illinois University (Carbondale); and literature cited in this document.

Table 16. Freshwater fishes recorded from the Kaskaskia River Assessment Area[1].

FAMILY *Scientific Name*[2,3,4]	Common Name	Headwaters	Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
PETROMYZONTIDAE						
Ichthyomyzon castaneus	chestnut lamprey			X	X	
Ichthyomyzon unicuspis	silver lamprey				X	
ACIPENSERIDAE						
Scaphirhynchus platorynchus	shovelnose sturgeon				X	

Table 16. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Headwaters	Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
POLYODONTIDAE						
Polyodon spathula	paddlefish				X	
LEPISOSTEIDAE						
Lepisosteus oculatus	spotted gar				X	X
Lepisosteus osseus	longnose gar				X	
Lepisosteus platostomus	shortnose gar				X	
AMIIDAE						
Amia calva	bowfin				X	X
HIODONTIDAE						
Hiodon alosoides	goldeye				X	
Hiodon tergisus	mooneye				X	
ANGUILLIDAE						
Anguilla rostrata	American eel				X	
CLUPEIDAE						
Alosa chrysochloris	skipjack herring				X	
Dorosoma cepedianum #	gizzard shad			X	X	X
Dorosoma petenense	threadfin shad				X	X
CYPRINIDAE						
Campostoma anomalum #	central stoneroller	X	X	X		
Campostoma oligolepis	largescale stoneroller		X	X		
*Carassius auratus**	goldfish	X	X	X	X	X
*Ctenopharyngodon idella**	grass carp				X	X
Cyprinella lutrensis #	red shiner		X	X	X	
Cyprinella spiloptera	spotfin shiner		X	X	X	
Cyprinella whipplei	steelcolor shiner		X	X	X	
Cyprinus carpio#*	common carp			X	X	X
Ericymba buccata #	silverjaw minnow		X	X	X	
Hybognathus argyritis	western silvery minnow				X	
Hybognathus nuchalis	Mississippi silvery minnow		X	X	X	
Hybognathus placitus	plains minnow				X	
***Hybopsis amblops* - SE**	**bigeye chub**			**X**	**X**	
***Hybopsis amnis* - SE**	**pallid shiner**			**X**	**X**	
*Hypophthalmichthys molotrix**	silver carp				X	X
Hypophthalmichthys nobilis	bighead carp				X	
Luxilus chrysocephalus	striped shiner	X	X	X	X	
Lythrurus fumeus	ribbon shiner		X	X		
Lythrurus umbratilis	redfin shiner		X	X	X	
Macrhybopsis aestivalis	speckled chub				X	
Macrhybopsis storeriana	silver chub				X	
Nocomis biguttatus	hornyhead chub		X	X		
Notemigonus crysoleucas	golden shiner			X	X	X
Notropis atherinoides	emerald shiner				X	
Notropis blennius	river shiner				X	
***Notropis boops* - SE**	**bigeye shiner**		**X**	**X**		

Table 16. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Headwaters	Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
Notropis buchanani	ghost shiner			X	X	
Notropis dorsalis #	bigmouth shiner		X	X	X	
Notropis ludibundus #	sand shiner		X	X	X	
Notropis shumardi	silverband shiner				X	
Notropis volucellus	mimic shiner				X	
Phenacobius mirabilis	suckermouth minnow	X	X	X		
Phoxinus erythrogaster	southern redbelly dace	X				
Pimephales notatus #	bluntnose minnow	X	X	X	X	
Pimephales promelas	fathead minnow		X	X		
Pimephales vigilax#	bullhead minnow			X	X	
Platygobio gracilis	flathead chub				X	
Semotilus atromaculatus #.	creek chub	X	X			
CATOSTOMIDAE						
Carpiodes carpio	river carpsucker			X	X	
Carpiodes cyprinus	quillback		X	X	X	
Carpiodes velifer	highfin carpsucker			X	X	
Catostomus commersoni #	white sucker		X	X	X	
Cycleptus elongatus	blue sucker				X	
Erimyzon oblongus #	creek chub	X	X	X		
Erimyzon sucetta	lake chubsucker		X			X
Hypentelium nigricans	northern hog sucker		X	X	X	
Ictiobus bubalus #	smallmouth buffalo				X	
Ictiobus cyprinellus	bigmouth buffalo				X	
Ictiobus niger	black buffalo				X	
Minytrema melanops	spotted sucker		X	X		
***Moxostoma carinatum* - ST**	**river redhorse**			**X**	**X**	
Moxostoma erythrurum	golden redhorse		X	X	X	
Moxostoma macrolepidotum	shorthead redhorse			X	X	
ICTALURIDAE						
Ameiurus catus	white catfish				X	
Ameiurus melas	black bullhead		X	X	X	X
Ameiurus natalis#	yellow bullhead		X	X	X	X
Ameiurus nebulosus	brown bullhead					X
Ictalurus furcatus	blue catfish				X	
Ictalurus punctatus #	channel catfish			X	X	X
Noturus exilis	slender madtom		X	X		
Noturus flavus	stonecat		X	X		
Noturus gyrinus #	tadpole madtom		X	X		
Noturus miurus	brindled madtom		X	X	X	
Noturus nocturnus	freckled madtom		X	X		
Pylodictis olivaris	flathead catfish			X	X	X
ESOCIDAE						
Esox americanus	grass pickerel	X	X	X		X
*Esox masquinongy**	muskellunge				X	X

Table 16. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Headwaters	Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
APHREDODERIDAE						
Aphredoderus sayanus	pirate perch		X			
ATHERINIDAE						
Labidesthes sicculus	brook silverside			X	X	X
*Menidia beryllina**	inland silverside					
FUNDULIDAE						
Fundulus notatus #	blackstripe topminnow	X	X	X		
Fundulus olivaceus	blackspotted topminnow	X	X	X		
POECILIIDAE						
Gambusia affinis	mosquitofish	X	X			X
GASTEROSTEIDAE						
Culaea inconstans	brook stickleback	X	X			X
COTTIDAE						
Cottus carolinae	banded sculpin	X	X			
MORONIDAE						
Morone chrysops	white bass			X	X	
Morone mississippiensis	yellow bass		X	X	X	X
CENTRARCHIDAE						
Ambloplites rupestris	rock bass		X	X	X	
Centrarchus macropterus	flier					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	
Lepomis microlophus	redear sunfish		X	X	X	X
Micropterus dolomieu	smallmouth bass		X	X	X	X
Micropterus salmoides #	largemouth bass		X	X	X	X
Pomoxis annularis	white crappie		X	X	X	X
Pomoxis nigromaculatus	black crappie		X	X	X	X
PERCIDAE						
***Ammocrypta clara* - SE**	**western sand darter**			**X**	**X**	
Etheostoma asprigene	mud darter		X	X	X	
Etheostoma chlorosomum	bluntnose darter		X	X	X	
Etheostoma gracile	slough darter		X	X		X
Etheostoma nigrum #	johnny darter	X	X	X	X	
Etheostoma spectabile	orangethroat darter	X	X	X		
Percina caprodes	logperch		X	X	X	
Percina maculata	blackside darter	X	X	X	X	
Percina phoxocephala	slenderhead darter		X	X	X	
Percina shumardi	river darter				X	
Stizostedion canadense	sauger			X	X	
Stizostedion vitreum	walleye			X	X	

Table 16. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Headwaters	Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
SCIAENIDAE						
Aplodinotus grunniens #	freshwater drum			X	X	

[1] Data from the Illinois Natural History Survey Fish Collection.
[2] Bold type indicates an Illinois endangered (SE) or Illinois threatened (ST) species.
[3] * = non-native species; # = common species.
[4] Total number of species = 117 (111 native, 6 introduced).

Table 17. Freshwater fishes recored from the Kaskaskia River Assessment Area, by habitat[1].

FAMILY *Scientific Name*[2,3,4]	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
PETROMYZONTIDAE						
Ichthyomyzon castaneus	chestnut lamprey	X	X			
Ichthyomyzon unicuspis	silver lamprey	X	X			
ACIPENSERIDAE						
Scaphirhynchus platorynchus	shovelnose sturgeon		X	X		
POLYODONTIDAE						
Polyodon spathula	paddlefish			X		X
LEPISOSTEIDAE						
Lepisosteus oculatus	spotted gar			X	X	X
Lepisosteus osseus	longnose gar				X	
Lepisosteus platostomus	shortnose gar		X		X	X
AMIIDAE						
Amia calva	bowfin			X	X	
HIODONTIDAE						
Hiodon alosoides	goldeye		X	X		
Hiodon tergisus	mooneye		X	X		
ANGUILLIDAE						
Anguilla rostrata	American eel		X	X		
CLUPEIDAE						
Alosa chrysochloris	skipjack herring		X	X		
Dorosoma cepedianum #	gizzard shad		X			X
Dorosoma petenense	threadfin shad		X	X		
CYPRINIDAE						
Campostoma anomalum #	central stoneroller	X	X			
Campostoma oligolepis	largescale stoneroller	X	X			
*Carassius auratus**	goldfish			X	X	X
*Ctenopharyngodon idella**	grass carp			X	X	
Cyprinella lutrensis #	red shiner		X	X		
Cyprinella spiloptera	spotfin shiner		X	X		
Cyprinella whipplei	steelcolor shiner		X	X		

Table 17. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Streams: Riffles	Streams: Runs	Streams: Pools	Standing Water: Littoral	Standing Water: Open Water
*Cyprinus carpio** #	common carp			X	X	
Ericymba buccata #	silverjaw minnow		X	X		
Hybognathus argyritis	western silvery minnow	X	X			
Hybognathus nuchalis	Mississippi silvery minnow		X	X		
Hybognathus placitus	plains minnow		X	X		
***Hybopsis amblops* - SE**	**bigeye chub**		X	X		
***Hybopsis amnis* - SE**	**pallid shiner**			X		
*Hypophthalmichthys molotrix**	silver carp			X		X
Hypophthalmichthys nobilis	bighead carp			X		
Luxilus chrysocephalus	striped shiner		X	X		
Lythrurus fumeus	ribbon shiner			X		
Lythrurus umbratilis	redfin shiner		X	X		
Macrhybopsis aestivalis	speckled chub		X	X		
Macrhybopsis storeriana	silver chub			X		
Nocomis biguttatus	hornyhead chub		X	X		
Notemigonus crysoleucas	golden shiner			X	X	X
Notropis atherinoides	emerald shiner			X		
Notropis blennius	river shiner		X	X		
***Notropis boops* - SE**	**bigeye shiner**			X		
Notropis buchanani	ghost shiner			X		
Notropis dorsalis #	bigmouth shiner		X	X		
Notropis ludibundus #	sand shiner		X	X		
Notropis shumardi	silverband shiner		X	X		
Notropis volucellus	mimic shiner		X	X		
Phenacobius mirabilis	suckermouth minnow	X	X			
Phoxinus erythrogaster	southern redbelly dace	X	X			
Pimephales notatus #	bluntnose minnow		X	X		
Pimephales promelas	fathead minnow			X		
Pimephales vigilax#	bullhead minnow		X	X		
Platygobio gracilis	flathead chub		X	X		
Semotilus atromaculatus #	creek chub			X		
CATOSTOMIDAE						
Carpiodes carpio	river carpsucker		X	X		
Carpiodes cyprinus	quillback		X	X		
Carpiodes velifer	highfin carpsucker		X	X		
Catostomus commersoni #	white sucker		X	X		
Cycleptus elongatus	blue sucker		X			
Erimyzon oblongus #	creek chub		X	X		
Erimyzon sucetta	lake chubsucker			X		
Hypentelium nigricans	northern hog sucker	X	X			
Ictiobus bubalus #	smallmouth buffalo			X		
Ictiobus cyprinellus	bigmouth buffalo			X		
Ictiobus niger	black buffalo			X		
Minytrema melanops	spotted sucker			X		

Table 17. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
***Moxostoma carinatum*-ST**	**river redhorse**		**X**	**X**		
Moxostoma erythrurum	golden redhorse		X	X		
Moxostoma macrolepidotum	shorthead redhorse		X	X		
ICTALURIDAE						
Ameiurus catus	white catfish			X		
Ameiurus melas	black bullhead			X	X	
Ameiurus natalis #	yellow bullhead			X	X	
Ameiurus nebulosus	brown bullhead				X	
Ictalurus furcatus	blue catfish		X	X		
Ictalurus punctatus #	channel catfish		X	X	X	
Noturus exilis	slender madtom	X				
Noturus flavus	stonecat	X				
Noturus gyrinus #	tadpole madtom		X	X		
Noturus miurus	brindled madtom	X				
Noturus nocturnus	freckled madtom		X	X		
Pylodictis olivaris	flathead catfish			X	X	
ESOCIDAE						
Esox americanus	grass pickerel			X	X	
*Esox masquinongy**	muskellunge			X	X	
APHREDODERIDAE						
Aphredoderus sayanus	pirate perch			X		
ATHERINIDAE						
Labidesthes sicculus	brook silverside			X	X	X
*Menidia beryllina**	inland silverside			X		X
FUNDULIDAE						
Fundulus notatus #	blackstripe topminnow			X		
Fundulus olivaceus	blackspotted topminnow			X		
POECILIIDAE						
Gambusia affinis	mosquitofish			X	X	
GASTEROSTEIDAE						
Culaea inconstans	brook stickleback			X	X	
COTTIDAE						
Cottus carolinae	banded sculpin	X				
MORONIDAE						
Morone chrysops	white bass			X		
Morone mississippiensis	yellow bass			X	X	
CENTRARCHIDAE						
Ambloplites rupestris	rock bass			X		
Centrarchus macropterus	flier				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	

Table 17. Continued.

FAMILY *Scientific Name*[2,3,4]	Common Name	Streams Riffles	Runs	Pools	Standing Water Littoral	Open Water
Lepomis megalotis#longear	sunfish			X		
Lepomis microlophus	redear sunfish			X	X	
Micropterus dolomieu	smallmouth bass			X	X	X
Micropterus salmoides #	largemouth bass			X	X	X
Pomoxis annularis	white crappie			X	X	X
Pomoxis nigromaculatus	black crappie			X	X	X
PERCIDAE						
***Ammocrypta clara* - SE**	**western sand darter**		**X**			
Etheostoma asprigene	mud darter	X		X		
Etheostoma chlorosomum	bluntnose darter			X	X	
Etheostoma gracile	slough darter			X	X	
Etheostoma nigrum #	johnny darter		X	X		
Etheostoma spectabile	orangethroat darter	X		X		
Percina caprodes	logperch		X	X		
Percina maculata	blackside darter			X		
Percina phoxocephala	slenderhead darter	X	X			
Percina shumardi	river darter	X				
Stizostedion canadense	sauger			X		
Stizostedion vitreum	walleye			X		
SCIAENIDAE						
Aplodinotus grunniens #	freshwater drum			X		

[1] Data from the Illinois Natural History Survey Fish Collection.
[2] Bold type indicates an Illinois endangered (SE) or Illinois threatened (ST) species.
[3] * = non-native species; # = common species.
[4] Total number of species = 117 (111 native, 6 introduced).

Table 18. Freshwater mussels recorded from the Kaskaskia River Assessment Area[1].

ORDER Subfamily *Scientific Name*[2,3,4]	Common Name	Headwaters/ Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
MARGARITIFERIDAE					
Cumberlandinae					
***Cumberlandia monodonta*-SE**	**spectaclecase**			**X**	
UNIONIDAE					
Anodontinae					
Alasmidonta marginata	elktoe		X	X	
***Alasmidonta viridis* - SE**	**slippershell mussel**	**X**	**X**		
Anodonta suborbiculata	flat floater				X
Anodontoides ferussacianus	cylindrical papershell	X	X		X
Arcidens confragosus	rock-pocketbook			X	
Lasmigona complanata	white heelsplitter	X	X	X	X
Lasmigona costata	flutedshell		X	X	

Table 18. Continued.

ORDER Subfamily *Scientific Name*[2,3,4]	Common Name	Headwaters/ Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
Pyganodon grandis	giant floater	X	X	X	X
Strophitus undulatus	squawfoot		X	X	X
Utterbackia imbecillis	paper pondshell		X	X	X
Ambleminae					
Amblema plicata #	threeridge		X	X	
***Elliptio dilatata* - ST**	**spike**		**X**	**X**	
***Fusconaia ebena* - ST**	**ebonyshell**			**X**	
Fusconaia flava #	Wabash pigtoe		X	X	
Megalonaias nervosa	washboard			X	
***Plethobasus cyphyus* - SE**	**sheepnose**			**X**	
Pleurobema sintoxia	round pigtoe		X	X	
Quadrula metanevra	monkeyface			X	
Quadrula nodulata	wartyback			X	
Quadrula pustulosa #	pimpleback		X	X	
Quadrula quadrula	mapleleaf		X	X	
Tritogonia verrucosa	pistolgrip		X	X	
Uniomerus tetralasmus	pondhorn	X	X		X
Lampsilinae					
Actinonaias ligamentina	mucket		X	X	
***Ellipsaria lineolata* - ST**	**butterfly**			**X**	
***Epioblasma triquetra* - SE**	**snuffbox**		**X**	**X**	
Lampsilis cardium #	plain pocketbook		X	X	
Lampsilis siliquoidea	fatmucket		X	X	X
Lampsilis teres	yellow sandshell		X	X	
Leptodea fragilis #	fragile papershell		X	X	
***Leptodea leptodon* - EXT**	**scaleshell**			**X**	
Ligumia recta	black sandshell			X	
Ligumia subrostrata	pondmussel	X	X		
Obliquaria reflexa	threehorn wartyback			X	
Potamilus alatus	pink heelsplitter		X	X	
Potamilus ohiensis	pink papershell		X	X	
Toxolasma parvus	lilliput	X	X	X	X
Truncilla donaciformis	fawnsfoot			X	
Truncilla truncata	deertoe			X	
***Villosa lienosa* - SE**	**little spectaclecase**		**X**	**X**	
CORBICULIDAE					
Corbicula fluminea *	Asian clam	X	X	X	X

[1] Data from the Illinois Natural History Survey Mollusk Collection.
[2] Bold type indicates an Illinois endangered (SE), Illinois threatened (ST) or Illinois extirpated (EXT) species.
[3] * = non-native species; # = common species.
[4] Total number of species = 42 (41 native, 1 introduced).

Table 19. Freshwater mussels recorded from the Kaskaskia River Assessment Area, by habitat.[1]

FAMILY Subfamily *Scientific Name* [2,3,4]	Common Name	Streams Riffles	Runs	Pools	Standing Water Littoral Zone
MARGARITIFERIDAE					
Cumberlandinae					
***Cumberlandia monodonta*-SE**	**spectaclecase**		**X**	**X**	
UNIONIDAE					
Anodontinae					
Alasmidonta marginata	elktoe	X	X		
***Alasmidonta viridis* - SE**	**slippershell mussel**	**X**	**X**		
Anodonta suborbiculata	flat floater			X	X
Anodontoides ferussacianus	cylindrical papershell		X	X	X
Arcidens confragosus	rock-pocketbook		X	X	
Lasmigona complanata	white heelsplitter		X	X	X
Lasmigona costata	flutedshell	X	X		
Pyganodon grandis	giant floater		X	X	X
Strophitus undulatus	squawfoot		X	X	X
Utterbackia imbecillis	paper pondshell		X	X	X
Ambleminae					
Amblema plicata #	threeridge	X	X	X	
***Elliptio dilatata* - ST**	**spike**	**X**	**X**		
***Fusconaia ebena* - ST**	**ebonyshell**	**X**	**X**		
Fusconaia flava #	Wabash pigtoe	X	X		
Megalonaias nervosa	washboard	X	X	X	
***Plethobasus cyphyus* - SE**	**sheepnose**	**X**	**X**		
Pleurobema sintoxia	round pigtoe	X	X		
Quadrula metanevra	monkeyface	X	X		
Quadrula nodulata	wartyback	X	X		
Quadrula pustulosa #	pimpleback	X	X		
Quadrula quadrula	mapleleaf	X	X	X	
Tritogonia verrucosa	pistolgrip	X	X		
Uniomerus tetralasmus	pondhorn		X	X	X
Lampsilinae					
Actinonaias ligamentina	mucket	X	X		
***Ellipsaria lineolata* - ST**	**butterfly**		**X**	**X**	
***Epioblasma triquetra* - SE**	**snuffbox**	**X**	**X**		
Lampsilis cardium #	plain pocketbook	X	X	X	
Lampsilis siliquoidea	fatmucket	X	X	X	X
Lampsilis teres	yellow sandshell	X	X		
Leptodea fragilis #	fragile papershell	X	X	X	
***Leptodea leptodon* - EXT**	**scaleshell**	**X**	**X**	**X**	
Ligumia recta	black sandshell	X	X		
Ligumia subrostrata	pondmussel	X	X	X	X
Obliquaria reflexa	threehorn wartyback	X	X	X	
Potamilus alatus	pink heelsplitter	X	X	X	

Table 19. Continued.

FAMILY Subfamily *Scientific Name* [2,3,4]	Common Name	Streams Riffles	Runs	Pools	Standing Water Littoral Zone
Potamilus ohiensis	pink papershell	X	X	X	
Toxolasma parvus	lilliput	X	X	X	X
Truncilla donaciformis	fawnsfoot	X	X		
Truncilla truncata	deertoe	X	X		
***Villosa lienosa* - SE**	**little spectaclecase**	**X**	**X**		
CORBICULIDAE					
Corbicula fluminea *	Asian clam	X	X	X	X

[1] Data from the Illinois Natural History Survey Mollusk Collection.
[2] Bold type indicates an Illinois endangered (SE), Illinois threatened (ST) or Illinois extirpated (EXT) species.
[3] * = non-native species; # = common species.
[4] Total number of species = 42 (41 native, 1 introduced).

Table 20. Freshwater crustaceans recorded from the Kaskaskia River Assessment Area .[1]

ORDER Family *Scientific Name*[2, 3, 4]	Caves & Springs	Headwaters	Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
ARGULOIDA (Fish lice)						
Argulidae						
Argulus sp.			X	X		X
ISOPODA (Isopods)						
Asellidae						
Caecidotea beattyi	X					
Caecidotea brevicauda		X	X			
Caecidotea forbesi						X
Caecidotea intermedia #		X	X	X	X	X
Caecidotea kendeighi	X					
Caecidotea packardi	X					
Lirceus sp.		X	X			
AMPHIPODA (Amphipods)						
Crangonyctidae						
Bactrurus brachycaudus		X				
Bactrurus mucronatus	X					
Crangonyx forbesi	X					
Crangonyx gracilis						X
Crangonyx minor	X					
Crangonyx pseudogracilis						X
Gammaridae						
***Gammarus acherondytes* - SE, FE**	**X**					
Gammarus minus	X					

Table 20. Continued.

ORDER Family *Scientific Name*[2,3,4]	Common Name	Caves & Springs	Headwaters	Creeks	Small Rivers	Med. & Lg. Rivers	Standing Water
Gammarus pseudolimnaeus		X	X				
Gammarus troglophilus			X				
Hyalellidae							
Hyalella azteca #			X	X	X	X	X
DECAPODA (Crayfishes & shrimps)							
Palaemonidae							
Palaemonetes kadiakensis	Mississippi grass shrimp			X	X	X	X
Cambaridae							
Procambarus acutus	White River crawfish			X	X	X	X
Procambarus gracilis	prairie crayfish			burrower			
Orconectes immunis	calico crayfish	X	X	X	X		X
Orconectes propinquus	clearwater crayfish			X	X	X	
Orconectes virilis #	virile crayfish	X	X	X		X	
Fallicambarus fodiens	burrowing crayfish			burrower			
Cambarus diogenes	devil crawfish			burrower			

[1] Data from the Illinois Natural History Survey Crustacean Collection.
[2] Bold type indicates an Illinois endangered (SE) and/or Federally endangered (FE) species.
[3] # = common species.
[4] Total number of species = 27.

Table 21. Freshwater crustaceans recorded from the Kaskaskia River Assessment Area, by habitat[1].

ORDER Family *Scientific Name*[2,3]	Caves & Springs	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
ARGULOIDA (Fish lice)						
Argulidae						
Argulus sp.			X	X		X
ISOPODA (Isopods)						
Asellidae						
Caecidotea beattyi	X					
Caecidotea brevicauda	X	X				
Caecidotea forbesi					X	
Caecidotea intermedia #	X	X		X		
Caecidotea kendeighi	X					
Caecidotea packardi	X					
Lirceus sp.		X	X			
AMPHIPODA (Amphipods)						
Crangonyctidae						
Bactrurus brachycaudus	X					

Table 21. Continued.

ORDER Family *Scientific Name*[2,3]	Common Name	Caves & Springs	Streams Riffles	Runs	Pools	Standing Water Littoral	Open Water
Bactrurus mucronatus		X					
Crangonyx forbesi		X					
Crangonyx gracilis					X	X	
Crangonyx minor		X					
Crangonyx pseudogracilis					X		
Gammaridae							
***Gammarus acherondytes* - SE, FE**		**X**					
Gammarus minus		X					
Gammarus pseudolimnaeus		X	X				
Gammarus troglophilus		X					
Hyalellidae							
Hyalella azteca #			X	X	X	X	
DECAPODA (Crayfishes & shrimps)							
Palaemonidae							
Palaemonetes kadiakensis	Mississippi grass shrimp				X	X	
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 virilis #	virile crayfish		X	X		X	
Fallicambarus fodiens	burrowing crayfish				burrower		
Cambarus diogenes	devil crawfish			burrower			

[1] Data from the Illinois Natural History Survey Crustacean Collection.
[2] Bold type indicates an Illinois endangered (SE) and/or Federally endangered (FE) species.
[3] # = common species.
[4] Total number of species = 27.

Table 22. Aquatic macroinvertebrates, exclusive of the Crustacea and unionid Mollusca, recorded for the Kaskaskia River Assessment Area.[1,2]

Phylum CNIDARIA - Coelenterates
Class HYDROZOA - Hydrozoans
Anthomedusae
Hydridae
Hydra sp.

Phylum NEMATODA - Nematode Worms
(species indeterminate)

Phylum NEMATOMORPHA - Horsehair Worms
Parachordodidae
Gordius sp.

Phylum BRYOZOA - Moss Animacules
Phylactolaemata
Plumatellidae
(species indeterminate)

Phylum TURBELLARIA - Flatworms
Tricladida
Planariidae
Dugesia dorotocephala
Phagocata gracilis
Phagocata velata

Table 22. Continued.

Phylum ANNELIDA - Segmented Worms
Class APHANONEURA - Suction-Feeding Worms
Aeolosomatida
Aeolosomatidae
Aeolosoma sp.
Class BRANCHIOBDELLAE - Crayfish Worms
Branchiobdellida
Cambarincolidae
(species indeterminate)
Class OLIGOCHAETA - Oligochaete Worms
Lumbricidae
(species indeterminate)
Haplotaxida
Haplotaxidae
Haplotaxis gordioides
Lumbriculida
Lumbriculidae
(species indeterminate)
Tubificida
Enchytraeidae
(species indeterminate)
Naididae
***Allonais paraguayensis* - R**
***Bratislavia unidentata* - R**
Chaetogaster diaphanus
Chaetogaster diastrophus
Chaetogaster limnaei
Dero digitata
Dero nivea
Nais bretscheri
Nais communis
Nais elinguis
Nais pardalis
Nais simplex
Nais variabilis
Ophidonais serpentina
Paranais frici
Pristina aequiseta
Pristina leidyi
Pristinella jenkinae
Slavina appendiculata
Stylaria lacustris
Tubificidae
Aulodrilus pigueti
Branchiura sowerbyi
Ilyodrilus templetoni
Limnodrilus cervix
Limnodrilus claparedeianus
Limnodrilus hoffmeisteri
Limnodrilus udekemianus
Quistadrilus multisetosus
Spirosperma ferox
Tasserkidrilus americanus
***Varichaetadrilus angustipenis* - R**
Lumbricidae
Eisenia foetida
Class HIRUDINEA - Leeches
Rhynchobdellida
Glossiphoniidae
Helobdella stagnalis
Helobdella triserialis
Placobdella multilineata
Placobdella ornata
Placobdella parasitica
Gnathobdellida
Hirudinidae
Haemopis terrestris
Pharyngobdellida
Erpobdellidae
Erpobdella punctata
Piscicolaria reducta

Phylum ARTHROPODA - Arthropods
Class CRUSTACEA
Amphipoda
Crangonyctidae
Crangonyx forbesi
Gammaridae
***Gammarus acherondytes* - FE, SE**
Gammarus minus
Gammarus pseudolimnaeus
Gammarus troglophilus
Hyalellidae
Hyalella azteca
Isopoda
Asellidae
Caecidotea brevicauda
Caecidotea intermedia
Caecidotea packardi
Ostracoda
Candonidae
Candona caudata
Cyprididae

Table 22. Continued.

Cypria ophthalmica
Physocypria pustulosa
Ilyocyprididae
Ilyocypris gibba
Class ARACHNIDA
Hydrachnida - Aquatic Mites
(species indeterminate)
Class INSECTA - Insects
Ephemeroptera - Mayflies
Baetidae
Baetis sp.
Caenidae
Caenis sp.
Ephemeridae
Hexagenia atrocaudata
Hexagenia bilineata
Hexagenia limbata
Hexagenia rigida
Pentagenia vitigera
Heptageniidae
Leucrocuta maculipennis
Stenacron interpunctatum
Stenonema sp.
Leptophlebiidae
Leptophlebia sp.
Leptophyidae
Trichorithodes atratus
Trichorithodes peridius
Trichorithodes stygiatus
Polymitarcidae
Ephoron album
Ephoron leukon
Potamanthidae
Anthopotamus verticis
Odonata - Damselflies and Dragonflies
Zygoptera - Damselflies
Calopterygidae
Calopteryx maculata
Hetaerina americana
Hetaerina titia
Coenagrionidae
Amphiagrion mesonum
Anomalagrion hastatum
Argia apicalis
Argia fumipennis violacea
Argia moesta
Argia tibialis
Enallagma antennatum
Enallagma aspersum
Enallagma basidens
Enallagma civile
Enallagma exsulans
Enallagma geminatum
Enallagma signatum
Enallagma traviatum
Ischnura posita
Ischnura verticalis
Lestidae
Archilestes grandis
Lestes disjunctus
Lestes dryas
Lestes forcipatus
Lestes rectangularis
Lestes unguiculatus
Anisoptera - Dragonflies
Aeshnidae
Aeshna constricta
Aeshna umbrosa
Anax junius
Anax longipes
Boyeria vinosa
Epiaeschna heros
Nasiaeschna pentacantha
Corduliidae
Epitheca princeps
Somatochlora sp.
Gomphidae
Gomphus exilis
Gomphus externus
Gomphus fraternus
Gomphus graslinellus
Gomphus lentulus
Gomphus vastus
Hagenius brevistylus
Ophiogomphus repinsulensis
Progomphus obscurus
Libellulidae
Celithemis elisa
Celithemis eponina
Erythemis simplicicollis
Erythrodiplax connata minuscula
Libellula cyanea
Libellula luctuosa
Libellula lydia
Libellula pulchella
Libellula semifasciata

Table 22. Continued.

Pachydiplax longipennis
Pantala flavescens
Pantala hymenaea
Perithemis tenera
Sympetrum ambiguum
Sympetrum internum
Sympetrum obtrusum
Sympetrum rubicundulum
Sympetrum semicinctum
Sympetrum vicinum
Tramea carolina
Tramea lacerata
Tramea onusta
Macromyiidae
Didymops transversa
Macromia georgina
Plecoptera - Stoneflies
Capniidae
Allocapnia granulata
Allocapnia vivipara
Perlidae
Acroneuria evoluta
Acroneuria abnormis
Acroneuria internata
Agnetina flavescens
Perlesta placida
Perlinella drymo
Taeniopterygidae
Strophopteryx fasciata
Taeniopteryx burksi
Taeniopteryx nivalis
Heteroptera - True Bugs
Belostomatidae - Giant Water Bugs
Belostoma flumineum
Belostoma lutarium
Benacus griseus
Lethocerus americanus
Lethocerus uhleri
Corixidae - Water Boatmen
Corisella edulis
Hesperocorixa nitida
Hesperocorixa obliqua
Hesperocorixa vulgaris
Palmocorixa buenoi
Ramphocorixa acuminata
Sigara alternata
Sigara grossolineata
Sigara hubbelli
Sigara modesta
Trichocorixa calva
Trichocorixa kanza
Trichocorixa naias
Gelastocoridae - Toad Bugs
Gelastocorus oculatus oculatus
Gerridae - Pond Skaters
Aquarius nebularis
Aquarius remigis
Gerris argenticollis
Gerris buenoi
Gerris insperatus
Gerris marginatus
Limnoporus canaliculatus
Metrobates hesperius
Neogerris hesione
Rheumatobates palosi
Trepobates inermis
Trepobates knighti
Trepobates pictus
Trepobates subnitidus
Hebridae - Velvet Water Bugs
Merragata hebroides
Hydrometridae - Water Measurers
Hydrometra martini
Mesoveliidae - Water Treaders
Mesovelia mulsanti
Naucoridae - Creeping Water Bugs
Pelocoris femoratus
Nepidae - Water Scorpions
Ranatra australis
Ranatra buenoi
Ranatra fusca
Ranatra kirkaldyi
Ranatra nigra
Notonectidae - Backswimmers
Buenoa margaritacea
Buenoa scimitra
Notonecta indica
Notonecta irrorata
Notonecta raleighi
Notonecta undulata
Pleidae - Pygmy Backswimmers
Neoplea striola
Veliidae - Little Water Striders
Microvelia americana
Microvelia pulchella
Rhagovelia oriander

Table 22. Continued.

Coleoptera - Beetles
- Dryopidae
  - *Helicus fastigiatus*
  - *Helicus lithophilus*
  - *Helicus* sp.
- Dytiscidae
  - *Acilius semisulcatus*
  - *Copelatus chevrolati*
  - *Coptotomus interrogutus*
  - *Coptotomus loticus*
  - *Coptotomus venustus*
  - *Cybister fimbriolatus*
  - *Desmopachria convexa*
  - *Dytiscus fasciventris*
  - *Graphoderes librus*
  - *Hydroporus consimilus*
  - *Hydroporus sericus*
  - *Hydroporus* sp.
  - *Hygrotus laccophilinus*
  - *Hygrotus nubilus*
  - *Laccophilus fasciatus*
  - *Laccophilus maculosus*
  - *Laccophilus proximus*
  - *Matus ovatus*
  - *Thermonectes basilaris*
  - *Thermonectes ornaticollis*
  - *Uvarus lacustris*
- Elmidae
  - *Ancyronix variegatus*
  - *Dubiraphia quadrinotata*
  - *Dubiraphia vittata*
  - *Macronychus glabratus*
  - *Stenelmis sexlineata*
  - *Stenelmis vittipennis*
- Gyrinidae - Whirlygig Beetles
  - *Dineutes horni*
- Haliplidae
  - *Haliplus borealis*
  - *Haliplus triopsis*
  - *Peltodytes duodecimpunctatus*
  - *Peltodytes edentulus*
  - *Peltodytes lengi*
  - *Peltodytes litoralis*
  - *Peltodytes muticus*
  - *Peltodytes pedunculatus*
  - *Peltodytes sexmaculatus*
- Hydrophilidae - Water Scavenger Beetles
  - *Berosus aculeatus*
  - *Berosus infuscatus*
  - *Berosus pantherinus*
  - *Berosus peregrinus*
  - *Berosus striatus*
  - *Cymbiodyta acuminata*
  - *Cymbiodyta fimbriata*
  - *Dibolocelus ovatus*
  - *Enochrus diffusus*
  - *Enochrus ochraceus*
  - *Enochrus pygmaeus*
  - *Enochrus sayi*
  - *Hydrobius fuscipes*
  - *Hydrochara obtusata*
  - *Hydrochus rufipes*
  - *Hydrochus neosquamifer*
  - *Hydrochus squamifer*
  - *Hydrophilus triangularis*
  - *Laccobius agilis*
  - *Paracymus confusus*
  - *Paracymus subcupreus*
  - *Tropisternus blatchleyi modestus*
  - *Tropisternus lateralis nimbatus*
  - *Tropisternus mexicanus striolatus*
  - *Tropisternus mixtus*
  - *Tropisternus natator*
- Noteridae
  - *Hydrocanthus iricolor*

Megaloptera - Fishflies, Dobsonflies
- Corydalidae
  - *Corydalus cornutus*
- Sialidae
  - *Sialis velata*

Trichoptera - Caddisflies
- Helicopsychidae
  - *Helicopsyche borealis*
- Hydropsychidae
  - *Ceratopsyche bronta*
  - *Cheumatopsyche pettiti*
  - *Cheumatopsyche speciosa*
  - *Diplectrona modesta*
  - *Hydropsyche betteni*
  - *Hydropsyche cuanis*
  - *Hydropsyche hageni*
  - *Hydropsyche phalerata*
  - *Hydropsyche simulans*
  - *Macrostemum zebratum*
  - *Potamyia flava*
- Hydroptilidae

Table 22. Continued.

Hydroptila albicornis
Hydroptila angusta
Hydroptila armata
Hydroptila hamata
Hydroptila cf. *scolops*
Hydroptila cf. *scolops*
Hydroptila waubesiana
Ithytrichia mazon
Mayatrichia ayama
Neotrichia okopa
Ochrotrichia shawnee
Ochrotrichia tarsalis
Orthotrichia americana
Oxyethira pallida
Leptoceridae
Athripsodes cf. *transversus*
Ceraclea ancyla
Ceraclea cancellata
Ceraclea tarsipunctata
Ceraclea transversa
Nectopsyche candida
Nectopsyche albida
Nectopsyche candida
Nectopsyche equisita
Oecetis avara
Oecetis cinerascens
Oecetis inconspicua
Setodes oligius
Trianodes tardus
Limnephilidae
Platycentropus radiatus
Pycnopsyche subfaciata
Philopotamidae
Chimara feria
Chimara obscura
Phryganeidae
Philostomus semifasciata
Phryganea sayi
Polycentropodidae
Cyrnellus fraternus
Cyrnellus marginalis
Neureclipsis crepuscularis
Paranyctiophylax vestitus
Polycentropus cinereus
Polycentropus centralis
Rhyacophilidae
Rhyacophila fenestra
Rhyacophila lobifera

Diptera - Flies
Ceratopogonidae
Bezzia sp.
Palpomyia complex
Chaoboridae
Chaoborus punctipennis
Chironomidae - Midges
Ablabesmyia illinoensis
Chironomus decorus
Coelotanypus concinnus
Conchapelopia sp.
Cricotopus bicinctus
Dicrotendipes nervosus
Glyptotendipes paripes
Harnischia curtilamellatus
Orthocladius spp.
Phaenopsectra flavipes
Polypedilum halterale
Polypedilum scalaenum
Procladius bellus
Procladius sublettei
Psectrotanypus dyari
Stenochironomus hilaris
Tanypus neopunctipennis
Tanytarsus sp.
Tribelos jucundus
Culicidae - Mosquitos
Aedes fitchii
Aedes trivittatus
Aedes vexan
Anopheles punctipennis
Anopheles quadrimaculatus
Culex erraticus
Culex pipiens
Culex restuans
Culex salinarius
Culex tarsalis
Psorophora discolor
Urotaenia sapphirina
Psychodidae
Psychoda sp.
Simuliidae - Blackflies
Simulium cf. *tuberosum* complex
Simulium vittatum complex
Stratiomyidae
(species indeterminate)
Tabanidae - Horseflies and Deerflies
Chrysops brunneus

Table 22. Continued.

Chrysops callidus
Chrysops cincticornis
Chrysops macquarti
Chrysops niger
Chrysops pikei
Chrysops univittatus
Chrysops vittatus
Tabanus atratus
Tabanus lineola
Tabanus quinquevittatus
Tabanus similis
Tipulidae - Craneflies
Tipula spp.

Phylum MOLLUSCA - Mollusks (exclusive of Unionidae)
Gastropoda - Snails
Ancylidae
Ferrissia sp.
Limnaeidae
Limnaea sp.
Physidae
Physa sp.
Physella sp.
Pelecypoda - Bivalve Mollusks
Corbiculidae
Corbicula fluminea
Sphaeriidae
Pisidium sp.
(species indeterminate)

[1] This list was compiled by M.J. Wetzel, D.W. Webb, and S.J. Taylor, Illinois Natural History Survey Center for Biodiversity.
[2] Bold type indicates a federally endangered (FE) and/or Illinois endangered (SE) species or species considered rare (R) in Illinois and throughout their known North American distribution.

Threatened and Endangered Species

Fishes

State endangered fishes known from the Kaskaskia River Assessment Area are the bigeye chub, last observed in 1899, the pallid shiner, last observed in 1899, bigeye shiner, last observed in 1965, and the western sand darter, observed in 1997. The river redhorse, last observed in 1901, is a state threatened fish.

It is doubtful that the bigeye chub, pallid shiner, and river redhorse still occur in the Kaskaskia River system; none has been observed since 1901. The bigeye shiner may also be gone since it has not been seen since 1965.

In the late 1800s, the pallid shiner was statewide in distribution, although populations were highly localized in small to large rivers. The pallid shiner was found at two localities in the Kaskaskia River in 1899 but has not been found in the drainage since and appears to be extirpated. Elsewhere in Illinois, the pallid shiner survives only in the upper Mississippi River and the Kankakee River. The species requires clean water over rocky substrates and often is associated with aquatic vegetation.

The bigeye chub was common in eastern Illinois, including the upper Kaskaskia drainage in Moultrie and Shelby counties in the late 1800s, but now is known in Illinois only from the Little Vermilion River below Georgetown. The bigeye chub requires beds of vegetation on gravel in clean, clear rivers.

Although once more widespread and known from several counties in the Kaskaskia River drainage, the bigeye shiner now is restricted in Illinois to isolated populations in the eastern and southern parts of the state. Like the bigeye chub, it requires expanses of gravel in clean, clear rivers.

The river redhorse lives in medium to large rivers with substrates of gravel, cobble or bedrock. In Illinois, the river redhorse is found in only a few large streams, including the Kankakee, Fox, and Vermilion rivers. The only stream in which it is common is the Kankakee River.

The western sand darter, once common and widespread in the Kaskaskia River, is now much more reduced in its distribution. It is known to occur only in a small segment of the river in Shelby and Fayette counties. The western sand darter is fairly common in clean sandy runs in portions of the upper Mississippi River from Carroll County to Rock Island County. Elsewhere in Illinois, the species survives only in the isolated stretch of the Kaskaskia River and possibly in Sugar River in Winnebago County.

Mussels

Three state threatened mussels (spike, ebonyshell, butterfly) and five state endangered mussels (spectaclecase, slippershell mussel, sheepnose, snuffbox, little spectaclecase) have historically been reported from this Assessment Area. Another species, the scaleshell, has been extirpated from Illinois (Cummings and Mayer 1997).

A summary of the past occurrence of each threatened or endangered mussel in the area is given below. Data used in these summaries have been taken from Cummings and Mayer (1997) and the INHS Mollusk Collection database.

Spike: The spike was relatively common in the Kaskaskia River drainage until the 1950s. Historical records are available from Clinton, Coles, Moultrie, Shelby, St. Clair, and Washington counties. It was found at five sites in the middle of the basin in the 1950s, three of which are now under Lake Shelbyville. It was last collected alive in 1979 in the Kaskaskia River at Carlyle in Clinton County.

Ebonyshell: Only two historical records are known for this mussel, both in the Kaskaskia River. It was found at Evansville in Randolph County in 1956 and New Athens, in St. Clair County in 1931. It is most likely extirpated from the basin.

Butterfly: There are two historical records for the butterfly in the Kaskaskia River drainage. Both records are over 50 years old and like the preceding species, the butterfly is most likely extirpated from the basin.

Spectaclecase: A single record for the spectaclecase from the Kaskaskia River (no locality or date given) is in the collection of the Field Museum of Natural History (#67949). This

species was not collected in the 1956 or 1978-79 surveys of the river and it is presumed extirpated from the Kaskaskia River drainage.

Slippershell mussel: The only record for the slippershell in the Kaskaskia River drainage is from the Kaskaskia River near Findlay, Shelby County collected in 1953 (Field Museum of Natural History #54797). This species was not collected in the 1956 or 1978-79 surveys of the river and it is presumed extirpated from the Kaskaskia River proper. Additional collections are needed in the headwater streams of the drainage where the slippershell may still occur.

Sheepnose: Historical records of the sheepnose in the Assessment Area include the Kaskaskia River near Keyesport, Clinton County (1929), Holliday (1954) and Ramsey (1956), both in Fayette County, and Shelbyville, Shelby County (1970). This species was not found in the 1956 or 1978-79 surveys of the river. An effort to find this mussel near Shelbyville in 1991 was unsuccessful. The sheepnose may be extirpated from the drainage.

Snuffbox: Matteson collected 14 snuffboxes from the Kaskaskia River near Sullivan, Moultrie County in 1956. This section of the river is now part of Lake Shelbyville, and this species is presumed to have been eliminated from the drainage by the construction of the reservoir.

Little spectaclecase: The only record of this species in the drainage is one subfossil shell collected near Atwood, Douglas County in 1989.

Scaleshell: Two records for the scaleshell are available: one from the Kaskaskia River near Covington, Washington County (pre-1921), and the other without date or locality data. This species was not collected in the 1956 or 1978-79 surveys of the river and it is presumed extirpated from the drainage and the state.

Crusteceans/Aquatic Macroinvertebrates

The amphipod *Gammarus acherondytes*, found only in Illinois, is listed as a state endangered and federally endangered species. *Gammarus acherondytes* is a troglobyte found in the Kaskaskia River drainage in Monroe County in Illinois Caverns, Krueger Dry Run Cave, and Fogelpole Cave.

Unique Habitats

The Kaskaskia River Assessment Area overlaps the southeastern part of the Sinkhole Plain of the Ozark Plateau of Illinois (Krohe 1999). Numerous springs occur in this area, particularly in St. Clair and Monroe counties. The biological diversity, water quality, and hydrogeology of springs in the KRAA are summarized in Webb et al. (1996) and Webb et al. (1998b). Additional information about the Sinkhole Plain can be found in the Critical Trends Assessment Project's Sinkhole Plain Assessment Area (Illinois Department of Natural Resources 1998).

Numerous caves are also found within the typology of the Assessment Area, including three of Illinois' largest caves - Illinois Caverns, Fogelpole Cave, and Krueger-Dry Run Cave. These three caves are important biologically because they support populations of the Illinois Cave Amphipod, *Gammarus acherondytes*, recently placed on the federal endangered species list (Webb 1993, 1995; Webb et al. 1998a). Bretz and Harris (1961), Peck and Lewis (1978), and Webb et al. (1993) summarize the geological, biological, and water quality of caves in Illinois, several of which occur within the KRAA.

Each of the springs and caves in the KRAA supports a moderate diversity of aquatic macroinvertebrates, including species of annelid worms, crustaceans, and insects not commonly collected from other areas in Illinois.

Non-native Species

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). It remains common in most areas of Illinois, including the Kaskaskia River Assessment Area.

In addition to common carp, grass carp, bighead carp, and silver carp are each establihsed in the Kaskakia River below Carlyle; each having been collected within the last three years. Silver carp now appears to be abundant in the navigation channel portion of the river.

The white catfish was introduced into Illinois rivers, including the Kaskaskia River, from Atlantic slope drainages in the 1950s or 1960s. However, the species has not been found in Illinois in recent decades and is presumed to no longer occur here.

The Asian clam is widespread (Champaign, Clinton, Douglas, Fayette, Madison, Montgomery, Moultrie, Piatt, and Shelby counties) but relatively uncommon in the Assessment Area. Effects of the Asian clam on native species and communities are difficult to measure, but some studies have suggested that the Asian clam may compete with native mussels for food. Although not documented in our collection, the zebra mussel may inhabit the lowest reaches of the mainstem Kaskaskia River near the confluence with the Mississippi River.

Of the aquatic macroinvertebrate taxa known or thought likely to occur in the Kaskaskia River 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 United States from a lake in Ohio in 1932, most likely 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 Kaskaskia River Assessment Area has been well studied with respect to fishes, mussels, and crayfishes. However, additional survey work in the smaller tributaries would better define the limits of some of the species, and possibly uncover additional populations of state endangered and other rare species.

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. Mark-recapture studies also are badly needed to understand normal movements of fishes and other aquatic organisms and, hence, to provide baseline data for interpreting the impacts of environmental alterations and management strategies.

Although there have been some historical as well as recent faunal studies conducted on the aquatic macroinvertebrates occurring in Illinois [e.g., Coleoptera (beetles) (Wooldridge 1967), Ephemeroptera (mayflies) (Burks 1953), Plecoptera (stoneflies) (Frison 1935), Trichoptera (caddisflies) (Ross 1944), Hemiptera (true bugs) (Lauck 1959, Taylor 1996), Diptera (flies) (Malloch 1915 a, b; Ross 1947; Ross and Horsfall 1965; Pechuman et al. 1983), and Annelida (segmented worms) (Wetzel 1992)], and several recent studies focusing on the fauna associated with springs and springbrooks in several counties within the Kaskaskia River basin (Webb et al. 1996, Webb et al. 1998b), the major groups of aquatic macroinvertebrates known to occur in the KRAA have not been as well studied as fishes, mussels, and crustaceans.

There are extensive historical and recent collections of aquatic macroinvertebrates in the permanent INHS Collections; much of this information, however, is not easily retrievable because either specimens have not yet been identified or the identified material has not yet been incorporated into a searchable database. Once specimens have been identified and incorporated into a database, comparisons between historical material and that obtained more recently could be made to evaluate changes in distribution and abundance. Moreover, long-term monitoring of selected groups of aquatic macroinvertebrates in

habitats throughout the state - particularly in headwater streams and, to a lesser extent, in small ponds, lakes, and wetland areas - would provide needed information on population trends and habitat associations.

Water Quality

The Illinois Water Quality Report (Illinois Environmental Protection Agency 1996) rated the Kaskaskia River upstream from Lake Shelbyville as "Full Support" (water quality meets the needs of all designated uses protected by applicable water quality standards). However, a 17.6 mile reach downstream from a chemical factory (River Mile 264) was impacted by organic contaminants and rated as "Partial Support/Minor Impairment" (water quality has been impaired, but only to a minor degree). The Kaskaskia River between Lake Shelbyville and Carlyle Lake was "Full Support" except for the lower 12.7 miles that were classified as "Partial Support/Minor Impairment." A 27.2 mile reach downstream from Carlyle Lake was rated as "Full Support" and the remainder of the river downstream to its mouth was rated "Partial Support/Minor Impairment" due to nutrients, siltation, and channelization. Numerous contaminants were detected in sediment and fish flesh from the mainstem.

Tributaries to the Kaskaskia rated as "Full Support" include Opossum Creek, Becks Creek, Mitchell Creek, Hurricane Creek, most of West Okaw River, the lower half of Ramsey Creek, 78% of Shoal Creek, and upper Silver Creek. Tributaries rated as "Partial Support/ Minor Impairment" include the upper half of Ramsey Creek, Flat Creek, parts of North Fork and East Fork, Sewer Creek, Grand Point Creek, 22% of Shoal Creek, lower Sugar Creek, lower Silver Creek, and stretches of Richland Creek. A few streams in the basin were rated as "Non-Support" (water quality has been severely impaired and is not capable of supporting the designated use to any degree) due to impacts from livestock wastes: Cattle Creek and Chicken Creek (direct tributaries to Shoal Creek) and the uppermost 8.6 miles of Lake Branch and a tributary to Lake Branch (tributaries to Sugar Creek). The rest of the streams in the basin 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.

The Biological Stream Characterization (Bertrand et al., 1996) rated Ramsey Creek from its mouth up to Caesar Creek and West Okaw River from its mouth up to Stringtown Branch as "Class A" streams (Unique Aquatic Resource). The Kaskaskia River upstream of Twomile Slough in Champaign County was rated as a "Class B" stream (Highly Valued Aquatic Resource). The remaining section of the river (from its mouth to Twomile Slough) is rated a "Class C" (Moderate Aquatic Resource) stream.

Tributaries in the basin that received a "Class B" rating include: Asa Creek, Beck Creek, Big Creek, East Fork Shoal Creek, Jonathon Branch, Jonathon Creek, Jordan Creek, Mitchell Creek, Nine Mile Creek, Richland Creek-North, Robinson Creek, Stringtown Branch, Twomile Slough, Whitley Creek, Lake Fork from its mouth to tributary at T16N,

R6E, sec. 11SW, Shoal Creek from Beaver Creek up to East Fork, and West Okaw River upstream of Stringtown Branch.

Tributaries in the basin that received a "Class C" rating include Ash Creek, Bolt Creek, Brush Creek, Camp Creek, Coal Creek, Copper Slough, Cress Creek, East Fork Silver Creek, Eklhorn Creek, Flat Branch, Grassy Branch, Hickory Creek, Hurricane Creek, Lake Fork Shoal Creek, Little Hickory Creek, Locust Fork, Marrowbone Creek, Mud Creek, Opossum Creek, Prairie DuLong Creek, South Fork Big Creek, Silver Creek, Suck Creek, Sugar Fork Silver Creek, West Fork Shoal Creek, Wendell Branch, Wolf Creek, Lake Fork upstream of tributary at T16N, R6E, sec. 11SW, Crooked Creek from mouth up to lost Creek and from Grand Point Creek up to road in T1N, R1E, sec. 3, E, East Fork Kaskaskia River from Jims Creek up to Lone Grove Creek, Lost Creek upstream of Prairie Creek, Middle Fork Shoal Creek from its mouth to Glenn Shoals Dam, North Fork Kaskaskia River upstream of tributary in T4N, R1E, sec. 13NW, Ramsey Creek upstream of Caesar Creek, Richland Creek from its mouth up to Monroe County line and upstream of Ill. Rt. 159, and Shoal Creek from its mouth up to Beaver Creek, from East Fork up to Dorris Creek, and upstream of Bearcat Creek. The remaining tributaries were rated as "Class D" streams (Limited Aquatic Resource) or not rated.

Smith (1971) gave the Kaskaskia River a variable rating. The headwaters have been periodically dredged and the upper section receives agricultural and some industrial pollution. The middle section receives mine wastes and oil field pollution while the lower section has been channelized for barge traffic. He also noted that the creation of Lake Shelbyville destroyed most of the habitats upstream from Shelbyville.

Biologically Significant Streams

Illinois streams have also 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). Twenty-four stream segments in Illinois currently are considered to be in the "A" category, and 50 in the "B" category.

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.

Six areas in the Kaskaskia River Assessment Area were recognized as Biologically Significant Streams (Page et al. 1992) because of the presence of threatened and/or endangered species and high mussel and/or fish diversity. These streams provide the best opportunities in the basin for the protection of large numbers of native species.

Kaskaskia River, Ill. Rt. 16 to Howe Creek (Shelby County) - This reach of the Kaskaskia River is 25 to 70 feet wide, consists of many pools and a few runs, and has not been channelized. The substrate is mainly sand with some silt and cobble. The riparian vegetation consists of oak-hickory woods. The western sand darter and a high diversity of mussels are found in this stretch of the river. The area is reasonably remote and has a wide, undisturbed riparian zone of large trees. The potential for protection appears to be high.

Kaskaskia River from Champaign/Douglas county line to Ill. Rt. 36 (Douglas County) - The Kaskaskia River here is 20 to 60 feet in width with depths ranging to three feet. The water is fairly clear with a substrate of sand, gravel, and silt. Some mud flats are found. Little aquatic vascular vegetation is present. The narrow riparian zone consists of brushy vegetation or floodplain trees. Row crop agriculture or pasture surrounds the stream. A high diversity of mussels is present.

Kaskaskia River, from U.S. Rt. 50 to Shoal Creek (Clinton County) - This stretch of the Kaskaskia River forms part of the county line of Clinton and Washington counties. The river is fairly wide (up to 100 feet) with depths ranging to six feet. No aquatic vascular vegetation is present. The substrate consists of sand, gravel, cobble, and some silt. A high diversity of mussels is found here.

Tributary to Horse Creek, Mammoth Cave (Monroe County) - The scud, *Gammarus acherondytes*, is a troglobyte occupying a few small streams flowing through caves in Monroe and St. Clair counties. The tributary of Horse Creek in Mammoth Cave is a clear, gravel and bedrock-bottomed stream supporting several rare troglobytes, including the largest known population of *G. acherondytes*.

Ramsey Creek, mouth to Caesar Creek (Montgomery/Fayette County) - This stream was rated as a "Class A Stream" by Bertrand et al. (1996) in the Biological Stream Characterization Report. Ramsey Creek is unique in the KRAA as it possesses a bedrock-boulder substrate in its lower reaches. The fish comunity is extremely diverse here and cmprises several speceis indicative of clear water and silt-free bottoms (e.g. highfin carpsucker, orangethroat darter, slenderhead darter).

West Okaw River, mouth to Stringtown bridge (Moultrie/Piatt County) - This stream was rated as a "Class A Stream" by Bertrand et al. (1996) in the Biological Stream Characterization Report. It possesses a sand/gravel substrate, abundant instream cover in the form of submerged logs, and a diverse fish community featuring several indicators of clear, flowing water (e.g. hornyhead chub, slenderhead darter, steelcolor shiner).

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 and the tiling of fields as land is prepared for agriculture. 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 and channelization of steams 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.

Floodplains of large rivers normally have low areas that fill with water during floods and survive year-round as shallow lakes. These lakes provide primary habitat for a wide variety of plants and animals, and because they naturally have luxuriant plant growth, they are important feeding areas for waterfowl, and they provide spawning areas, nurseries for larvae, and overwintering refugia for fishes. Unfortunately, most of the bottomland lakes in Illinois have been drained to create cropland, and those that remain have become shallow and barren because of the tremendous silt loads deposited in them each year during periods of high water. The shallow muddy lakes no longer support the plant life that was fundamental to successful completion of the life cycles of many aquatic species.

The construction of levees along stream channels has severed the link between stream comunities and their floodplain, preventing the exchange of nutients, sediment transport, movement to spawning/nursery areas, and other critical funtions dependant upon this connection. In heavily leveed watersheds high flows and energy are funneled downsteam, worsening the severity of flood events in receiving waters such as the Mississippi River.

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. Nonpoint sources are now a larger problem than are point sources and include siltation and agricultural pesticides that reach streams following the removal of floodplain vegetation.

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 and widening of a stream to enhance drainage of the surrounding land. The straightening converts the diversity of habitats in a stream to a monotypic "raceway" that supports few species. Because of their sedentary nature mussels are particularly susceptible to the effects of channelization. Widespread channelization of headwater streams adds to the hydrologic instability of watershed, increasing the severity of drought and flood events.

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 building sewage treatment plants and avoiding the construction of mainstream impoundments when possible. Other initiatives, such as stopping the removal of riparian vegetation, cessation of stream channelization, and the drainage of bottomland lakes, require more public education and governmental action including, 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 fishing, water quality, or commercial fishing and usually governmental agencies have been responsible, directly or indirectly, for these 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.

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.

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

Herkert, J.R. 1994. Endangered and Threatened Species of Illinois: Status and Distribution, Volume 3 - 1994 Changes to the Illinois List of Endangered and Threatened Species. Illinois Endangered Species Protection Board, Springfield. 33 pp.

Illinois Department of Natural Resources. 1998. Biological and Conservation Database System (BCD), Division of Natural Heritage, Office of Resource Conservation, Illinois Department of Natural Resources.

Illinois Department of Natural Resources. 1999. Kaskaskia River Area Assessment, Volume 2: Water resources. Illinois Department of Natural Resources. Springfield, IL.

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

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

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. Illinois Geological Survey Report of Investigations 129.

Fehrenbacher, J.B., J.D. Alexander, I.J. Jansen, R.A. Pope, M.A. Flock, W.F. Andrews, L.J. Bushue, J.W. Scott, and E.E. Voss. 1982. General soil map of Illinois. Agricultural Experiment Station, College of Agriculture, University of Illinois at Urbana-Champaign in cooperation with the Soil Conservation Service, U.S. Department of Agriculture.

McFall, D. and J. Karnes (eds.). 1995. A directory of Illinois nature preserves, Volume 2. Illinois Department of Natural Resources, Springfield, IL. 327 pp.

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 Preserves system. Part 2. The natural divisions of Illinois. IL 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. 88 pp.

Taft, J.B. 1997a. Savannas and open woodlands. Chapter 2 (pages 24-54) *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.

Telford, C.J. 1926. Third report on a forest survey of Illinois. Illinois Natural History Survey Bulletin 16: 1-102.

Vestal, A.G. 1931. A preliminary vegetation map of Illinois. Illinois State Academy of Science Transactions 23: 204-217.

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.

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.

Admiraal, A.N., M.J. Morris, T.C. Brooks, J.W. Olson, and M.V. Miller. 1997. Illinois wetland restoration and creation guide. Illinois Natural History Survey Special Publication No. 19. Champaign. vi + 188 pages.

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 Highly Fragmented Landscapes. Chapman and Hall, New York.

Bell, D.T. 1974. Tree stratum composition and distribution in the streamside forest. American Midland Naturalist 92:35-46.

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.

Case, F.W., Jr. and R.B. Case. 1997. Trilliums. Timber Press, Portland, OR.

Curtis, J.T. 1959. The Vegetation of Wisconsin. University of Wisconsin Press, Madison, WI.

Englemann, H. 1863. Remarks upon the causes producing the different characters of vegetation known as prairies, flats, and barrens in southern Illinois, with special reference to observations made in Perry and Jackson counties. The American Journal of Science and Arts 108: 384-396.

Faulkner, J. and T. Esker. 1996. Proposal for the dedication of Ramsey Railroad Prairie in Fayette County as an Illinois Nature Preserve. Illinois Nature Preserves Commission meeting #153, Item 7.

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

Gardner, J.E. and J. Taft. 1984. A limited survey and assessment of the bat fauna occurring in twenty-six selected Illinois Department of Transportation study areas in eight Illinois counties. Submitted to IDOT, Springfield, Illinois. 205 pp.

Gehlhausen, S.M., M.W. Schwartz, C.K. Augspurger. in press. An analysis of vegetation and microclimatic edge effects in two mixed-mesophytic forest fragments. Plant Ecology.

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.

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

Herkert, J.R. 1994. Endangered and Threatened Species of Illinois: Status and Distribution, Volume 3 - 1994 Changes to the Illinois List of Endangered and Threatened Species. Illinois Endangered Species Protection Board, Springfield. 33 pp.

Illinois Department of Natural Resources. 1998. 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, IL ii + 20 pp.

Solecki, M.K. 1989. A proposal for dedication of a nature preserve at Lake Lou Yaeger Shoal Creek Nature Preserve, Montgomery County. Illinois Nature Preserves Commission Meeting #125, Item 9.

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.

Solecki, M.K. 1997. Invasive plants and their control. Pages 251-278 *in*: Packard, S. and C. F. Mutel (eds.). The Tallgrass Restoration Handbook - For Prairie, Savannas, and Woodlands. Society for Ecological Restoration. Island Press.

Taft, J.B. 1995. Ecology, distribution, and rareness patterns of threatened and endangered prairie plants in Illinois. Pages 21-31 *in*: T.E. Rice (editor). Proceedings of the fourth Central Illinois Prairie Conference. Milliken University, Decatur, IL.

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

Taft, J.B. 1997 (1997a). 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. 1997b. Botanical survey with emphasis on *Boltonia decurrens*, a species listed as Threatened by the United State Fish and Wildlife Service and Illinois Endangered Species Protection Board, in the FA 999 (Alignment #2, Addendum #3) Illinois Department of Transportation alignment in St. Clair County. Memorandum dated 15 October 1997 to the Illinois Department of Transportation, Springfield, reports the results of 1996-1997 field work.

Taft, J.B. 1999a. Botanical resources of the Kaskaskia River corridor - preliminary report. Report submitted to Southwestern Illinois RC&D, Mascoutah, IL.

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 IL 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 and Wildlife Service Research Report 2.

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.

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.

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

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

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

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.

McClain, W.E. 1983. Photodocumentation of the loss of hill prairie within Pere Marquette State Park. Jersey County, Illinois. Transactions of the Illinois State Academy of Science 76: 343-346.

McClain, W.E. 1997. Prairie establishment and landscaping. Illinois Department of Natural Resources, Division of Natural Heritage. Natural Heritage Technical Publication #2.

McFall, D. and J. Karnes (eds.). 1995. A directory of Illinois nature preserves, Volume 2. Illinois Department of Natural Resources, Springfield, IL. 327 pp.

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

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.

Nelson, P.W. 1985. The Terrestrial Natural Communities of Missouri. MO Department of Natural Resources and Missouri Department of Conservation, Jefferson City.

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.

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 M.W. Schwartz. 1994. Prairies. Pages 1-32 *in*: J.P. Ballenot (ed.). The changing Illinois Environment: critical trends. Volume 3: Ecological Resources. Illinois Department of Energy and Natural Resources, Springfield.

Schwartz, M.W. and J. Heim. 1996. Effects of a prescribed fire on degraded forest vegetation. Natural Areas Journal 16: 184-191.

Birds

Bohlen, H.D., and W. Zimmerman. 1989. The Birds of Illinois. Indiana University Press, Bloomington. 222 pp.

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.

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

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 midwestern prairie fragments: The effects of prescribed burning and habitat area. Natural Areas Journal 14:128-135.

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. IL Department of Conservation, Natural Heritage Technical Publication. No. 1 20 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 Department of Natural Resources. (*in preparation*). Illinois Birds - Illinois Breeding Bird Atlas. http://www.inhs.uiuc.edu/chf/pub/ifwis/birds/index.html. July 8, 1998.

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

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* Ecology and management of cowbirds, (J.N.M. Smith, S.K. Robinson, S.I. Rothstein, S.G. Sealy, and T.Cook, eds.). University of Texas Press, Austin, Texas.

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.

Rothstein, S.I., and S.K. Robinson. 1994. Conservation and coevolutionary implications of brood parasitism by cowbirds. Trends in Ecology and Evolution. 9: 162-164.

Warner, R.E. 1994. Agricultural land use and grassland habitat in Illinois: Future shock for Midwestern birds? Conservation Biology 8:147-156.

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.

Barbour, R.W. and W.H. Davis. 1969. Bats of America. The University Press of Kentucky, Lexington. 286 pp.

Bluett, B. 1997. River otter recovery update. Illinois Department of Natural Resources, Division of Natural Resources, Furbearer Program Management Note 97-1. [3 pp.]

Brack, V., Jr. 1983. The foraging ecology of bats in Indiana with emphasis on the endangered Indiana bat, *Myotis sodalis*. Unpublished Ph.D. dissertation, Purdue University, West Lafayette, IN.

Callahan, E.V, R.D. Drobney, and R.L. Clawson. 1997. Selection of summer roosting sites by Indiana bats (*Myotis sodalis*) in Missouri. Journal of Mammalogy 78:818-825.

Chapman, J. A. and G. A. Feldhamer. 1982. Wild Mammals of North America: Biology, Management, and Economics. Johns Hopkins University Press, Baltimore.

Churcher, P.B. and J.H. Lawton. 1987. Predation by domestic cats in an English village. Journal of Zoology 212:439-455.

Clark, B.K., J.B. Bowles, and B.S. Clark. 1987. Summer habitat of the endangered Indiana bat in Iowa. American Midland Naturalist 118:32-39.

Coleman, J.S. and S.A. Temple. 1996. On the prowl. Wisconsin Natural Resources 20(6):4-8.

Cope, J.B., A.R. Richter, and R.S. Mills. 1973. A summer concentration of the Indiana bat, *Myotis sodalis*, in Wayne County, Indiana. Proceedings of the Indiana Academy of Science 83:482-484.

Feldhamer, G.A., and C.R. Paine. 1987. Distribution and relative abundance of the golden mouse (*Ochrotomys nuttallii*) in Illinois. Transctions of the Illinois Academy of Science 80:213-225.

Gardner, J.E., J.D. Garner, and J.E. Hofmann. 1991. Summer roost selection and roosting behavior of *Myotis sodalis* (Indiana bat) in Illinois. Final report, submitted to Endangered Species Coordinator, Region 3, U.S. Fish and Wildlife Service and Indiana/ Gray Bat Recovery Team, U.S. Fish and Wildlife Service. vii+56 pp.

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.

Getz, L.L., F.B. Cole, and D.L. Gates. 1978. Interstate roadsides as dispersal rutes for *Microtus pennsylvanicus*. Journal of Mammalogy 59:208-212.

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.

Hofmann, J.E. 1998. A survey of Franklin's ground squirrel (*Spermophilus franklinii*) in east-central Illinois. Center for Biodiversity Technical Report 1998(11). Illinois Natural History Survey, Champaign. 31 pp.

Hofmann, J.E., J.E. Gardner, and M.J. Morris. 1990. Distribution, abundance and habitat of the marsh rice rat (*Oryzomys palustris*) in southern Illinois. Transactions of the Illinois State Academy of Science 83:162-180.

Humphrey, S.R., A.R. Richter, and J.B. Cope. 1977. Summer habitat and ecology of the endangered Indiana bat, *Myotis sodalis*. Journal of Mammalogy 58:334-346.

Illinois Department of Natural Resources. 1998. 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, IL ii + 20 pp.

Jackson, H.H.T. 1961. Mammals of Wisconsin. University of Wisconsin Press, Madison. 504 pp.

Kjolhaug, M.S., A. Woolf, and W.D. Klimstra. 1987. Current status and distribution of the swamp rabbit in Illinois. Transactions of the Illinois State Academy of Science 80:299-308.

Kurta, A., J. Kath, E.L. Smith, R. Foster, M.W. Orick, and R. Ross. 1993a. A maternity roost of the endangered Indiana bat (*Myotis sodalis*) in an unshaded, hollow sycamore tree (*Platanus occidentalis*). American Midland Naturalist 130:405-407.

Kurta, A., D. King, J.A. Teramino, J.M. Stribley, and K.J. Williams. 1993b. Summer roosts of the endangered Indiana bat (*Myotis sodalis*) on the northern edge of its range. American Midland Naturalist 129:132-138.

Kurta, A., K.J. Williams, and R. Mies. 1996. Ecological, behavioural, and thermal observations of a peripheral population of Indiana bats (*Myotis sodalis*). Pages 102-117 *in:* Bats and Forests Symposium. R.M.R. Barclay and R.M. Brigham, eds. Research Branch, British Columbia Ministry of Forests, Victoria Working Paper 23:1-292.

LaVal, R.K., R.L. Clawson, M.L. LaVal, and W. Caire. 1977. Foraging behavior and nocturnal activity patterns of Missouri bats, with emphasis on the endangered species *Myotis grisescens* and *Myotis sodalis*. Journal of Mammalogy 58:592-599.

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.

McCord, C.M. and J.E. Cardoza. 1982. Bobcat and lynx. Pages 728-766 *in:* Wild mammals of North America. J.A. Chapman and G.A. Feldhamer, eds. Johns Hopkins University Press, Baltimore. 1147 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.

Rollings, C.T. 1945. Habits, food, and parasites of the bobcat in Minnesota. Journal of Wildlife Management 9:131-145.

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

Schwartz, C.W. and E.R. Schwartz. 1981. The wild mammals of Missouri. Second ed. University of Missouri Press and Missouri Department of Conservation, Columbia. 356 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, Illinois Natural History Survey. 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. 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.

Amphibians and Reptiles

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. 1998. 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.

Wilson, A.K. 1998. Biological Inventory of the Kaskaskia River Corridor: Amphibian and Reptile Inventory and Habitat Surveys, 1997-1998. Unpublished report to the Illinois Department of Natural Resources, Springfield. 9 pp.

Aquatic Biota

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.

Bretz, J.H. and S.E. Harris, Jr. 1961. Caves of Illinois. Illinois state Geological Survey, Report of Investigations 215:1-83.

Brigham, A. 1973. Water quality investigations in the Lake Shelbyville, Illinois basin. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. v + 44 pp.

Brigham, A. 1974a. Annual summary of biological investigations at Carlyle Lake 1972-1973. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. 12 pp. + appendix.

Brigham, A. 1974b. Water quality investigations in the Lake Shelbyville, Illinois basin. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. v + 42 pp. + appendix.

Brigham, A. 1975. Water quality investigations in the Lake Shelbyville, Illinois basin. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. iv + 23 pp. + 2 appendices.

Brigham, A. 1976. Water quality and biological investigations in the Lake Shelbyville, Illinois basin. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. v + 41 pp. + appendix.

Brigham, A., W. Brigham, and R.W. Larimore. 1970. Water quality investigations in the Shelbyville Reservoir, Illinois. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. 29 pp.

Brigham, A., W. Brigham, and R.W. Larimore. 1972. Water quality investigations in the Lake Shelbyville, Illinois basin. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. iv + 32 pp.

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

Clement, K.T., J.M. Kasprowicz, and S.O. Swadener. 1979a. Annual summary of biological investigations at Carlyle Lake 1977-1978. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. 48 pp.

Clement, K., J. Kasprowicz, and S. Swadener. 1979b. Annual summary of water quality and biological investigations in the Lake Shelbyville basin 1977-1978. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. 126 pp.

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.

DeWalt, R. E., and D. W. Webb. 1998. Summer Ephemeroptera, Plecoptera, and Trichoptera (EPT) species richness and Hilsenhoff Biotic Index at eight stream segments in the lower Illinois River basin. Illinois Natural History Survey, Center for Biodiversity, Technical Report 1998 (9). 31 pp. 11 May.

Dufford, D.W. 1975. Annual summary of biological investigations at Carlyle Lake 1973-1974. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. 16 pp.

Dufford, D.W., S.W. Waite, and S.O. Swadener. 1976. Annual summary of biological investigations at Carlyle Lake 1974-1975. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. 21 pp.

Dufford, D.W., S.W. Waite, and S.O. Swadener. 1977 [Dufford et al. 1977a]. Annual summary of biological investigations at Carlyle Lake 1975-1976. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. 56 pp.

Dufford, D.W., L.W. Coutant, S.O. Swadener, and S.W. Waite. 1977 [Dufford et al. 1977b]. Water quality and biological investigations in the Lake Shelbyville basin 1975-1976. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. 86 pp. + appendices.

Dufford, D.W., S.W. Waite, and S.O. Swadener. 1978 [Dufford et al. 1978a]. Annual summary of biological investigations at Carlyle Lake 1976-1977. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. 46 pp.

Dufford, D.W., S.W. Waite, S.O. Swadener, and L.W. Coutant. 1978 [Dufford et al. 1978b]. Water quality and biological investigations in the Lake Shelbyville basin 1976-1977. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. 126 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.

Illinois Department of Natural Resources. 1998. Sinkhole Plain Area Assessment, Volume 3: Living resources. Illinois Department of Natural Resources. Springfield, IL.

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.

Krohe, J., Jr. 1999. The Sinkhole Plain - An inventory of the region's resources. Critical Trends Assessment Program, Illinois Department of Natural Resources, Office of Reality and Environmental Planning, Springfield. 22 pp.

Larimore, R.W., A. Brigham, and W. Brigham. 1971. Water quality investigations in the Lake Shelbyville, Illinois basin. Annual report submitted to the U.S. Army Corps of Engineers, St. Louis District, St. Louis, MO. iv + 44 pp.

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.

Luce, W.M. 1933. A survey of the fishery of the Kaskaskia River. Illinois Natural History Survey Bulletin. 20:71-123.

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.

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.

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. Technical Report No. 1992(1). Illinois Natural History Survey, Champaign. 485 pp.

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.

Peck, S.B. and J.J. Lewis. 1978. Zoogeography and evolution of the subterranean invertebrate faunas of Illinois and southeastern Missouri. National Speleol. Society Bulletin 40:39-63.

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.

Suloway, L., J.J. Suloway, and E.E. Herricks. 1981. Changes in the freshwater mussel (Mollusca: Pelecypoda: Unionidae) fauna of the Kaskaskia River, Illinois, with emphasis on the effects of impoundment. Transactions of the Illinois State Academy of Science. 74(1/2):79-90.

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.

Ross, H.H., and W.R. Horsfall. 1965. A synopsis of the mosquitoes of Illinois (Diptera, Culicidae). Illinois Natural History Survey, Biological Notes 52:1-50.

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. Unpublished Ph.D. thesis, Zoology Department, Southern Illinois University at Carbondale. xviii + 345 pp.

Tranquilli, J.A., and R.W. Larimore, editors. 1979. Environmental studies of Coffeen Lake - First annual report to Central Illinois Public Service Company. Illinois Natural History Survey, Urbana.

Tranquilli, J.A., and R.W. Larimore, editors. 1980. Environmental studies of Coffeen Lake - Second annual report to Central Illinois Public Service Company. Illinois Natural History Survey, Urbana. October. Volume 1 - text; Volume 2 - appendices.

Tranquilli, J.A., and R.W. Larimore, editors. 1981. Environmental studies of Coffeen Lake: Part I - Environmental studies of Coffeen Lake, a thermally-altered reservoir; Part II - Ecological investigations of Shoal Creek. Final report to Central Illinois Public Service Company. Illinois Natural History Survey, Urbana. October.

Webb, D. W. 1993. Status survey for a cave amphipod, *Gammarus acherondytes*, Hubricht and Mackin (Crustacea: Amphipoda) in southern Illinois. Illinois Natural History Survey Center for Biodiversity Technical Report 1993(9):1-7.

Webb, D. W. 1995. Status report on the cave amphipod *Gammarus acherondytes* Hubricht and Mackin (Crustacea: Amphipoda) in Illinois. Illinois Natural History Survey Center for Biodiversity Technical Report 1995(22):1-22.

Webb, D. W., L. M. Page, S. J. Taylor, and J. K. Krejca. 1998 [Webb et al. 1998a]. The current status and habitats of the Illinois cave Amphipod, *Gammarus acherondytes* Hubricht and Mackin (Crustacea: Amphipoda). Journal of Cave and Karst Studies 60(3): 172-178a.

Webb, D.W., M. J. Wetzel, P.C. Reed, L.R. Phillippe, and M.A. Harris. 1995. Aquatic biodiversity in Illinois springs. Journal of the Kansas Entomological Society 68(2) suppl. 93-107.

Webb, D. W., M. J. Wetzel, P. C. Reed, L. R. Phillippe, and T. C. Young. 1996. Biodiversity, hydrogeology, and water quality of 10 karst springs in the Salem Plateau Section of Illinois. Pages 146-185. *in*: M. Davis, (ed.) Research on agricultural chemicals in Illinois groundwater: status and future directions. VI. Illinois Groundwater Consortium. Proceedings of Sixth Annual Conference, Makanda, Illinois, 27-28 March 1996. 320 pp.

Webb, D.W., M.J. Wetzel, P.C. Reed, L.R. Phillippe, and T.C. Young. 1998 [Webb et al. 1998b]. The macroinvertebrate biodiversity, water quality, and hydrogeology of ten karst springs in the Salem Plateau Section of Illinois, USA. Pages 39-48, *in:* L. Botosaneanu (ed.). Studies in Crenobiology - The biology of springs and springbrooks. Backhuys Publishers, Leiden, The Netherlands. 261 pp. ISBN 90-73348-04-8.

Webb, D.W., S.J. Taylor, and J.K. Krejca. 1993. The biological resources of Illinois caves and other subterranean environments. Determination of the diversity, distribution, and status of the subterranean faunas of Illinois caves and how these faunas are related to groundwater quality. Illinois Natural History Survey Center for Biodiversity Technical Report 1993 (8):1-157.

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.

Appendix 1

Incomplete list of vascular plants known from the Kaskaskia River Assessment Area, with notes on their habitat associations.

Common Name[1,2]	Scientific Name[1,2]	Forest: Upland	Forest: Floodplain	Forest: Flatwoods	Prairie: Prairie	Prairie: Hill	Savanna: Savanna	Savanna: Barrens	Wetland: Marsh	Wetland: Seep	Wetland: Pond/Shrub	Primary: Sandstone Cliff	Primary: Limestone/ Dolomite	Cultural
Adam's-needle*	*Yucca flaccida**													x
adam-and-eve	*Aplectrum hyemale*	x												
agrimony, soft	*Agrimonia pubescens*	x												
agrimony, swamp	*Agrimonia parviflora*	x	x		x									
agrimony, woodland	*Agrimonia rostellata*	x												
Alexander, golden	*Zizia aurea*	x	x		x	x	x							
alfalfa*	*Medicago sativa**				x									x
aloe, false	*Manfreda virginica*	x				x		x						
alumroot, prairie	*Heuchera richardsonii*				x		x							
alumroot, tall	*Heuchera americana* var. *hirsuticaulis*	x			x			x						
amaranth*, green	*Amaranthus hybridus**		x											x
amaranth*, prostrate	*Amaranthus graecizans**													x
amaranth*, rough	*Amaranthus retroflexus**													x
ammannia, long-leaved	*Ammannia coccinea*		x											
androsace	*Androsace occidentalis*	x											x	x
anemone, false rue	*Isopyrum biternatum*	x												
anemone, meadow	*Anemone canadensis*		x						x					x
anemone, rue	*Thalictrum thalictroides*	x												
anemone, tall	*Anemone virginiana*	x			x		x							
anise-root	*Osmorhiza longistylis*	x	x											
arrowhead, common	*Sagittaria latifolia*								x					
arrowhead, thick-stalked	*Sagittaria calycina*								x					
arrowleaf, short-leaved	*Sagittaria brevirostra*								x					
arrowwood	*Viburnum dentatum*	x												
arrowwood, Southern	*Viburnum dentatum* var. *deamii*	x												
artichoke, Jerusalem	*Helianthus tuberosus*		x											x
arum, arrow	*Peltandra virginica*		x						x		x			
ash, black	*Fraxinus nigra*									x				
ash, green	*Fraxinus pennsylvanica*		x						x					
ash, pumpkin	*Fraxinus profunda*		x											
ash, wafer	*Ptelea trifoliata*	x			x	x	x							
ash, white	*Fraxinus americana*	x	x											
asparagus*, garden	*Asparagus officinalis**				x									x
aster	*Aster urophyllus*	x												x
aster, arrow-leaved	*Aster sagittifolius*	x			x		x							
aster, blue	*Aster anomalus*	x						x						
aster, bristly	*Aster puniceus*								x					
aster, Drummond's	*Aster drummondii*	x												

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
Class														
Sub-class		Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
aster, false	*Boltonia diffusa*				x									x
aster, false	*Boltonia asteroides*		x	x										
aster, hairy	*Aster pilosus*		x		x									x
aster, heath	*Aster ericoides*				x		x							
aster, New England	*Aster novae-angliae*				x									
aster, Ontario	*Aster ontarionis*		x											
aster, panicled	*Aster simplex*		x	x										
aster, prairie	*Aster turbinellus*	x				x								
aster, Short's	*Aster shortii*	x												
aster, side-flowering	*Aster lateriflorus*		x		x		x							
aster, sky-blue	*Aster azureus*				x	x								
aster, small white	*Aster vimineus*													x
aster, small-headed	*Aster parviceps*					x								
aster, smooth blue	*Aster laevis*				x									
aster, spreading	*Aster patens*	x			x	x		x						
aster, willow	*Aster praealtus*				x		x							
auntlucy	*Ellisia nyctelea*		x											x
avens, rough	*Geum laciniatum*		x						x					
avens, spring	*Geum vernum*				x									x
avens, white	*Geum canadense*	x	x		x									
azolla, Mexican	*Azolla mexicana*										x			
balsam, old-field	*Gnaphalium obtusifolium*							x						x
barberry*, Japanese	*Berberis thunbergii**	x												
barley*, common	*Hordeum vulgare**													x
barley, little	*Hordeum pusillum*													x
bean, clustered wild	*Strophostyles umbellata*	x	x					x						x
bean, small wild	*Strophostyles leiosperma*	x	x					x						x
bean, trailing wild	*Strophostyles helvola*	x	x					x						x
bean, wild kidney	*Phaseolus polystachios*	x												
beard-tongue, foxglove	*Penstemon digitalis*				x	x	x							
beard-tongue, hairy	*Penstemon hirsutus*				x		x							
beard-tongue, pale	*Penstemon pallidus*	x			x	x	x							
beard-tongue, smooth	*Penstemon calycosus*	x			x	x								x
beard-tongue, western	*Penstemon tubaeflorus*				x									x
beauty, spring	*Claytonia virginica*	x	x		x		x							
bedstraw, annual	*Galium aparine*	x	x		x									x
bedstraw, hairy	*Galium pilosum*	x						x						
bedstraw, shining	*Galium concinnum*	x						x						
bedstraw, sweet-scented	*Galium triflorum*	x												
beebalm, basil	*Monarda clinopodia*	x												
beech, American	*Fagus grandifolia*	x												
beggar's-ticks	*Bidens tripartita*		x						x					x
beggar's-ticks, common	*Bidens frondosa*								x					x
beggar's-ticks, swamp	*Bidens discoidea*								x					x
beggar's-ticks, tall	*Bidens vulgata*								x					x
bellflower, American	*Campanula americana*		x		x									
bellwort	*Uvularia grandiflora*	x												
bergamot, wild	*Monarda fistulosa*			x	x	x	x							

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
Class		Forest			Prairie		Savanna		Wetland			Primary		
Sub-class		Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
betony, fen	*Pedicularis lanceolata*				x	x	x							
bindweed	*Calystegia silvatica* ssp.													x
bindweed*, field	*Convolvulus arvensis**													x
bindweed, American	*Calystegia sepium*				x									x
bindweed, corpse	*Polygonum cristatum*	x		x										
bindweed, dwarf	*Calystegia spithamea*	x				x	x	x						
birch, river	*Betula nigra*		x											
birdweed*, black	*Polygonum convolvulus**													x
bishop's weed, mock	*Ptilimnium costatum*		x	x										
bishop's weed, mock - SE	***Ptilimnium nuttallii* - SE**													x
bittercress	*Cardamine pensylvanica*		x		x									
bittercress*, hairy	*Cardamine hirsuta**													x
bittercress, bulb	*Cardamine bulbosa*		x						x	x				
bittercress, small-flowered	*Cardamine parviflora* var. *arenicola*	x						x						x
bittersweet, climbing	*Celastrus scandens*													x
bitterweed	*Helenium amarum*													x
blackberry	*Rubus frondosus*	x												x
blackberry*, cut-leaved	*Rubus laciniatus**													x
blackberry, common	*Rubus allegheniensis*	x		x	x									x
blackberry, highbush	*Rubus argutus*	x												x
blackberry, yankee	*Rubus pensylvanicus*	x		x										x
bladdernut	*Staphylea trifolia*	x	x											
bladderwort, humped	*Utricularia gibba*								x		x			
blazing-star	*Liatris ligulistylis*				x		x	x						
blazing-star	*Liatris squarrosa*	x		x			x	x						
blazing-star - ST	***Liatris scariosa* var. *nieuwlandii* - ST**	x					x	x						
blazing-star, prairie	*Liatris pycnostachya*			x	x	x	x							
blazing-star, rough	*Liatris aspera*				x	x	x	x						
blite*, strawberry	*Chenopodium capitatum**													x
bloodroot	*Sanguinaria canadensis*	x												
blue beech	*Carpinus caroliniana*	x												
blue-eyed grass, common	*Sisyrinchium albidum*				x	x	x							
blue-eyed grass, stout	*Sisyrinchium angustifolium*		x		x									
bluebells	*Mertensia virginica*		x											
bluestar	*Amsonia tabernaemontana*		x											
bluestem, big	*Andropogon gerardii*				x	x	x	x						
bluestem, little	*Schizachyrium scoparium*				x	x	x	x						
bluets	*Hedyotis caerulea*	x												
bluets, broad-leaved	*Hedyotis purpurea* var. *calycosa*	x						x						
bluets, long-leaved	*Hedyotis longifolia*					x								
bluets, slender-leaved	*Hedyotis nuttalliana*	x						x						
bluets, tiny	*Hedyotis crassifolia*	x						x						
bluevine	*Cynanchum laeve*													x
boneset, common	*Eupatorium perfoliatum*								x	x				
boneset, false	*Brickellia eupatorioides*					x								
boneset, late	*Eupatorium serotinum*	x	x		x									x
boneset, tall	*Eupatorium altissimum*				x		x							x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Forest			Prairie		Savanna		Wetland			Primary		
	Sub-class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
boneset, upland	*Eupatorium sessilifolium*	x		x										
bouncing-bet*	*Saponaria officinalis**				x									x
boxelder	*Acer negundo*		x	x										
breeches, Dutchman's	*Dicentra cucullaria*	x												
brome*, hairy	*Bromus commutatus**													x
brome*, smooth	*Bromus inermis**				x									x
brome, woodland	*Bromus pubescens*	x						x						
brookweed	*Samolus valerandii*		x											
broomsedge	*Andropogon virginicus*				x									x
buckeye, Ohio	*Aesculus glabra*	x	x											
bugleweed	*Lycopus virginicus*		x						x					
bulrush, great	*Scirpus tabernaemontanii*								x					
bulrush, red	*Scirpus pendulus*				x				x					x
bulrush, river	*Scirpus fluviatilis*								x		x			x
bundleflower, Illinois	*Desmanthus illinoensis*				x									
bur*, buffalo	*Solanum rostratum**													x
burdock*, common	*Arctium minus**													x
burhead, creeping	*Echinodorus cordifolius*										x			
burreed, branched	*Sparganium androcladum*								x					
burreed, common	*Sparganium eurycarpum*								x					
bushclover*, silky	*Lespedeza cuneata**													x
bushclover, creeping	*Lespedeza repens*	x						x						
bushclover, round-headed	*Lespedeza capitata*				x		x							
bushclover, slender	*Lespedeza virginica*	x				x		x						
bushclover, Stuve's	*Lespedeza stuevei*	x						x						
bushclover, trailing	*Lespedeza procumbens*	x												
bushclover, violet	*Lespedeza violacea*	x			x			x						
buttercup*, papillose	*Ranunculus sardous**													x
buttercup, early	*Ranunculus fascicularis*	x												
buttercup, Harvey's	*Ranunculus harveyi*	x												
buttercup, hooked	*Ranunculus recurvatus*	x												
buttercup, little-leaf	*Ranunculus abortivus*	x	x		x									x
buttercup, rough	*Ranunculus hispidus*	x	x											
buttercup, swamp	*Ranunculus septentrionalis*		x											
buttercup, yellow water	*Ranunculus flabellaris*										x			
butterflyweed	*Asclepias tuberosa*				x	x	x							
butterweed	*Senecio glabellus*		x								x			x
button*, bachelor's	*Centaurea cyanus**													x
buttonbush	*Cephalanthus occidentalis*								x		x			
buttonweed	*Diodia teres*	x						x						
buttonweed, large	*Diodia virginiana*		x											
buttonweed, smooth	*Spermacoce glabra*		x						x					
camphorweed	*Pluchea camphorata*		x											
campion*, glaucus	*Silene cserei**													x
campion, snowy	*Silene nivea*	x								x				
campion, starry	*Silene stellata*	x				x	x							
cardinal flower	*Lobelia cardinalis*		x						x					
carpetweed*	*Mollugo verticillata**													x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
carrion-flower, common	*Smilax lasioneuron*	x												
carrion-flower, dark green	*Smilax pulverulenta*	x												
carrion-flower, Illinois	*Smilax illinoensis*	x												
carrion-flower, upright	*Smilax ecirrhata*	x												
cat's foot	*Antennaria neglecta*				x		x	x						
catbriar, bristly	*Smilax hispida*	x	x		x									
catbrier	*Smilax bona-nox*	x						x						
catbrier	*Smilax rotundifolia*	x												
catchfly*	*Silene latifolia**													x
catchfly, sleepy	*Silene antirrhina*				x									x
cattail*, narrow-leaved	*Typha angustifolia**								x					
cattail, common	*Typha latifolia*				x				x					
cedar, Eastern red	*Juniperus virginiana*	x				x	x	x						
chamomile*, garden	*Chamaemelum nobile**													x
chamomile*, German	*Matricaria chamomilla**													x
cheeses*	*Malva neglecta**													x
cherry*, perfumed	*Prunus mahaleb**													x
cherry, common choke	*Prunus virginiana*	x		x										
cherry, wild black	*Prunus serotina*	x		x										
chervil, streambank	*Chaerophyllum procumbens*		x											
chervil, wild	*Chaerophyllum tainturieri*													x
chess*, Japanese	*Bromus japonicus**				x									x
chess*, smooth	*Bromus racemosus**													x
chickory*	*Cichorium intybus**													x
chickweed*, common	*Stellaria media**				x									x
chickweed*, common mouse-	*Cerastium vulgatum**													x
chickweed*, jagged	*Holosteum umbellatum**				x									x
chickweed*, three-styled	*Cerastium dubium**													x
chickweed, low forked	*Paronychia fastigiata*			x				x						
chickweed, nodding	*Cerastium nutans*								x					x
chickweed, tall forked	*Paronychia canadensis*			x				x						
cinquefoil*, sulfur	*Potentilla recta**				x									x
cinquefoil, common	*Potentilla simplex*	x		x	x		x	x						
cinquefoil, rough	*Potentilla norvegica*													x
clammyweed	*Polanisia dodecandra*													x
clearweed, Canada	*Pilea pumila*		x											
clover*, alsike	*Trifolium hybridum**				x									x
clover*, low hop	*Trifolium campestre**													x
clover*, red	*Trifolium pratense**				x									x
clover*, white	*Trifolium repens**													x
clover*, white sweet	*Melilotus alba**				x	x								x
clover*, yellow sweet	*Melilotus officinalis**				x	x								x
clover, buffalo - SE	***Trifolium reflexum* - SE**			x				x						
clubmoss, marsh	*Selaginella apoda*								x	x				
cocklebur	*Xanthium strumarium*										x			x
cohosh, blue	*Caulophyllum thalictroides*	x												
collinsia, violet - SE	***Collinsia violacea* - SE**	x												
columbine, wild	*Aquilegia canadense*	x			x		x						x	

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Dolomite	Limestone/	Cultural
columbo, American	*Frasera caroliniensis*	x				x		x							
compass-plant	*Silphium laciniatum*				x										
coneflower, pale purple	*Echinacea pallida*				x	x	x								
coneflower, purple	*Echinacea purpurea*				x	x	x								
coneflower, yellow	*Ratibida pinnata*				x	x	x								
coontail	*Ceratophyllum demersum*										x				
coralberry	*Symphoricarpos orbiculatus*	x	x					x							
coralroot	*Corallorhiza wisteriana*		x												
coralroot, fall	*Corallorrhiza odontorhiza*	x													
coreopsis*, golden	*Coreopsis tinctoria**														x
coreopsis*, large-flowered	*Coreopsis grandiflora**														x
coreopsis, prairie	*Coreopsis palmata*				x	x	x								
coreopsis, sand	*Coreopsis lanceolata*					x								x	
coreopsis, tall	*Coreopsis tripteris*				x		x								
corn-cockle*	*Agrostemma githago**														x
cornsalad	*Valerianella radiata*		x		x										x
corydalis, pale	*Corydalis flavula*		x												
cottonweed*	*Froelichia gracilis**														x
cottonwood, Eastern	*Populus deltoides*		x												
cottonwood, swamp	*Populus heterophylla*		x												
cow-parsnip	*Heracleum lanatum*		x												x
cowbane	*Oxypolis rigidior*								x	x					
crab, Iowa	*Malus ioensis*	x			x										x
cranesbill, Carolina	*Geranium carolinianum*	x			x										x
creeper, Virginia	*Parthenocissus quinquefolia*	x	x	x		x									x
creeping Charlie*	*Glechoma hederacea**		x												x
cress, field	*Lepidium campestre**														x
cress, field penny	*Thlaspi arvense**														x
cress, hoary	*Cardaria draba**														x
cress, lake	*Armoracia aquatica*								x		x				
cress, marsh yellow	*Rorippa islandica*								x		x				
cress, marsh yellow	*Rorippa islandica* var. *fernaldiana*								x		x				
cress, mouse-eared	*Arabidopsis thaliana**														x
cress, sessile-flowered	*Rorippa sessiliflora*		x						x						
cress, smooth rock	*Arabis laevigata*	x						x							
cress, toothed	*Arabis shortii*		x												
cress, violet	*Iodanthus pinnatifidus*	x	x												
cress, Virginia rock	*Sibara virginica*														x
croton, sand	*Croton glandulosus* var. *septentrionalis*														x
crowfoot, cursed	*Ranunculus sceleratus*										x				
crowfoot, small-flowered	*Ranunculus micranthus*	x	x				x								x
crowfoot, white water	*Ranunculus longirostris*										x				
crownbeard, yellow	*Verbesina helianthoides*	x			x	x		x							
cucumber, bur	*Sicyos angulatus*		x												
cudweed, early	*Gnaphalium purpureum*							x							x
Culver's-root	*Veronicastrum virginicum*	x			x		x								
cup-plant	*Silphium perfoliatum*				x						x				x
cuphea, clammy	*Cuphea viscosissima*										x		x		x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
Class														
Sub-class		Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
cypress*, bald	*Taxodium distichum**										x			
dainties	*Phyllanthus caroliniensis*													x
daisy*, ox-eye	*Leucanthemum vulgare**				x									x
dandelion*, common	*Taraxacum officinale**				x									x
dandelion*, red-seeded	*Taraxacum laevigatum**													x
dandelion, dwarf	*Krigia caespitosa*											?		
dandelion, dwarf	*Krigia dandelion*	x						x						
dandelion, false	*Krigia biflora*	x		x			x							
dandelion, false	*Pyrrhopappus carolinianus*	x						x				x		
dayflower	*Commelina diffusa*		x											
dayflower	*Commelina virginica*		x											
dayflower*, common	*Commelina communis**													x
deadnettle, purple	*Lamium purpureum**													x
dewberry, common	*Rubus flagellaris*	x		x	x		x							
dittany	*Cunila oreganoides*	x						x						
dock*, curly	*Rumex crispus**				x									x
dock, pale	*Rumex altissimus*		x		x				x					
dock, swamp	*Rumex verticillatus*								x					
dodder, common	*Cuscuta gronovii*		x						x		x			
dodder, compact	*Cuscuta compacta*		x						x					
dodder, knowtweed	*Cuscuta polygonorum*		x						x					
dodder, rope	*Cuscuta glomerata*				x									
dogbane	*Apocynum cannabinum*				x	x	x							x
dogbane, climbing	*Trachelospermum difforme*		x	x										
dogbane, spreading	*Apocynum androsaemifolium*			x	x		x	x						
dogwood, flowering	*Cornus florida*	x												
dogwood, gray	*Cornus racemosa*	x			x		x							
dogwood, pale	*Cornus obliqua*		x						x					
dogwood, rough-leaved	*Cornus drummondii*	x	x		x									
doll's-eyes	*Actaea pachypoda*	x												
dropseed, Northern	*Sporobolus heterolepis*				x	x								
dropseed, rough	*Sporobolus asper*													x
duckweed, glade	*Wolfiella gladiata*										x			
duckweed, great	*Spirodela polyrhiza*								x					
duckweed, small	*Lemna minor*										x			
elderberry	*Sambucus canadensis*		x											x
elephant's-foot	*Elephantopus carolinianus*		x											x
elm, American	*Ulmus americana*	x	x											
elm, slippery	*Ulmus rubra*	x	x	x										
evening primrose, common	*Oenothera biennis*				x									x
evening primrose, ragged	*Oenothera laciniata*													x
false-buckwheat, climbing	*Polygonum scandens*		x		x		x							
false-indigo	*Amorpha fruticosa*		x											
featherfoil	*Hottonia inflata*										x			
fennel*, dog	*Anthemis cotula**													x
fern, berry bladder	*Cystopteris bulbifera*												x	
fern, bracken	*Pteridium aquilinum*				?		?							
fern, broad beech	*Phegopteris hexagonoptera*	x												

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
fern, bronze	*Botrychium dissectum*	x												
fern, bronze	*Botrychium dissectum* var. *obliquum*	x												
fern, Christmas	*Polystichum acrostichoides*	x										x		
fern, fragile	*Cystopteris protrusa*	x												
fern, lady	*Athyrium angustum*	x												
fern, maidenhair	*Adiantum pedatum*	x												
fern, marsh shield	*Thelypteris palustris* var. *pubescens*								x					
fern, rattlesnake	*Botrychium virginianum*	x		x	x									
fern, sensitive	*Onoclea sensibilis*		x						x		x			
fescue*, meadow	*Festuca pratensis**				x									x
fescue*, tall	*Festuca arundinacea**													x
fescue, greater nodding	*Festuca paradoxa*	x												
fescue, nodding	*Festuca obtusa*	x												
fescue, six weeks	*Vulpia octoflora*							x				x		x
figwort, late	*Scrophularia marilandica*		x											
fireweed	*Erechtites hieracifolia*	x	x					x						x
flag, southern blue	*Iris shrevei*								x		x			
flax*, small-fruited false	*Camelina microcarpa**													x
flax, small yellow	*Linum medium* var. *texanum*	x			x	x	x	x					?	
fleabane, annual	*Erigeron annuus*	x		x	x									x
fleabane, daisy	*Erigeron strigosus*				x		x							x
fleabane, dwarf	*Conyza ramosissima*													x
fleabane, marsh	*Erigeron philadelphicus*				x				x					x
flower, leather	*Clematis pitcheri*		x											
flower-of-an-hour*	*Hibiscus trionum**													x
fogfruit	*Phyla lanceolata*		x		x									x
forget-me-not, white	*Myosotis verna*	x	x											x
four o'clock, wild	*Mirabilis nyctaginea*				x									x
foxglove, ear-leaved - ST	***Tomanthera auriculata* - ST**				x		x	x						x
foxglove, false	*Agalinis purpurea*				x					x				
foxglove, mullein	*Dasistoma macrophylla*	x					x	x						
foxglove, slender false	*Agalinis tenuifolia*				x					x				
foxglove, smooth false	*Aureolaria flava*	x				x	x	x						
foxglove, yellow false	*Aureolaria grandiflora* var. *pulchra*	x					x	x						
foxtail	*Alopecurus aequalis*								x		x			
foxtail*, giant	*Setaria faberi**				x									x
foxtail*, green	*Setaria viridis**													x
foxtail, annual	*Alopecurus carolinianus*													x
foxtail, bristly	*Setaria verticillata**													x
foxtail, perennial	*Setaria geniculata*				x									x
garlic*, field	*Allium vineale**													
garlic, false	*Nothoscordum bivalve*	x			x	x		x						
garlic, wild	*Allium canadense*		x	x	x		x							x
gaura, biennial	*Gaura biennis*				x		x							
gaura, common	*Gaura longiflora*				x			x						
gentian, closed	*Gentiana andrewsii*				x									
gentian, downy	*Gentiana puberulenta*				x									
gentian, prairie rose - SE	***Sabatia campestris* - SE**				x									

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest: Upland	Forest: Floodplain	Forest: Flatwoods	Prairie: Prairie	Prairie: Hill	Savanna: Savanna	Savanna: Barrens	Wetland: Marsh	Wetland: Seep	Wetland: Pond/Shrub	Primary: Sandstone Cliff	Primary: Limestone/ Dolomite	Cultural
gentian, rose	*Sabatia angularis*				x		x							
geranium*, small	*Geranium pusillum**													x
geranium, wild	*Geranium maculatum*	x					x							
germander	*Teucrium canadense*		x		x				x					
germander, American	*Teucrium canadense* var. *virginicum*		x		x				x					
ginger, wild	*Asarum canadense* var. *reflexum*	x												
ginseng	*Panax quinquefolius*	x												
goat's beard*, sand	*Tragopogon dubius**													x
goat's-beard	*Aruncus dioicus*	x												
goldenglow, wild	*Rudbeckia laciniata*		x											
goldenrod, early	*Solidago juncea*				x		x							x
goldenrod, elm-leaved	*Solidago ulmifolia*	x												
goldenrod, grass-leaved	*Euthamia graminifolia*				x		x		x					
goldenrod, late	*Solidago gigantea*				x				x					
goldenrod, Missouri	*Solidago missouriensis*				x		x							x
goldenrod, old field	*Solidago nemoralis*			x	x	x	x							x
goldenrod, rigid	*Solidago rigida*				x									
goldenrod, rough	*Solidago radula*	x						x						
goldenrod, rough-leaved	*Solidago patula*									x				
goldenrod, showy	*Solidago speciosa*				x	x	x							
goldenrod, tall	*Solidago canadensis*				x	x								x
goldenrod, viscid grass-leaved	*Euthamia gymnospermoides*				x									
goldenseal	*Hydrastis canadensis*	x												
goldenweed*	*Prionopsis ciliata**													x
gooseberry, Missouri	*Ribes missouriense*	x	x											x
goosefoot, woodland	*Chenopodium standleyanum*	x												x
grape, catbird	*Vitis palmata*		x											
grape, frost	*Vitis vulpina*		x											
grape, raccoon	*Ampelopsis cordata*													x
grape, river	*Vitis riparia*		x	x	x		x							
grape, summer	*Vitis aestivalis*	x	x	x				x						
grape, winter	*Vitis cinerea*		x		x		x							
grass*, annual blue	*Poa annua**													x
grass*, barnyard	*Echinochloa crus-galli**													x
grass*, Bermuda	*Cynodon dactylon**													x
grass*, birdseed	*Phalaris canariensis**													x
grass*, bulbous blue	*Poa bulbosa**													x
grass*, Canadian blue	*Poa compressa**				x		x							x
grass*, cheat	*Bromus secalinus**													x
grass*, cheat	*Bromus tectorum**				x									x
grass*, crowfoot	*Eleusine indica**													x
grass*, hairy crab	*Digitaria sanguinalis**													x
grass*, Johnson	*Sorghum halepense**				x									x
grass*, jointed goat	*Triticum cylindricum**													x
grass*, Kentucky blue	*Poa pratensis**				x	x	x							x
grass*, orchard	*Dactylis glomerata**													x
grass*, perennial rye	*Lolium perenne**													x
grass*, pigeon	*Setaria glauca**													x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest: Upland	Forest: Floodplain	Forest: Flatwoods	Prairie: Prairie	Prairie: Hill	Savanna: Savanna	Savanna: Barrens	Wetland: Marsh	Wetland: Seep	Wetland: Pond/Shrub	Primary: Sandstone Cliff	Primary: Limestone/ Dolomite	Cultural
grass*, plains blue	*Poa arida**													x
grass*, reed canary	*Phalaris arundinacea**		x		x				x					x
grass*, smooth crab	*Digitaria ischaemum**													x
grass*, squirrel tail	*Hordeum jubatum**													x
grass*, stink	*Eragrostis cilianensis**													x
grass*, windmill	*Chloris verticillata**													x
grass, autumn bent	*Agrostis perennans*	x	x	x										
grass, beak	*Diarrhena americana*		x											
grass, beaked panic	*Panicum anceps*													x
grass, blue joint	*Calamagrostis canadensis*				x				x					
grass, bottlebrush	*Elymus hystrix*	x				x	x							
grass, broad-leaved panic	*Panicum latifolium*	x						x						
grass, catchfly	*Leersia lenticularis*								x					
grass, common satin	*Muhlenbergia frondosa*		x								x		x	
grass, creeping love	*Eragrostis hypnoides*									x	x			x
grass, dear-tongue	*Panicum clandestinum*		x											
grass, downy lens	*Paspalum ciliatifolium* var. *stramineum*													x
grass, fall witch	*Leptoloma cognatum*				x									x
grass, few-flowered	*Panicum oligosanthes*				x	x	x	x						
grass, fly-away	*Agrostis scabra*													x
grass, four-rowed bead	*Paspalum pubiflorum* var. *glabrum*										x			x
grass, fowl manna	*Glyceria striata*		x		x				x					
grass, French	*Psoralea onobrychis*				x		x							
grass, gama	*Tripsacum dactyloides*				x									x
grass, giant bead	*Paspalum floridanum*				x									
grass, ice cream	*Eragrostis trichodes*				?									?
grass, Indian	*Sorghastrum nutans*				x	x	x	x						
grass, June	*Koeleria macrantha*				x			x						
grass, lace	*Eragrostis capillaris*	x												x
grass, large-fruited panic	*Panicum boscii*	x						x						
grass, leafy satin	*Muhlenbergia mexicana*		x											
grass, lens	*Paspalum ciliatifolium*													x
grass, long-awned wood	*Brachyelytrum erectum*	x												
grass, munro	*Panicum rigidulum*		x											x
grass, Northern rush	*Sporobolus vaginiflorus*				x	x								x
grass, old witch	*Panicum capillare*													x
grass, panic	*Panicum commutatum*	x												
grass, panic	*Panicum lanuginosum*			x	x		x	x						
grass, Philadelphia panic	*Panicum philadelphicum*	x												x
grass, plains three awn	*Aristida oligantha*	x												x
grass, poverty	*Aristida dichotoma*													x
grass, poverty oat	*Danthonia spicata*	x		x		x	x	x						
grass, prairie cord	*Spartina pectinata*				x		x							
grass, prairie panic	*Panicum leibergii*	x						x						
grass, prairie switch	*Panicum virgatum*				x	x	x							
grass, prairie wedge	*Sphenopholis obtusata*	x			x		x	x						
grass, purple love	*Eragrostis spectabilis*						x							x
grass, rice cut	*Leersia oryzoides*		x		x				x					

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
grass, rock satin	*Muhlenbergia sobolifera*	x						x						
grass, round-fruited	*Panicum sphaerocarpon*							x						
grass, salt-marsh cockspur	*Echinochloa walteri*		x						x					
grass, sandbar love	*Eragrostis frankii*										x			x
grass, Scribner's panic	*Panicum oligosanthes* var. *scribnerianum*				x	x	x	x						
grass, short-leaved satin	*Muhlenbergia bushii*		x											
grass, slender crab	*Digitaria filiformis*	x												x
grass, slender panic	*Panicum flexile*									x				
grass, slender three awn	*Aristida ramosissima*													x
grass, slender-leaved	*Panicum linearifolium*	x						x						
grass, small love	*Eragrostis pectinacea*													x
grass, small-fruited panic	*Panicum microcarpon*	x						x						
grass, small-fruited panic	*Panicum polyanthes*	x												
grass, smooth lens	*Paspalum laeve*		x											x
grass, smooth satin	*Muhlenbergia glabrifloris*		x		x									
grass, smooth woolly	*Panicum lindheimeri*	x		x										
grass, spear	*Poa chapmaniana*													x
grass, spiny barnyard	*Echinochloa muricata*		x		x				x					
grass, starved panic	*Panicum depauperatum*							x						
grass, swamp bead	*Paspalum fluitans*										x			
grass, three awn	*Aristida longespica*				x									x
grass, tickle	*Agrostis hyemalis*			x	x									x
grass, white	*Leersia virginica*		x	x										
grass, white-haired panic	*Panicum villosissimum*	x			x	x		x						
grass, woodland blue	*Poa sylvestris*		x											
grass, wool	*Scirpus cyperinus*								x					
green-dragon	*Arisaema dracontium*		x											
gromwell, American	*Lithospermum latifolium*	x												
ground cherry*, tall	*Physalis longifolia**													x
ground cherry, clammy	*Physalis heterophylla*	x												x
ground cherry, hairy	*Physalis pubescens*													x
ground cherry, lance-leaved	*Physalis virginiana*	x												x
ground cherry, smooth	*Physalis subglabrata*	x												x
groundnut	*Apios americana*				x		x							x
gumplant*	*Grindelia squarossa**													x
hackberry	*Celtis occidentalis*	x	x	x										
haw, black	*Viburnum prunifolium*	x												
hawkweed, hairy	*Hieracium gronovii*	x						x						
hawkweed, long-bearded	*Hieracium longipilum*	x						x						
hawthorn	*Crataegus coccinioides*	x												
hawthorn	*Crataegus cuneiformis*	x												
hawthorn, cockspur	*Crataegus crus-galli*	x												
hawthorn, downy	*Crataegus mollis*		x											
hawthorn, frosted	*Crataegus pruinosa*	x												
hawthorn, green	*Crataegus viridis*		x											
hawthorn, sugar	*Crataegus calpodendron*		x											x
hawthorn, washington	*Crataegus phaenopyrum*	x												
hazelnut	*Corylus americana*	x			x		x							

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
hedge-nettle, marsh	*Stachys tenuifolia* var. *hispida*								x					
hedge-nettle, rough	*Stachys aspera*								x					
hedge-nettle, smooth	*Stachys tenuifolia*								x					
hedge-parsley*, Japanese	*Torilis japonica**				x									x
heliotrope*, Indian	*Heliotropium indicum**													x
hellebore, false - ST	***Veratrum woodii* - ST**	x												
hemlock*, poison	*Conium maculatum**				x									x
hemlock, water	*Cicuta maculata*				x				x					x
henbit*	*Lamium amplexicaule**													x
hepatica	*Hepatica nobilis* var. *acuta*	x												
hickory, bitternut	*Carya cordiformis*	x	x											
hickory, black	*Carya texana*	x		x				x						
hickory, false shagbark	*Carya ovalis*	x		x										
hickory, kingnut	*Carya laciniosa*	x	x											
hickory, mockernut	*Carya tomentosa*	x		x										
hickory, pignut	*Carya glabra*	x		x			x							
hickory, shagbark	*Carya ovata*	x		x			x	x						
hog peanut	*Amphicarpa bracteata*	x		x			x	x						
hogwort	*Croton capitatus*													x
holly, swamp	*Ilex decidua*		x	x										
hollyhock*	*Althea rosea**													x
honewort	*Cryptotaenia canadensis*		x											
honeysuckle*, amur	*Lonicera maackii**	x	x											x
honeysuckle*, Japanese	*Lonicera japonica**	x		x										x
honeysuckle*, Morrow's	*Lonicera morrowii**													x
honeysuckle*, trumpet	*Lonicera sempervirens**													x
hop-hornbeam	*Ostrya virginiana*	x												
hops*, Japanese	*Humulus japonicus**													x
hops, common	*Humulus lupulus*		x		x									x
horehound*, common	*Marrubium vulgare**													x
horse-gentian, early	*Triosteum aurantiacum*	x												
horse-gentian, Illinois	*Triosteum illinoense*		x											
horse-gentian, late	*Triosteum perfoliatum*	x												
horse-nettle	*Solanum carolinense*				x									x
horsetail, common	*Equisetum arvense*								x					x
horsetail, Joliet	*Equisetum x ferrissii*				x				x					x
horseweed	*Conyza canadensis*				x									x
hyacinth*, common grape	*Muscari botryoides**													x
hyacinth, wild	*Camassia scilloides*				x		x							
hydrangea, wild	*Hydrangea arborescens*										x	x		
hyssop, clammy hedge	*Gratiola neglecta*		x								x			
hyssop, giant yellow	*Agastache nepetoides*	x												
hyssop, round-fruited hedge	*Gratiola virginiana*		x								x			
hyssop, water	*Bacopa rotundifolia*										x			
Indian-pipe	*Monotropa uniflora*	x												
Indian-plantain, great	*Cacalia muhlenbergii*	x						x						
Indian-plantain, pale	*Cacalia atriplicifolia*	x						x						
Indianhemp	*Apocynum sibiricum*				x									x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Forest			Prairie		Savanna		Wetland			Primary		
	Sub-class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
interrupted fern	*Osmunda claytonii*											x		
iris, blue water	*Iris brevicaulis*				x				x					
ironweed, Baldwin's	*Vernonia baldwinii*				x		x							x
ironweed, Missouri	*Vernonia missurica*				x		x		x					x
ironweed, tall	*Vernonia gigantea*		x						x					
jack-in-the-pulpit	*Arisaema triphyllum*	x	x											
Jacob's-ladder	*Polemonium reptans*	x	x											
jimsonweed*	*Datura stramonium**													x
joe pye weed, purple	*Eupatorium purpureum*	x												
Juneberry	*Amelanchier arborea*	x												
knapweed*, spotted	*Centaurea maculosa**				x									
knotweed*, common	*Polygonum aviculare**													x
knotweed*, Japanese	*Polygonum cuspidatum**													x
knotweed, bushy	*Polygonum ramosissimum*				x				x					
knotweed, erect	*Polygonum erectum*													x
knotweed, slender	*Polygonum tenue*											x		
knotweed, Virginia	*Polygonum virginianum*	x	x											
knotweed, water	*Polygonum amphibium*				x				x		x			
kudzu*	*Pueraria lobata**	x												x
ladies' tresses, little	*Spiranthes tuberosa*				x	x	x	x						
ladies' tresses, nodding	*Spiranthes cernua*				x	x	x							
ladies' tresses, slender	*Spiranthes gracilis*				x	x	x	x						
lady's-thumb*	*Polygonum persicaria**													x
lady's-thumb, curttop	*Polygonum lapathifolium*								x					
lamb's quarters*	*Chenopodium album**													x
larkspur*, rocket	*Consolida ambigua**													x
larkspur, dwarf	*Delphinium tricorne*	x	x		x		x							
leadplant	*Amorpha canescens*				x		x							
lespedeza*, bicolor	*Lespedeza bicolor**													x
lespedeza*, Japanese	*Kummerowia striata**													x
lettuce*, prickly	*Lactuca serriola**													x
lettuce*, willow-leaved	*Lactuca saligna**													x
lettuce, blue	*Lactuca floridana*	x												
lettuce, glaucous white	*Prenanthes racemosa*				x		x							
lettuce, rough white	*Prenanthes aspera*				x		x							
lettuce, tall white	*Prenanthes altissima*	x												
lettuce, wild	*Lactuca canadensis*	x			x									x
licorice, wild	*Galium circaezans*	x		x		x		x						
lily*, orange day	*Hemerocallis fulva**													x
lily, Michigan	*Lilium michiganense*	x			x		x							
linden, American	*Tilia americana*	x	x											
lizard's-tail	*Saururus cernuus*								x		x			
lobelia, great blue	*Lobelia siphilitica*		x						x					
lobelia, spiked	*Lobelia spicata*				x	x	x	x						
locust*, black	*Robinia pseudoacacia**		x											x
locust, honey	*Gleditsia triacanthos*		x											
looking-glass, Venus'	*Triodanus perfoliata*				x		x	x				x		
looking-glass, Venus'	*Triodanus perfoliata* var. *biflora*				x		x	x				x		

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Forest			Prairie		Savanna		Wetland			Primary		
	Sub-class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
loosestrife*, dotted	*Lysmachia punctata**													x
loosestrife, false	*Ludwigia polycarpa*				x									x
loosestrife, fringed	*Lysimachia ciliata*		x		x		x							
loosestrife, lance-leaved	*Lysimachia lanceolata*		x		x									
loosestrife, narrow-leaved	*Lysimachia quadriflora*								x	x				
loosestrife, purple	*Lythrum alatum*				x				x	x				
loosestrife, swamp	*Decodon verticillatus*								x					
lopseed	*Phryma leptostachya*	x	x											
lotus, american	*Nelumbo lutea*										x			
madder, wild	*Galium obtusum*				x				x					
mallow, glade	*Napaea dioica*		?											?
mallow, hairy rose	*Hibiscus lasiocarpus*		x						x		x			
mallow, halberd-leaved rose	*Hibiscus laevis*		x						x		x			
mallow, swamp rose	*Hibiscus moscheutos*		x						x		x			
maple, black	*Acer nigrum*	x												
maple, red	*Acer rubrum*	x		x										
maple, silver	*Acer saccharinum*		x											
maple, sugar	*Acer saccharum*	x												
marigold, nodding bur	*Bidens cernua*								x					x
marigold, swamp	*Bidens aristosa*				x				x					
marigold, tall swamp	*Bidens coronata*								x					
marsh marigold	*Caltha palustris*								x	x				
marsh-elder	*Iva annua*				x									x
Mary, blue-eyed	*Collinsia verna*		x											
Mayapple	*Podophyllum peltatum*	x	x	x										
medic*, black	*Medicago lupulina**													x
mercury, large-seeded	*Acalypha deamii*		x											
mercury, slender three-seeded	*Acalypha gracilens*			x				x				x		
mercury, three-seeded	*Acalypha rhomboidea*	x	x	x										
mercury, three-seeded	*Acalypha virginica*	x	x	x	x									
mermaid, false	*Floerkea proserpinacoides*	x	x											
mermaid-weed	*Proserpinaca palustris*										x			
milfoil*, common	*Achillea millefolium**				x									x
milfoil, various-leaved water	*Myriophyllum heterophyllum*										x			
milkweed, common	*Asclepias syriaca*				x		x							x
milkweed, green	*Asclepias viridiflora*				x	x	x							
milkweed, green-flowered	*Asclepias viridis*				x									x
milkweed, horsetail	*Asclepias verticillata*				x		x							x
milkweed, prairie	*Asclepias sullivantii*				x									
milkweed, purple	*Asclepias purpurascens*				x		x							
milkweed, swamp	*Asclepias incarnata*				x				x					x
milkweed, tall green	*Asclepias hirtella*				x		x							
milkweed, variegated	*Asclepias variegata*		x	x										
milkwort, field	*Polygala sanguinea*				x		x							x
milkwort, whorled	*Polygala verticillata*	x			x	x	x	x						
millet*, foxtail	*Setaria italica**													x
mimosa*	*Albizia julibrissin**													x
mint*, apple	*Mentha x rotundifolia**													x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Forest			Prairie		Savanna		Wetland			Primary		
	Sub-class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
mint, Ohio horse	*Blephilia ciliata*				x		x							
mint, wild	*Mentha arvensis* var. *villosa*								x					
mint, wood	*Blephilia hirsuta*	x	x											
mistflower	*Eupatorium coelestinum*		x											x
monarda	*Monarda bradburiana*	x				x		x						
moneywort*	*Lysimachia nummularia**		x											x
monkeyflower	*Mimulus ringens*		x		x									
monkeyflower, winged	*Mimulus alatus*		x											
moonseed	*Menispermum canadense*		x											
morning glory*, ivy-leaved	*Ipomoea hederacea**				x									x
morning glory*, red	*Ipomoea coccinea**													x
morning glory, small	*Ipomoea lacunosa*													x
mountain-mint, common	*Pycnanthemum virginianum*				x									
mountain-mint, hairy	*Pycnanthemum pilosum*	x				x	x	x			x			
mountain-mint, slender	*Pycnanthemum tenuifolium*			x	x	x								
mousetail	*Myosurus minimus*													x
mulberry*, white	*Morus alba**	x	x											x
mulberry, red	*Morus rubra*	x	x	x										
mullein*, moth	*Verbascum blattaria**													x
mullein*, wooly	*Verbascum thapsus**				x									x
mustard*, black	*Brassica nigra**													x
mustard*, hedge	*Sisymbrium officinale**													x
mustard*, tansy	*Descurainia pinnata**				x									x
mustard*, treacle	*Erysimum repandum**													x
mustard*, tumble	*Sisymbrium altissimum**													x
naiad, lesser	*Najas minor*										x			
nannyberry, rusty	*Viburnum rufidulum*	x						x						
needles, Spanish	*Bidens bipinnata*		x											x
nettle, false	*Boehmeria cylindrica*		x						x					
nettle, tall	*Urtica dioica*		x											
nettle, wood	*Laportea canadensis*		x											
nightshade, black	*Solanum ptycanthum*													x
nightshade, enchanter's	*Circaea lutetiana* ssp. *canadensis*	x												
nimblewill	*Muhlenbergia schreberi*	x												x
nits-and-lice	*Hypericum drummondii*	x						x				x		
oak, basket	*Quercus michauxii*		x											
oak, black	*Quercus velutina*	x		x			x	x						
oak, blackjack	*Quercus marilandica*	x		x			x	x						
oak, burr	*Quercus macrocarpa*	x	x	x			x							
oak, overcup	*Quercus lyrata*		x	x										
oak, pin	*Quercus palustris*		x	x	x									
oak, post	*Quercus stellata*	x		x			x	x						
oak, red	*Quercus rubra*	x		x										
oak, scarlet	*Quercus coccinea*	x						x						
oak, shingle	*Quercus imbricaria*	x		x	x		x	x						
oak, Shumard's	*Quercus shumardii*		x											
oak, Southern red	*Quercus falcata*	x	x											
oak, swamp white	*Quercus bicolor*		x	x			x							

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
Class		Forest			Prairie		Savanna		Wetland			Primary		
Sub-class		Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
oak, white	*Quercus alba*	x		x			x	x						
oak, yellow chestnut	*Quercus prinoides* var. *acuminata*	x	x											
oats*, wild	*Avena sativa**													x
oats, sea	*Chasmanthium latifolium*		x											
obe-wan-conobea	*Leucospora multifida*		x								x			x
obedient-plant	*Physostegia virginiana*				x	x	x							
obedient-plant, showy	*Physostegia speciosa*		x		x		x							
olive*, autumn	*Elaeagnus umbellata**	x			x									x
olive*, Russian	*Elaeagnus angustifolia**													x
orchid, green-fringed	*Platanthera lacera*				x		x							
orchid, purple fringeless	*Platanthera peramoena*		x											
orchid, purple fringless	*Habenaria peramoena*		x											
orchid, tubercled - SE	***Platanthera flava* var. *herbiola* -SE**		x											
orchid, yellow lady's slipper	*Cypripedium pubescens*	x												
orchis, showy	*Galearis spectabilis*	x												
osage-orange*	*Maclura pomifera**	x	x											x
oyster-salsify*	*Tragopogon porrifolius**													x
panicum, fall	*Panicum dichotomiflorum*													x
pansy*, wild	*Viola rafinesquii**	x						x						x
parsley, prairie	*Polytaenia nuttallii*				x									
parsley, thicket	*Perideridia americana*				x		x							
parsnip*, wild	*Pastinaca sativa**				x									x
parsnip, hairy meadow	*Thaspium barbinode*						x	x						
parsnip, purple meadow	*Thaspium trifoliatum*		x											
parsnip, water	*Sium suave*								x		x			
parsnip, yellow meadow	*Thaspium trifoliatum* var. *flavum*		x											
passion flower, large	*Passiflora incarnata*													x
passion flower, small	*Passiflora lutea* var. *glabriflora*	x		x				x						
pawpaw	*Asimina triloba*	x												
pea*, everlasting	*Lathyrus latifolius**													x
pea, partridge	*Cassia fasciculata*				x		x							x
peach*	*Prunus persica**													x
pear*	*Pyrus communis**													x
pearlwort	*Sagina decumbens*												?	x
pecan	*Carya illinoensis*		x											
pellitory, Pennsylvania	*Parietaria pensylvanica*		x											
pencilflower	*Stylosanthes biflora*				x	x		x				x		
pennyroyal, American	*Hedeoma pulegiodes*	x		x				x					x	
pennyroyal, rough	*Hedeoma hispida*	x						x					x	
pepper*, water	*Polygonum hydropiper**								x					x
pepper, mild water	*Polygonum hydropiperoides*		x	x					x					
peppergrass*, small	*Lepidium densiflorum**													x
peppergrass, common	*Lepidium virginicum*	x			x									x
periwinkle*, common	*Vinca minor**													x
persimmon	*Diospyros virginiana*	x	x		x									x
petunia, stalked wild	*Ruellia pedunculata*	x												
phlox, blue	*Phlox divaricata*	x	x											
phlox, garden	*Phlox paniculata*		x											

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Forest			Prairie		Savanna		Wetland			Primary		
	Sub-class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
phlox, prairie	*Phlox pilosa*				x	x	x	x						
phlox, smooth	*Phlox glaberrima* ssp. *interior*				x									
physic, Indian	*Porteranthus stipulatus*	x		x		x		x						
pickerelweed	*Pontederia cordata*								x		x			
pigweed*, spiny	*Amaranthus spinosus**													x
pimpernel, yellow	*Taenidia integerrima*	x			x	x	x	x						
pimpernell, false	*Lindernia dubia* var. *anagallidea*								x		x			
pimpernell, slender false	*Lindernia dubia*								x		x			
pineappleweed*	*Matricaria matricarioides**													x
pinesap	*Monotropa hypopithys*	x												
pineweed	*Hypericum gentianoides*	x						x				x		
pink*, deptford	*Dianthus armeria**				x									x
pinweed, narrow-leaved	*Lechea tenuifolia*			x				x						
plant*, beefsteak	*Perilla frutescens**													x
plantain*, English	*Plantago lanceolata**				x									x
plantain, bracted	*Plantago aristata*											x		x
plantain, dwarf	*Plantago virginica*											x		x
plantain, red-stalked	*Plantago rugelii*													x
plantain, Robin's	*Erigeron pulchellus*	x						x						
plantain, small	*Plantago pusilla*											x		
plum, American	*Prunus americana*	x			x		x							x
plum, Canada	*Prunus nigra*	x												
plum, chickasaw	*Prunus angustifolia*													x
plum, wild	*Prunus americana* var. *lanata*			x										
plum, wild goose	*Prunus hortulana*													x
poison-ivy	*Toxicodendron radicans*	x	x	x										x
pokeweed	*Phytolacca americana*													x
pondweed*, beginner's	*Potamogeton crispus**										x			
pondweed, American	*Potamogeton nodosus*										x			
pondweed, baby	*Potamogeton pusillus*										x			
pondweed, large-leaved	*Potamogeton amplifolius*										x			
pondweed, leafy	*Potamogeton foliosus*										x			
pondweed, water-thread	*Potamogeton diversifolius*										x			
poplar*, white	*Populus alba**													x
prairie-clover, purple	*Dalea purpurea*				x	x	x							
prairie-clover, white	*Dalea candida*				x	x	x							
prairie-dock	*Silphium terebinthinaceum*				x	x								
prickly-ash	*Xanthoxylum americanum*	x	x											
prickly-pear, Eastern	*Opuntia humifusa*											x	x	
primrose willow, creeping	*Ludwigia peploides* ssp. *glabrescens*				x						x			
privet*, common	*Ligustrum vulgare**	x												x
privet, swamp	*Forestiera acuminata*		x								x			
puccoon, fringed	*Lithospermum insisum*					x								
puccoon, hoary	*Lithospermum canescens*				x		x							
puncture-vine	*Tribulus terrestris*													x
purpletop, common	*Tridens flavus*				x		x							x
purpletop, spiked	*Tridens strictus*													x
purse*, shepherd's	*Capsella bursa-pastoris**													x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Forest			Prairie		Savanna		Wetland			Primary		
	Sub-class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
purslane*	*Portulaca oleracea**													x
purslane, marsh	*Ludwigia palustris* var. *americana*										x			
pussytoes	*Antennaria plantaginifolia*	x			x	x	x	x						
Queen Anne's lace*	*Daucus carota**				x									x
quillwort, black	*Isoetes melanopoda*			x										
quinine, wild	*Parthenium integrifolium*			x	x	x	x	x						
ragweed, common	*Ambrosia artemisiifolia*				x		x							x
ragweed, giant	*Ambrosia trifida*		x		x									x
ragweed, lanceleaf	*Ambrosia bidentata*				x									x
ragweed, western	*Ambrosia psilostachya*				x									
ragwort, golden	*Senecio aureus*													x
raspberry*, cultivated	*Rubus idaeus**													x
raspberry, black	*Rubus occidentalis*	x		x	x		x							x
rattlebox	*Crotalaria sagittalis*				x									x
rattlesnake-master	*Eryngium yuccifolium*				x	x	x	x						
redbud	*Cercis canadensis*	x												x
redtop*	*Agrostis alba**				x									x
reed, common	*Phragmites australis*				x				x					
reed, common wood	*Cinna arundinacea*		x	x	x									
rice, Southern wild	*Zizanopsis miliaceae*										x			
rocket*, Dame's	*Hesperis matronalis**		x											x
rocket*, yellow	*Barbarea vulgaris**				x									x
rockrose	*Helianthemum bicknellii*	x						x						
rose*, multiflora	*Rosa multiflora**	x	x	x	x									x
rose, Illinois	*Rosa setigera*			x			x							
rose, pasture	*Rosa carolina*	x		x	x	x	x	x						
rose, swamp	*Rosa palustris*								x		x			
rosinweed	*Silphium integrifolium*				x	x	x							
rue, early meadow	*Thalictrum dioicum*	x												
rue, goat's	*Tephrosia virginiana*				x	x	x	x						
rue, purple meadow	*Thalictrum dasycarpum*				x		x		x					
rue, waxy meadow	*Thalictrum revolutum*				x		x		x					
ruellia, hairy	*Ruellia humilis*				x	x	x							x
ruellia, smooth	*Ruellia strepens*	x	x											
rush, bristleless dark green	*Scirpus georgianus*								x					
rush, common	*Juncus effusus* var. *solutus*										x			
rush, dark green	*Scirpus atrovirens*				x				x					x
rush, Dudley's	*Juncus dudleyi*				x									
rush, grass-leaved	*Juncus marginatus*				x				x					
rush, hedgehog club	*Cyperus ovularis*		x											x
rush, inland	*Juncus interior*				x									x
rush, joint	*Juncus nodosus*									x				
rush, path	*Juncus tenuis*			x	x									x
rush, sharp-fruited	*Juncus acuminatus*				x				x	x	x			x
rush, short-fruited	*Juncus brachycarpus*				x				x					
rush, short-headed	*Juncus brachycephalus*									x				
rush, side-flowering	*Juncus secundus*				x							x		
rush, stout	*Juncus nodatus*								x		x			

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
Class														
Sub-class		Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
rush, Torrey's	*Juncus torreyi*								x					
rush, two-flowered	*Juncus biflorus*								x		x			
rushfoil	*Crotonopsis elliptica*			x										
rye*	*Secale cereale**													x
rye, nodding wild	*Elymus canadensis*				x	x	x							
rye, riverbank wild	*Elymus riparius*		x											
rye, silky wild	*Elymus villosus*	x	x	x	x	x								
rye, virginia wild	*Elymus virginicus*	x	x		x	x	x							
saltbush*, fat-hen	*Atriplex patula**													x
sandbur, mat	*Cenchrus longispinus*													x
sandwort*, thyme-leaved	*Arenaria serpyllifolia**				x									x
sassafras	*Sassafras albidum*	x		x	x		x	x						
saxifrage, swamp	*Saxifraga pensylvanica*		x		x							x		
scorpion grass	*Myosotis macrosperma*	x						x						x
scorpion grass*, field	*Myosotis arvensis**				x									
scouring rush, smooth	*Equisetum laevigatum*								x					
scouring rush, tall	*Equisetum hymale* var. *affine*		x		x				x					x
sedge	*Carex suberecta*				x					x				
sedge, autumn	*Fimbristylis autumnalis*							x			x			
sedge, awl-fruited oval	*Carex tribuloides*		x		x				x					
sedge, awned flat	*Cyperus aristatus*		x								x			x
sedge, awned graceful	*Carex davisii*		x		x									
sedge, beech wood	*Carex laxiflora*	x	x											
sedge, bent bracted	*Carex retroflexa*	x												
sedge, Bicknell's	*Carex bicknellii*				x									
sedge, blue	*Carex glaucodea*	x		x				x						
sedge, blunt-scaled oak	*Carex artitecta*	x		x				x						
sedge, blunt-scaled wood	*Carex albursina*	x												
sedge, bottlebrush	*Carex lurida*		x						x					
sedge, bristly cattail	*Carex frankii*		x											
sedge, brook flat	*Cyperus rivularis*		x							x	x			
sedge, brown fox	*Carex vulpinoidea*				x				x					x
sedge, common bur	*Carex grayi*		x											
sedge, common cattail	*Carex typhina*		x											
sedge, common fox	*Carex stipata*		x											
sedge, common hop	*Carex lupulina*		x						x					
sedge, common lake	*Carex lacustris*								x					
sedge, common wood	*Carex blanda*	x					x							
sedge, crested oval	*Carex cristatella*				x				x					
sedge, crowfoot fox	*Carex crus-corvi*		x											
sedge, curly-styled wood	*Carex rosea*	x					x							
sedge, dark-scaled	*Carex buxbaumii*				x					x				
sedge, downy green	*Carex swanii*		x											
sedge, drooping - ST	***Carex prasina* - ST**									x	x			
sedge, dwarf bracted	*Carex leavenworthii*	x			x									
sedge, early oak	*Carex umbellata*				x		x							
sedge, false green flat	*Cyperus pseudovegatus*		x											x
sedge, fescue oval	*Carex festucacea*	x	x	x	x									

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Forest			Prairie		Savanna		Wetland			Primary		
	Sub-class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
sedge, few-fruited gray	*Carex oligocarpa*		x											
sedge, fibrous-rooted - ST	***Carex communis* - ST**	x												
sedge, field nut	*Cyperus esculentus*		x								x			x
sedge, field oval	*Carex molesta*				x									x
sedge, green-headed fox	*Carex conjuncta*								x					
sedge, hairy green	*Carex hirsutella*			x				x						
sedge, hairy wood	*Carex hirtifolia*	x												
sedge, hybrid lake	*Carex x subimpressa*								x					
sedge, James' grass	*Carex jamesii*	x												
sedge, knobbed hop	*Carex lupuliformis*		x						x					
sedge, lance-fruited oval	*Carex scoparia*		x		x				x					
sedge, large yellow	*Carex annectens*				x				x					x
sedge, long-awned bracted	*Carex gravida*				x		x							
sedge, long-scaled green	*Carex bushii*	x		x	x			x						
sedge, long-scaled nut	*Cyperus strigosus*		x		x									x
sedge, loose-headed bracted	*Carex sparganioides*		x											
sedge, loose-headed oval	*Carex projecta*		x											
sedge, Mead's stiff	*Carex meadii*				x		x							
sedge, narrow-leaved cattail	*Carex squarrosa*		x											
sedge, narrow-leaved wood	*Carex digitalis*	x												
sedge, pale	*Carex granularis*		x						x					
sedge, Pennsylvania oak	*Carex pensylvanica*	x					x	x						
sedge, plains oval	*Carex brevior*				x		x							x
sedge, porcupine	*Carex hystricina*									x				
sedge, red-rooted nut	*Cyperus erythrorhizos*		x								x			x
sedge, sand bracted	*Carex muhlenbergii*				x			x						
sedge, Short's	*Carex shortiana*				x		x							x
sedge, short-headed bracted	*Carex cephalophora*	x												
sedge, short-pointed flat	*Cyperus acuminatus*		x								x			x
sedge, short-scaled green	*Carex caroliniana*		x	x										
sedge, slender wood	*Carex gracilescens*	x												
sedge, small yellow fox	*Carex annectens* var. *xanthocarpa*				x				x					x
sedge, smooth clustered	*Carex aggregata*	x		x										
sedge, southern hop	*Carex louisianica*		x											
sedge, southern lake	*Carex hyalinolepis*								x					
sedge, spreading oval	*Carex normalis*			x	x									
sedge, straight-styled wood	*Carex radiata*	x												
sedge, swamp oval	*Carex muskingumensis*		x											
sedge, three -way	*Dulichium arundinaceum*								x					
sedge, wood gray	*Carex grisea*	x	x											
sedge, wooly	*Carex lanuginosa*				x				x					
seedbox	*Ludwigia alternifolia*			x	x						x			
self-heal	*Prunella vulgaris* var. *lanceolata*	x			x		x							
self-heal*, lawn	*Prunella vulgaris**													x
senna, Maryland	*Cassia marilandica*									x				x
sicklepod	*Cassia obtusifolia*										x			
sida*, prickly	*Sida spinosa**													x
skullcap, downy	*Scutellaria incana*	x						x						

Appendix 1. Continued.

Class		Forest			Prairie		Savanna		Wetland			Primary		
Sub-class		Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
Common Name[1,2]	Scientific Name[1,2]													
skullcap, hairy	*Scutellaria elliptica*	x			x			x						
skullcap, heart-leaved	*Scutellaria ovata*	x												
skullcap, heart-leaved	*Scutellaria ovata* var. *versicolor*	x												
skullcap, mad-dog	*Scutellaria lateriflora*		x						x					
skullcap, small	*Scutellaria australis*	x			x			x						
skullcap, small	*Scutellaria parvula*			x		x								
skullcap, veiny	*Scutellaria nervosa*		x											
smartweed	*Polygonum punctatum*				x				x					
smartweed*, creeping	*Polygonum cespitosum* var. *longisetum**													x
smartweed, bristly	*Polygonum setaceum* var. *interjectum*								x					
smartweed, common	*Polygonum pensylvanicum*		x		x				x					
snakeroot, Canadian black	*Sanicula canadensis*	x		x	x		x							
snakeroot, Clustered black	*Sanicula gregaria*	x			x									
snakeroot, Sampson's	*Psoralea psoralioides* var. *eglandulosa*	x		x				x						
snakeroot, seneca	*Polygala senega*	x			x		x			x				
snakeroot, Virginia	*Aristolochia serpentaria*	x		x				x						
snakeroot, white	*Eupatorium rugosum*	x		x	x									
snapdragon*, dwarf	*Chaenorrhinum minus**													x
sneezeweed	*Helenium autumnale*					x			x					
sneezeweed, purple-headed	*Helenium flexuosum*				x									x
snow-on-the-mountain*	*Euphorbia marginata**													x
Soloman's seal, false	*Smilacina racemosa*	x		x	x		x							
Soloman's seal, great	*Polygonatum commutatum*	x					x							
sorghum*	*Sorghum bicolor**													x
sorrel*, field	*Rumex acetosella**													x
spatterdock	*Nuphar luteum*										x			
spearwort	*Ranunculus laxicaulis*		x		x									
spearwort, small	*Ranunculus pusillus*		x											
speedwell*, corn	*Veronica arvensis**				x									x
speedwell*, dwarf bird's-eye	*Veronica polita**													x
speedwell, purslane	*Veronica peregrina*													x
spicebush	*Lindera benzoin*		x											
spiderwort, broad-leaved	*Tradescantia subaspera*		x											
spiderwort, common	*Tradescantia ohiensis*			x	x	x	x	x						
spiderwort, Virginia	*Tradescantia virginiana*	x		x	x	x	x	x						
spike rush, angled	*Eleocharis quadrangulata*								x					
spike rush, blunt	*Eleocharis obtusa*								x					
spike rush, golden-stemmed	*Eleocharis elliptica*								x					
spike rush, great	*Eleocharis palustris*				x				x					
spike rush, marsh	*Eleocharis smallii*								x					
spike rush, needle	*Eleocharis acicularis*		x		x				x					
spike rush, red-rooted	*Eleocharis erythropoda*								x					
spike rush, slender	*Eleocharis verrucossa*			x	x									
spike rush, Wolf's	*Eleocharis wolfii*			x	x									
spikenard, American	*Aralia racemosa*	x												
spleenwort, ebony	*Asplenium platyneuron*	x												
spurge, flowering	*Euphorbia corollata*			x	x	x	x	x						

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest: Upland	Forest: Floodplain	Forest: Flatwoods	Prairie: Prairie	Prairie: Hill	Savanna: Savanna	Savanna: Barrens	Wetland: Marsh	Wetland: Seep	Wetland: Pond/Shrub	Primary: Sandstone Cliff	Primary: Limestone/Dolomite	Cultural
spurge, nodding	*Chamaesyce maculata*				x									x
spurge, spotted creeping	*Chamaesyce supina*													x
spurge, spreading	*Chamaesyce humistrata*		x											x
spurge, toothed	*Poinsettia dentata*				x									x
St. John's wort*, common	*Hypericum perforatum**													x
St. John's wort, clasping	*Hypericum gymnanthum*		?											
St. John's wort, dwarf	*Hypericum mutilum*		x											
St. John's wort, marsh	*Triadenum tubulosum*		x											
St. John's wort, round-fruited	*Hypericum sphaerocarpum*				x				x					x
St. John's wort, shrubby	*Hypericum prolificum*	x												x
St. John's wort, spotted	*Hypericum punctatum*	x			x									x
star, shooting	*Dodecatheon meadia*	x			x	x	x							
star-of-Bethlehem*, common	*Ornithogallum umbellatum**													x
star-violet	*Hedyotis pusilla*	x						x						x
stargrass, yellow	*Hypoxis hirsuta*	x			x		x	x				x		
starwort*	*Stellaria graminea**													x
starwort, large water	*Callitriche heterophylla*				x						x			
starwort, terrestrial	*Callitriche terrestris*		x		x									x
stickseed	*Hackelia virginiana*	x												x
stitchwort	*Stellaria longifolia*		x											
stonecrop, ditch	*Penthorum sedoides*		x		x				x					x
stonecrop, three-leaved	*Sedum ternatum*											x		
strawberry, wild	*Fragaria virginiana*	x			x	x	x	x						
sugarberry	*Celtis laevigata*		x											
sumac, aromatic	*Rhus aromatica*				x	x								
sumac, dwarf	*Rhus copallina*	x				x								x
sumac, smooth	*Rhus glabra*				x		x							x
sundrops, prairie	*Oenothera pilosella*				x									
sundrops, thread-leaved	*Oenothera linifolia*											x		
sunflower*, common	*Helianthus annuus**													x
sunflower*, petioled	*Helianthus petiolaris**													x
sunflower, bristly	*Helianthus hirsutus*		x	x										
sunflower, downy	*Helianthus mollis*			x	x		x							
sunflower, false	*Heliopsis helianthoides*						x							x
sunflower, pale leaved	*Helianthus strumosus*		x											x
sunflower, sawtooth	*Helianthus grosseserratus*				x		x		x					
sunflower, woodland	*Helianthus divaricatus*	x		x	x	x	x	x						
Susan, black-eyed	*Rudbeckia hirta*	x			x	x	x	x						x
Susan, brown-eyed	*Rudbeckia triloba*	x	x		x									
Susan, sweet black-eyed	*Rudbeckia subtomentosa*		x											
sweet cicely, hairy	*Osmorhiza claytonii*	x	x											
sweet potato, wild	*Ipomoea pandurata*					x								x
sweetflag	*Acorus americanus*								x					
sycamore	*Platanus occidentalis*		x											x
tajo, yerba de	*Eclipta prostrata*													x
tansy*, common	*Tanacetum vulgare**													x
tea, New Jersey	*Ceanothus americanus*				x	x	x	x						
tea, prairie	*Croton monanthogynus*													x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Forest			Prairie		Savanna		Wetland			Primary		
	Sub-class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
tearthumb, arrow-leaved	*Polygonum sagittatum*		x						x					
teasel*, common	*Dipsacus sylvestris**													x
teasel*, cut-leaved	*Dipsacus laciniatus**													x
thistle*, bull	*Cirsium vulgare**													x
thistle*, musk bristle	*Carduus nutans**													x
thistle*, prickly sow	*Sonchus asper**													x
thistle, common sow	*Sonchus oleraceus*													x
thistle, Hill's - ST	***Cirsium hillii* - ST +**				x	x	x							
thistle, pasture	*Cirsium discolor*				x									x
thistle, tall	*Cirsium altissimum*	x			x			x						
tick trefoil, panicled	*Desmodium paniculatum*	x			x									x
tick trefoil, sessile-leaved	*Desmodium sessilifolium*				x									
tick-trefoil, bare-stemmed	*Desmodium nudiflorum*	x												
tick-trefoil, bracted	*Desmodium cuspidatum*	x												
tick-trefoil, hairy	*Desmodium ciliare*	x												
tick-trefoil, Illinois	*Desmodium illinoense*				x									
tick-trefoil, pointed	*Desmodium glutinosum*	x						x						
tick-trefoil, round-leaved	*Desmodium rotundifolium*	x						x						
tick-trefoil, showy	*Desmodium canadense*				x	x	x							
tick-trefoil, small-leaved	*Desmodium marilandicum*	x												
tick-trefoil, smooth	*Desmodium glabellum*	x			x									
tick-trefoil, stiff	*Desmodium obtusum*	x												
tickseed, purple-stemmed	*Bidens connata*								x					x
timothy*	*Phleum pratense**													x
timothy, upland wild	*Muhlenbergia racemosa*	x												
toadflax, false	*Comandra umbellata*				x		x							
tobacco, Indian	*Lobelia inflata*		x	x										
tomato, strawberry	*Physalis pruinosa*													x
toothwort	*Dentaria laciniata*	x			x		x							
touch-me-not, pale	*Impatiens pallida*	x	x											
touch-me-not, spotted	*Impatiens capensis*	x	x						x					
tree, Kentucky coffee	*Gymnocladus dioica*		x											
trefoil*, birdsfoot	*Lotus corniculatus**													x
trillium, green - SE	***Trillium viride* - SE**	x												
trillium, red	*Trillium recurvatum*	x	x		x		x							
trout lily, white	*Erythronium albidum*	x					x							
trumpet-creeper	*Campsis radicans*	x	x											x
tumbleweed	*Amaranthus albus*													x
turtlehead, pink	*Chelone obliqua* var. *speciosa*		x											
turtlehead, white	*Chelone glabra*								x	x				
twayblade, purple	*Liparis lilifolia*	x		x										
twinleaf	*Jeffersonia diphylla*	x												
velvet leaf*	*Abutilon theophrasti**													x
vervain	*Verbena* x *engelmannii*													x
vervain, blue	*Verbena hastata*				x				x					
vervain, creeping	*Verbena bracteata*													x
vervain, hoary	*Verbena stricta*				x									x
vervain, narrow-leaved	*Verbena simplex*				x									x

Appendix 1. Continued.

Common Name[1,2]	Scientific Name[1,2]	Forest			Prairie		Savanna		Wetland			Primary		
	Class	Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
vervain, rose	*Glandularia canadensis*	x				x		x						
vervain, white	*Verbena urticifolia*								x					x
vetch*, crown	*Coronilla varia**													x
vetch*, winter	*Vicia villosa**													x
vetch*, wooly pod	*Vicia dasycarpa**													x
vetch, Canadian milk	*Astragalus canadensis*				x		x							
violet	*Viola palmata*	x						x						
violet	*Viola* x *bernardii*				x									
violet, arrow-leaved	*Viola sagittata*			x	x									
violet, bird's foot	*Viola pedata*	x						x					x	
violet, common blue	*Viola pratincola*	x	x											x
violet, common white	*Viola striata*		x											
violet, downy yellow	*Viola pubescens*	x	x											
violet, marsh blue	*Viola obliqua*		x						x					
violet, Missouri	*Viola missouriensis*		x											
violet, prairie	*Viola pedatifida*				x		x							
violet, smooth yellow	*Viola pubescens* var. *eriocarpa*	x	x											
violet, woodland blue	*Viola affinis*		x											
violet, woolly blue	*Viola sororia*		x		x									
wahoo	*Euonymus atropurpureus*	x												
walnut, black	*Juglans nigra*	x	x											x
water plantain, common	*Alisma plantago-aquatica* var. *parviflorum*								x					
Water-pennywort - SE	***Hydrocotyle ranunculoides* - SE**										x			
waterhemp, tall	*Amaranthus tuberculatus*													x
waterhemp, tamarisk	*Amaranthus rudis*		x											x
waterhorehound, common water	*Lycopus americanus*								x					
waterhorehound, stalked	*Lycopus rubellus*		x						x					
waterleaf, great	*Hydrophyllum appendiculatum*	x												
waterleaf, large-leaf	*Hydrophyllum macrophyllum*	x												
waterleaf, Virginia	*Hydrophyllum virginianum*	x												
waterlily, fragrant	*Nymphaea odorata*										x			
watermeal	*Wolffia columbiana*										x			
waterweed, slender	*Elodea nuttallii*										x			
weatherglass*, poor man's	*Anagallis arvensis**													x
wheat*	*Triticum aestivum**													x
wheelwort	*Rotala ramosior*										x			
whitlow grass*, vernal	*Eriophila verna**													x
whitlow grass, common	*Draba reptans*												x	
whitlow grass, short-leaved	*Draba brachycarpa*	x			x									x
wild indigo, cream	*Baptisia leucophaea*				x		x							
wild indigo, white	*Baptisia lactea*			x	x		x							
willow herb, cinnamon	*Epilobium coloratum*								x					
willow*, white	*Salix alba**								x					x
willow, black	*Salix nigra*		x						x		x			
willow, heart-leaved	*Salix eriocephala*								x					
willow, peach-leaved	*Salix amygdaloides*								x		x			
willow, prairie	*Salix humilis*				x		x							

Appendix 1. Continued.

Class		Forest			Prairie		Savanna		Wetland			Primary		
Sub-class		Upland	Floodplain	Flatwoods	Prairie	Hill	Savanna	Barrens	Marsh	Seep	Pond/Shrub	Sandstone Cliff	Limestone/ Dolomite	Cultural
Common Name[1,2]	Scientific Name[1,2]													
willow, pussy	*Salix discolor*								x					
willow, sandbar	*Salix exigua*		x		x						x			
willow, silky	*Salix sericea*								x					
willow, water	*Justicia americana*										x			
wingstem	*Verbesina alternifolia*		x											
wintercreeper*	*Euonymus fortunei**													x
wood sorrel, common	*Oxalis dillenii*	x												x
wood sorrel, tall	*Oxalis stricta*	x			x		x							x
wood sorrel, violet	*Oxalis violacea*	x		x	x	x	x	x						
woodsia, common	*Woodsia obtusa*	x						x						
wormseed*, American	*Chenopodium ambrosioides**													x
woundwort	*Stachys palustris*				x				x					
yam, wild	*Dioscorea quaternata*	x		x										
yam, wild	*Dioscorea villosa*	x		x										

[1] Bold type indicates an Illinois endangered (SE) or Illinois threatened (ST) species.
[2] An asterisk (*) indicates introduced, non-native species.

Appendix 2

Incomplete list of vascular plants known from the Kaskaskia River Assessment Area (from Appendix 1), sorted by scientific name.

Scientific Name[1,2]	Common Name[1,2]
*Abutilon theophrasti**	velvet leaf*
Acalypha deamii	mercury, large-seeded
Acalypha gracilens	mercury, slender three-seeded
Acalypha rhomboidea	mercury, three-seeded
Acalypha virginica	mercury, three-seeded
Acer negundo	boxelder
Acer nigrum	maple, black
Acer rubrum	maple, red
Acer saccharinum	maple, silver
Acer saccharum	maple, sugar
*Achillea millefolium**	milfoil*, common
Acorus americanus	sweetflag
Actaea pachypoda	doll's-eyes
Adiantum pedatum	fern, maidenhair
Aesculus glabra	buckeye, Ohio
Agalinis purpurea	foxglove, false
Agalinis tenuifolia	foxglove, slender false
Agastache nepetoides	hyssop, giant yellow
Agrimonia parviflora	agrimony, swamp
Agrimonia pubescens	agrimony, soft
Agrimonia rostellata	agrimony, woodland
*Agrostemma githago**	corn-cockle*
*Agrostis alba**	redtop*
Agrostis hyemalis	grass, tickle
Agrostis perennans	grass, autumn bent
Agrostis scabra	grass, fly-away
*Albizia julibrissin**	mimosa*
Alisma plantago-aquatica var. *parviflorum*	water plantain, common
Allium canadense	garlic, wild
*Allium vineale**	garlic*, field
Alopecurus aequalis	foxtail
Alopecurus carolinianus	foxtail, annual
*Althea rosea**	hollyhock*
Amaranthus albus	tumbleweed
*Amaranthus graecizans**	amaranth*, prostrate
*Amaranthus hybridus**	amaranth*, green
*Amaranthus retroflexus**	amaranth*, rough
Amaranthus rudis	waterhemp, tamarisk
*Amaranthus spinosus**	pigweed*, spiny
Amaranthus tuberculatus	waterhemp, tall
Ambrosia artemisiifolia	ragweed, common
Ambrosia bidentata	ragweed, lanceleaf
Ambrosia psilostachya	ragweed, western
Ambrosia trifida	ragweed, giant
Amelanchier arborea	Juneberry
Ammannia coccinea	ammannia, long-leaved
Amorpha canescens	leadplant
Amorpha fruticosa	false-indigo
Ampelopsis cordata	grape, raccoon
Amphicarpa bracteata	hog peanut
Amsonia tabernaemontana	bluestar
*Anagallis arvensis**	weatherglass*, poor man's
Andropogon gerardii	bluestem, big
Andropogon virginicus	broomsedge
Androsace occidentalis	androsace
Anemone canadensis	anemone, meadow
Anemone virginiana	anemone, tall
Antennaria neglecta	cat's foot
Antennaria plantaginifolia	pussytoes
*Anthemis cotula**	fennel*, dog
Apios americana	groundnut
Aplectrum hyemale	adam-and-eve
Apocynum androsaemifolium	dogbane, spreading
Apocynum cannabinum	dogbane
Apocynum sibiricum	Indianhemp
Aquilegia canadense	columbine, wild
*Arabidopsis thaliana**	cress, mouse-eared
Arabis laevigata	cress, smooth rock
Arabis shortii	cress, toothed
Aralia racemosa	spikenard, American
*Arctium minus**	burdock*, common
*Arenaria serpyllifolia**	sandwort*, thyme-leaved
Arisaema dracontium	green-dragon
Arisaema triphyllum	jack-in-the-pulpit
Aristida dichotoma	grass, poverty
Aristida longespica	grass, three awn
Aristida oligantha	grass, plains three awn
Aristida ramosissima	grass, slender three awn
Aristolochia serpentaria	snakeroot, Virginia
Armoracia aquatica	cress, lake
Aruncus dioicus	goat's-beard

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Asarum canadense var. *reflexum*	ginger, wild
Asclepias hirtella	milkweed, tall green
Asclepias incarnata	milkweed, swamp
Asclepias purpurascens	milkweed, purple
Asclepias sullivantii	milkweed, prairie
Asclepias syriaca	milkweed, common
Asclepias tuberosa	butterflyweed
Asclepias variegata	milkweed, variegated
Asclepias verticillata	milkweed, horsetail
Asclepias viridiflora	milkweed, green
Asclepias viridis	milkweed, green-flowered
Asimina triloba	pawpaw
*Asparagus officinalis**	asparagus*, garden
Asplenium platyneuron	spleenwort, ebony
Aster anomalus	aster, blue
Aster azureus	aster, sky-blue
Aster drummondii	aster, Drummond's
Aster ericoides	aster, heath
Aster laevis	aster, smooth blue
Aster lateriflorus	aster, side-flowering
Aster novae-angliae	aster, New England
Aster ontarionis	aster, Ontario
Aster parviceps	aster, small-headed
Aster patens	aster, spreading
Aster pilosus	aster, hairy
Aster praealtus	aster, willow
Aster puniceus	aster, bristly
Aster sagittifolius	aster, arrow-leaved
Aster shortii	aster, Short's
Aster simplex	aster, panicled
Aster turbinellus	aster, prairie
Aster urophyllus	aster
Aster vimineus	aster, small white
Astragalus canadensis	vetch, Canadian milk
Athyrium angustum	fern, lady
*Atriplex patula**	saltbush*, fat-hen
Aureolaria flava	foxglove, smooth false
Aureolaria grandiflora var. *pulchra*	foxglove, yellow false
*Avena sativa**	oats*, wild
Azolla mexicana	azolla, Mexican
Bacopa rotundifolia	hyssop, water
Baptisia lactea	wild indigo, white
Baptisia leucophaea	wild indigo, cream
*Barbarea vulgaris**	rocket*, yellow
*Berberis thunbergii**	barberry*, Japanese
Betula nigra	birch, river
Bidens aristosa	marigold, swamp
Bidens bipinnata	needles, Spanish
Bidens cernua	marigold, nodding bur
Bidens connata	tickseed, purple-stemmed
Bidens coronata	marigold, tall swamp
Bidens discoidea	beggar's-ticks, swamp
Bidens frondosa	beggar's-ticks, common
Bidens tripartita	beggar's-ticks
Bidens vulgata	beggar's-ticks, tall
Blephilia ciliata	mint, Ohio horse
Blephilia hirsuta	mint, wood
Boehmeria cylindrica	nettle, false
Boltonia asteroides	aster, false
Boltonia diffusa	aster, false
Botrychium dissectum	fern, bronze
Botrychium dissectum var. *obliquum*	fern, bronze
Botrychium virginianum	fern, rattlesnake
Brachyelytrum erectum	grass, long-awned wood
*Brassica nigra**	mustard*, black
Brickellia eupatorioides	boneset, false
*Bromus commutatus**	brome*, hairy
*Bromus inermis**	brome*, smooth
*Bromus japonicus**	chess*, Japanese
Bromus pubescens	brome, woodland
*Bromus racemosus**	chess*, smooth
*Bromus secalinus**	grass*, cheat
*Bromus tectorum**	grass*, cheat
Cacalia atriplicifolia	Indian-plantain, pale
Cacalia muhlenbergii	Indian-plantain, great
Calamagrostis canadensis	grass, blue joint
Callitriche heterophylla	starwort, large water
Callitriche terrestris	starwort, terrestrial
Caltha palustris	marsh marigold
Calystegia sepium	bindweed, American
Calystegia silvatica ssp. *fraterniflorus*	bindweed
Calystegia spithamea	bindweed, dwarf
Camassia scilloides	hyacinth, wild
*Camelina microcarpa**	flax*, small-fruited false
Campanula americana	bellflower, American
Campsis radicans	trumpet-creeper
*Capsella bursa-pastoris**	purse*, shepherd's
Cardamine bulbosa	bittercress, bulb
*Cardamine hirsuta**	bittercress*, hairy
Cardamine parviflora var. *arenicola*	bittercress, small-flowered
Cardamine pensylvanica	bittercress
*Cardaria draba**	cress, hoary
*Carduus nutans**	thistle*, musk bristle
Carex aggregata	sedge, smooth clustered

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Carex albursina	sedge, blunt-scaled wood
Carex annectens	sedge, large yellow
Carex annectens var. *xanthocarpa*	sedge, small yellow fox
Carex artitecta	sedge, blunt-scaled oak
Carex bicknellii	sedge, Bicknell's
Carex blanda	sedge, common wood
Carex brevior	sedge, plains oval
Carex bushii	sedge, long-scaled green
Carex buxbaumii	sedge, dark-scaled
Carex caroliniana	sedge, short-scaled green
Carex cephalophora	sedge, short-headed bracted
***Carex communis* - ST**	**sedge, fibrous-rooted - ST**
Carex conjuncta	sedge, green-headed fox
Carex cristatella	sedge, crested oval
Carex crus-corvi	sedge, crowfoot fox
Carex davisii	sedge, awned graceful
Carex digitalis	sedge, narrow-leaved wood
Carex festucacea	sedge, fescue oval
Carex frankii	sedge, bristly cattail
Carex glaucodea	sedge, blue
Carex gracilescens	sedge, slender wood
Carex granularis	sedge, pale
Carex gravida	sedge, long-awned bracted
Carex grayi	sedge, common bur
Carex grisea	sedge, wood gray
Carex hirsutella	sedge, hairy green
Carex hirtifolia	sedge, hairy wood
Carex hyalinolepis	sedge, southern lake
Carex hystricina	sedge, porcupine
Carex jamesii	sedge, James' grass
Carex lacustris	sedge, common lake
Carex lanuginosa	sedge, wooly
Carex laxiflora	sedge, beech wood
Carex leavenworthii	sedge, dwarf bracted
Carex louisianica	sedge, southern hop
Carex lupuliformis	sedge, knobbed hop
Carex lupulina	sedge, common hop
Carex lurida	sedge, bottlebrush
Carex meadii	sedge, Mead's stiff
Carex molesta	sedge, field oval
Carex muhlenbergii	sedge, sand bracted
Carex muskingumensis	sedge, swamp oval
Carex normalis	sedge, spreading oval
Carex oligocarpa	sedge, few-fruited gray
Carex pensylvanica	sedge, Pennsylvania oak
***Carex prasina* - ST**	**sedge, drooping - ST**
Carex projecta	sedge, loose-headed oval
Carex radiata	sedge, straight-styled wood
Carex retroflexa	sedge, bent bracted
Carex rosea	sedge, curly-styled wood
Carex scoparia	sedge, lance-fruited oval
Carex shortiana	sedge, Short's
Carex sparganioides	sedge, loose-headed bracted
Carex squarrosa	sedge, narrow-leaved cattail
Carex stipata	sedge, common fox
Carex suberecta	sedge
Carex swanii	sedge, downy green
Carex tribuloides	sedge, awl-fruited oval
Carex typhina	sedge, common cattail
Carex umbellata	sedge, early oak
Carex vulpinoidea	sedge, brown fox
Carex x subimpressa	sedge, hybrid lake
Carpinus caroliniana	blue beech
Carya cordiformis	hickory, bitternut
Carya glabra	hickory, pignut
Carya illinoensis	pecan
Carya laciniosa	hickory, kingnut
Carya ovalis	hickory, false shagbark
Carya ovata	hickory, shagbark
Carya texana	hickory, black
Carya tomentosa	hickory, mockernut
Cassia fasciculata	pea, partridge
Cassia marilandica	senna, Maryland
Cassia obtusifolia	sicklepod
Caulophyllum thalictroides	cohosh, blue
Ceanothus americanus	tea, New Jersey
Celastrus scandens	bittersweet, climbing
Celtis laevigata	sugarberry
Celtis occidentalis	hackberry
Cenchrus longispinus	sandbur, mat
*Centaurea cyanus**	button*, bachelor's
*Centaurea maculosa**	knapweed*, spotted
Cephalanthus occidentalis	buttonbush
*Cerastium dubium**	chickweed*, three-styled
Cerastium nutans	chickweed, nodding
*Cerastium vulgatum**	chickweed*, common mouse-ear
Ceratophyllum demersum	coontail
Cercis canadensis	redbud
*Chaenorrhinum minus**	snapdragon*, dwarf
Chaerophyllum procumbens	chervil, streambank
Chaerophyllum tainturieri	chervil, wild
*Chamaemelum nobile**	chamomile*, garden
Chamaesyce humistrata	spurge, spreading
Chamaesyce maculata	spurge, nodding
Chamaesyce supina	spurge, spotted creeping

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Chasmanthium latifolium	oats, sea
Chelone glabra	turtlehead, white
Chelone obliqua var. *speciosa*	turtlehead, pink
*Chenopodium album**	lamb's quarters*
*Chenopodium ambrosioides**	wormseed*, American
*Chenopodium capitatum**	blite*, strawberry
Chenopodium standleyanum	goosefoot, woodland
*Chloris verticillata**	grass*, windmill
*Cichorium intybus**	chickory*
Cicuta maculata	hemlock, water
Cinna arundinacea	reed, common wood
Circaea lutetiana ssp. *canadensis*	nightshade, enchanter's
Cirsium altissimum	thistle, tall
Cirsium discolor	thistle, pasture
***Cirsium hillii* - ST**	**thistle, Hill's - ST**
*Cirsium vulgare**	thistle*, bull
Claytonia virginica	beauty, spring
Clematis pitcheri	flower, leather
Collinsia verna	Mary, blue-eyed
***Collinsia violacea* - SE**	**collinsia, violet - SE**
Comandra umbellata	toadflax, false
*Commelina communis**	dayflower*, common
Commelina diffusa	dayflower
Commelina virginica	dayflower
*Conium maculatum**	hemlock*, poison
*Consolida ambigua**	larkspur*, rocket
*Convolvulus arvensis**	bindweed*, field
Conyza canadensis	horseweed
Conyza ramosissima	fleabane, dwarf
Corallorhiza wisteriana	coralroot
Corallorrhiza odontorhiza	coralroot, fall
*Coreopsis grandiflora**	coreopsis*, large-flowered
Coreopsis lanceolata	coreopsis, sand
Coreopsis palmata	coreopsis, prairie
*Coreopsis tinctoria**	coreopsis*, golden
Coreopsis tripteris	coreopsis, tall
Cornus drummondii	dogwood, rough-leaved
Cornus florida	dogwood, flowering
Cornus obliqua	dogwood, pale
Cornus racemosa	dogwood, gray
*Coronilla varia**	vetch*, crown
Corydalis flavula	corydalis, pale
Corylus americana	hazelnut
Crataegus calpodendron	hawthorn, sugar
Crataegus coccinioides	hawthorn
Crataegus crus-galli	hawthorn, cockspur
Crataegus cuneiformis	hawthorn
Crataegus mollis	hawthorn, downy
Crataegus phaenopyrum	hawthorn, washington
Crataegus pruinosa	hawthorn, frosted
Crataegus viridis	hawthorn, green
Crotalaria sagittalis	rattlebox
Croton capitatus	hogwort
Croton glandulosus var. *septentrionalis*	croton, sand
Croton monanthogynus	tea, prairie
Crotonopsis elliptica	rushfoil
Cryptotaenia canadensis	honewort
Cunila oreganoides	dittany
Cuphea viscosissima	cuphea, clammy
Cuscuta compacta	dodder, compact
Cuscuta glomerata	dodder, rope
Cuscuta gronovii	dodder, common
Cuscuta polygonorum	dodder, knowtweed
Cynanchum laeve	bluevine
*Cynodon dactylon**	grass*, Bermuda
Cyperus acuminatus	sedge, short-pointed flat
Cyperus aristatus	sedge, awned flat
Cyperus erythrorhizos	sedge, red-rooted nut
Cyperus esculentus	sedge, field nut
Cyperus ovularis	rush, hedgehog club
Cyperus pseudovegatus	sedge, false green flat
Cyperus rivularis	sedge, brook flat
Cyperus strigosus	sedge, long-scaled nut
Cypripedium pubescens	orchid, yellow lady's slipper
Cystopteris bulbifera	fern, berry bladder
Cystopteris protrusa	fern, fragile
*Dactylis glomerata**	grass*, orchard
Dalea candida	prairie-clover, white
Dalea purpurea	prairie-clover, purple
Danthonia spicata	grass, poverty oat
Dasistoma macrophylla	foxglove, mullein
*Datura stramonium**	jimsonweed*
*Daucus carota**	Queen Anne's lace*
Decodon verticillatus	loosestrife, swamp
Delphinium tricorne	larkspur, dwarf
Dentaria laciniata	toothwort
*Descurainia pinnata**	mustard*, tansy
Desmanthus illinoensis	bundleflower, Illinois
Desmodium canadense	tick-trefoil, showy
Desmodium ciliare	tick-trefoil, hairy
Desmodium cuspidatum	tick-trefoil, bracted
Desmodium glabellum	tick-trefoil, smooth
Desmodium glutinosum	tick-trefoil, pointed
Desmodium illinoense	tick-trefoil, Illinois
Desmodium marilandicum	tick-trefoil, small-leaved
Desmodium nudiflorum	tick-trefoil, bare-stemmed

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Desmodium obtusum	tick-trefoil, stiff
Desmodium paniculatum	tick trefoil, panicled
Desmodium rotundifolium	tick-trefoil, round-leaved
Desmodium sessilifolium	tick trefoil, sessile-leaved
*Dianthus armeria**	pink*, deptford
Diarrhena americana	grass, beak
Dicentra cucullaria	breeches, Dutchman's
Digitaria filiformis	grass, slender crab
*Digitaria ischaemum**	grass*, smooth crab
*Digitaria sanguinalis**	grass*, hairy crab
Diodia teres	buttonweed
Diodia virginiana	buttonweed, large
Dioscorea quaternata	yam, wild
Dioscorea villosa	yam, wild
Diospyros virginiana	persimmon
*Dipsacus laciniatus**	teasel*, cut-leaved
*Dipsacus sylvestris**	teasel*, common
Dodecatheon meadia	star, shooting
Draba brachycarpa	whitlow grass, short-leaved
Draba reptans	whitlow grass, common
Dulichium arundinaceum	sedge, three -way
Echinacea pallida	coneflower, pale purple
Echinacea purpurea	coneflower, purple
*Echinochloa crus-galli**	grass*, barnyard
Echinochloa muricata	grass, spiny barnyard
Echinochloa walteri	grass, salt-marsh cockspur
Echinodorus cordifolius	burhead, creeping
Eclipta prostrata	tajo, yerba de
*Elaeagnus angustifolia**	olive*, Russian
*Elaeagnus umbellata**	olive*, autumn
Eleocharis acicularis	spike rush, needle
Eleocharis elliptica	spike rush, golden-stemmed
Eleocharis erythropoda	spike rush, red-rooted
Eleocharis obtusa	spike rush, blunt
Eleocharis palustris	spike rush, great
Eleocharis quadrangulata	spike rush, angled
Eleocharis smallii	spike rush, marsh
Eleocharis verrucossa	spike rush, slender
Eleocharis wolfii	spike rush, Wolf's
Elephantopus carolinianus	elephant's-foot
*Eleusine indica**	grass*, crowfoot
Ellisia nyctelea	auntlucy
Elodea nuttallii	waterweed, slender
Elymus canadensis	rye, nodding wild
Elymus hystrix	grass, bottlebrush
Elymus riparius	rye, riverbank wild
Elymus villosus	rye, silky wild
Elymus virginicus	rye, virginia wild
Epilobium coloratum	willow herb, cinnamon
Equisetum arvense	horsetail, common
Equisetum hymale var. *affine*	scouring rush, tall
Equisetum laevigatum	scouring rush, smooth
Equisetum x ferrissii	horsetail, Joliet
Eragrostis capillaris	grass, lace
*Eragrostis cilianensis**	grass*, stink
Eragrostis frankii	grass, sandbar love
Eragrostis hypnoides	grass, creeping love
Eragrostis pectinacea	grass, small love
Eragrostis spectabilis	grass, purple love
Eragrostis trichodes	grass, ice cream
Erechtites hieracifolia	fireweed
Erigeron annuus	fleabane, annual
Erigeron philadelphicus	fleabane, marsh
Erigeron pulchellus	plantain, Robin's
Erigeron strigosus	fleabane, daisy
*Eriophila verna**	whitlow grass*, vernal
Eryngium yuccifolium	rattlesnake-master
*Erysimum repandum**	mustard*, treacle
Erythronium albidum	trout lily, white
Euonymus atropurpureus	wahoo
*Euonymus fortunei**	wintercreeper*
Eupatorium altissimum	boneset, tall
Eupatorium coelestinum	mistflower
Eupatorium perfoliatum	boneset, common
Eupatorium purpureum	joe pye weed, purple
Eupatorium rugosum	snakeroot, white
Eupatorium serotinum	boneset, late
Eupatorium sessilifolium	boneset, upland
Euphorbia corollata	spurge, flowering
*Euphorbia marginata**	snow-on-the-mountain*
Euthamia graminifolia	goldenrod, grass-leaved
Euthamia gymnospermoides	goldenrod, viscid grass-leaved
Fagus grandifolia	beech, American
*Festuca arundinacea**	fescue*, tall
Festuca obtusa	fescue, nodding
Festuca paradoxa	fescue, greater nodding
*Festuca pratensis**	fescue*, meadow
Fimbristylis autumnalis	sedge, autumn
Floerkea proserpinacoides	mermaid, false
Forestiera acuminata	privet, swamp
Fragaria virginiana	strawberry, wild
Frasera caroliniensis	columbo, American
Fraxinus americana	ash, white
Fraxinus nigra	ash, black

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Fraxinus pennsylvanica	ash, green
Fraxinus profunda	ash, pumpkin
*Froelichia gracilis**	cottonweed*
Galearis spectabilis	orchis, showy
Galium aparine	bedstraw, annual
Galium circaezans	licorice, wild
Galium concinnum	bedstraw, shining
Galium obtusum	madder, wild
Galium pilosum	bedstraw, hairy
Galium triflorum	bedstraw, sweet-scented
Gaura biennis	gaura, biennial
Gaura longiflora	gaura, common
Gentiana andrewsii	gentian, closed
Gentiana puberulenta	gentian, downy
Geranium carolinianum	cranesbill, Carolina
Geranium maculatum	geranium, wild
*Geranium pusillum**	geranium*, small
Geum canadense	avens, white
Geum laciniatum	avens, rough
Geum vernum	avens, spring
Glandularia canadensis	vervain, rose
*Glechoma hederacea**	creeping Charlie*
Gleditsia triacanthos	locust, honey
Glyceria striata	grass, fowl manna
Gnaphalium obtusifolium	balsam, old-field
Gnaphalium purpureum	cudweed, early
Gratiola neglecta	hyssop, clammy hedge
Gratiola virginiana	hyssop, round-fruited hedge
*Grindelia squarossa**	gumplant*
Gymnocladus dioica	tree, Kentucky coffee
Habenaria peramoena	orchid, purple fringless
Hackelia virginiana	stickseed
Hedeoma hispida	pennyroyal, rough
Hedeoma pulegiodes	pennyroyal, American
Hedyotis caerulea	bluets
Hedyotis crassifolia	bluets, tiny
Hedyotis longifolia	bluets, long-leaved
Hedyotis nuttalliana	bluets, slender-leaved
Hedyotis purpurea var. *calycosa*	bluets, broad-leaved
Hedyotis pusilla	star-violet
Helenium amarum	bitterweed
Helenium autumnale	sneezeweed
Helenium flexuosum	sneezeweed, purple-headed
Helianthemum bicknellii	rockrose
*Helianthus annuus**	sunflower*, common
Helianthus divaricatus	sunflower, woodland
Helianthus grosseserratus	sunflower, sawtooth
Helianthus hirsutus	sunflower, bristly
Helianthus mollis	sunflower, downy
*Helianthus petiolaris**	sunflower*, petioled
Helianthus strumosus	sunflower, pale leaved
Helianthus tuberosus	artichoke, Jerusalem
Heliopsis helianthoides	sunflower, false
*Heliotropium indicum**	heliotrope*, Indian
*Hemerocallis fulva**	lily*, orange day
Hepatica nobilis var. *acuta*	hepatica
Heracleum lanatum	cow-parsnip
*Hesperis matronalis**	rocket*, Dame's
Heuchera americana var. *hirsuticaulis*	alumroot, tall
Heuchera richardsonii	alumroot, prairie
Hibiscus laevis	mallow, halberd-leaved rose
Hibiscus lasiocarpus	mallow, hairy rose
Hibiscus moscheutos	mallow, swamp rose
*Hibiscus trionum**	flower-of-an-hour*
Hieracium gronovii	hawkweed, hairy
Hieracium longipilum	hawkweed, long-bearded
*Holosteum umbellatum**	chickweed*, jagged
*Hordeum jubatum**	grass*, squirrel tail
Hordeum pusillum	barley, little
*Hordeum vulgare**	barley*, common
Hottonia inflata	featherfoil
*Humulus japonicus**	hops*, Japanese
Humulus lupulus	hops, common
Hydrangea arborescens	hydrangea, wild
Hydrastis canadensis	goldenseal
***Hydrocotyle ranunculoides* - SE**	**Water-pennywort - SE**
Hydrophyllum appendiculatum	waterleaf, great
Hydrophyllum macrophyllum	waterleaf, large-leaf
Hydrophyllum virginianum	waterleaf, Virginia
Hypericum drummondii	nits-and-lice
Hypericum gentianoides	pineweed
Hypericum gymnanthum	St. John's wort, clasping
Hypericum mutilum	St. John's wort, dwarf
*Hypericum perforatum**	St. John's wort*, common
Hypericum prolificum	St. John's wort, shrubby
Hypericum punctatum	St. John's wort, spotted
Hypericum sphaerocarpum	St. John's wort, round-fruited
Hypoxis hirsuta	stargrass, yellow
Ilex decidua	holly, swamp
Impatiens capensis	touch-me-not, spotted
Impatiens pallida	touch-me-not, pale
Iodanthus pinnatifidus	cress, violet
*Ipomoea coccinea**	morning glory*, red

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
*Ipomoea hederacea**	morning glory*, ivy-leaved
Ipomoea lacunosa	morning glory, small
Ipomoea pandurata	sweet potato, wild
Iris brevicaulis	iris, blue water
Iris shrevei	flag, southern blue
Isoetes melanopoda	quillwort, black
Isopyrum biternatum	anemone, false rue
Iva annua	marsh-elder
Jeffersonia diphylla	twinleaf
Juglans nigra	walnut, black
Juncus acuminatus	rush, sharp-fruited
Juncus biflorus	rush, two-flowered
Juncus brachycarpus	rush, short-fruited
Juncus brachycephalus	rush, short-headed
Juncus dudleyi	rush, Dudley's
Juncus effusus var. *solutus*	rush, common
Juncus interior	rush, inland
Juncus marginatus	rush, grass-leaved
Juncus nodatus	rush, stout
Juncus nodosus	rush, joint
Juncus secundus	rush, side-flowering
Juncus tenuis	rush, path
Juncus torreyi	rush, Torrey's
Juniperus virginiana	cedar, Eastern red
Justicia americana	willow, water
Koeleria macrantha	grass, June
Krigia biflora	dandelion, false
Krigia caespitosa	dandelion, dwarf
Krigia dandelion	dandelion, dwarf
*Kummerowia striata**	lespedeza*, Japanese
Lactuca canadensis	lettuce, wild
Lactuca floridana	lettuce, blue
*Lactuca saligna**	lettuce*, willow-leaved
*Lactuca serriola**	lettuce*, prickly
*Lamium amplexicaule**	henbit*
*Lamium purpureum**	deadnettle, purple
Laportea canadensis	nettle, wood
*Lathyrus latifolius**	pea*, everlasting
Lechea tenuifolia	pinweed, narrow-leaved
Leersia lenticularis	grass, catchfly
Leersia oryzoides	grass, rice cut
Leersia virginica	grass, white
Lemna minor	duckweed, small
*Lepidium campestre**	cress, field
*Lepidium densiflorum**	peppergrass*, small
Lepidium virginicum	peppergrass, common
Leptoloma cognatum	grass, fall witch
*Lespedeza bicolor**	lespedeza*, bicolor
Lespedeza capitata	bushclover, round-headed
*Lespedeza cuneata**	bushclover*, silky
Lespedeza procumbens	bushclover, trailing
Lespedeza repens	bushclover, creeping
Lespedeza stuevei	bushclover, Stuve's
Lespedeza violacea	bushclover, violet
Lespedeza virginica	bushclover, slender
*Leucanthemum vulgare**	daisy*, ox-eye
Leucospora multifida	obe-wan-conobea
Liatris aspera	blazing-star, rough
Liatris ligulistylis	blazing-star
Liatris pycnostachya	blazing-star, prairie
***Liatris scariosa* var. *n ieuwlandii* -ST**	**blazing-star - ST**
Liatris squarrosa	blazing-star
*Ligustrum vulgare**	privet*, common
Lilium michiganense	lily, Michigan
Lindera benzoin	spicebush
Lindernia dubia	pimpernell, slender false
Lindernia dubia var. *anagallidea*	pimpernell, false
Linum medium var. *texanum*	flax, small yellow
Liparis lilifolia	twayblade, purple
Lithospermum canescens	puccoon, hoary
Lithospermum insisum	puccoon, fringed
Lithospermum latifolium	gromwell, American
Lobelia cardinalis	cardinal flower
Lobelia inflata	tobacco, Indian
Lobelia siphilitica	lobelia, great blue
Lobelia spicata	lobelia, spiked
*Lolium perenne**	grass*, perennial rye
*Lonicera japonica**	honeysuckle*, Japanese
*Lonicera maackii**	honeysuckle*, amur
*Lonicera morrowii**	honeysuckle*, Morrow's
*Lonicera sempervirens**	honeysuckle*, trumpet
*Lotus corniculatus**	trefoil*, birdsfoot
Ludwigia alternifolia	seedbox
Ludwigia palustris var. *americana*	purslane, marsh
Ludwigia peploides ssp. *glabrescens*	primrose willow, creeping
Ludwigia polycarpa	loosestrife, false
Lycopus americanus	waterhorehound, common water
Lycopus rubellus	waterhorehound, stalked
Lycopus virginicus	bugleweed
Lysimachia ciliata	loosestrife, fringed
Lysimachia lanceolata	loosestrife, lance-leaved
*Lysimachia nummularia**	moneywort*

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Lysimachia quadriflora	loosestrife, narrow-leaved
*Lysmachia punctata**	loosestrife*, dotted
Lythrum alatum	loosestrife, purple
*Maclura pomifera**	osage-orange*
Malus ioensis	crab, Iowa
*Malva neglecta**	cheeses*
Manfreda virginica	aloe, false
*Marrubium vulgare**	horehound*, common
*Matricaria chamomilla**	chamomile*, German
*Matricaria matricarioides**	pineappleweed*
*Medicago lupulina**	medic*, black
*Medicago sativa**	alfalfa*
*Melilotus alba**	clover*, white sweet
*Melilotus officinalis**	clover*, yellow sweet
Menispermum canadense	moonseed
Mentha arvensis var. *villosa*	mint, wild
*Mentha x rotundifolia**	mint*, apple
Mertensia virginica	bluebells
Mimulus alatus	monkeyflower, winged
Mimulus ringens	monkeyflower
Mirabilis nyctaginea	four o'clock, wild
*Mollugo verticillata**	carpetweed*
Monarda bradburiana	monarda
Monarda clinopodia	beebalm, basil
Monarda fistulosa	bergamot, wild
Monotropa hypopithys	pinesap
Monotropa uniflora	Indian-pipe
*Morus alba**	mulberry*, white
Morus rubra	mulberry, red
Muhlenbergia bushii	grass, short-leaved satin
Muhlenbergia frondosa	grass, common satin
Muhlenbergia glabrifloris	grass, smooth satin
Muhlenbergia mexicana	grass, leafy satin
Muhlenbergia racemosa	timothy, upland wild
Muhlenbergia schreberi	nimblewill
Muhlenbergia sobolifera	grass, rock satin
*Muscari botryoides**	hyacinth*, common grape
*Myosotis arvensis**	scorpion grass*, field
Myosotis macrosperma	scorpion grass
Myosotis verna	forget-me-not, white
Myosurus minimus	mousetail
Myriophyllum heterophyllum	milfoil, various-leaved water
Najas minor	naiad, lesser
Napaea dioica	mallow, glade
Nelumbo lutea	lotus, american
Nothoscordum bivalve	garlic, false
Nuphar luteum	spatterdock
Nymphaea odorata	waterlily, fragrant
Oenothera biennis	evening primrose, common
Oenothera laciniata	evening primrose, ragged
Oenothera linifolia	sundrops, thread-leaved
Oenothera pilosella	sundrops, prairie
Onoclea sensibilis	fern, sensitive
Opuntia humifusa	prickly-pear, Eastern
*Ornithogallum umbellatum**	star-of-Bethlehem*, common
Osmorhiza claytonii	sweet cicely, hairy
Osmorhiza longistylis	anise-root
Osmunda claytonii	interrupted fern
Ostrya virginiana	hop-hornbeam
Oxalis dillenii	wood sorrel, common
Oxalis stricta	wood sorrel, tall
Oxalis violacea	wood sorrel, violet
Oxypolis rigidior	cowbane
Panax quinquefolius	ginseng
Panicum anceps	grass, beaked panic
Panicum boscii	grass, large-fruited panic
Panicum capillare	grass, old witch
Panicum clandestinum	grass, dear-tongue
Panicum commutatum	grass, panic
Panicum depauperatum	grass, starved panic
Panicum dichotomiflorum	panicum, fall
Panicum flexile	grass, slender panic
Panicum lanuginosum	grass, panic
Panicum latifolium	grass, broad-leaved panic
Panicum leibergii	grass, prairie panic
Panicum lindheimeri	grass, smooth woolly
Panicum linearifolium	grass, slender-leaved
Panicum microcarpon	grass, small-fruited panic
Panicum oligosanthes	grass, few-flowered
Panicum oligosanthes var. *scribnerianum*	grass, Scribner's panic
Panicum philadelphicum	grass, Philadelphia panic
Panicum polyanthes	grass, small-fruited panic
Panicum rigidulum	grass, munro
Panicum sphaerocarpon	grass, round-fruited
Panicum villosissimum	grass, white-haired panic
Panicum virgatum	grass, prairie switch
Parietaria pensylvanica	pellitory, Pennsylvania
Paronychia canadensis	chickweed, tall forked
Paronychia fastigiata	chickweed, low forked
Parthenium integrifolium	quinine, wild
Parthenocissus quinquefolia	creeper, Virginia
Paspalum ciliatifolium	grass, lens
Paspalum ciliatifolium var. *stramineum*	grass, downy lens

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Paspalum floridanum	grass, giant bead
Paspalum fluitans	grass, swamp bead
Paspalum laeve	grass, smooth lens
Paspalum pubiflorum var. *glabrum*	grass, four-rowed bead
Passiflora incarnata	passion flower, large
Passiflora lutea var. *glabriflora*	passion flower, small
*Pastinaca sativa**	parsnip*, wild
Pedicularis lanceolata	betony, fen
Peltandra virginica	arum, arrow
Penstemon calycosus	beard-tongue, smooth
Penstemon digitalis	beard-tongue, foxglove
Penstemon hirsutus	beard-tongue, hairy
Penstemon pallidus	beard-tongue, pale
Penstemon tubaeflorus	beard-tongue, western
Penthorum sedoides	stonecrop, ditch
Perideridia americana	parsley, thicket
*Perilla frutescens**	plant*, beefsteak
*Phalaris arundinacea**	grass*, reed canary
*Phalaris canariensis**	grass*, birdseed
Phaseolus polystachios	bean, wild kidney
Phegopteris hexagonoptera	fern, broad beech
*Phleum pratense**	timothy*
Phlox divaricata	phlox, blue
Phlox glaberrima ssp. *interior*	phlox, smooth
Phlox paniculata	phlox, garden
Phlox pilosa	phlox, prairie
Phragmites australis	reed, common
Phryma leptostachya	lopseed
Phyla lanceolata	fogfruit
Phyllanthus caroliniensis	dainties
Physalis heterophylla	ground cherry, clammy
*Physalis longifolia**	ground cherry*, tall
Physalis pruinosa	tomato, strawberry
Physalis pubescens	ground cherry, hairy
Physalis subglabrata	ground cherry, smooth
Physalis virginiana	ground cherry, lance-leaved
Physostegia speciosa	obedient-plant, showy
Physostegia virginiana	obedient-plant
Phytolacca americana	pokeweed
Pilea pumila	clearweed, Canada
Plantago aristata	plantain, bracted
*Plantago lanceolata**	plantain*, English
Plantago pusilla	plantain, small
Plantago rugelii	plantain, red-stalked
Plantago virginica	plantain, dwarf
***Platanthera flava* var. *herbiola* - SE**	**orchid, tubercled - SE**
Platanthera lacera	orchid, green-fringed
Platanthera peramoena	orchid, purple fringeless
Platanus occidentalis	sycamore
Pluchea camphorata	camphorweed
*Poa annua**	grass*, annual blue
*Poa arida**	grass*, plains blue
*Poa bulbosa**	grass*, bulbous blue
Poa chapmaniana	grass, spear
*Poa compressa**	grass*, Canadian blue
*Poa pratensis**	grass*, Kentucky blue
Poa sylvestris	grass, woodland blue
Podophyllum peltatum	Mayapple
Poinsettia dentata	spurge, toothed
Polanisia dodecandra	clammyweed
Polemonium reptans	Jacob's-ladder
Polygala sanguinea	milkwort, field
Polygala senega	snakeroot, seneca
Polygala verticillata	milkwort, whorled
Polygonatum commutatum	Soloman's seal, great
Polygonum amphibium	knotweed, water
*Polygonum aviculare**	knotweed*, common
Polygonum cespitosum var. *longisetum**	smartweed*, creeping
*Polygonum convolvulus**	birdweed*, black
Polygonum cristatum	bindweed, corpse
*Polygonum cuspidatum**	knotweed*, Japanese
Polygonum erectum	knotweed, erect
*Polygonum hydropiper**	pepper*, water
Polygonum hydropiperoides	pepper, mild water
Polygonum lapathifolium	lady's-thumb, curttop
Polygonum pensylvanicum	smartweed, common
*Polygonum persicaria**	lady's-thumb*
Polygonum punctatum	smartweed
Polygonum ramosissimum	knotweed, bushy
Polygonum sagittatum	tearthumb, arrow-leaved
Polygonum scandens	false-buckwheat, climbing
Polygonum setaceum var. *interjectum*	smartweed, bristly
Polygonum tenue	knotweed, slender
Polygonum virginianum	knotweed, Virginia
Polystichum acrostichoides	fern, Christmas
Polytaenia nuttallii	parsley, prairie
Pontederia cordata	pickerelweed
*Populus alba**	poplar*, white
Populus deltoides	cottonwood, Eastern
Populus heterophylla	cottonwood, swamp
Porteranthus stipulatus	physic, Indian
*Portulaca oleracea**	purslane*

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Potamogeton amplifolius	pondweed, large-leaved
*Potamogeton crispus**	pondweed*, beginner's
Potamogeton diversifolius	pondweed, water-thread
Potamogeton foliosus	pondweed, leafy
Potamogeton nodosus	pondweed, American
Potamogeton pusillus	pondweed, baby
Potentilla norvegica	cinquefoil, rough
*Potentilla recta**	cinquefoil*, sulfur
Potentilla simplex	cinquefoil, common
Prenanthes altissima	lettuce, tall white
Prenanthes aspera	lettuce, rough white
Prenanthes racemosa	lettuce, glaucous white
*Prionopsis ciliata**	goldenweed*
Proserpinaca palustris	mermaid-weed
Prunella vulgaris var. *lanceolata*	self-heal
*Prunella vulgaris**	self-heal*, lawn
Prunus americana	plum, American
Prunus americana var. *lanata*	plum, wild
Prunus angustifolia	plum, chickasaw
Prunus hortulana	plum, wild goose
*Prunus mahaleb**	cherry*, perfumed
Prunus nigra	plum, Canada
*Prunus persica**	peach*
Prunus serotina	cherry, wild black
Prunus virginiana	cherry, common choke
Psoralea onobrychis	grass, French
Psoralea psoralioides var. *eglandulosa*	snakeroot, Sampson's
Ptelea trifoliata	ash, wafer
Pteridium aquilinum	fern, bracken
Ptilimnium costatum	bishop's weed, mock
***Ptilimnium nuttallii* -SE**	**bishop's weed, mock-SE**
*Pueraria lobata**	kudzu*
Pycnanthemum pilosum	mountain-mint, hairy
Pycnanthemum tenuifolium	mountain-mint, slender
Pycnanthemum virginianum	mountain-mint, common
Pyrrhopappus carolinianus	dandelion, false
*Pyrus communis**	pear*
Quercus alba	oak, white
Quercus bicolor	oak, swamp white
Quercus coccinea	oak, scarlet
Quercus falcata	oak, Southern red
Quercus imbricaria	oak, shingle
Quercus lyrata	oak, overcup
Quercus macrocarpa	oak, burr
Quercus marilandica	oak, blackjack
Quercus michauxii	oak, basket
Quercus palustris	oak, pin
Quercus prinoides var. *acuminata*	oak, yellow chestnut
Quercus rubra	oak, red
Quercus shumardii	oak, Shumard's
Quercus stellata	oak, post
Quercus velutina	oak, black
Ranunculus abortivus	buttercup, little-leaf
Ranunculus fascicularis	buttercup, early
Ranunculus flabellaris	buttercup, yellow water
Ranunculus harveyi	buttercup, Harvey's
Ranunculus hispidus	buttercup, rough
Ranunculus laxicaulis	spearwort
Ranunculus longirostris	crowfoot, white water
Ranunculus micranthus	crowfoot, small-flowered
Ranunculus pusillus	spearwort, small
Ranunculus recurvatus	buttercup, hooked
*Ranunculus sardous**	buttercup*, papillose
Ranunculus sceleratus	crowfoot, cursed
Ranunculus septentrionalis	buttercup, swamp
Ratibida pinnata	coneflower, yellow
Rhus aromatica	sumac, aromatic
Rhus copallina	sumac, dwarf
Rhus glabra	sumac, smooth
Ribes missouriense	gooseberry, Missouri
*Robinia pseudoacacia**	locust*, black
Rorippa islandica	cress, marsh yellow
Rorippa islandica var. *fernaldiana*	cress, marsh yellow
Rorippa sessiliflora	cress, sessile-flowered
Rosa carolina	rose, pasture
*Rosa multiflora**	rose*, multiflora
Rosa palustris	rose, swamp
Rosa setigera	rose, Illinois
Rotala ramosior	wheelwort
Rubus allegheniensis	blackberry, common
Rubus argutus	blackberry, highbush
Rubus flagellaris	dewberry, common
Rubus frondosus	blackberry
*Rubus idaeus**	raspberry*, cultivated
*Rubus laciniatus**	blackberry*, cut-leaved
Rubus occidentalis	raspberry, black
Rubus pensylvanicus	blackberry, yankee
Rudbeckia hirta	Susan, black-eyed
Rudbeckia laciniata	goldenglow, wild
Rudbeckia subtomentosa	Susan, sweet black-eyed
Rudbeckia triloba	Susan, brown-eyed
Ruellia humilis	ruellia, hairy
Ruellia pedunculata	petunia, stalked wild
Ruellia strepens	ruellia, smooth
*Rumex acetosella**	sorrel*, field

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Rumex altissimus	dock, pale
*Rumex crispus**	dock*, curly
Rumex verticillatus	dock, swamp
Sabatia angularis	gentian, rose
***Sabatia campestris* - SE**	**gentian, prairie rose -SE**
Sagina decumbens	pearlwort
Sagittaria brevirostra	arrowleaf, short-leaved
Sagittaria calycina	arrowhead, thick-stalked
Sagittaria latifolia	arrowhead, common
*Salix alba**	willow*, white
Salix amygdaloides	willow, peach-leaved
Salix discolor	willow, pussy
Salix eriocephala	willow, heart-leaved
Salix exigua	willow, sandbar
Salix humilis	willow, prairie
Salix nigra	willow, black
Salix sericea	willow, silky
Sambucus canadensis	elderberry
Samolus valerandii	brookweed
Sanguinaria canadensis	bloodroot
Sanicula canadensis	snakeroot, Canadian black
Sanicula gregaria	snakeroot, Clustered black
*Saponaria officinalis**	bouncing-bet*
Sassafras albidum	sassafras
Saururus cernuus	lizard's-tail
Saxifraga pensylvanica	saxifrage, swamp
Schizachyrium scoparium	bluestem, little
Scirpus atrovirens	rush, dark green
Scirpus cyperinus	grass, wool
Scirpus fluviatilis	bulrush, river
Scirpus georgianus	rush, bristleless dark green
Scirpus pendulus	bulrush, red
Scirpus tabernaemontanii	bulrush, great
Scrophularia marilandica	figwort, late
Scutellaria australis	skullcap, small
Scutellaria elliptica	skullcap, hairy
Scutellaria incana	skullcap, downy
Scutellaria lateriflora	skullcap, mad-dog
Scutellaria nervosa	skullcap, veiny
Scutellaria ovata	skullcap, heart-leaved
Scutellaria ovata var. *versicolor*	skullcap, heart-leaved
Scutellaria parvula	skullcap, small
*Secale cereale**	rye*
Sedum ternatum	stonecrop, three-leaved
Selaginella apoda	clubmoss, marsh
Senecio aureus	ragwort, golden
Senecio glabellus	butterweed
*Setaria faberi**	foxtail*, giant
Setaria geniculata	foxtail, perennial
*Setaria glauca**	grass*, pigeon
*Setaria italica**	millet*, foxtail
*Setaria verticillata**	foxtail, bristly
*Setaria viridis**	foxtail*, green
Sibara virginica	cress, Virginia rock
Sicyos angulatus	cucumber, bur
*Sida spinosa**	sida*, prickly
Silene antirrhina	catchfly, sleepy
*Silene cserei**	campion*, glaucus
*Silene latifolia**	catchfly*
Silene nivea	campion, snowy
Silene stellata	campion, starry
Silphium integrifolium	rosinweed
Silphium laciniatum	compass-plant
Silphium perfoliatum	cup-plant
Silphium terebinthinaceum	prairie-dock
*Sisymbrium altissimum**	mustard*, tumble
*Sisymbrium officinale**	mustard*, hedge
Sisyrinchium albidum	blue-eyed grass, common
Sisyrinchium angustifolium	blue-eyed grass, stout
Sium suave	parsnip, water
Smilacina racemosa	Soloman's seal, false
Smilax bona-nox	catbrier
Smilax ecirrhata	carrion-flower, upright
Smilax hispida	catbriar, bristly
Smilax illinoensis	carrion-flower, Illinois
Smilax lasioneuron	carrion-flower, common
Smilax pulverulenta	carrion-flower, dark green
Smilax rotundifolia	catbrier
Solanum carolinense	horse-nettle
Solanum ptycanthum	nightshade, black
*Solanum rostratum**	bur*, buffalo
Solidago canadensis	goldenrod, tall
Solidago gigantea	goldenrod, late
Solidago juncea	goldenrod, early
Solidago missouriensis	goldenrod, Missouri
Solidago nemoralis	goldenrod, old field
Solidago patula	goldenrod, rough-leaved
Solidago radula	goldenrod, rough
Solidago rigida	goldenrod, rigid
Solidago speciosa	goldenrod, showy
Solidago ulmifolia	goldenrod, elm-leaved
*Sonchus asper**	thistle*, prickly sow
Sonchus oleraceus	thistle, common sow
Sorghastrum nutans	grass, Indian
*Sorghum bicolor**	sorghum*
*Sorghum halepense**	grass*, Johnson

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Sparganium androcladum	burreed, branched
Sparganium eurycarpum	burreed, common
Spartina pectinata	grass, prairie cord
Spermacoce glabra	buttonweed, smooth
Sphenopholis obtusata	grass, prairie wedge
Spiranthes cernua	ladies' tresses, nodding
Spiranthes gracilis	ladies' tresses, slender
Spiranthes tuberosa	ladies' tresses, little
Spirodela polyrhiza	duckweed, great
Sporobolus asper	dropseed, rough
Sporobolus heterolepis	dropseed, Northern
Sporobolus vaginiflorus	grass, Northern rush
Stachys aspera	hedge-nettle, rough
Stachys palustris	woundwort
Stachys tenuifolia	hedge-nettle, smooth
Stachys tenuifolia var. *hispida*	hedge-nettle, marsh
Staphylea trifolia	bladdernut
*Stellaria graminea**	starwort*
Stellaria longifolia	stitchwort
*Stellaria media**	chickweed*, common
Strophostyles helvola	bean, trailing wild
Strophostyles leiosperma	bean, small wild
Strophostyles umbellata	bean, clustered wild
Stylosanthes biflora	pencilflower
Symphoricarpos orbiculatus	coralberry
Taenidia integerrima	pimpernel, yellow
*Tanacetum vulgare**	tansy*, common
*Taraxacum laevigatum**	dandelion*, red-seeded
*Taraxacum officinale**	dandelion*, common
*Taxodium distichum**	cypress*, bald
Tephrosia virginiana	rue, goat's
Teucrium canadense	germander
Teucrium canadense var. *virginicum*	germander, American
Thalictrum dasycarpum	rue, purple meadow
Thalictrum dioicum	rue, early meadow
Thalictrum revolutum	rue, waxy meadow
Thalictrum thalictroides	anemone, rue
Thaspium barbinode	parsnip, hairy meadow
Thaspium trifoliatum	parsnip, purple meadow
Thaspium trifoliatum var. *flavum*	parsnip, yellow meadow
Thelypteris palustris var. *pubescens*	fern, marsh shield
*Thlaspi arvense**	cress, field penny
Tilia americana	linden, American
***Tomanthera auriculata*-ST**	**foxglove, earleaved-ST**
*Torilis japonica**	hedge-parsley*, Japanese
Toxicodendron radicans	poison-ivy
Trachelospermum difforme	dogbane, climbing
Tradescantia ohiensis	spiderwort, common
Tradescantia subaspera	spiderwort, broad-leaved
Tradescantia virginiana	spiderwort, Virginia
*Tragopogon dubius**	goat's beard*, sand
*Tragopogon porrifolius**	oyster-salsify*
Triadenum tubulosum	St. John's wort, marsh
Tribulus terrestris	puncture-vine
Tridens flavus	purpletop, common
Tridens strictus	purpletop, spiked
*Trifolium campestre**	clover*, low hop
*Trifolium hybridum**	clover*, alsike
*Trifolium pratense**	clover*, red
***Trifolium reflexum* - SE**	**clover, buffalo - SE**
*Trifolium repens**	clover*, white
Trillium recurvatum	trillium, red
***Trillium viride* - SE**	**trillium, green - SE**
Triodanus perfoliata	looking-glass, Venus'
Triodanus perfoliata var. *biflora*	looking-glass, Venus'
Triosteum aurantiacum	horse-gentian, early
Triosteum illinoense	horse-gentian, Illinois
Triosteum perfoliatum	horse-gentian, late
Tripsacum dactyloides	grass, gama
*Triticum aestivum**	wheat*
*Triticum cylindricum**	grass*, jointed goat
*Typha angustifolia**	cattail*, narrow-leaved
Typha latifolia	cattail, common
Ulmus americana	elm, American
Ulmus rubra	elm, slippery
Urtica dioica	nettle, tall
Utricularia gibba	bladderwort, humped
Uvularia grandiflora	bellwort
Valerianella radiata	cornsalad
***Veratrum woodii* - ST**	**hellebore, false - ST**
*Verbascum blattaria**	mullein*, moth
*Verbascum thapsus**	mullein*, wooly
Verbena bracteata	vervain, creeping
Verbena hastata	vervain, blue
Verbena simplex	vervain, narrow-leaved
Verbena stricta	vervain, hoary
Verbena urticifolia	vervain, white
Verbena x *engelmannii*	vervain
Verbesina alternifolia	wingstem
Verbesina helianthoides	crownbeard, yellow
Vernonia baldwinii	ironweed, Baldwin's
Vernonia gigantea	ironweed, tall
Vernonia missurica	ironweed, Missouri
*Veronica arvensis**	speedwell*, corn
Veronica peregrina	speedwell, purslane
*Veronica polita**	speedwell*, dwarf bird's eye

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]	Scientific Name[1,2]	Common Name[1,2]
*Vicia dasycarpa**	vetch*, wooly pod	*Viola rafinesquii**	pansy*, wild
Veronicastrum virginicum	Culver's-root	*Viola sagittata*	violet, arrow-leaved
Viburnum den tatum	arrowwood	*Viola sororia*	violet, woolly blue
Viburnum dentatum var. *deamii*	arrowwood, Southern	*Viola striata*	violet, common white
		Viola x *bernardii*	violet
Viburnum prunifolium	haw, black	*Vitis aestivalis*	grape, summer
Viburnum rufidulum	nannyberry, rusty	*Vitis cinerea*	grape, winter
*Vicia dasycarpa**	vetch*, wooly pod	*Vitis palmata*	grape, catbird
*Vicia villosa**	vetch*, winter	*Vitis riparia*	grape, river
*Vinca minor**	periwinkle*, common	*Vitis vulpina*	grape, frost
Viola affinis	violet, woodland blue	*Vulpia octoflora*	fescue, six weeks
Viola missouriensis	violet, Missouri	*Wolffia columbiana*	watermeal
Viola obliqua	violet, marsh blue	*Wolfiella gladiata*	duckweed, glade
Viola palmata	violet	*Woodsia obtusa*	woodsia, common
Viola pedata	violet, bird's foot	*Xanthium strumarium*	cocklebur
Viola pedatifida	violet, prairie	*Xanthoxylum americanum*	prickly-ash
Viola pratincola	violet, common blue	*Yucca flaccida**	Adam's-needle*
Viola pubescens	violet, downy yellow	*Zizanopsis miliaceae*	rice, Southern wild
Viola pubescens var. *eriocarpa*	violet, smooth yellow	*Zizia aurea*	Alexander, golden

[1] Bold type indicates an Illinois endangered (SE) or Illinois threatened (ST) species
[2] Asterisk (*) indicates introduced, non-native species