Volume 3

Living Resources

FOX RIVER
AREA ASSESSMENT

ILLINOIS
DEPARTMENT OF
NATURAL
RESOURCES

FOX RIVER AREA ASSESSMENT

VOLUME 3: LIVING RESOURCES

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About This Report

The Fox River Area Assessment examines an area situated along the Fox River which spans eleven counties in north-eastern Illinois. Because significant natural community and species diversity is found in the area, it has been designated a state Resource Rich Area.

This report is part of a series of reports on areas of Illinois where a public-private partnership has been formed. 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.[1] Three conclusions were drawn from the baseline investigation:

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

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

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

At the same time that CTAP was publishing its baseline findings, the Illinois Conservation Congress and the Water Resources and Land Use Priorities Task Force were presenting their respective findings. These groups agreed with the CTAP conclusion that the state's

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

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.

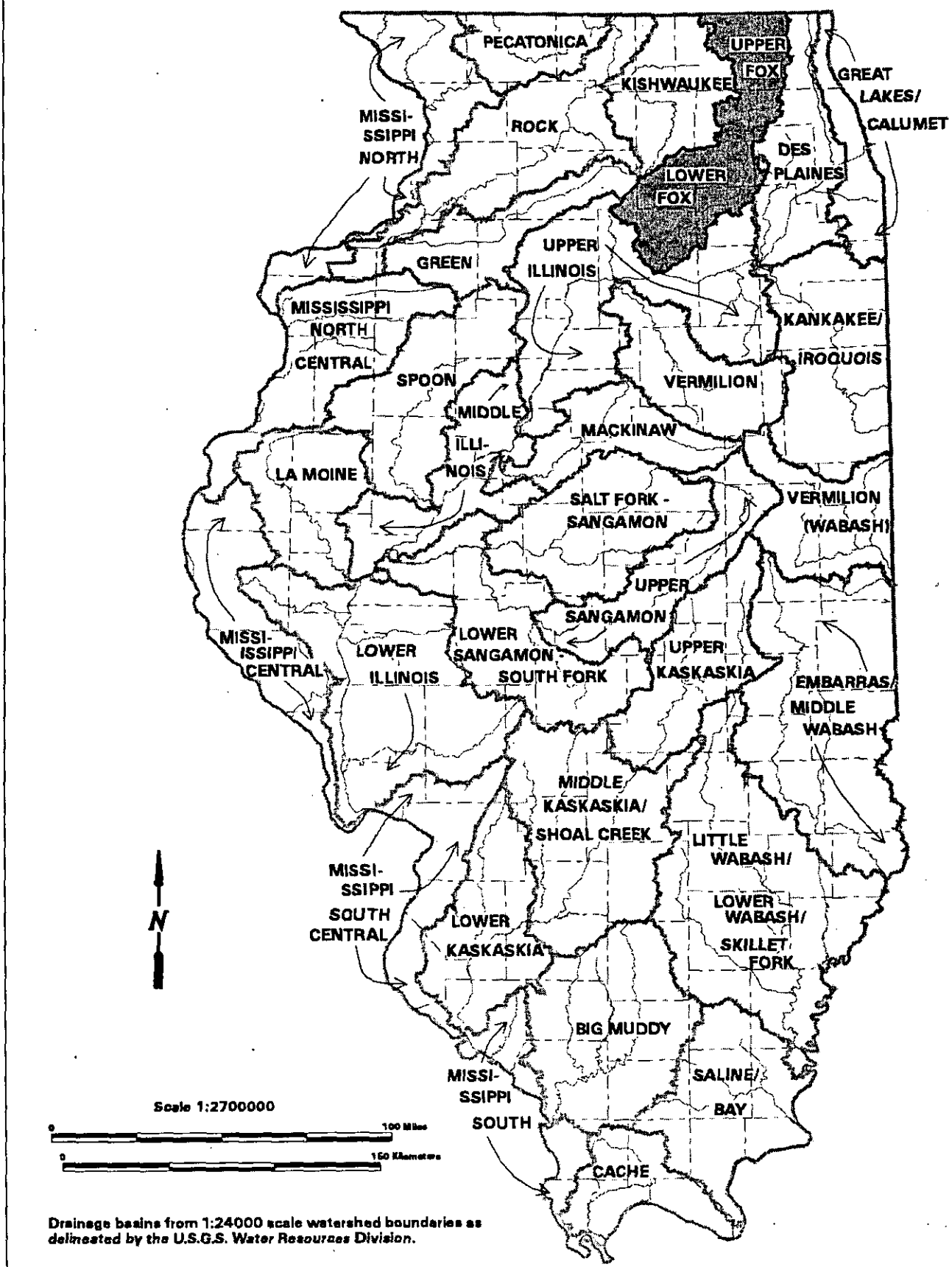
From the three initiatives was born Conservation 2000, a six-year program to begin reversing ecosystem degradation, primarily through the Ecosystems Program, a cooperative process of public-private partnerships that are intended to merge natural resource stewardship with economic and recreational development. To achieve this goal, the program will provide 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 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.

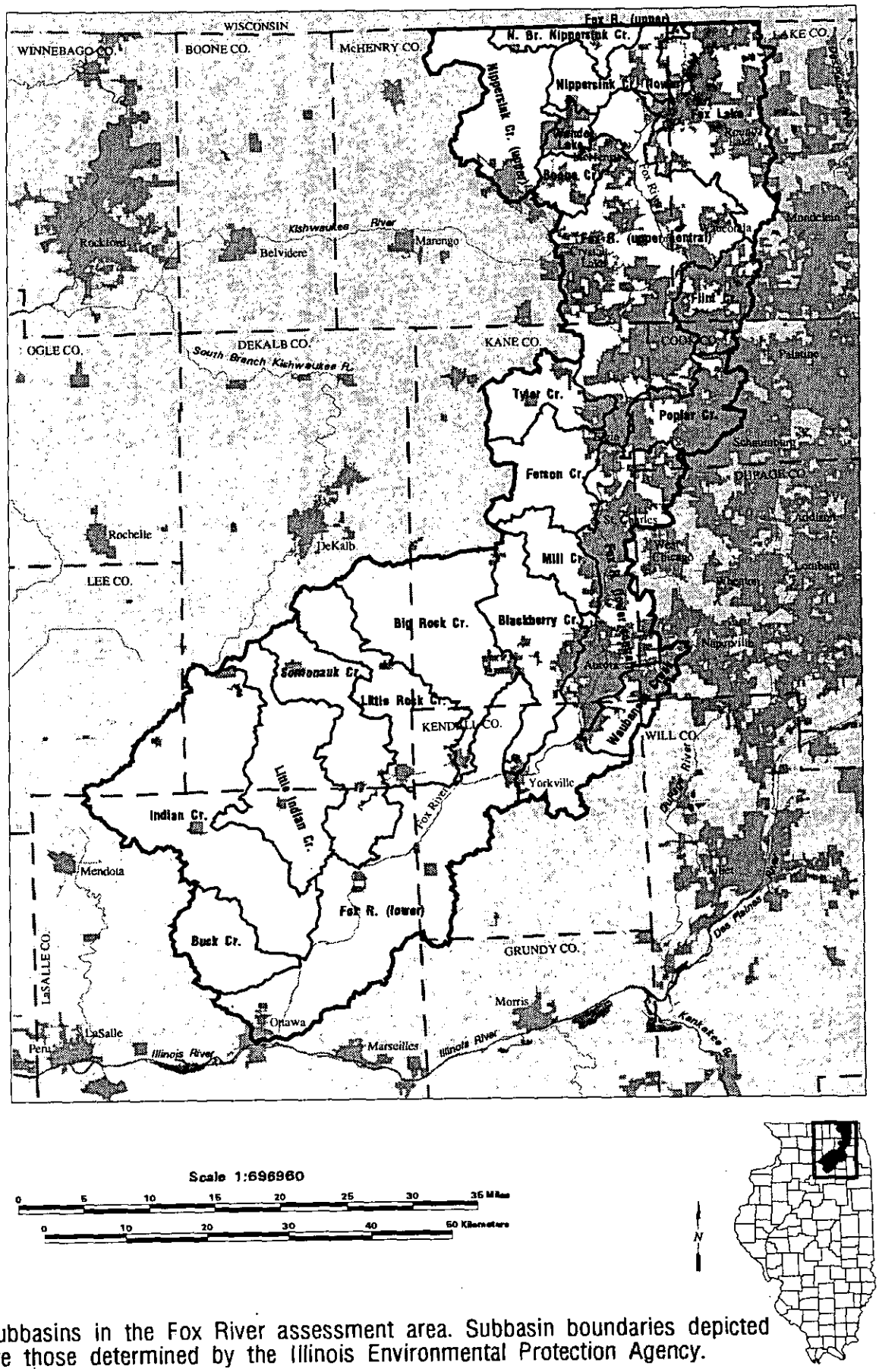
The Fox River Area Assessment

The Fox River assessment covers an area of approximately 1,720 mile (1,092,874 acres) spanning eleven counties in north-eastern Illinois, including parts of Lake, McHenry, Kane, Cook, Kendall, DeKalb, and LaSalle counties, and small parts of Lee, DuPage, Will, and Grundy counties. The boundaries of the assessment area coincide with the boundaries of the Illinois portion of the Fox River Basin. This area encompasses 22 subbasins of the Fox River watershed (identified by the Illinois Environmental Protection Board), from the Illinois-Wisconsin border to the confluence of the Fox and Illinois Rivers at Ottawa, Illinois. This is a distance of 115 miles along the river. The northernmost eight subbasins, totaling 285,844 acres, have been designated as a "Resource Rich Area" because they contain significant natural community diversity. The Fox River Ecosystem Partnership was subsequently formed around this core area of high quality ecological resources.

This assessment is comprised of five 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 the six counties with the greatest



Major Drainage Basins of Illinois and Location of the Fox River Assessment Area



Subbasins in the Fox River assessment area. Subbasin boundaries depicted are those determined by the Illinois Environmental Protection Agency.

amount of land in the area -- DeKalb, Kane, Kendall, Lake, LaSalle, and McHenry 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, ranging from the Paleo-Indian (B.C. 10,000) to the Postwar Industrial (A.D. 1946), known in the assessment watershed. Volume 5, *Early Accounts of the Ecology of the Fox River Area*, describes the ecology of the area as recorded by historical writings of explorers, pioneers, early visitors and early historians.

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Introduction

Physiographic Characteristics

The Fox River Assessment Area (FRAA) encompasses approximately 1,707.61 miles^2 (1,092,874 acres) in the northeastern quarter of Illinois (Figure 1). It includes parts of De Kalb, Du Page, Kane, Kendall, Lake, La Salle, McHenry counties, Cook, Grundy, and Lee counties (Figure 1). This assessment area covers the watershed of the Fox River from the Wisconsin state line south and west to its confluence with the Illinois River at Ottawa, Illinois (Figures1 and 2). Approximately 50.38% of the FRAA occurs in the Morainal Section of the Northeastern Morainal Division (860.3 miles^2 or 550.591.82 acres) and 49.6% in the Grand Prairie Section of the Grand Prairie Division (847.3 miles^2 or 543,277.02 acres) (Table 1, Figure 3) . According to Schwegman (1973), "The Morainal Section encompasses the moraines and morainic systems of the late advances of the Woodfordian substrate of Wisconsinan glaciation. This section contains most of Illinois' glacial lakes as well as its true bogs. Glacial landforms are well represented" (Schwegman 1973). "The Grand Prairie Section encompasses the area outside the Northeastern Morainal Division that was covered by the Woodfordian substage of the Wisconsinan stage of Pleistocene glaciation, excluding the outwash and sand areas.... Mesic black-soil prairie, marshes, and prairie potholes in the young, poorly-drained drift are characteristic. Glacial landforms are common."

Table 1. Natural Divisions occurring in the Fox River Assessment Area.

Division & Section	Acres[1]	% of FRAA
Northeastern Morainal/Morainal Section	550,592	50.4
Grand Prairie/Grand Prairie Section	542,277	49.6
Total:	1,092,869	100.0

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

Elevation within the FRAA ranges from about 1,187 ft. above sea level in McHenry County, at a location approximately 3 miles northeast of Harvard and 2 miles south of the Wisconsin state line, to about 473 ft. above sea level at the juncture of the Fox and Illinois rivers at Ottawa in McLean County. This topographic relief is provided by extensive glacial moraines (Willman and Frye 1970). These moraines are of Woodfordian age, a substage of the Wisconsinan glaciation and the most recent episode of Pleistocene glaciation. For much of its course, the Fox River flows through intermorainal areas between several morainal complexes. Gravelly glacial till is frequently exposed along the edges of the moraines.

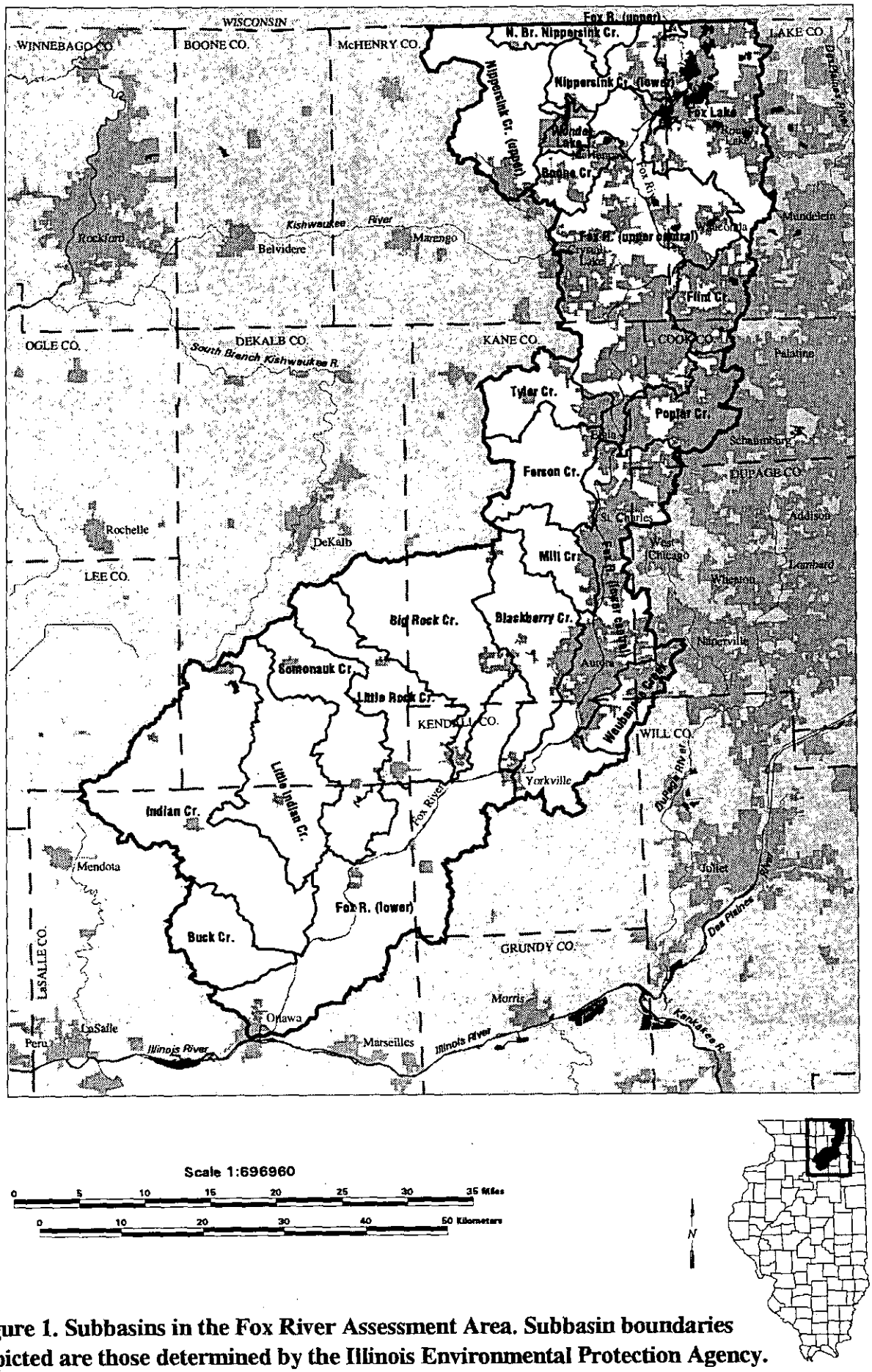
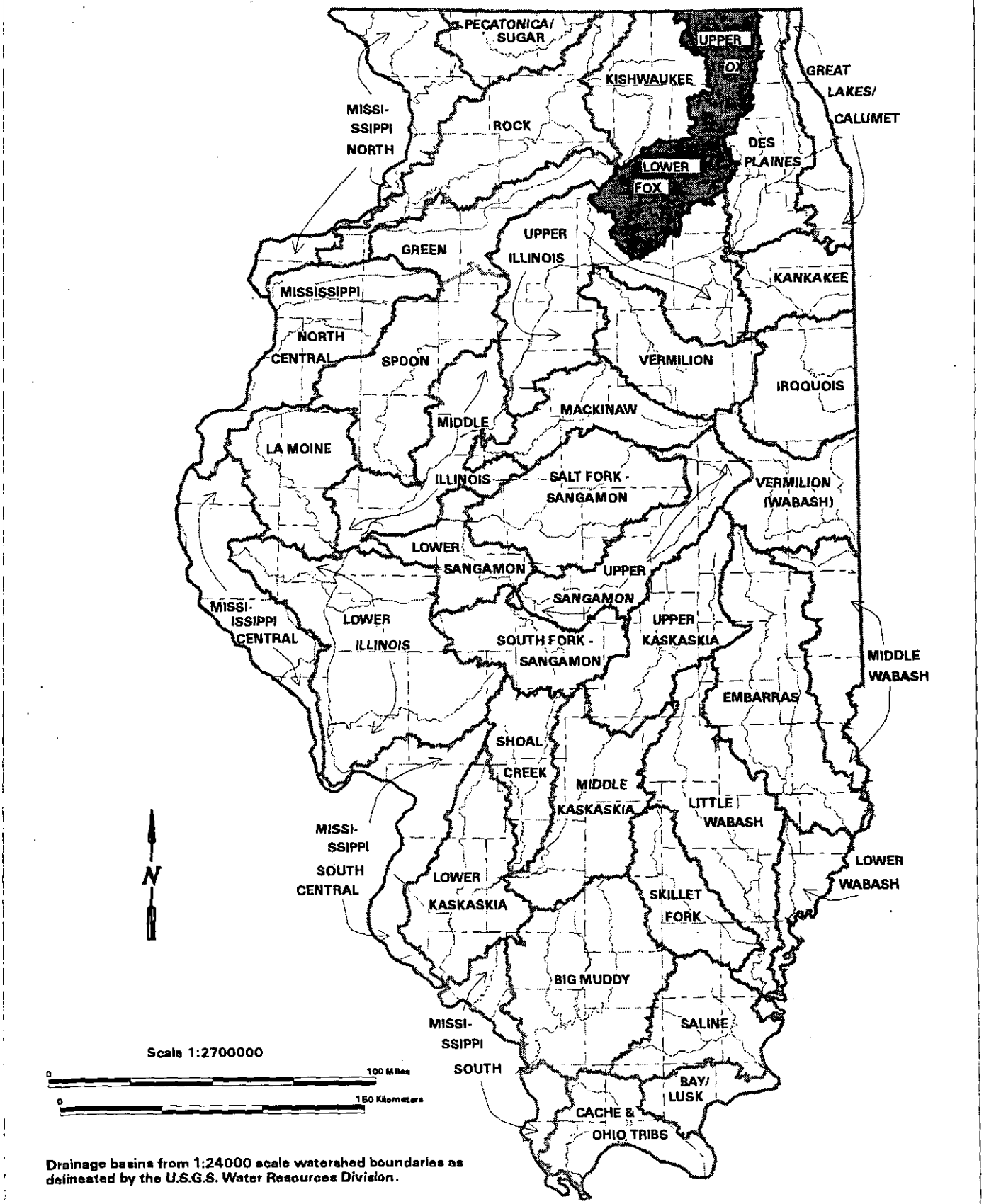


Figure 1. Subbasins in the Fox River Assessment Area. Subbasin boundaries depicted are those determined by the Illinois Environmental Protection Agency.



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

Figure 2. Major drainage basins of Illinois and location of the Fox River Assessment Area

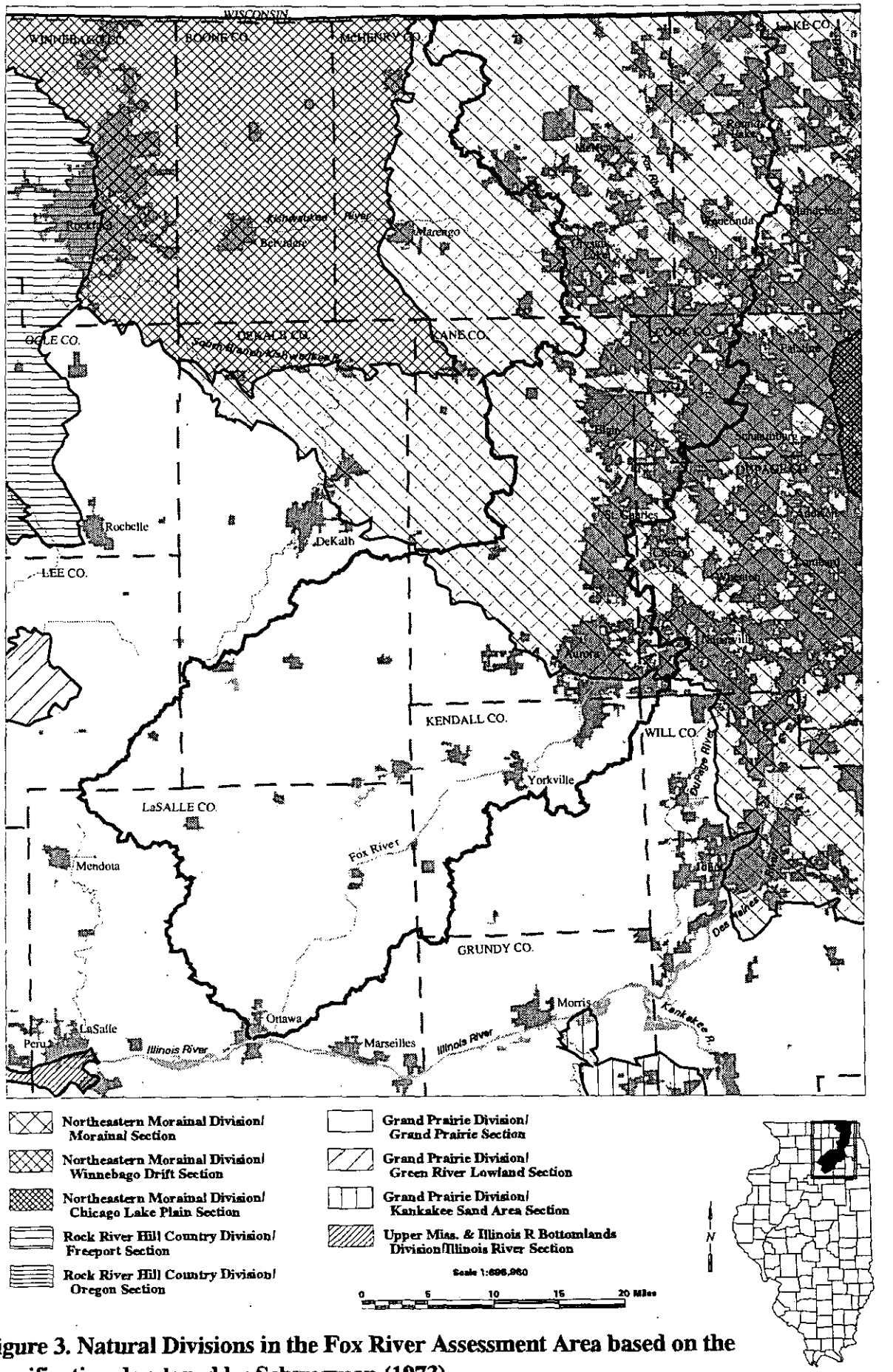


Figure 3. Natural Divisions in the Fox River Assessment Area based on the classification developed by Schwegman (1973).

Bedrock mostly is buried deeply by glacial drift, but limestone and dolomite outcrops occur along some streams. There are exposed dolomite cliffs at Mooseheart Ravine along Mill Creek, west of Batavia (Young 1986), and the Fox River flows through an area with exposed sandstone west of the Marseilles Morainal System, northeast of Ottawa. In the FRAA that lies within the Northeastern Morainal Division, the soils are largely derived from a thin surface layer of loess and underlying glacial drift (Wascher et al. 1960). Drainage varies from well-drained on the sloping uplands to poorly drained with slow permeability in intermorainal areas. The region is characterized by numerous natural lakes, kames, eskers, drumlins, and kettle-holes. In the Grand Prairie Section of the FRAA, soils are derived from windblown loess, glacial drift, or lakebed sediments. Drainage ranges from well drained to somewhat and poorly drained. Permability often is very slow in lowland situations.

Climate Patterns[1]

The climate in the Fox River Area Assessment (FRAA) is typical of many continental locations in that there are rather wide temperature fluctuations. Precipitation is also variable. The average high temperature in the summer is in the 80s (°F) and low 90s with average lows in the 50s and 60s. Winter highs are generally in the 20s and 30s with lows in the teens and 20's. Record temperature extremes range from -26° F to a high of 111° F. There is an average of just over five continuous months without frost each year.

Precipitation is highest during April through September (averages of 3.83 to 4.25 inches per month) and lowest in January (1.56 inches) and February (1.34 inches), with a yearly average of 36.88 inches.

Vegetation History

The presettlement vegetation in Illinois can be described generally as prairie and forest. Interpretations of the original distribution of prairie and forest (Vestal 1931a,b; Anderson 1970, 1991; Iverson et al. 1989) consistently indicate a predominance of prairie occupying about 60% and forest about 40% of the state's total land area. The estimated acres and percentages of forest and prairie that occurred in 1820 in the counties comprising the majority of the FRAA are given in Table 2. The figures vary considerably among regions of the FRAA. For instance, forest covered only 7.13% of De Kalb County while it covered 63.2% of Lake County (but see below). In the early 1800s, prairies covered about 34.1% of Lake County but 92.7% of De Kalb County (Iverson et al. 1989).

[1] Information in this section has been taken from the Fox River Area Assessment, Volume 2 (Illinois Department of Natural Resources 1997a). Refer to that volume for a more detailed discussion of climate patterns and long term trends in the FRAA.

Table 2. Estimated acreage and percent land cover of forest, prairie, and water in the counties of the FRAA, prior to European settlement (1820).[1]

County	Forest Acres	%	Prairie Acres	%	Water Acres	%
De Kalb	29,600	7.3	373,000	92.7	0	0
Du Page	28,800	13.5	184,700	86.5	0	0
Kane	116,500	35.0	216,100	65.0	0	0
Kendall	22,000	10.7	182,500	89.3	0	0
Lake	189,500	63.2	102,400	34.1	8,100	2.7
La Salle	111,300	15.3	612,800	84.3	3,200	0.4
McHenry	165,700	42.7	220,900	57.0	1,200	0.3
Totals	**663,400**		**1,892,400**		**12,500**	

[1] Data from Iverson et al. (1989).

The above figures are simplistic because the original native vegetation of the FRAA was a complex mosaic of different types of forests, flatwoods, savannas, blacksoil and gravel prairies, marshes, bogs, fens, sedge meadows, seeps, ponds, lakes, and, locally, cliff faces. Part of the FRAA is within the transition zone of prairie and forest (Anderson 1983) and probably supported considerable amounts of tallgrass savanna (Nuzzo 1986). For example, analyzing data from the Government Land Office survey in Lake County (around 1840) in order to distinguish savanna from forest, about 51% of the county can be classified as savanna and only 13% as forest (Moran 1978). However, savannas typically were spatially dynamic and their total area and distribution varied on the presettlement landscape depending on several factors, including local conditions of climate and fire frequency and intensity (Taft 1997). Fire is generally considered to have been a major ecological factor in the maintenance of tallgrass prairie, savanna, and open woodland vegetation in the Midwest (Anderson 1970, 1972, 1983, 1990; Axelrod 1985; Collins et al. 1990; McClain and Elzinga 1994; Steinauer and Collins 1996; Taft et al. 1995). Fire, drought, and grazing animal herds collectively are considered to have had important impacts on community structure and species composition on vegetation within the Grand Prairie Natural Division (Gleason 1913, Rogers and Anderson 1979, Robertson et al. 1997).

Total area of wetlands prior to European settlement can be inferred from county-wide data on the amount of hydric soils. Estimated figures for the counties that comprise the majority of the FRAA are given in Table 3. Prior to European settlement, wetlands covered perhaps 45% of Lake County, while the figure for De Kalb County was only 4%. Estimates of the current extent of natural and artificial wetlands are given in Table 3. Lake County has the highest amount of wetlands, both in acres (33,087) and percentage (11.1%) while De Kalb has the least with 4,072 acres or 1.0% of the county (Suloway and Hubbell 1994).

Table 3. Estimate of the current and presettlement extent of natural wetlands (of all quality ratings) and artificial wetlands in the counties that comprise the majority of the FRAA[1].

County	Estimated number of hydric acres[2]; presettlement	% hydric acres/ county, estimated	Acres of all[3] wetland types at present	% acres/ county for wetlands at present
De Kalb	16,500	4	4,072	1.0
Du Page	49,700	38	11,016	5.2
Kane	92,300	31	10,144	3.1
Kendall	57,500	30	2,781	1.4
Lake	78,000	45	33,087	11.1
La Salle	213,700	31	9,296	1.3
McHenry	110,800	31	24,095	6.2

[1] Data from Havera et al. (1994) and Suloway and Hubbell (1994).
[2] Hydric soils are associated with wetlands, therefore this areage is correlated with presettlement wetland acreage.
[3] These wetlands are diverse and included palustrine, lacustrine, and riverine types as well as bogs, fens, sedge meadows, and seeps.

Current Land Cover

Characterization of the land cover of the FRAA is based on information from the Land Cover of Illinois Database, which was derived from Landsat Thematic satellite imagery acquired between 1991 and 1995 (Illinois Geographic Information System).

The landscape of the FRAA is currently dominated by agricultural land, chiefly cropland (50.0% of the total area) (Table 4, Figure 4). Urban/built-up land and grassland each occupy approximately 17% of the total area (Table 4, Figure 5) . The Fox River basin encompasses the western edge of the Chicago metropolitan area so the urban/built-up land in the FRAA is concentrated in the east-central part of the assessment area.

Table 4. Current land Cover for the Fox River Assessment Area.

Land Cover	Acres	Percent
Cropland	546,352	50.0
Urban/Built-up	189,536	17.3
Grassland	185,943	17.0
Upland forest	103,361	9.5
Nonforested wetlands	42,403	3.9
Water	16,176	1.5
Bottomland forest	9,100	0.8
Total acres:	1,092,871	100.0

[1] Acreage from the Land Cover of Illinois Database, (Illinois Geographic Information System).

Grassland, including pastures, hay, idle fields, road and railroad rights-of-way, and remnant prairies makes up 17% of the FRAA (Table 4, Figure 6). Although there are 185, 943 acres of grassland in the region, a total of only 30.1 acres of high-quality (undegraded) native prairie is scattered throughout the area. An unknown quantity of degraded prairie persists locally, some of which has high restoration potential.

Approximately 10.3% of the area is woodland, with 9.5% being upland forest and 0.8% bottomland forest (Table 4). As in the presettlement landscape, much of the forested area is concentrated on the slopes and bottomlands associated with rivers and their tributaries (Figure 7).

Wetlands have also declined dramatically in the FRAA. Based on the Land Cover of Illinois Database (Illinois Geographic Information System), a current estimate of total wetland area in the region (bottomland forest and nonforested wetlands such as marshes, wet meadows, and ponds) is about 51,503 acres or 4.7% of the FRAA (Table 4). These wetland areas are concentrated in the northern part of the assessment area (Figure 8). Open water (1.5% of the area) occurs in the lakes in the northern part of the assessment area and in the Fox River (Table 4, Figure 9).

The Illinois Wetlands Inventory (IWI) provides more detailed information about the different types of wetland acreage in the area (Illinois Geographic Information System). For the FRAA, the IWI data were derived from high-altitude photography taken between 1981 and 1985. IWI data are the most recent comprehensive wetland data available for the state. Based on IWI data, the FRAA, particularly the upper portion, is relatively rich in wetlands, which occupy 4.9% of the FRAA area compared to 3.5% of the total area of the state (Suloway and Hubbell 1994) (Table 5). Of the 51 USGS hydrologic basins in the state, the upper Fox River (north of Elgin) ranked first in percentage of wetland area and ninth in total wetlands acreage (Suloway and Hubbell 1994). In the FRAA, wetlands occupy about 53,401 acres (Table 5). Approximately 44.8% of the wetlands in the FRAA are shallow marsh/wet meadow followed by deep marsh (15.3%), bottomland forest (12.9%), shallow lake (11.8%), and open water wetlands (10.9%). Shallow marsh/wet meadow wetlands are particularly abundant in the FRAA; they comprise about 45% of the wetlands acreage in the FRAA compared to 13% of the wetlands acreage for the state. There is a similar pattern for deep marsh (15.3% in the FRAA compared to 3.1% statewide) and shallow lake (11.8% in the FRAA versus 4.1% statewide). Bottomland forests, however, are not abundant in the FRAA; 12.9% of wetlands are bottomland forest in the FRAA compared to 60.5% for the state as a whole.

The mean size of contiguous forested wetlands is 6.0 acres; there are 1,135 separate forested wetlands in the FRAA. The four largest contiguous forested tracts (91 to 152 acres) are located in the lower part of the basin on tributaries to the Fox River. Emergent wetlands range in size from less than 0.1 acre to 824 acres, with a mean size of 6.5 acres. There are 4,927 separate emergent wetlands in the FRAA. The largest emergent wetland is in the Chain-O-Lakes area. Of the 12 largest contiguous emergent wetlands (245 to 824 acres), all but 1 are located in Lake, McHenry, and northwestern Cook counties. In the FRAA several of the landcover types area concentrated along streams.

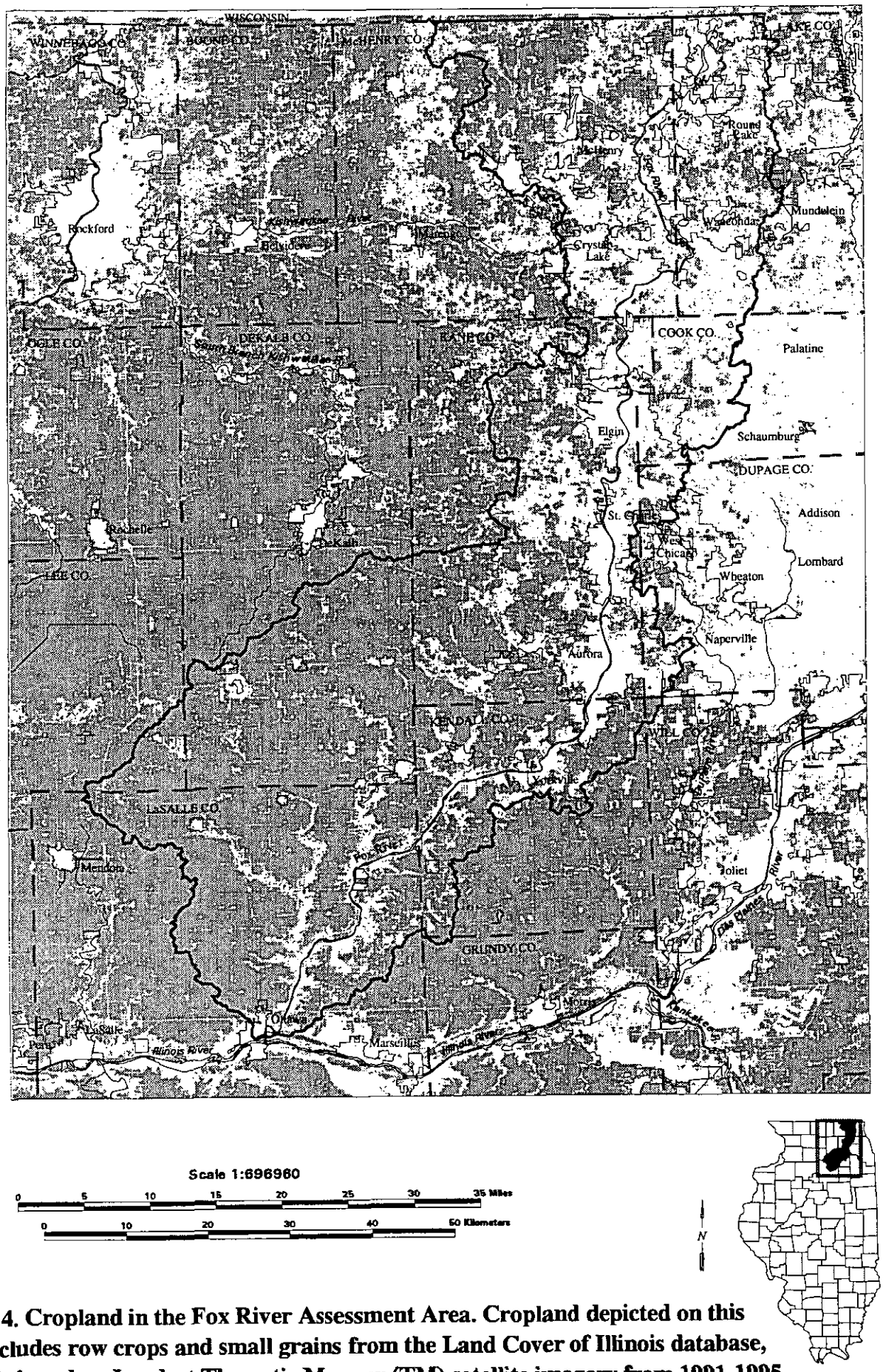


Figure 4. Cropland in the Fox River Assessment Area. Cropland depicted on this map includes row crops and small grains from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

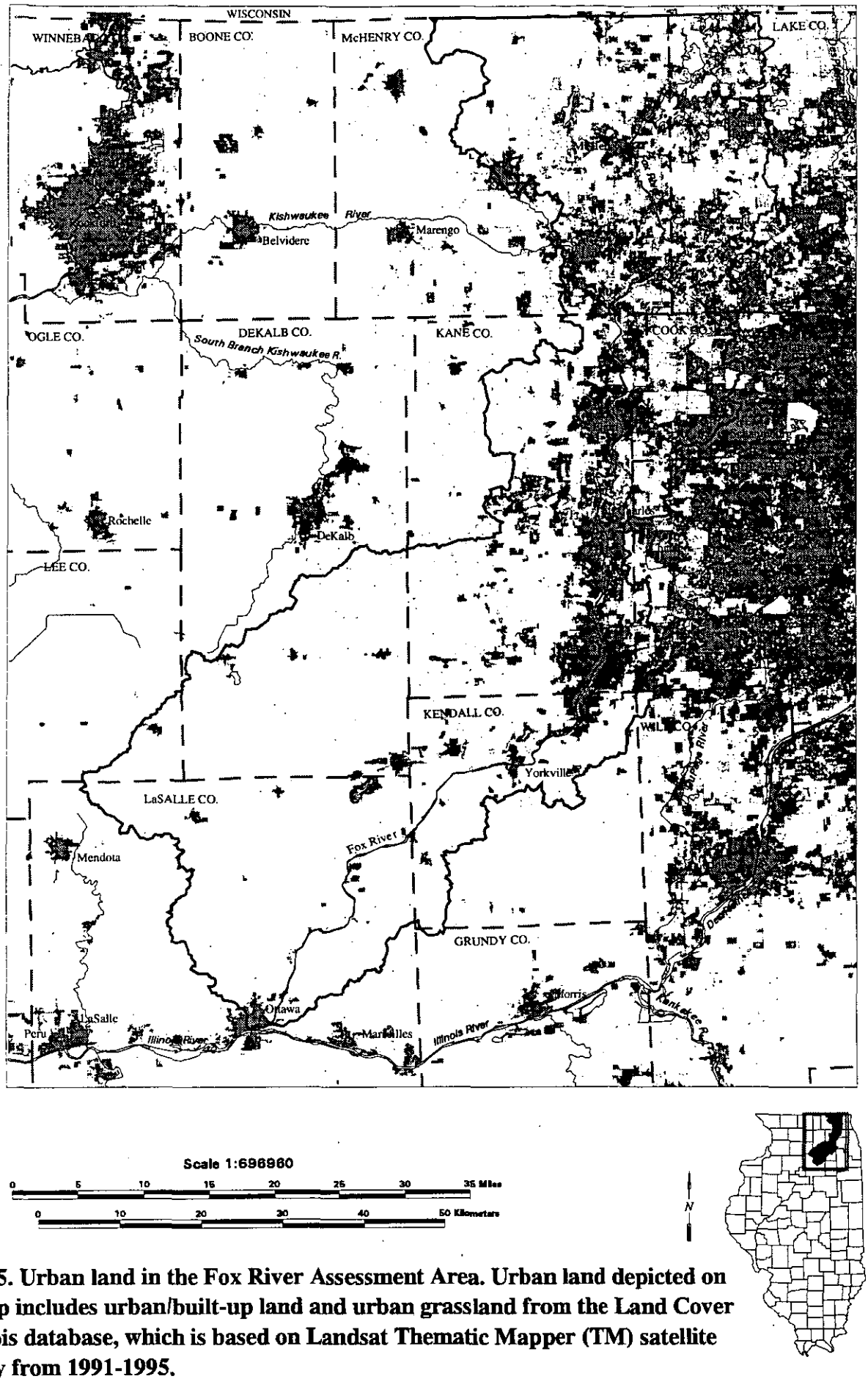


Figure 5. Urban land in the Fox River Assessment Area. Urban land depicted on this map includes urban/built-up land and urban grassland from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

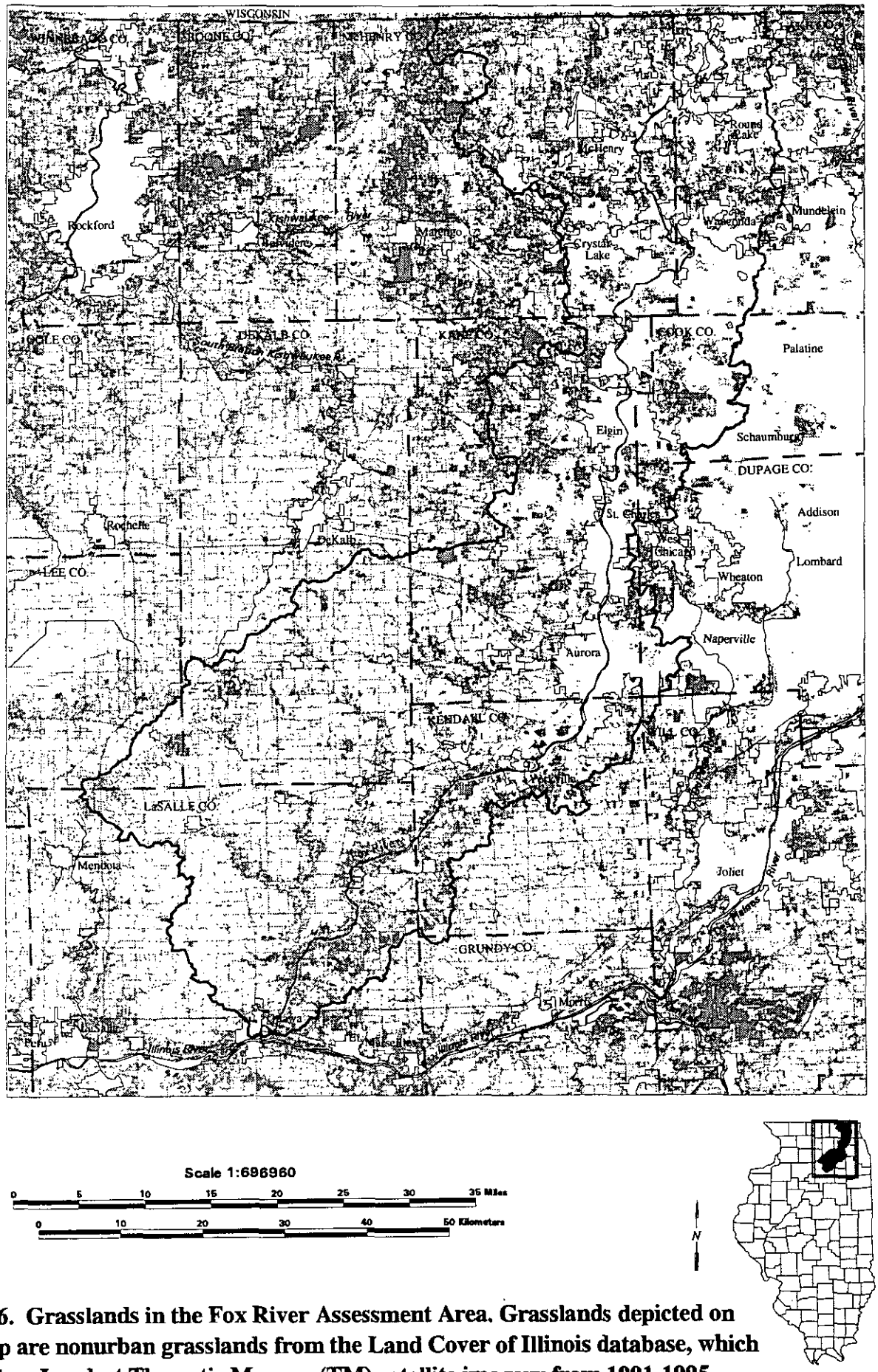


Figure 6. Grasslands in the Fox River Assessment Area. Grasslands depicted on this map are nonurban grasslands from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

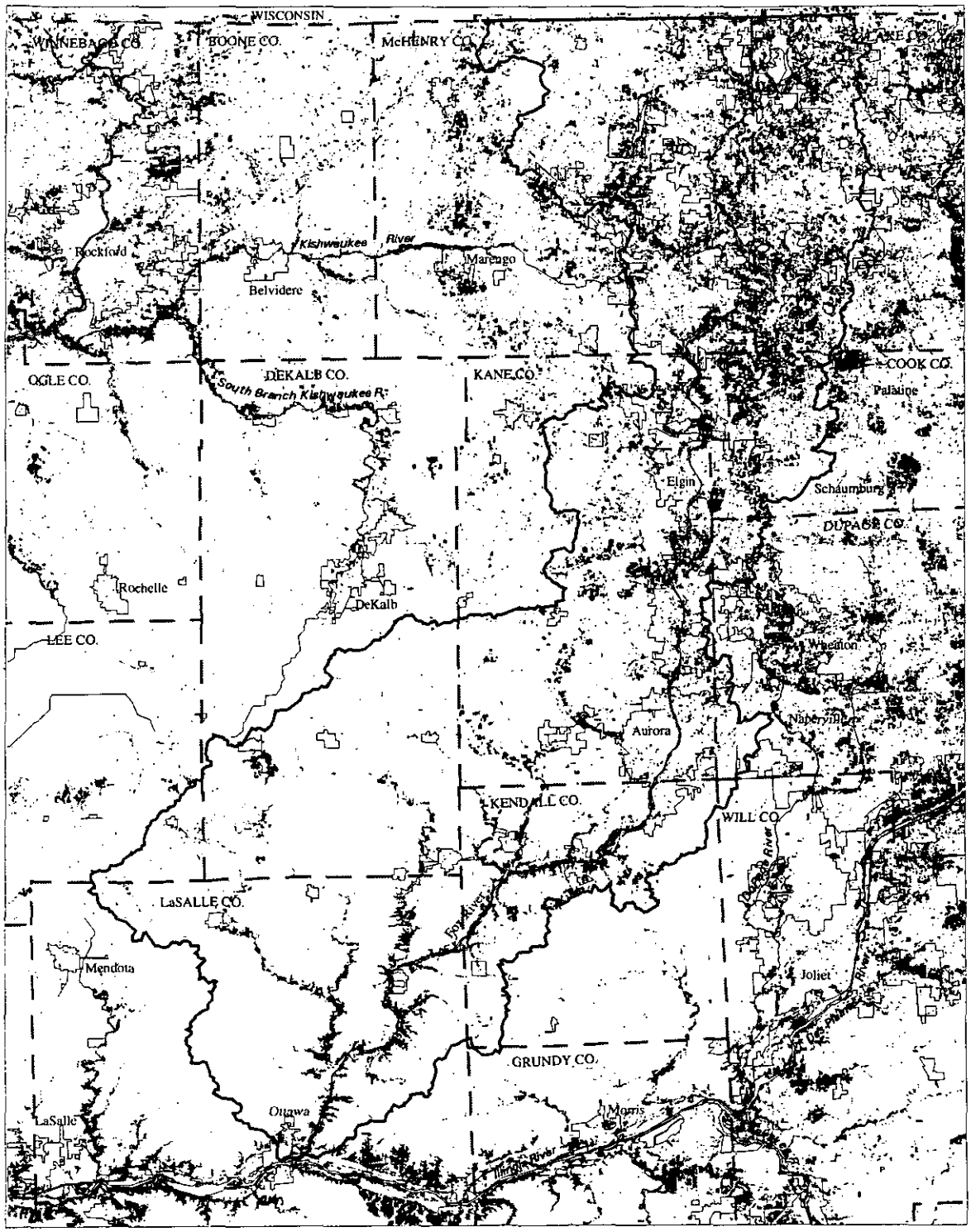


Figure 7. Forest in the Fox River Assessment Area. Forest depicted on this map includes upland and bottomland forest from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

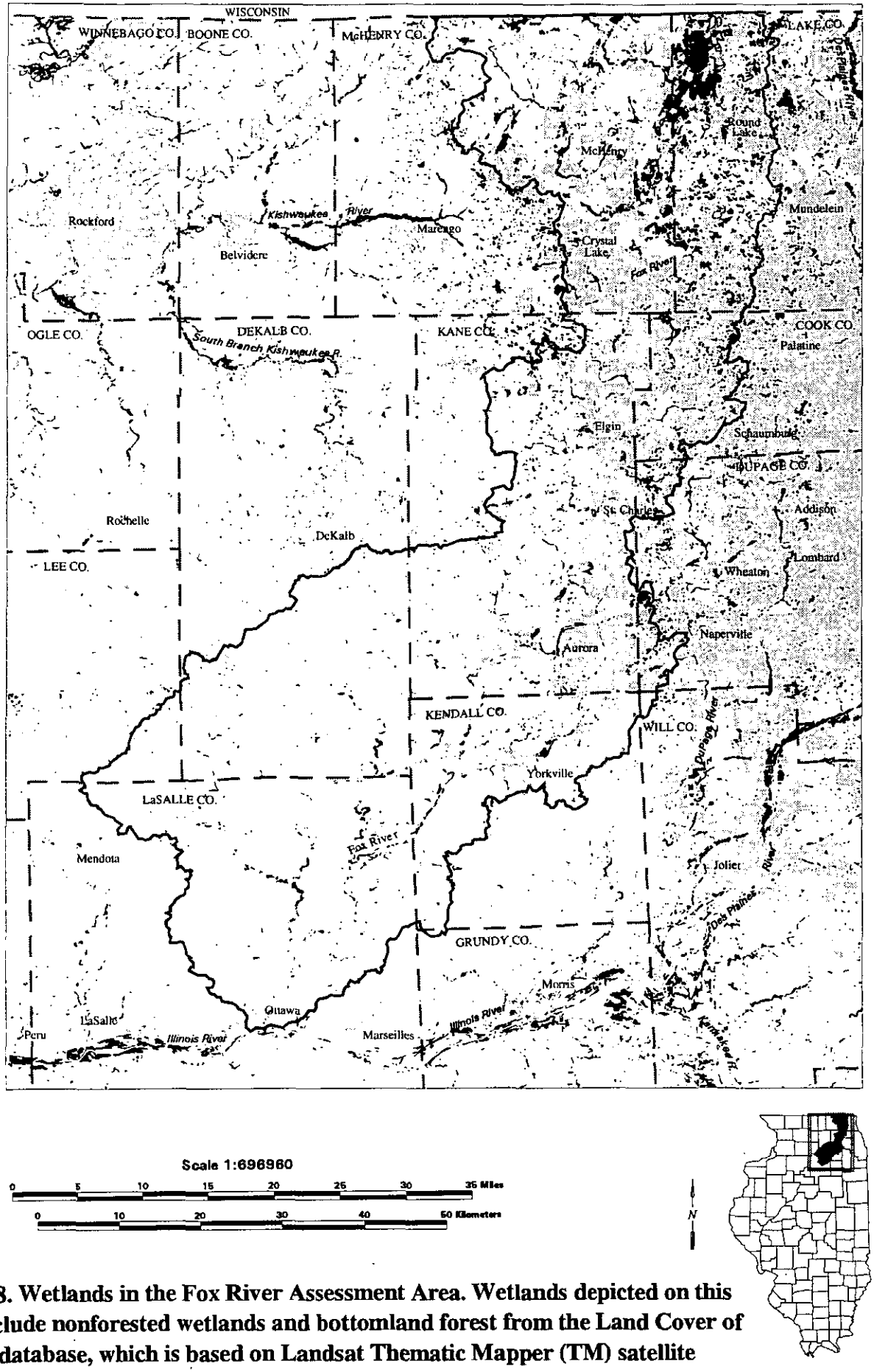


Figure 8. Wetlands in the Fox River Assessment Area. Wetlands depicted on this map include nonforested wetlands and bottomland forest from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

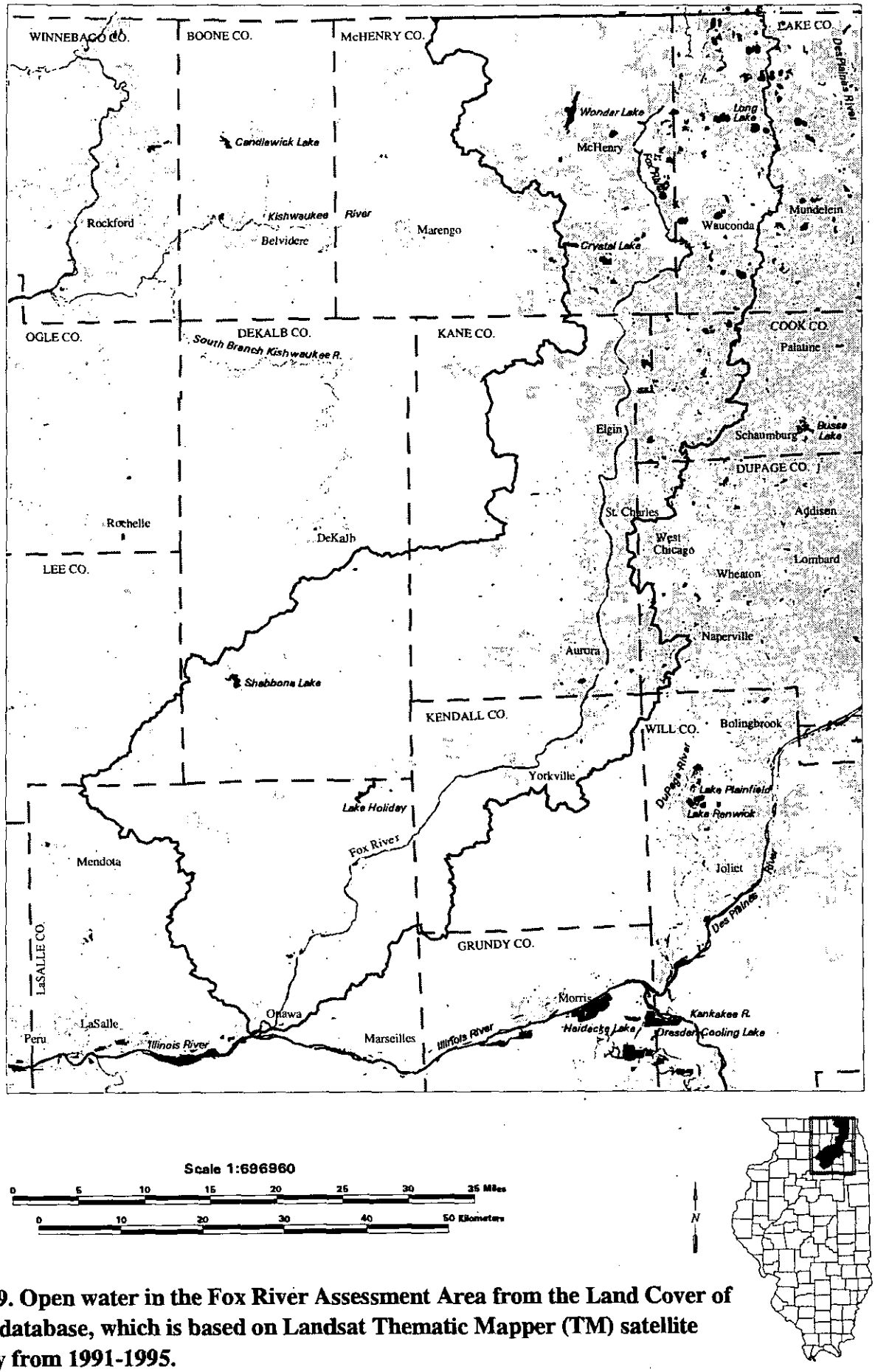


Figure 9. Open water in the Fox River Assessment Area from the Land Cover of Illinois database, which is based on Landsat Thematic Mapper (TM) satellite imagery from 1991-1995.

Table 5. Wetland Habitat of the Fox River Assessment Area[1].

Category	Acreage	% of Wetland Area	% of FRA Area
Shallow Water Wetlands			
Palustrine Wetlands			
Shrub-Scrub Wetlands	1,962.51	3.7	0.2
Forested Wetlands			
Bottomland Forest	6,910.17	12.9	0.6
Swamp	3.35	0.0	0.0
Emergent Wetlands			
Shallow Marsh/Wet Meadow	23,905.26	44.8	2.2
Deep Marsh	8,196.84	15.3	0.8
Open Water Wetlands	5,844.04	10.9	0.5
Subtotal Palustrine	**46,822.17**	**87.7**	**4.3**
Lacustrine Wetlands			
Shallow Lake	6,289.02	11.8	0.6
Lake Shore	6.29	0.0	0.0
Emergent Lake	0.00	0.0	0.0
Subtotal Lacustrine	**6,295.31**	**11.8**	**0.6**
Riverine Wetlands			
Perennial Riverine	9.90	0.0	0.0
Intermittent Riverine	273.57	0.5	0.0
Subtotal Riverine	**283.47**	**0.5**	**0.0**
Total Wetlands	**53,400.95**	**100.0**	**4.9**

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

Approximatley 22% of the upland forest, 37% of the nonforested wetland, and 62% of the bottomland forest occurs within 300 feet of a stream, a zone that only occupies 13% of the total land area. In spite of this concentration of natural habitats along streams, these corridors are still 30% cropland and 11.7% urbanland. Forty-one percent of the wetland acreage is within 300 feet of a stream in the FRAA. Of the forested wetland acreage, 68% is within 300 feet of a stream while about one-third of the emergent wetlands fall within this area.

Biologically Significant Features of Natural Communities

State and County Land

Although the majority of the land in the FRAA is used for agricultural purposes, 25,601 acres (2.3% of the FRAA) have been set aside by the state or the various counties in the FRAA as state parks or forest preserves (Table 6, 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. There is no federally protected land in the FRAA.

Table 6. State and county land owned land in the Fox River Assessment Area.
(There is no federally owned land in the Fox River Assessment Area)

State Land[1]:	Acres
Chain-O-Lakes State Park	3,643
McHenry Dam & Lake Defiance State Park	1,657
Shabbona Lake State Park	1,761
Silver Springs State Park	1,270
Total State Land:	8,331

County Land:	Acres
Kane	6,010
Lake	5,474
McHenry	5,032
DeKalb	438
Kendall	278
Lee	0
Grundy	0
Will	0
Cook	NA[2]
DuPage	NA[2]
LaSalle	NA[2]
Total County Land:	17,270

[1] This table does not include any natural areas or nature preserves that may be state owned.
[2] Data not available

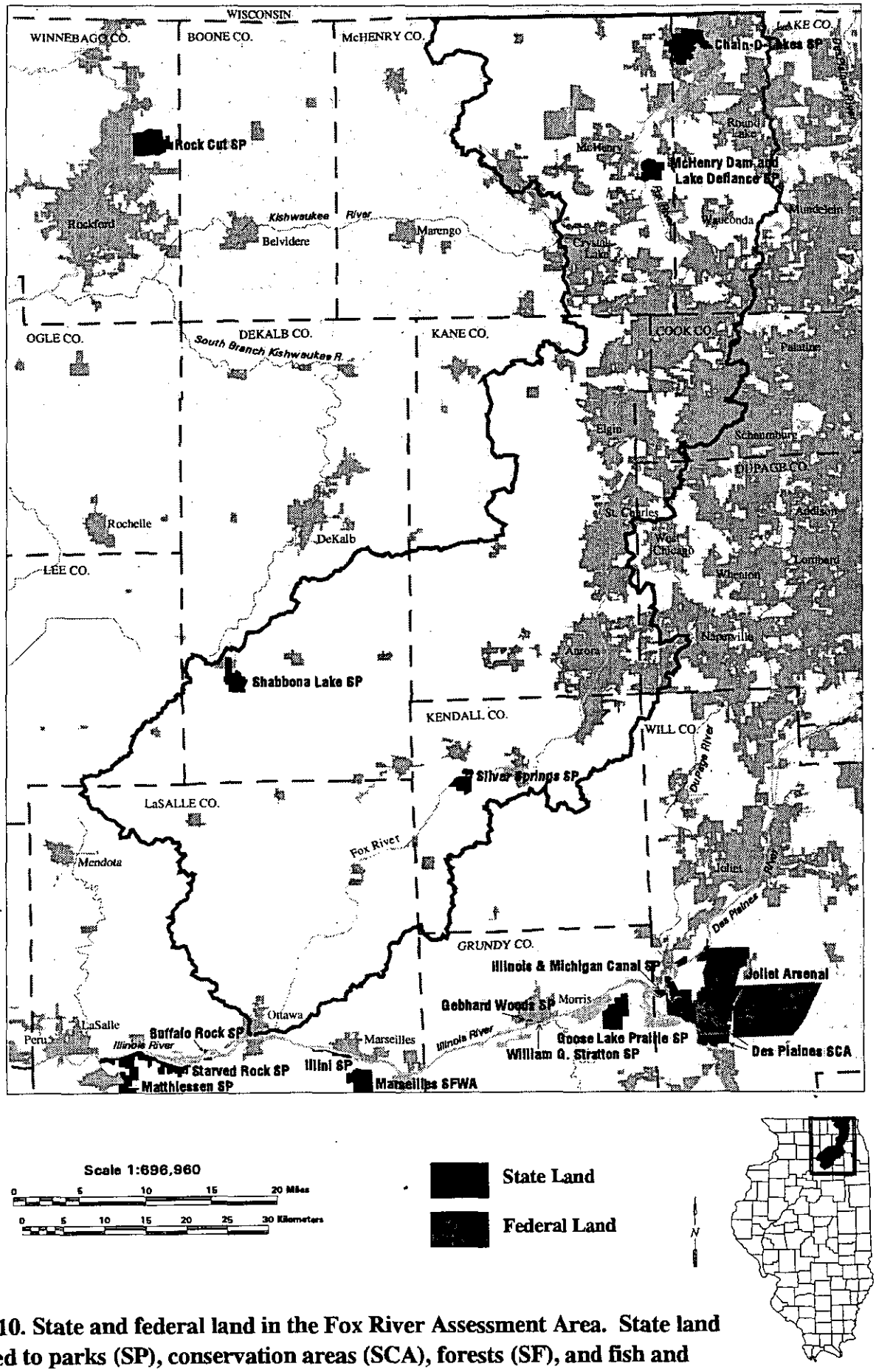


Figure 10. State and federal land in the Fox River Assessment Area. State land is limited to parks (SP), conservation areas (SCA), forests (SF), and fish and wildlife areas (SFWA).

Natural Areas and Nature Preserves

In 1978, an inventory of natural areas in Illinois was completed by the University of Illinois and the Natural Land Institute under a contract with the Illinois Department of Conservation (now the Illinois Department of Natural Resources). The original inventory was a three-year project that consisted of surveys to find, evaluate, describe, and classify natural areas of statewide significance (White 1978). The Illinois Natural Areas Inventory (INAI) is an ongoing process. The methods and criteria established during the original inventory are still used today to continually update the INAI by re-evaluating the previously defined natural areas or finding new sites that qualify.

The INAI established seven categories of natural areas based on significant features. The categories are: I - High Quality Natural Communities; II - Habitat for Endangered Species; III - Habitat for Relict Species; IV - Outstanding Geological Areas; V - Approved Natural Areas and Restoration Sites; VI - Unique Natural Areas; and VII - Outstanding Aquatic Areas. The INAI established a grading system to designate natural quality (White 1978). The natural quality of a community or area was graded from "A" (relatively stable or undisturbed) to "E" (very early successional or severely disturbed). In general only A and B communities are designated as significant or exceptional features.

Within the FRAA, 113 sites have been identified by the INAI (Table 7, Figure 11). One hundred-ten of these sites qualify as high-quality, undegraded (Category I) natural areas for the INAI (Table 8). These include remnants of the following natural communities in Table 8: dry-mesic and mesic upland forest (Grades A and B); dry-mesic, wet-mesic and wet prairie (Grades A and B); dry and dry-mesic gravel prairie (Grades A and B); gravel hill prairie (Grade B); dry-mesic savanna (Grade B); marsh (Grade A and B); graminoid, low shrub, tall shrub, and forested bog (Grades A and B); calcareous floating mat, graminoid fen, low shrub fen, tall shrub fen, and forested fen (Grades A and B); sedge meadow (Grades A and B); calcareous seep (Grades A and B); lake and pond (Grades A and B); and dolomite cliff (Grade A).

The combined area for all natural areas in the FRAA is approximately 16,125.32 acres or 1.5% of the assessment area. Of this, 660.3 acres are Category 1, Grade A land and 4,845.6 acres is Category 1 Grade B land. The total area of Category 1 Grade A and B land are therefore 5,505.9 (Table 8), or about 0.5% of the FRAA. This percentage of undegraded land in the FRAA is considerably larger than the percentage given in the INAI (0.07%) for total land and water area found throughout Illinois that remains in a high-quality, relatively undisturbed condition (White 1978). It is also significant that throughout the state, the INAI found only 25,723 acres of Grades A and B (high-quality, undegraded) terrestrial natural communities, of which 5,505.9 (21.4%) occur within the FRAA. This indicates that the FRAA is a significant statewide repository of high-quality natural areas.

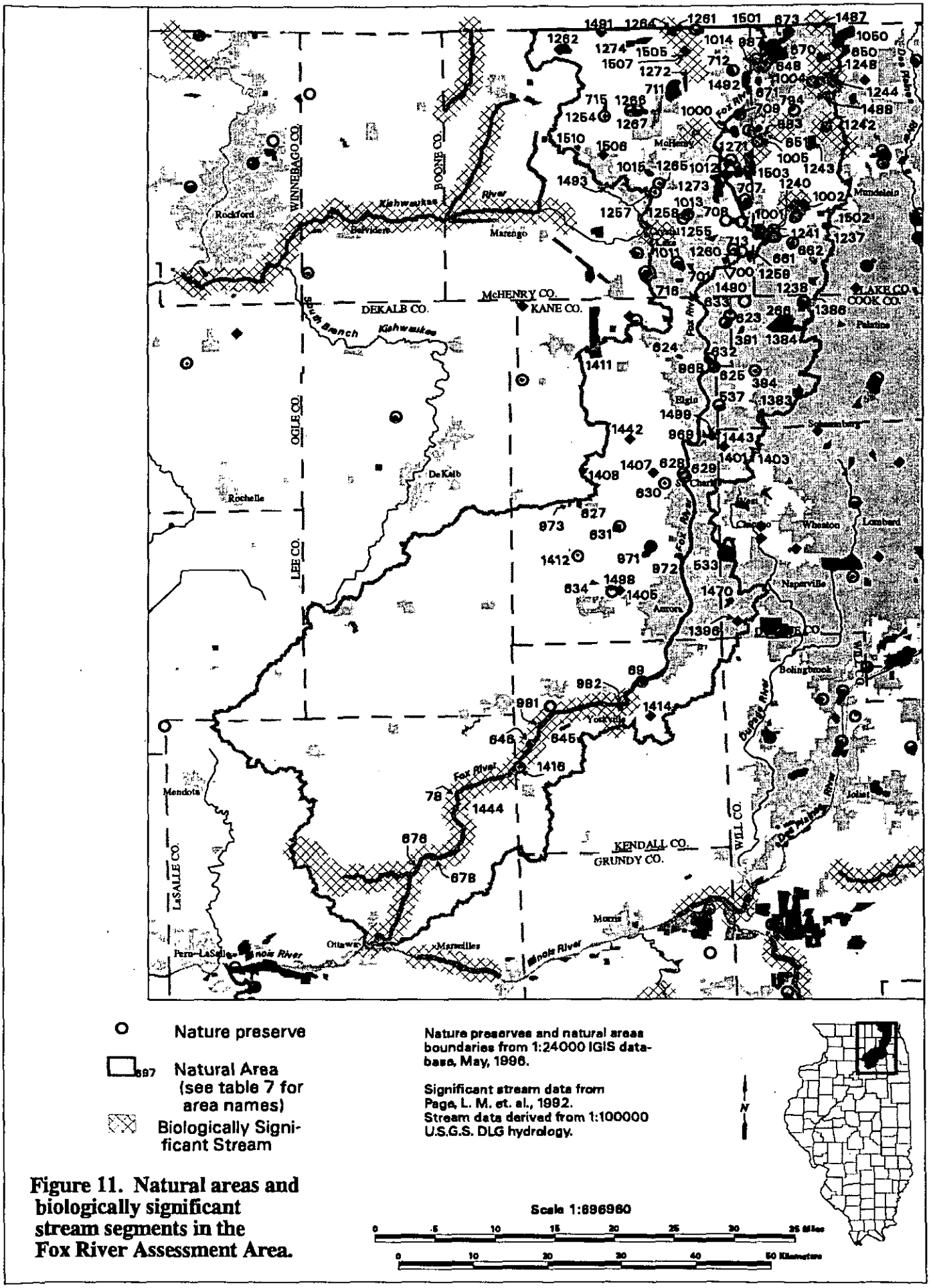


Figure 11. Natural areas and biologically significant stream segments in the Fox River Assessment Area.

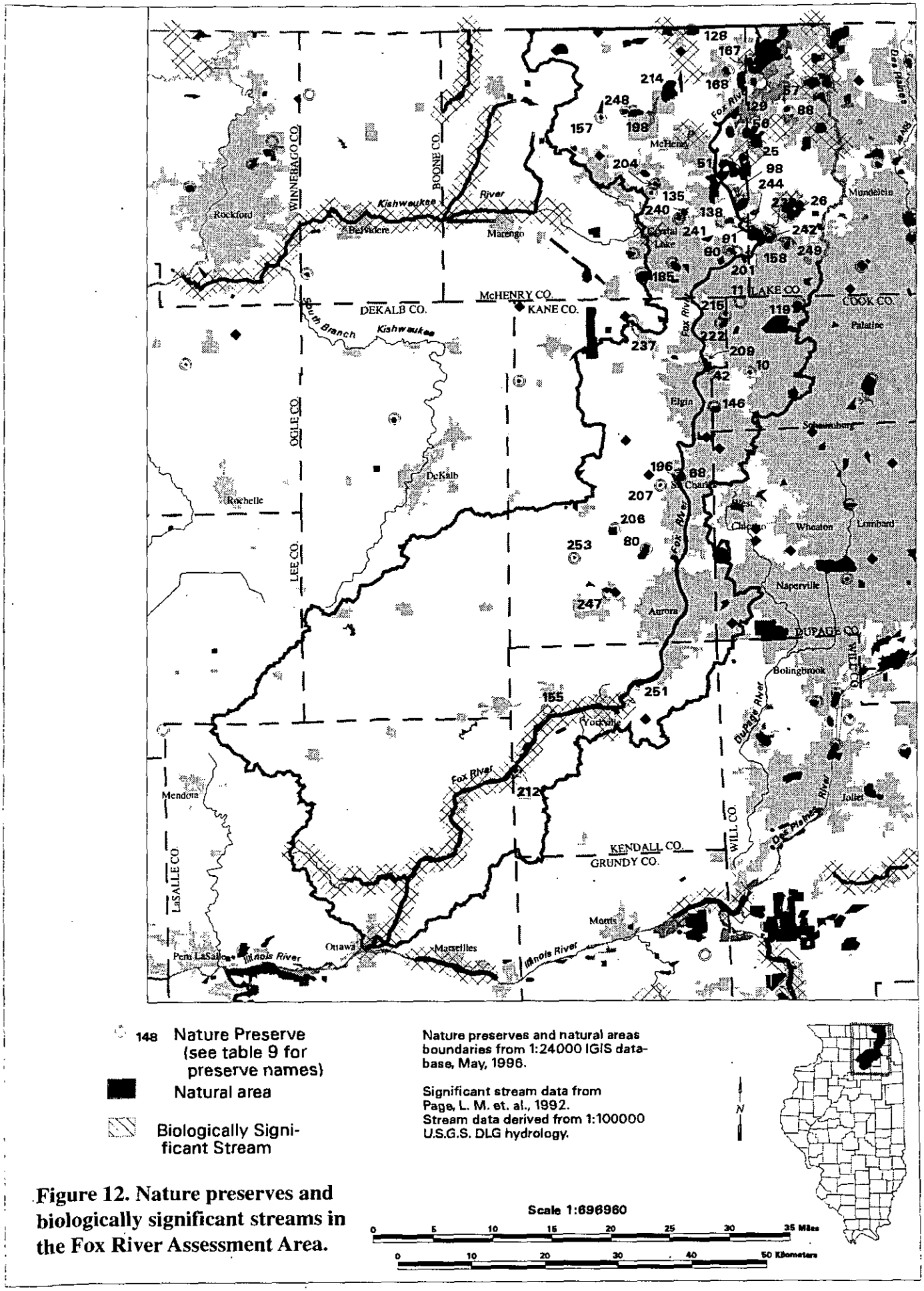


Figure 12. Nature preserves and biologically significant streams in the Fox River Assessment Area.

Table 7. Natural areas in the Fox River Assessment Area and surrounding region[1].

NA#[2]	County	Acres	Name
53	De Kalb	20.54	Wilkinson Marsh
54	Grundy	6.25	Commonwealth Edison Hill Prairie
55	Grundy	35.46	Dupont Hill Prairies
69	**Kendall**	**24.48**	**Yorkville Prairie**
70	Lake	71.08	St. Francis Boys Camp
78	**La Salle**	**0.53**	**Sheridan Red Pine Site**
79	La Salle	160.45	Matthiessen
80	La Salle	6.46	Seneca Hill Prairie
81	La Salle	243.95	Margery C. Carlson
83	McHenry	25.64	Harvard Geological Area
98	McHenry	27.42	Harvard East Geological Area
255	Du Page	79.51	Black Partridge Woods
266	**Cook**	**959.99**	**Crabtree Nature Center**
348	Boone	12.52	Flora Prairie
391	**Cook**	**17.72**	**Spring Creek Prairie**
394	**Cook**	**8.80**	**Shoe Factory Road Prairie**
432	Grundy	7.38	Waupecan Creek Geological Area
451	De Kalb	7.69	Afton Cemetery Prairie
474	La Salle	4.28	Deer Park South Geological Area
475	La Salle	4.42	La Salle South Geological Area
476	La Salle	5.76	Illinois Valley College Geological Area
477	La Salle	1.82	Split Rock Geological Area
505	Du Page	113.53	West Chicago Prairie
506	Du Page	1,411.66	Morton Arboretum
522	De Kalb	35.01	De Kalb Geological Area
523	Du Page	40.14	Meacham Grove
524	Du Page	32.49	Churchill Prairie
526	Du Page	9.81	Belmont Prairie
527	Du Page	51.31	Maple Grove Forest Preserve
528	Du Page	2.00	Hinsdale Prairie
529	Du Page	56.24	Lemont East Geological Area
530	Du Page	197.43	Fullersburg Woods Nature Center
532	Du Page	1,130.84	Waterfall Glen
533	**Kane**	**676.11**	**Fermilab**
534	Cook	642.93	Busse Woods
536	Cook	24.38	Lemont Bluff Geological Area
537	**Cook**	**80.12**	**Bluff Springs Fen**
560	Grundy	14.48	Collins Station Prairie
561	Grundy	19.25	Mazon Creek Geological Area
562	Grundy	5.01	Aux Sables Railroad Prairie
622	Kane	35.63	Rutland Township Bog
623	**Kane**	**81.96**	**Helm's Woods**
624	**Kane**	**21.63**	**Sleepy Hollow**
625	**Kane**	**26.10**	**Trout Park**

Table 7. Continued

NA#[2]	County	Acres	Name
626	**Kane**	**5.95**	**Burlington Prairie**
627	**Kane**	**54.61**	**Elburn Forest Preserve**
628	**Kane**	**13.92**	**Ferson's Creek Sedge Meadow**
629	**Kane**	**73.39**	**Norris Woods**
630	**Kane**	**4.51**	**Murray Prairie**
631	**Kane**	**103.63**	**Johnson's Mound**
632	**Kane**	**27.10**	**Fox River Fen**
633	**Kane**	**1.32**	**Carpentersville White Fringed Orchid Site**
634	**Kane**	**7.70**	**Kaneville Geological Area**
645	**Kendall**	**15.77**	**Silver Springs Railroad Prairie**
646	**Kendall**	**56.77**	**Dixon Valley Sedge Meadow**
648	**Lake**	**553.37**	**Grass Lake Wetlands**
649	Lake	61.66	Wadsworth Prairie and Savanna
650	Lake	91.50	Antioch Bog
651	**Lake**	**16.18**	**Stanley Road Bog**
652	Lake	85.21	Fourth Lake
653	Lake	20.62	River Road Woods
661	**Lake**	**45.82**	**Barrington Bog**
662	**Lake**	**73.57**	**Tower Lake Fen**
663	Lake	133.49	Lloyd's Woods
667	Lake	4.79	Sarah Fenton Hinde Preserve
670	**Lake**	**164.90**	**Loon Lake**
671	**Lake**	**61.71**	**Dunn's Lake**
673	**Lake**	**317.70**	**Channel Lake**
674	La Salle	12.50	Ernat's Marsh
675	La Salle	11.28	Catlin Salt Marsh
676	**La Salle**	**16.01**	**Wedron Palisades**
677	La Salle	53.86	Clark Run
678	**La Salle**	**8.90**	**Marsh Relicts**
681	La Salle	11.02	La Salle East Geological Area
690	Lee	12.35	Compton Geological Area
691	Lee	6.46	Ashton East Geological Area
700	**McHenry**	**5.06**	**Ski Hill Prairie**
701	**McHenry**	**20.24**	**Larsen Prairie**
705	McHenry	19.13	Deep Cut Marsh Wildlife Refuge
707	**McHenry**	**292.20**	**Cotton Creek Marsh**
708	**McHenry**	**49.21**	**Bates Fen**
709	**McHenry**	**72.87**	**Weingart Road Sedge Meadow**
710	McHenry	92.63	Beck Woods Conservation Area
711	**McHenry**	**693.71**	**Delta Kames**
712	**McHenry**	**60.47**	**Spring Grove Fen**
713	**McHenry**	**16.49**	**Hillside Prairie**
714	McHenry	10.66	Coyne Arrow Grass Site
715	**McHenry**	**19.50**	**Rt. 47 Balsam Poplar Site**

Table 7. Continued

NA#[2]	County	Acres	Name
716	**McHenry**	**9.44**	**Algonquin Geological Area**
720	McHenry	655.16	Kishwaukee River
773	Ogle	3.00	Beach Cemetery Prairie
794	**Lake**	**40.95**	**Gavin Bog and Prairie**
881	Will	72.34	Material Services Prairie
883	Will	53.33	Lockport Prairie East
884	Will	167.54	Messenger Woods
886	Will	38.79	Hickory Creek Sedge Meadow
888	Will	116.17	Grant Creek Prairie
889	Will	9.24	Des Plaines Dolomite Prairie
891	Will	3.01	Schweizer West Geological Area
892	Will	5.23	Plaines Station Geological Area
893	Will	4.38	Markgraf Quarry
895	Will	2.30	Wilmington Geological Area
896	Will	54.81	Wilmington West Geological Area
897	Will	4.18	Rockdale Geological Area
902	Will	140.84	Munch Area
914	Winnebago	1.86	Winquist Prairie
915	Winnebago	4.28	Silver Creek Prairie
916	Winnebago	21.20	Bell Bowl Prairie
917	Winnebago	67.72	Rockton Bog
918	Winnebago	59.52	Harlem Hills
919	Winnebago	19.66	Nimtz Ponds
920	Winnebago	74.49	Searls Park Prairie
932	Will	244.05	Lockport Prairie
934	Will	114.44	Wilmington Shrub Prairie
936	Will	200.88	Romeoville Prairie
937	Will	302.42	Pilcher Park
968	**Kane**	**22.55**	**Chicago Junior School Area**
969	**Kane**	**14.09**	**South Elgin Sedge Meadow**
971	**Kane**	**211.20**	**Nelson Lake Marsh**
972	**Kane**	**43.42**	**Mooseheart Ravine**
973	**Kane**	**0.93**	**Maple Park Railroad Prairie**
977	Boone	13.35	Ipsen Prairie
980	Kankakee	2,793.22	Kankakee River
981	**Kendall**	**4.96**	**Millhurst Fen**
982	**Kendall**	**25.01**	**Yorkville Seep**
983	**McHenry**	**289.42**	**Pistakee Bog**
987	**Lake**	**139.36**	**Turner Lake**
1000	**McHenry**	**166.00**	**Lac Louette**
1001	**Lake**	**447.65**	**Lyons Prairie and Marsh**
1002	**Lake**	**618.66**	**Wauconda Bog**
1003	Lake	384.71	Macarthur Woods
1004	**Lake**	**342.07**	**Cedar Lake**

Table 7. Continued

NA#[2]	County	Acres	Name
1005	**Lake**	**321.53**	**Volo Bog**
1010	La Salle	190.15	Pecumsaugan Creek—Blackball Mine
1011	**McHenry**	**145.66**	**Lake-in-the-Hills Fen**
1012	**McHenry**	**440.14**	**Kettle Moraine**
1013	**McHenry**	**50.40**	**Sterne's Fen**
1014	McHenry	230.51	Elizabeth Lake
1015	**McHenry**	**70.08**	**Boone Creek Fen and Seep**
1025	Winnebago	45.68	South Ledges of Kinnikinnick Creek
1026	Winnebago	96.76	Willow Creek
1038	Winnebago	10.58	Owen Center Road Prairie
1039	Will	10.16	Long Run Seep
1042	Winnebago	1.45	Hamborg Railroad Prairie
1047	Will	357.48	Hitts Siding Prairie
1050	Lake	680.54	Deer Lake—Redwing Slough
1060	Will	327.21	Lake Renwick Heron Colony
1067	Grundy	1,659.54	Goose Lake Prairie
1077	La Salle	1,678.48	Starved Rock State Park
1080	Will	0.94	Vermont Cemetery Prairie
1082	Will	20.76	Rockdale Railroad Prairie
1108	Ogle	0.00	Killbuck Prairie
1231	Lake	1.46	Prairie White Fringed Orchid Preserve
1232	Lake	0.00	Old Mchenry Road Site
1233	Lake	0.00	Long Grove Site
1236	Lake	9.25	Buffalo Grove Prairie
1237	**Lake**	**33.88**	**Fairfield Road Marsh South**
1238	**Lake**	**31.82**	**Cuba Marsh**
1240	**Lake**	**24.08**	**Roberts Road Fen**
1241	**Lake**	**5.42**	**Rivers Bend Marsh**
1242	**Lake**	**225.24**	**Round Lake**
1243	**Lake**	**220.46**	**Round Lake Marsh**
1244	**Lake**	**223.46**	**Deep Lake**
1248	**Lake**	**25.29**	**Sun Lake**
1249	Lake	0.00	McDonald Woods Marsh
1252	Lake	40.47	Liberty Prairie
1253	Lake	240.40	Almond Marsh
1254	**McHenry**	**14.81**	**Bystricky Prairie**
1255	**McHenry**	**36.49**	**Hollows Conservation Area**
1256	McHenry	39.99	Turnberry Fen
1257	**McHenry**	**7.56**	**Parker Fen**
1258	**McHenry**	**5.35**	**Veteran's Acres Park**
1259	**McHenry**	**4.26**	**Cary Main Street Prairie**
1260	**McHenry**	**6.75**	**Cary Junior High Prairie**
1261	**McHenry**	**14.83**	**State Line Marsh**
1262	**McHenry**	**385.21**	**Alden Sedge Meadow**

Table 7. Continued

NA#[2]	County	Acres[3]	Name
1263	McHenry	296.70	Exner Marsh
1264	**McHenry**	**125.16**	**Genoa City Sedge Meadow**
1265	**McHenry**	**11.16**	**Gladstone Fen**
1266	**McHenry**	**28.33**	**Lind Forest**
1267	**McHenry**	**169.63**	**Barber Fen**
1264	McHenry	125.16	Genoa City Sedge Meadow
1265	McHenry	11.16	Gladstone Fen
1266	McHenry	28.33	Lind Forest
1268	McHenry	76.73	Harvard Savanna
1269	McHenry	45.42	Hum Railroad Prairie East
1270	McHenry	167.79	Hum Railroad Prairie West
1271	**McHenry**	**86.96**	**Lily Lake**
1272	**McHenry**	**21.51**	**Nippersink Prairie**
1273	**McHenry**	**441.79**	**Stickney Run Conservation Area**
1274	**McHenry**	**87.53**	**Streets Lake**
1360	Grundy	0.67	Hildy Prairies
1361	Grundy	13.60	Third Avenue Prairie
1369	Will	5,779.67	Joliet Army Ammunition Plant
1370	Will	1.61	Rock Run American Burnet Site
1371	Will	3.41	Rock Run Corn Salad Site
1372	Will	77.12	O'Hara Woods
1381	Cook	11.18	Palatine Prairie
1383	**Cook**	**94.01**	**Gray Farm Park Marsh**
1384	**Cook**	**92.18**	**Palatine Road Marsh**
1385	Cook	52.56	Wgn Marsh
1386	**Cook**	**205.88**	**Baker's Lake**
1391	Du Page	50.32	Swift Road Meadow
1392	Du Page	0.00	Wood Dale Grove
1395	Du Page	0.00	West Dupage Forest Preserve
1396	**Du Page**	**0.00**	**Frontenac Road Marsh**
1397	Du Page	0.00	Herricks Lake Forest Preserve
1398	Du Page	0.00	McKee Marsh
1399	Du Page	7.66	East Branch Marsh
1400	Du Page	18.49	Songbird Slough
1401	**Du Page**	**0.00**	**Pratts Wayne Woods Forest Preserve**
1402	Du Page	30.40	Prince Crossing Marsh
1403	**Du Page**	**18.54**	**Route 59 Marsh**
1404	Du Page	0.00	Fischer Woods
1405	**Kane**	**0.00**	**Carson Marsh**
1407	**Kane**	**0.00**	**Burr Woods Marsh**
1408	**Kane**	**19.41**	**Lily Lake Marsh**
1410	Kane	29.69	Huntley Road Marsh
1411	Kane	1,480.63	Kane County Swainson's Hawk Habitat
1412	**Kane**	**3.36**	**Lakin Hill Prairie**

Table 7. Continued

NA#[2]	County	Acres[3]	Name
1414	**Kendall**	**0.00**	**Reservation Woods**
1416	**Kendall**	**14.19**	**Millington Fen**
1433	Du Page	0.00	Rodenburg Marsh
1438	Grundy	839.77	Illinois River - Dresden
1442	**Kane**	**0.00**	**Russell Fen**
1443	**Kane**	**11.55**	**Tri-county Wetland**
1444	**Kendall**	**2,123.10**	**Fox River**
1446	La Salle	679.07	Illinois River - Marseilles
1447	Livingston	1,492.88	Vermilion River
1462	Will	28.60	Manhattan Creek
1463	Winnebago	8.75	Beloit Gravel Prairie
1464	Winnebago	6.99	Burr Oak Road Prairie
1470	**Du Page**	**50.27**	**Eola Road Marsh**
1471	Du Page	0.00	Lyman Woods
1474	**Kane**	**0.00**	**Freeman Kame**
1486	Will	253.30	Theodore Street Marsh
1487	Lake	24.94	Cross Lake
1488	**Lake**	**92.64**	**Windance Acres Marsh**
1490	**McHenry**	**50.01**	**Cary Old Water Tower Prairie**
1491	**McHenry**	**560.36**	**Hebron Peatland**
1492	**McHenry**	**268.28**	**Nippersink Marsh**
1493	**McHenry**	**7.15**	**Woodstock Marsh**
1496	Du Page	14.38	County Farm Road Wetland
1498	**Kane**	**35.61**	**Bliss Woods Marsh**
1499	**Kane**	**4.31**	**DeSanto's Brewster Creek Site**
1501	**Lake**	**0.82**	**Intern Seep**
1502	**Lake**	**27.78**	**Schreiber Lake Bog**
1503	**McHenry**	**342.35**	**Black-crown Marsh**
1504	McHenry	222.25	Kloempken Marsh
1505	**McHenry**	**116.92**	**Lange Road Marsh**
1506	**McHenry**	**157.37**	**Nippersink Creek**
1507	**McHenry**	**84.89**	**North Branch of Nippersink Creek**
1508	McHenry	108.32	Piscasaw Creek
1509	McHenry	210.74	Pleasant Valley
1510	**McHenry**	**11.68**	**Rose Farm Prairie**
1513	Will	382.63	Blodgett Road Dolomite Prairie
1516	Du Page	1776.74	Springbrook Prairie
1519	Kane	0.00	Hemmer - Kloempken Wetland
	Total in FRAA:	**16,125.32**	

[1] Bold type indicates natural areas and their acreage within the FRAA.

[2] The number of the natural area (NA#) refers to the number designated in the Natural Heritage database (Illinois Department of Natural Resources 1997b) and in Figure 11.

[3] Natural areas with a 0.00 acreage figure do not have an established boundary and therefore have not had their area calculated.

Table 8. Category 1 natural communities represented in the Fox River Assessment Area (FRAA).

(Category 1 indicates natural communities that have remained relatively undisturbed and in high quality condition: Grade A and B)[1].

Community type	Grades (in FRAA)	Acres of Category 1 in the FRAA			Acres of Category 1 in Illinois			% of Illinois Category 1 in the FRAA		
		Grade A	Grade B	FRAA Total	Grade A	Grade B	Illinois Total	Grade A	Grade B	% ofIllinois Total
dry-mesic upland forest	A,B	48.0	158.0	206.0	986.0	334.0	1320.0	4.9	47.3	15.6
mesic upland forest	B	-	43.0	43.0	2084.0	1473.0	3557.0	-	2.9	1.2
northern flatwoods	B	-	1.0	1.0	-	86.0	86.0	-	1.2	1.2
dry-mesic prairie	A,B	2.0	1.0	3.0	9.4	50.0	59.4	21.3	2.0	5.1
wet-mesic prairie	B	-	12.5	12.5	26.0	99.0	125.0	-	12.6	10.0
wet prairie	B	-	1.0	1.0	12.0	169.0	181.0	-	0.6	0.6
dry gravel prairie	A,B	3.0	9.0	12.0	3.4	15.0	18.4	88.2	60.0	65.2
dry-mesic gravel prairie	B	-	1.0	1.0	9.5	34.0	43.5	-	2.9	2.3
gravel hill prairie	B	-	5.6	5.6	0.9	5.6	6.5	-	100.0	86.2
mesic savanna	B		0.9	0.9	-	2.0	2.0	-	45.0	45.0
marsh	A,B	249.0	659.0	908.0	310.0	1920.0	2230.0	80.3	34.3	40.7
graminoid bog	A,B	5.0	2.0	7.0	6.9	2.8	9.7	72.5	71.4	72.2
low shrub bog	A,B	21.0	8.0	29.0	21.0	8.0	29.0	100.0	100.0	100.0
tall shrub bog	B	-	14.0	14.0	45.0	50.0	95.0	-	28.0	14.7
forested bog	A,B	31.0	68.0	99.0	31.0	68.0	99.0	100.0	100.0	100.0
calcareous floating mat	A,B	89.0	60.0	149.0	107.0	60.0	167.0	83.2	100.0	89.2
graminoid fen	A,B	58.0	66.0	124.0	67.0	66.0	133.0	86.6	100.0	93.2
low shrub fen	A	0.4	-	0.4	0.4	-	0.4	100.0	-	100.0
forested fen	B	-	14.5	14.5	-	15.0	15.0	-	96.7	96.7
sedge meadow	A,B	115.0	204.0	319.0	155.0	533.0	688.0	74.2	38.3	46.4
calcareous seep	A,B	12.0	2.1	14.1	14.0	10.1	24.1	85.7	20.8	58.5
pond	A,B	21.4	163.0	184.4	204.0	919.0	1123.0	10.5	17.7	16.4
lake	B	-	3352.0	3352.0	-	3352.0	3352.0	-	100.0	100.0
dolomite cliff community	A	5.5	-	5.5	-	-	-	-	-	-
Totals		660.3	4845.6	5505.9	4092.5	9271.5	13364.0			

[1] White and Madany (1978).

The purpose of the INAI is to identify high quality natural areas and other significant features in Illinois. Identification, however, does not automatically ensure that an area will be protected. Once an area is selected, further action is required to protect it. The highest level of protection offered is for the area to be designated as an Illinois Nature Preserve. This means that the area has been formally protected in perpetuity by the landowner through the state. The majority of nature preserves in Illinois are publicly owned, but many are maintained in private ownership. Almost every nature preserve falls within a natural area.

A total of 47 Illinois Nature Preserves occur within the FRAA (Table 7, Figure 11). Many nature preserves are quite small, representing mere fragments of once large natural communities; however, these are still important for conservation (Schwartz and van Mantgem 1997). Lying mostly at the borders of an expanding Greater Chicago area, the FRAA faces many problems in the urban/rural interface; Shafer (1997) discusses the design of nature reserves in this context.

Table 9. Nature preserves in the Fox River Assessment Area and surrounding region[1].

NP#[2]	Corr - NA[3]	County	Acres	Name
2	255	Cook	80.0	Black Partridge Woods
3	534	Cook	440.0	Busse Woods
10	**394**	**Cook**	**9.0**	**Shoe Factory Road Prairie**
11	**390**	**Cook**	**560.0**	**Spring Lake**
18	1077	La Salle	592.0	Starved Rock
21	1067	Grundy	1,628.1	Goose Lake Prairie
25	**1005**	**Lake**	**186.0**	**Volo Bog**
26	**1002**	**Lake**	**67.0**	**Wauconda Bog**
36	917	Winnebago	67.0	Rockton Township Bog
42	**625**	**Kane**	**26.0**	**Trout Park**
44	773	Ogle	2.3	Beach Cemetery Prairie
46	918	Winnebago	53.0	Harlem Hills
51	**1012**	**McHenry**	**242.0**	**Kettle Moraine**
53	379	Boone	102.0	Kinnikinnick Creek
56	**983**	**McHenry**	**118.0**	**Pistakee Bog**
57	**1004**	**Lake**	**30.2**	**Cedar Lake Bog**
67	888	Will	78.0	Grant Creek Prairie
68	**629**	**Kane**	**73.0**	**Norris**
75	526	Du Page	10.4	Belmont Prairie
79	228	Lake	32.0	Reed-Turner Woodland
80	**971**	**Kane**	**172.0**	**Nelson Lake Marsh**
81	935	Will	259.0	Braidwood Dunes and Savanna
82	1003	Lake	446.0	MacArthur Woods
83	649	Lake	267.0	Wadsworth Prairie
88	**794**	**Lake**	**136.5**	**Gavin Bog and Prairie**
90	**713**	**McHenry**	**4.6**	**Cary Prairie**
91	**1001**	**Lake**	**299.6**	**Lyons Prairie and Marsh**

Table 9. Continued

NP# [2]	Corr - NA[3]	County	Acres	Name
93	1372	Will	80.0	O'Hara Woods
98	**707**	**McHenry**	**247.4**	**Cotton Creek Marsh**
99	663	Lake	96.0	Lloyd's Woods
110	882	Will	249.0	Lockport Prairie
117	920	Winnebago	66.0	Searls Park Prairie
119	**1386**	**Cook**	**180.1**	**Bakers Lake**
124	1010	La Salle	304.1	Pecumsaugan Creek/Blackball Mine
126	936	Will	108.4	Romeoville Prairie
128	**1014**	**McHenry**	**115.8**	**Elizabeth Lake**
129	**709**	**McHenry**	**44.6**	**Weingart Road Sedge Meadow**
135	**1257**	**McHenry**	**10.0**	**Julia M. & Royce L. Parker Fen**
138	**0**	**McHenry**	**12.7**	**Oakwood Hills Fen**
146	**537**	**Cook**	**74.0**	**Bluff Springs Fen**
149	1026	Winnebago	20.0	Plum Grove
153	688	Lee	23.4	Bartlett Woods
155	**0**	**Kendall**	**85.7**	**Maramech Woods**
157	**1254**	**McHenry**	**18.0**	**Bystricky Prairie**
158	**661**	**Lake**	**41.0**	**Barrington Bog**
163	0	Grundy	1.83	Short Pioneer Cemetery Prairie
167	**988**	**Lake**	**86.3**	**Turner Lake Fen**
168	**712**	**McHenry**	**34.0**	**Spring Grove Fen**
181	934	Will	155.5	Wilmington Shrub Prairie
185	**1011**	**McHenry**	**67.3**	**Lake-in-the-Hills Fen**
188	1039	Will	43.3	Long Run Seep
193	1252	Lake	40.8	Liberty Prairie
194	1253	Lake	15.3	Oak Openings
195	1253	Lake	109.6	Almond Marsh
196	**628**	**Kane**	**30.9**	**Ferson's Creek Fen**
198	**1267**	**McHenry**	**20.3**	**Barber Fen**
201	**1259**	**McHenry**	**73.6**	**Carl &Claire Marie Sands-Main St. Prairie**
202	79	La Salle	86.5	Matthiessen Dells
204	**1265**	**McHenry**	**4.2**	**Gladstone Fen**
206	**631**	**Kane**	**185.0**	**Johnson's Mound**
207	**630**	**Kane**	**20.0**	**LeRoy Oaks**
209	**632**	**Kane**	**11.8**	**Fox River Fen**
212	**1416**	**Kendall**	**4.5**	**Tucker-Millington Fen**
214	**711**	**McHenry**	**330.0**	**Glacial Park**
215	**623**	**Kane**	**155.0**	**Helm Woods**
217	1060	Will	321.0	Lake Renwick
222	**623**	**Kane**	**13.0**	**Kemper Park**
223	1256	McHenry	36.6	Kishwaukee Fen
225	524	Du Page	65.0	Churchill Prairie
227	348	Boone	9.7	Flora Prairie
228	626	Kane	6.0	Burlington Prairie

Table 9. Continued

NP#[2]	Corr - NA[3]	County	Acres	Name
229	53	De Kalb	46.0	Wilkinson-Renwick Marsh
231	902	Will	227.0	Sand Ridge Savannah
233	**1240**	**Lake**	**20.0**	**Farm Trails North**
235	1263	McHenry	117.0	Exner Marsh
237	0	Kane	35.0	Freeman Kame
240	**1013**	**McHenry**	**180.5**	**Sterne's Fen**
241	**1258**	**McHenry**	**72.3**	**Wingate Prairie**
242	**662**	**Lake**	**40.0**	**Wagner Fen**
244	**708**	**McHenry**	**183.0**	**Bates Fen**
245	884	Will	407.0	Messenger Woods
247	**0**	**Kane**	**70.0**	**Bliss Woods**
248	**1266**	**McHenry**	**20.0**	**Lind Forest**
249	**662**	**Lake**	**10.0**	**Tower Lakes Fen**
251	**69**	**Kendall**	**26.0**	**Yorkville Prairie**
253	**1412**	**Kane**	**14.0**	**Almon Underwood Prairie**
		Total in FRAA:	**4,425**	

[1] Bold type designates nature preserves within the FRAA.
[2] The nature preserve number (NP#) refers to the number designated in the Natural Heritage database (Illinois Department of Natural Resources 1997b) and in Figure 11.
[3] Each of the nature preserves is associated with a corresponding natural area (Corr-NA) referred to in Table 7.

Biological Stream Characterization and Biologically Significant Streams

Illinois streams have also been categorized according to 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 (Hite and Bertrand 1989), 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, entitled the "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.

Eighteen lakes and streams of the Fox River basin were recognized as biologically significant (Page et al. 1992) because of the presence of threatened or endangered species, or their high mussel and fish diversity (Table 10, Figure 11). These 18 bodies of water provide the best opportunities in the basin for the protection of large numbers of native aquatic species. These sites are described in more detail in the chapter on "Aquatic Biota".

Table 10. Biologically significant stream segment and lakes in the Fox River Assessment Area.

Streams	Length (Miles)
Fox River tributary at Yorkville	2.3
Buck Creek	15.3
North Branch,Nippersink Creek; WI border to Nippersink Creek	7.1
Fox River, Morgan Creek to Illinois River confluence	38.1
Total miles:	62.8

Lakes	Area (Acres)
Crystal Lake	225.5
Bangs Lake	288.8
Lily Lake	82.1
Sullivan Lake	55.3
McCullom Lake	236.6
Wooster Lake	94.3
Grays Lake	72.6
Round Lake	225.5
Deep Lake	203.8
Cedar Lake	287.7
East Loon Lake	160.3
West Loon Lake	156.5
Turner Lake	33.7
Cross Lake	81.6
Total acres:	2204.3

Threatened and Endangered Species

At least 153 species of state threatened and endangered plants and animals occur in the FRAA (Table 11), including 1 species that is federally endangered and 2 that are federally threatened. Of the state's 363 threatened or endangered plants, about 28% are known to occur in the FRAA. For other taxa, the percentage of the state's threatened or endangered species that occur in the area are as follows: mollusks (19.2%), insects (45.4%), fishes (26.7%), amphibians (0.0%), reptiles (7.7%), birds (73.8%), and mammals (11.1%). This list includes only those species known to breed in the area; i.e. migrant and overwintering birds are not included in this list (those species are mentioned in the chapter on bird communities).

Table 11. Threatened and endangered species occurring in the Fox River Assessment Area[1].
(SE = state endangered; ST = state threatened; FE = federally endangered; FT = fedeerally threatened)

Plants:		
alder buckthorn	*Rhamnus alnifolia*	SE
American brroklime	*Veronica americana*	SE
American burreed	*Sparganium americanus*	SE
American cranberry	*Vaccinium macrocarpon*	SE
American dog-violet	*Viola conspersa*	ST
American larch	*Larix laricina*	ST
American slough grass	*Beckmannia syzigachne*	SE
autumn willow	*Salix serissima*	SE
balsam poplar	*Populus balsamifera*	SE
beaked rush	*Rhynchospora alba*	ST
beaked sedge	*Carex rostrata*	ST
beaked spikesedge	*Eleocharis rostellata*	ST
bearded wheat grass	*Agropyron trachycaulum var. unilaterale*	SE
black-seeded rice	*Oryzopsis racemosa*	ST
bog bedstraw	*Galium labradoricum*	ST
brownish sedge	*Carex brunnescens var. sphaerostachya*	SE
bulrush	*Scirpus hattorianus*	SE
bunchberry	*Cornus canadensis*	SE
cliff goldenrod	*Solidago sciaphila*	ST
common bog arrow grass	*Triglochin maritima*	SE
cordroot sedge	*Carex chordorrhiza*	SE
Crawe's sedge	*Carex crawei*	ST
Crawford's oval sedge	*Carex crawfordii*	SE
cuckoo flower	*Cardamine pratensis var. palustris*	SE
downy willow herb	*Epilobium strictum*	ST
dwarf raspberry	*Rubus pubescens*	ST
ear-leaved foxglove	*Tomanthera auriculata*	ST
false asphrodel	*Tofieldia glutinosa*	ST
false bugbane	*Cimicifuga racemosa*	SE
fern pondweed	*Potamogeton robbinsii*	SE
few-flowered spike sedge	*Eleocharis pauciflora*	SE
few-seeded sedge	*Carex oligosperma*	SE
flat-leaved bladderwort	*Utricularia intermedia*	SE
forked aster	*Aster furcatus*	ST
folden sedge	*Carex aurea*	SE
frass pink orchid	*Calopogon tuberosus*	SE
frass-leaved pondweed	*Potamogeton gramineus*	SE
fray bog sedge	*Carex canescens var. disjuncta*	SE
freen-fruited burreed	*Sparganium chlorocarpum*	SE
fairy marsh yellow cress	*Rorippa islandica var. hispida*	SE
feart-leaved plantain	*Plantago cordata*	SE
femlock parsley	*Conioselinum chinense*	SE
fighbush blueberry	*Vaccinium corymbosum*	SE
Hill's thistle	*Cirsium pumilum*	ST
fooded ladies' tresses	*Spiranthes romanzoffiana*	SE

Table 11. Continued

Plants (continued):		
horned bladderwort	*Utricularia cornuta*	SE
ill-scented trillium	*Trillium erectum*	SE
inland shadbush	*Amelanchier interior*	SE
leatherleaf	*Chamaedaphne calyculata*	ST
little green sedge	*Carex viridula*	SE
marsh speedwell	*Veronica scutellata*	ST
marsh valerian	*Valeriana sitchensis*	SE
millet grass	*Milium effusum*	SE
nodding trillium	*Trillium cernuum var. macranthum*	SE
northern gooseberry	*Ribes hirtellum*	SE
pink lady's slipper	*Cypripedium acaule*	SE
pitcher plant	*Sarracenia purpurea*	SE
prairie bush clover	*Lespedeza leptostachya*	SE, FT
prairie white-fringed orchid	*Platanthera leucophaea*	SE, FT
purple-flowering rasberry	*Rubus odoratus*	SE
queen-of-the-prairie	*Filipendula rubra*	ST
red pine	*Pinus resinosa*	SE
red-berried elder	*Sambucus pubens*	ST
Richardson's rush	*Juncus alpinus*	SE
rock elm	*Ulmus thomasii*	SE
round-leaved serviceberry	*Amelanchier sanguinea*	SE
round-leaved sundew	*Drosera rotundifolia*	SE
rusty cotton grass	*Eriophorum virginicum*	SE
shortleaf sedge	*Carex disperma*	SE
showy lady's slipper	*Cypripedium reginae*	SE
slender bog arrow grass	*Triglochin palustris*	SE
small bladderwort	*Utricularia minor*	SE
Ssmall cranberry	*Vaccinium oxycoccos*	SE
small sundrops	*Oenothera perennis*	SE
small yellow lady' slipper	*Cypripedium parviflorum*	SE
small yellow sedge	*Carex cryptolepis*	SE
Smith's bulrush	*Scirpus smithii*	SE
snake mouth	*Pogonia ophioglossoides*	SE
snowberry	*Symphoricarpos albus var. albus*	SE
speckled alder	*Alnus incana subsp. rugosa*	SE
spotted coral-root orchid	*Corallorhiza maculata*	ST
spotted pondweed	*Potamogeton pulcher*	SE
spreading sedge	*Carex laxiculmis*	ST
star-flower	*Trientalis borealis*	ST
stiff pondweed	*Potamogeton strictifolius*	SE
tall sunflower	*Helianthus giganteus*	SE
three-seeded bog sedge	*Carex trisperma*	SE
tufted bulrush	*Scirpus cespitosus var. callosus*	SE
water arum	*Calla palustris*	SE
water Marigold	*Megalodonta beckii*	SE
white camass	*Zigadenus venenosus var. gramineus*	SE

Table 11. Continued

Plants (continued):		
white cedar	*Thuja occidentalis*	ST
white lady's slipper	*Cypripedium candidum*	SE
white-stemmed pondweed	*Potamogeton praelongus*	SE
woolly milkweed	*Asclepias otarioides*	SE
yellow birch	*Betula alleghaniensis*	SE
yellow monkey flower	*Mimulus glabratus*	SE
yellow-lipped ladies' tresses	*Spiranthes lucida*	SE
Mollusks:		
rainbow	*Villosa iris*	SE
slippershell mussel	*Alasmidonta viridis*	SE
spike	*Elliptio dilatata*	ST
sheepnose	*Plethobasus cyphyus*	SE
Wavy-rayed lampmussel	*Lampsilis fasciola*	SE
Insects:		
Cobweb Skipper	*Hesperia metea*	ST
Ottoe Skipper	*Hesperia ottoe*	ST
Hoary Elfin	*Incisalia polia*	SE
Melissa Blue	*Lycaeides melissa*	SE, FE
Swamp Metalmark	*Calephelis mutica*	SE
Fish:		
blackchin shiner	*Notropis heterodon*	ST
blacknose shiner	*Notropis heterolepis*	SE
greater redhorse	*Moxostoma valenciennesi*	SE
greater redhorse	*Moxostoma valenciennesi*	SE
Iowa darter	*Etheostoma exile*	SE
pugnose shiner	*Notropis anogenus*	SE
river redhorse	*Moxostoma carinatum*	ST
weed shiner	*Notropis texanus*	SE
Reptiles:		
massasauga	*Sistrurus catenatus*	ST
Birds:		
Pied-billed Grebe	*Podilymbus podiceps*	ST
Double-crested Cormorant	*Phalarocorax auritus*	ST
American Bittern	*Botaurus lentiginosus*	SE
Least Bittern	*Ixobrychus exilis*	SE
Great Egret	*Ardea albus*	SE
Snowy Egret	*Egretta thula*	SE
Black-crowned Night-Heron	*Nycticorax nycticorax*	SE
Yellow-crowned Night-Heron	*Nycticorax violaceus*	ST
Bald Eagle	*Haliaeetus leucocephalus*	SE, FT
Northern Harrier	*Circus cyaneus*	SE

Table 11. Continued

Birds (continued):		
Sharp-shinned Hawk	*Accipiter striatus*	SE
Red-shouldered Hawk	*Buteo lineatus*	SE
Black Rail	*Laterallus jamaicensis*	SE
King Rail	*Rallus elegans*	ST
Virginia Rail	*Rallus limicola*	ST
Common Moorhen	*Gallinula chloropus*	ST
Sandhill Crane	*Grus canadensis*	SE
Upland Sandpiper	*Bartramia longicauda*	SE
Wilson's Phalarope	*Phalaropus tricolor*	SE
Forster's Tern	*Sterna forsteri*	SE
Black Tern	*Chilidonias niger*	ST
Barn Owl	*Tyto alba*	SE
Long-eared Owl	*Asio otus*	SE
Short-eared Owl	*Asio flammeus*	SE
Brown Creeper	*Certhia americana*	ST
Bewick's Wren	*Thryomanes bewickii*	SE
Marsh Wren	*Cistothorus palustris*	ST
Veery	*Catharus fuscescens*	ST
Loggerhead Shrike	*Lanius ludovicianus*	ST
Henslow's Sparrow	*Ammodramus henslowii*	SE
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	SE
Mammals:		
river otter	*Lontra canadensis*	SE

[1] This list only includes those species that are reproducing in the area (e.g., migrant and wintering birds are not listed).

Natural Vegetation Communities

The description of the vegetation for the Fox River Assessment Area (FRAA) is organized into six sections: 1) Comparison 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 Recommendations.

Comparisons of FRAA Biodiversity to Statewide Patterns

Prairie - Researchers estimate that prairie originally occupied about 58.95% of the land cover of Illinois, some 21,639,050 acres (Iverson et al. 1989). By 1978, only about 2,300 acres of high-quality (Grades A and B) prairie were left in the state, less than 0.01% (White 1978, Robertson and Schwartz 1994). On a state-wide basis, Iverson (1988) and Iverson et al. (1989) estimate that between 1920 and 1989 about 19,186,210 acres of prairie were converted to agriculture, 1,125,190 acres of prairie were converted to urban areas, and 959,880 acres of prairie were replaced by forest.

In the seven counties that comprise most of the FRAA, there were an estimated 1,892,400 acres of prairie in 1820 (Iverson et al. 1989). The Illinois Natural Areas Inventory (INAI) (White 1978) identified a total of 721.7 acres of high-quality prairie in these counties, which represents only 0.04% of the original 1,892,400 acres. However, the amount left in the FRAA is considerably less than this as 670 of the 721.7 acres of high-quality prairie were in Lake County alone, and most of this was at Illinois Beach State Park, which is well outside the boundaries of the FRAA. Based on Government Land Office survey records, around 1820 the area of the FRAA was about 31% prairie, or about 342,320 acres. Currently only 35.1 acres of high-quality, undegraded prairie (about 0.01% of original extent) is known to occur in the entire FRAA (Table 8). Compared with the rest of Illinois, the FRAA is about the same with regard to prairies — this habitat has essentially been eliminated with only a few small remnants left to remind us of what prairies really were like.

Forest - Iverson et al. (1989) estimated that in 1820 about 13,828,840 acres, or 37.67%, of Illinois was covered with forest. Iverson et al. (1989), and Iverson and Schwartz (1994) estimated about 4.26 million total acres of forest (about 31% of original extent) were present in 1985. On a state-wide basis, Iverson et al. (1989) and Iverson (1988) estimate that between 1820 and 1989 some 9,902,710 acres of forest were converted to agriculture, 544,730 acres of forest were absorbed by urban development, and 2,640,900 acres remained in forest, albeit often with the natural quality very degraded by logging and grazing. By the 1970s, the INAI (White 1978) found that only about 11,600 acres of high-quality forest remained in Illinois. This total is only 0.08% of original extent and 0.27% of the remaining forest.

Within the seven core counties of the FRAA, there was an estimated 663,400 acres of forest in 1820, with 101,700 acres of all qualities of forest remaining in 1985 (Iverson et al. 1989). Based on Government Land Office records, around 1820 the area of the FRAA was about 68% forest and savanna (about 742,957 acres), with unknown proportions of each. Currently, within the FRAA proper, about 113,061 acres of forest (about 15% of original extent) remains (Illinois Geographic Information System). A total of 250 acres have been identified by the INAI that is high-quality and undegraded (Table 8). Compared to statewide trends, there appears to have been a greater level of habitat loss and degradation in the FRAA as currently only scattered small patches of high-quality forest remain (e.g., 0.03% of original extent and 0.22% of the remaining forest).

Savanna - The vegetation of Illinois often is mapped as either forest or prairie (Anderson 1970, Iverson and Joselyn 1990). In reality, the landscape of Illinois prior to European settlement was a mosaic of many different natural communities. Landscape-scale fires swept across the prairies and carried into the forests, and consequently savannas were a major feature on much of the landscape (Kline 1997, Taft 1997). However, no estimate has ever been developed for the amount of savanna that existed in Illinois in the early 1800s (Nuzzo 1986). Presettlement vegetation maps based on the original Government Land Office survey records for Lake County (Moran 1978) and De Kalb, Kane, and Du Page counties (Moran 1980, Kilburn 1955) show that much or even most of the land cover usually considered to be forest was in fact originally savanna, and hence savannas were a common feature of the FRAA prior to European settlement. Today, savannas are one of the rarest habitats in Illinois and the Midwest (Nuzzo 1985, Taft 1997).

The INAI (White 1978) identified only 1,299.2 acres of savanna in all of Illinois, mostly sand savanna. In the seven core counties of the FRAA, the inventory included only 156 acres, of which 155 were in Lake County mostly at Illinois Beach State Park, well outside the FRAA. Within the FRAA, only one high-quality, undegraded savanna is listed in the current Natural Areas Inventory database (Table 8), which is located within Turner Lake Fen Nature Preserve (Heidorn 1987). Small amounts of savanna occur at Poplar Creek Savanna southeast of Elgin and at Riverwoods north of St. Charles. At Sleepy Hollow there are also areas of savanna and barrens (Young 1986, also personal observation of K. Robertson at Sleepy Hollow 1992, Byers and Arient 1997). Bowles et al. (1994) studied savannas in the Blackberry Creek and Nelson Lake drainages and an area east of the Fox River south of Batavia. Two savannas that appear to be within the FRAA (one each in Lake and Du Page counties) are shown on the map of localities sampled by Madany (1981), but names or exact locations are not given. Bowles and McBride (1995) gave names but not exact locations for the areas studied, but it appears that none of the areas they identified as savannas occurred within the FRAA. The status of savannas in the FRAA appears to be the same as elsewhere in Illinois — once frequently occurring, but largely undocumented, and now very rare and inadequately studied.

Wetlands - Natural wetlands in Illinois have declined from presettlement statewide estimates of about 23% of the land area (about 9,412,659 acres) to about 2.6% (Havera

and Suloway 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 original wetland area. Because of the recent glacial history in the upper FRAA, this area contained extensive wetlands. Estimates of the acreages and percentages of original wetland area, based on extent of hydric soils, for the seven core counties of the FRAA are given in Table 3, except for De Kalb County, which had only 4% of the area in wetlands, most counties exceeded 30% of total area in wetland.

Today, 11.1% of the area in Lake County is covered with wetlands, while figures for other counties are: McHenry (6.2%), Du Page (5.2%), Kane (3.1%), Kendall (1.4%), La Salle (1.3%), and De Kalb (1.0%). In terms of the percent loss of wetlands since presettlement, Lake County lost between 40-69%; De Kalb County lost 70-79%; Cook, Du Page and McHenry counties lost 80-89%; and Grundy, Kane, Kendall, La Salle, and Lee counties lost 90-99% (Suloway and Hubbell 1994). At present about 53,401 acres of wetlands (4.9% of the land area) occur in the FRAA. A total of 1,655 acres (about 3.1% of remaining wetland area) are high-quality and undegraded (White 1978, Illinois Department of Natural Resources 1997). Compared to statewide trends, it appears that there has been less total loss of wetlands in the FRAA and a greater proportion of those remaining are undegraded.

Vascular Plants - The FRAA is a floristically rich area, largely because of the area's ecological diversity. An incomplete species list is given in Appendix 1, nomenclature follows Mohlenbrock (1986). This list was compiled from various sources: 1) published literature (Bowles et al. 1996, Moran 1981, Sheviak and Haney 1973, Swink and Wilhelm 1994, Taft and Solecki 1990, Young 1986), 2) hard-copy files in the herbarium of the Illinois Natural History Survey that contain field notes from Robert A. Evers and others and copies of documents prepared when areas were proposed for dedication as Illinois Nature Preserves, 3) technical reports (e.g., Taft 1992, Taft 1994a, Taft 1994b), and 4) personal communications with Jon Duerr (Kane County Forest Preserve District) and Ed Collins (McHenry County Conservation District).

Based on this information, the list in Appendix 1 contains 1,392 taxa (species, subspecies, and varieties). Of these, 1,064 (81.7%) are native to the FRAA, while 326 (23.3%) have been introduced from other geographical areas and have become naturalized. Undoubtedly, a substantial number of other species occur in the FRAA but are not included in the list as we have seen no documented evidence. Nevertheless, it is clear that the FRAA has one of the richest floras of any Assessment Area in Illinois. A previous search of the Illinois Plant Information Network (Iverson et al. 1997) using data derived from Mohlenbrock and Ladd (1978) showed that the counties in and around the FRAA have among the highest richness of vascular plants in Illinois, along with several counties in southern Illinois. Summary data listed Cook County with 1,500-1,800 taxa; Lake County with 1,301-1,500 taxa; Du Page and Kane counties with 1,101-1,300 taxa; and De Kalb, Grundy, Kendall, La Salle, Lee, and McHenry counties with 901-1,100 taxa.

We estimated that approximately 2,200 taxa of vascular plants occur in and are native to Illinois, while about 900 taxa have been introduced, giving a total of 3,100 for the state (Post 1991). A conservative estimate is that at least 44% of the total species of native and naturalized vascular plants that occur in Illinois can be found in the FRAA. A number of plant species that occur in the FRAA are rare elsewhere in Illinois, and a few species are only known in Illinois from the FRAA. Most of these species are in habitats that are also rare elsewhere in the state, such as bogs, fens, calcareous floating mats, sedge meadows, and dry gravel prairies on kames and eskers. Due to the extensive changes in land use that have occurred in the past 150 years, several species of plants have been eliminated from the FRAA. We have seen documented evidence of 22 extirpated species (Bowles 1991, Bowles et al. 1991, Mohlenbrock 1986, Post 1991, Sheviak 1974, Swink and Wilhelm 1994, Young 1986) (Table 12). Of these, 13 have been extirpated from the state while 9 still occur elsewhere in Illinois and are listed as State Endangered.

Illinois Threatened and Endangered Species

A total of 102 endangered and threatened (E&T) species (Table 13) are known currently to occur or to have occurred recently in the FRAA (Herkert 1991, 1994; Illinois Endangered Species Protection Board 1994). Of these, 77 are state endangered and 25 are state threatened; two state endangered species are also listed as federally threatened — prairie bush clover (*Lespedeza leptostachya*) and prairie white-fringed orchid (*Platanthera leucophaea*). In Illinois, there are 306 plant species currently listed as endangered and 57 listed as threatened, thus 25.2% of the state endangered species and 43.9% of the state threatened species occur within the FRAA. Today, 26 endangered and threatened species of plants are found in Illinois only within the FRAA or nearby, which is indicative of the area's special ecological conditions. About 68 E&T species in the FRAA occur in wetlands — particularly bogs, fens, sedge meadows, floating mats, marshes, and seeps — which largely are restricted to northern Illinois; a total of 19 occur in forests; 17 occur in prairies; 12 occur in aquatic areas such as ponds, lakes, and streams; 5 are found on bluffs and cliffs; and 3 occur in savannas (Table 13). These habitat categories are not mutually exclusive since species can occur in more than one habitat. The vast majority of the E&T plant species are restricted to high-quality natural communities, and thus today they are found mostly in Illinois Nature Preserves and other high-quality habitats at sites recognized by the Illinois Natural Areas Inventory (see Herkert 1997). While plant species in all official Illinois Nature Preserves are legally protected, many natural areas are in private ownership and under current Illinois law endangered and threatened plant species have no legal protection on private property. In addition to these 102 endangered and threatened plants, 22 species have recently been extirpated from the area (Table 12) and 5 are on the official watch list (Table 14).

There are several reasons for species being rare and consequently listed as endangered or threatened in Illinois (e.g., Taft 1995). These include the following examples. (1) The species are naturally sparse or occur infrequently, probably even prior to European settlement (ear-leaved foxglove is an example in the FRAA). (2) The species occur in Illinois at the edge of their natural geographical range and are found primarily in a few counties at the border of the state. This is the situation with the majority of endangered

and threatened species in the FRAA. These species are common, often abundant, in areas to the north and east of Illinois, and they only occur in Illinois in the northern counties. (3) The populations that occur in Illinois are geographically separated or disjunct from the principal range of the species. The extant population of red pine in the FRAA could be considered an example. (4) Species are restricted or endemic to Illinois and do not occur elsewhere. There are no species truly endemic to the FRAA, and only two species are considered endemic to Illinois — Kankakee mallow in Kankakee County and thismia, originally found in southeastern Cook County and now thought to be extinct. (5) Habitat degradation caused by human-induced activities, such as gravel or peat mining, soil scraping, grazing by livestock, and the introduction of aggressive non-native species, that often can replace native species. (6) Disruption of ecological processes such as fire, resulting in ecological changes in fire-dependent community types. (7) Habitat destruction, primarily due to the conversion of the land for agricultural and urban uses. The latter reason is the ultimate cause for rarity of native organisms in Illinois, and this impact will beundoubtedly exacerbated within the FRAA in the near future as the area currently is undergoing a great increase in urban sprawl. These causes collectively have led to the elimination or extirpation of a number of species from the FRAA. In addition, the number of individuals of many species, particularly threatened and endangered taxa (Table 12), have been reduced by these activities and this may lead to further loss of species as population sizes may be too low for species to sustain themselves.

Table 12. Speices once present but now extirpated from the Fox River Assessment Area.

Common Name	Scientific Name	Status	Habitat	EORs[1]	Historic and Current Occurrence in FRAA & Illinois
American mountain ash	*Sorbus americana*	SE	bogs and rocky woods	—	Formerly Antioch Bog, Lake Co.; only one extant population in IL, Ogle Co.; formerly also Cook Co.
arrow grass	*Scheuchzeria palustris var. americana*	SE	bogs and sedge mats	—	Formerly Lake and McHenry cos.; believed extirpated from IL (Bowles et al. 1991).
bog rosemary	*Andromeda glaucophylla*	—	bogs	—	Formerly Lake and McHenry cos.; presumably extirpated from IL.
bristly sarsaparilla	*Aralia hispida*	—	bogs, sandy areas	—	Formerly Volo Bog, Lake Co.; probably extirpated from IL (Bowles et al. 1991).
Drummond's rock cress	*Arabis drummondii*	—	dry sandy or gravelly soil	—	Formerly Elgin in Kane Co. and Cook Co.; extirpated from IL (Swink & Wilhelm 1994).
hairy white violet	*Viola incognita*	SE	seeps and swamps	—	Formerly at Trout Park in Elgin, Kane Co, also McHenry and Ogle cos.; extant populations in Cook Jo Daviess, and Lake cos. (Bowles et al. 1991).
leafy prairie clover	*Dalea foliosa (Petalosetmum foliosum)*	SE FT	dolomite prairies	—	The type specimen was collected near Geneva, Kane Co., but this species has long been extirpated from FRAA; still extant in Will and Du Page cos.; recently reintroduced in Kane Co.
New York fern	*Thelypteris noveboracensis*	SE	seeps, mesic forests, cliffs	—	Formerly Elgin, Kane Co.; extant populations in Pope Co.; formerly also Jackson, Kankakee, and Monroe cos.
oval milkweed	*Asclepias ovalifolia*	SE	prairies	—	Formerly Ringwood, McHenry Co. and near Oswego, Kendall Co., formerly also Lake and Kankakee cos.; extant population in Cook Co.
prairie dandelion	*Microseris cuspidata*	SE	gravel and hill prairies	—	Formerly Ringwood Prairie, McHenry County; still extant in ca. 4 cos. in IL.
purple avens	*Geum rivale*	—	seeps	—	Formerly near Elgin in Kane Co. and an old record from McHenry and Winnebago cos.; believed extirpated from IL (Bowles et al. 1991).

Table 12. Continued

Common Name	Scientific Name	Status	Habitat	EORs[1]	Historic and Current Occurrence in FRAA & Illinois
ragged fringed orchid	*Platanthera lacera*	—	bogs	—	Formerly known from Cook, De Kalb, Kankakee, Kane, Will cos.; probably extirpated from IL (Swink & Wilhelm1994).
ribbon-leaved pondweed	*Potamogeton eiphydrus*	—	ponds, lakes	—	Formerly Deep Lake, Lake Co.; presumed extirpated from IL (Mohlenbrock 1970).
seaside crowfoot	*Ranunculus cymbalaria*	SE	wetlands	—	Formerly Elgin, Kane Co. also McHenry and Du Page cos.; extant populations in Cook and Lake cos. (Bowles et al. 1991).
small bur reed	*Sparganium minimum*	—	wet areas	—	Formerly, Ringwood, McHenry County; extirpated from IL (Swink and Wilhelm 1994).
small enchanter's nightshade	*Circaea alpina*	SE	cool ravines	—	Probably extirpated from Kane County (Young 1986); formerly known from Cook and Lake cos.; two extant populations in Jo Daviess Co.
twin-flower	*Linnaea borealis*	—	bogs	—	Formerly Antioch Bog, Lake County; extirpated from IL (Swink and Wilhelm 1994).
Vasey's pondweed	*Potamogeton vaseyi*	SE	ponds, lakes	—	Formerly Ringwood, McHenry County; presumably extirpated from IL (Bowles et al. 1991)
Vasey's rush	*Juncus vaseyi*	SE	sedge meadows	—	The type specimen of this species was collected near Ringwood in McHenry Co., now extirpated from FRAA; extant populations in Winnebago Co. (Bowles et al. 1991).
Virginia chainfern	*Woodwardia virginica*	—	bogs	—	Formerly Lake and McHenry cos.; believed extirpated from IL (Bowles et al. 1991).
western wild lettuce	*Lactuca ludoviciana*	SE	prairies	—	Formerly known from Cook, De Kalb, Lake, and McHenry cos. plus 11 other cos.; perhaps extirpated from Illinois (Bowles et al. 1991)
white adder's mouth	*Malaxis brachypoda*	—	fens	—	Formerly known from a hanging fen in Elgin, Kane Co; extirpated from IL (Swink & Wilhelm 1994)

[1] EORs = Element Occurance Records - indicates the number of reported sightings of each species.

Table 13. Threatened and endangered species reported from the Fox River Assessment Area.
(SE = state endangered: ST = state threatened; FT = federally threatened)

Common Name	Scientific Name	Status	Habitat	EORs[1]	Range U.S., IL, and Fox River area
alder buckthorn	*Rhamnus alnifolia*	SE	bogs, fens, seeps	2	NE U.S. and the Rocky Mtns. — Known in IL from 2 populations in Kendall Co. and wholly within the FRAA; formerly Kane, Lake, McHenry, Peoria, Tazewell cos.
American brooklime	*Veronica americana*	SE	seeps, springs, marshes, fens	2	N U.S. — Extant populations in Kane (probably) and Kendall cos., also La Salle Co. (outside FRAA); formerly Peoria and Tazewell cos.
American burreed	*Sparganium americanum*	SE	muddy shores and shallow water	2	E U.S. — Extant populations in Kane and Winnebago cos.; formerly Cook, Du Page, McHenry cos. and 3 other cos.
American cranberry	*Vaccinium macrocarpon*	SE	bogs	6	NE U.S. — Extant populations in Cook (outside FRAA), Lake, and McHenry cos.; formerly Will Co.
American dog violet	*Viola conspersa*	ST	mesic forests, flatwoods	1	NE U.S. and the Appalachian Mtns. — Extant populations in Cook (outside FRAA), De Kalb (probably outside FRAA), Du Page (outside FRAA), Lake, McHenry cos.
American larch	*Larix laricina*	ST	bogs, forested fens	7	NE U.S. to N IL — Extant populations in Lake and McHenry cos.; formerly Cook Co.
American slough	*Beckmannia syzigachne*	SE	wet prairies grass	1	W and N central U.S. — Extant populations in Lake and McHenry cos.; formerly Cook Co. and McDonough Co.
Autumn willow	*Salix serissima*	SE	bogs, marshes	3	E and central U.S. — Known in Illinois only from Lake and McHenry cos., extant populations in both cos.

Table 13. Continued

Common Name	Scientific Name	Status	Habitat	EORs[1]	Range U.S., IL, and Fox River area
Balsam poplar	*Populus balsamifera*	SE	mesic prairie; bogs	1	Boreal and sub-Arctic Canada and Alaska south into N U.S. Extant populations in Lake (outside FRAA) and McHenry cos.; formerly Cook Co.
Beaked rush	*Rhynchospora alba*	ST	bogs; fens	5	N U.S. — Extant populations in Cook (outside FRAA), Lake, and McHenry cos.; formerly Peoria Co.
Beaked sedge	*Carex rostrata*	ST	sedge meadows; calcareous floating mats	15	N U.S. — Extant populations known in Du Page (outside FRAA), Kane, Lake, McHenry, and Winnebago cos.; formerly Lee and McDonough cos.
Beaked spikesedge	*Eleocharis rostellata*	ST	graminoid fens, marl flats	12	Atlantic coast and locally inland — Extant populations in Cook, Kendall, Lake, McHenry, and Will cos.
Bearded wheat grass	*Agropyron trachycaulum var. unilaterale (A. subsecundum, Herkert 1991)*	SE	mesic prairies, dolomite, outcrops, sand prairies	2	Southern Canada and adjacent northern U.S. into northern IL — Extant populations in Cook, Lake, Jo Daviess, and Winnebagocos.; formerly Du Page, McHenry, and Tazewell cos.
Black-seeded rice grass	*Oryzopsis racemosa*	ST	mesic forests	1	NE U.S. —Extant populations outside FRAA in Cook, Grundy, Kane, Lake, and La Salle cos.; also 5 other cos.; formerly Peoria, Stephenson, and Vermilion cos.
Bog bedstraw	*Galium labradoricum*	ST	bogs, fens	22	NE U.S. Known in IL from Kane, Lake, and McHenry cos., extant populations in all three cos.
Brownish sedge	*Carex brunnescens var. sphaerostachya*	SE	forested bogs	2	NE U.S. and Appalachian Mtns. — Known in IL from Lake Co., one extant population
Bulrush	*Scirpus hattorianus*	SE	open wetlands	1	NE U.S. — A little known species; extant populations are known from Cook, Du Page, Kankakee, and Lake cos., uncertain if any of these occurs in the FRAA
Bunchberry	*Cornus canadensis*	SE	forested bogs, sandstone canyons	1	NE U.S., Rocky Mtns. — Extant populations in La Salle (outside FRAA) and McHenry cos., also Ogle Co.; formerly Cook and Lake cos.
Cliff goldenrod	*Solidago sciaphila*	ST	Dolomite and sandstone cliffs	1	MI to MN, south to N IL. One extant population in LaSalle Co.; also known from Jo Daviess and Carroll cos. and possibly Ogle Co.
Common bog arrow grass	*Triglochin maritima*	SE	fens, pannes	8	N U.S. into the Rocky Mtns. — Extant populations in Kane, Lake and McHenry cos.; formerly Cook and Tazewell cos.
Cordroot sedge	*Carex chordorrhiza*	SE	bogs	2	Northeast U.S. — Known in IL only from Lake Co.; formerly McHenry Co.
Crawe's sedge	*Carex crawei*	ST	fens, sand prairies, and swales	5	N and E U.S. — Extant populations in Cook, Du Page, Kankakee, McHenry, Will cos; outside FRAA in Kane and Lake cos.; formerly Boone and Grundy cos. (Bowles 1991)
Crawford's oval sedge	*Carex crawfordii*	SE	marsh	1	NJ, MI, WI, MN, and WA. — Known in IL only from 1 population in Lake Co.
Cuckoo flower	*Cardamine pratensis var. palustris*	SE	calcareous mats and marshes	3	NE U.S. — Known in IL only from McHenry and Lake cos., extant populations in both cos.
Downy willow herb	*Epilobium strictum*	ST	bogs, fens, seeps	8	NEU.S. — Extant populations Lake and McHenry cos.; formerly Peoria, Winnebago, and Woodford cos.
Dwarf raspberry	*Rubus pubescens*	ST	mesic forests, bogs, fens	3	NE U.S. into the Rocky Mtns. Extant populations in Cook (outside FRAA), Du Page (outside FRAA), Kane, and Lake cos.; formerly Winnebago Co.
Ear-leaved foxglove	*Tomanthera auriculata*	ST	moist prairies, savannas	2	OH to MN, south to KS. — Extant populations known from Cook, Du Page, Kane, Kendall, and Lake cos.; also extant populations in 6 other cos.; formerly Grundy and 12 other cos.
False asphrodel	*Tofieldia glutinosa*	ST	bogs, fens	6	E U.S. — Extant populations Cook, Kane, Lake, and McHenry cos. ; formerly Will Co.
False bugbane	*Cimicifuga racemosa*	SE	forested seep	1	E - central and NE U.S. — Extant populations in Kendall, McHenry, and Ogle cos.; formerly Carroll and Cook Co.

Table 13. Continued

Common Name	Scientific Name	Status	Habitat	EORs[1]	Range U.S., IL, and Fox River area
fern pondweed	*Potamogeton robbinsii*	SE	glacial lakes	5	N U.S. — Known in IL only from Cook, Lake, and McHenry cos., extant populations in all three cos.
few-flowered spike sedge	*Eleocharis pauciflora*	SE	fens	1	NE U.S. south into the Rocky Mtns. — Extant populations outside FRAA in Cook and Lake cos; also in McHenry Co.
few-seeded sedge	*Carex oligosperma*	SE	bogs	3	NE U.S. — Extant populations known in IL only from Kane (outside FRAA), Lake, and McHenry cos.
flat-leaved bladderwort	*Utricularia intermedia*	SE	shallow water of bogs andfens	7	NE U.S. — Extant populations in Cook, Kane, Lake, and McHenry cos.; formerly Ogle and Tazewell cos.
forked aster	*Aster furcatus*	ST	N facing seep along slopes & bluffs	5	E - central U.S. — Extant populations in Grundy (outside FRAA), Kane, Kendall, Lake, La Salle, and McHenry cos. also Kankakee, Lee, Mason, and Winnebago cos.
golden sedge	*Carex aurea*	SE	wet meadows	2	N U.S. — Extant populations in Cook (outside FRAA), Kane and Lake (outside FRAA) cos. (Bowles et al. 1991)
grass pink orchid	*Calopogon tuberosus*	SE	prairies, bogs, and fens	8	E U.S. — Extant populations in Cook (outside FRAA), Lake, McHenry, Will and Winnebago cos.; formerly from outside FRAA in Du Page, Grundy, La Salle, and 12 other cos.
grass-leaved pondweed	*Potamogeton gramineus*	SE	lakes, ponds, streams	9	Arctic and Boreal Alaska, N U.S. and the Rocky Mtns. — Extant populations in Cook (outside FRAA), Lake, and McHenry cos.
Gray bog sedge	*Carex canescens var. disjuncta*	SE	bogs	2	MN south to VA, OH, IN, and IL. — Known in IL only from Lake Co., one population
green-fruited bur-reed	*Sparganium chlorocarpum*	SE	muddy shores & shallow water	2	NE U.S. south to IL — Extant populations in Kane, McHenry, and Union cos.; formerly Cook and Lake cos.
hairy marsh yellow cress	*Rorippa islandica var. hispida*	SE	marshes, disturbed wetlands	6	N U.S. into the Rocky Mtns. — Extant populations in Cook (outside FRAA), Du Page (probably outside FRAA), Lake, and McHenry cos.; also Iroquois and Winnebago cos.
heart-leaved plantain	*Plantago cordata*	SE	shaded gravel stream bars	1	E and central U.S. — Extant population in Kendall Co., also Grundy, Lake cos., and several other cos. downstate
hemlock parsley	*Conioselinum chinense*	SE	forested seep	—	Boreal E Canada south into the NE U.S. and the Appalachian Mtns. Currently found in Illinois at one site in Kane Co.; formerly Cook Co.
highbush blueberry	*Vaccinium corymbosum*	SE	sand prairies, bogs	3	E U.S. — Extant populations in Cook (outside FRAA), Lake, and McHenry cos., also Winnebago Co.; formerly Lee Co.
Hill's thistle	*Cirsium pumilum*	ST	dry prairies	6	PA west to MN and SD. — Extant populations in Kane and McHenry cos, also, outside FRAA in De Kalb, Du Page, Grundy, & 10 other cos. ; formerly Lake Cook, & 23 other cos.
hooded ladies' tresses	*Spiranthes romanzoffiana*	SE	floating sedge mat	1	Alaska south into the N U.S. — Extant populations in IL known in McHenry Co.; formerly Coles, Cook, and Peoria cos.
horned bladderwort	*Utricularia cornuta*	SE	bogs, fens, pannes	1	NE U.S. and SE coastal plain — Extant populations in Lake (outside FRAA) and McHenry cos.; formerly Cook Co.
ill-scented trillium	*Trillium erectum*	SE	mesic forests	1	NE U.S. into the Appalachian Mtns. — Extant population in McHenry Co. in FRAA, also Carroll Co; formerly Lake Co.
inland shadbush	*Amelanchier interior*	SE	sand/dolomite stream bluffs; bogs	1	WI, MN, IL, IA, and SD. — Extant populations in Du Page (outside FRAA) and McHenry cos.; also extant in Jo Daviess and Winnebago cos.; formerly Antioch Bog in Lake Co.
leatherleaf	*Chamaedaphne calyculata*	ST	low shrub bogs	6	Eastern U.S. — Extant populations outside FRAA in Cook & Kane cos, also in Lake & McHenry cos.; formerly Winnebago Co.
little green sedge	*Carex viridula*	SE	springs, marl flats calcareous sites	4	NE U.S. south in the Rocky Mtns. — Known in IL only from Cook (outside FRAA), Du Page, Lake, and McHenry cos.
marsh speedwell	*Veronica scutellata*	ST	marshes, graminoid fens	2	NEU.S. and into the Rocky Mtns. — Extant populations in Cook (outside FRAA), Du Page, Lake, Iroquois, and Will cos.; formerly Fulton, Kankakee, Peoria, and Woodford cos.
marsh valerian	*Valeriana sitchensis (V. uliginosa, Herkert* 1991)	SE	fens	2	NE U.S. — Known in IL only from two extant populations in McHenry Co., both within the FRAA

Table 13. Continued

Common Name	Scientific Name	Status	Habitat	EORs[1]	Range U.S., IL, and Fox River area
millet grass	*Milium effusum*	SE	moist woods, swamps	—	E Canada and NE U.S. — Extant populations in Cook (outside FRAA) and Kane cos., Young (1986) indicates it still occurs in Kane Co., no specific locality given; formerly Tazewell Co.
nodding trillium	*Trillium cernuum var. macranthum*	SE	mesic forests	—	Boreal Canada south into E U.S. — 2 extant populations in McHenry Co. in FRAA; also extant in Cook Co. (outside FRAA)
northern gooseberry	*Ribes hirtellum*	SE	bogs, wet mesic forests	2	NE U.S. — Extant populations in Lake Co., also Lee Co.; formerly Cook, De Kalb, McHenry, Will, and Winnebago cos.
pale vetchling	*Lathyrus ochroleucus*	ST	savannas, ravines	6	NE U.S. — Extant populations in Jo Daviess, Kane, Lake (evidently outside FRAA), McHenry, and Ogle cos.; formerly Cook, Du Page, and Winnebago cos.
pink lady's slipper	*Cypripedium acaule*	SE	wet-mesic forests, fens, bogs	1	Eastern U.S. — Extant populations in Lake and McHenry cos.; formerly Cook and Ogle cos.
pinweed	*Lechea intermedia*	SE	savanna	5	NE U.S. — Extant populations in Kane, Lake (outside FRAA), McHenry cos.; also Lee and Winnebago cos.; formerly Cook Co.
pitcher plant	*Sarracenia purpurea*	SE	bogs, fens; calcareous mats	7	NE U.S. and the coastal plain. — Extant populations in Lake and McHenry cos.; formerly Cook Co.
plains buttercup	*Ranunculus rhomboideus*	ST	hill/gravel prairies	4	N - central U.S. — Extant populations in McHenry Co., also Stephenson and Winnebago cos.; formerly Boone, Cook, De Kalb, Jo Daviess, and Ogle cos.
prairie bush clover	*Lespedeza leptostachya*	SE FT	dry gravel prairie	1	IL, WI, IA, and MN — Extant populations known in Cook, Du Page (outside FRAA), and McHenry cos. evidently outside FRAA), also Lee, Ogle, and Winnebago cos.
prairie white-fringed orchid	*Platanthera leucophaea*	SE, FT	mesic/wet prairies	3	E - central and E U.S. — Extant populations in Cook, Du Page, Grundy, Kendall, Lake, and McHenry cos., also 3 other cos.; formerly in De Kalb Co. & over 20 other cos. (Bowles et al. 1992)
purple-flowering raspberry	*Rubus odoratus*	SE	seeps	–	E Canada south into NE U.S. and the Appalachian Mtns. — Some populations probably native to FRAA, others introduced. Extant populations in Kane, Lake, and McHenry cos.; formerly Cook and La Salle cos.
queen-of-the-prairie	*Filipendula rubra*	ST	fens and seeps	—	E U.S. — Extant populations in McHenry Co., also, outside FRAA in Cook,Grundy, La Salle, and 4 other cos. in IL; formerly in 7 cos.
red pine	*Pinus resinosa*	SE	dry mesic woods; bluffs	1	NE U.S. and disjunct in IL — Extant native population known in La Salle Co. and wholly in FRAA; formerly Lake Co. (Brenneman 1956)
red-berried elder	*Sambucus pubens*	ST	rocky forested slopes, bogs	—	Canada, Alaska, N U.S., south in the Appalachian Mts. — One extant population may exist in McHenry Co., also Boone, De Kalb, La Salle (outside FRAA), Ogle, and Winnebago cos.; formerly Cook, Lake, and Will cos.
Richardson's rush	*Juncus alpinus*	SE	fens, marshes	1	Northern U.S. — Extant populations in Cook (outside FRAA), Du Page (outside FRAA), Kane, Lake, and McHenry cos.
rock elm	*Ulmus thomasii*	SE	mesic floodplain forests	1	N - central and NE U.S. — Extant populations in Kane Kendall Adams, and Jo Daviess cos.; formerly Cook and Will cos.
round-leaved serviceberry	*Amelanchier sanguinea*	SE	upland forests	2	NE U.S., south in the Appalachian Mts. — Extant populations in Cook, Kane, Lake (outside FRAA), and La Salle (probably outside FRAA) cos.
round-leaved sundew	*Drosera rotundifolia*	SE	bogs	5	E and W U.S. — Extant populations in Cook (outside FRAA), Lake, and McHenry cos.; formerly Ogle co.
rusty cotton grass	*Eriophorum virginicum*	SE	bogs	4	NE U.S., south to northeastern IL. — Extant populations known in IL only from McHenry and Lake cos.
shortleaf sedge	*Carex disperma*	SE	bogs	4	Alaska and south into northern U.S. — Extant populations in Lake and McHenry cos.; formerly Kane Co.
showy lady's slipper	*Cypripedium reginae*	SE	fens, bogs	4	NE U.S. and the Appalachian Mtns. — Extant populations in Kane, Kendall, Lake, McHenry and Woodford cos.; formerly Cook Co. and 11 other cos.

Table 13. Continued

Common Name	Scientific Name	Status	Habitat	EORs[1]	Range U.S., IL, and Fox River area
slender bog arrow grass	*Triglochin palustris*	SE	fens, pannes	9	N U.S. into the Rocky Mtns. — Extant populations in Cook, Kendall, Lake, McHenry cos.; formerly Kane Co. and 3 other cos.
slender sandwort	*Arenaria patula*	SE	rock ledges and dolomite prairies	—	SE U.S. — Extant populations outside FRAA in Cook, Du Page, and Grundy cos, also in Kendall Co.; formerly St. Clair Co.
small bladderwort	*Utricularia minor*	SE	Bogs, calcareous floating mats, fens,swales	3	N U.S. — Extant populations in Cook, Lake, and McHenry cos.; formerly Clay and Saline cos.
small cranberry	*Vaccinium oxycoccos*	SE	bogs	1	NE U.S. — In Illinois known only from Lake Co. and wholly within FRAA, one population.
small sundrops	*Oenothera perennis*	SE	gravel prairies	1	E U.S. — Populations in Cook (outside FRAA) and Lake cos., also Winnebago Co.; formerly Will Co.
small yellow lady' slipper	*Cypripedium parviflorum (C. calceolus var. parviflorum Herkert 1991)*	SE	forested and graminoid fens, sand prairies	7	NE U.S. into the Appalachian Mtns. — Extant populations in Kane, Lake, and McHenry cos.; formerly Cook and Winnebago cos.
small yellow sedge	*Carex cryptolepis*	SE	wet meadows	2	MN, NJ, OH, and IN. — Known in IL from only from Du Page and Lake cos., one population in each co. ; formerly Cook Co.
Smith's bulrush	*Scirpus smithii*	SE	pond margins	1	NE U.S. — Evidently one extant population occurs in Lake Co. the only known current occurrence of the species in IL; formerly Cass, Mason, and Peoria cos.
snake mouth	*Pogonia ophioglossoides*	SE	wet sand prairies, bogs, fens	6	E U.S. — Extant populations in Cook, Lake, and McHenry cos.;formerly from three other cos.
snowberry	*Symphoricarpos albus var. albus*	SE	sandstone and steep north facing slopes.	2	Alaska south to VA, MI, MN, and CA. — Only known in IL from Kane and La Salle cos. and wholly within the FRAA, extant populations in both cos.
speckled alder	*Alnus incana ssp. rugosa (A.rugosa, Herkert 1991)*	SE	swamps and bogs	—	E and central Canada, south into NE U.S. — Extant populations in Kane, Lake, McHenry, and Winnebago cos.; formerly from Cook and Boone cos.
spotted coral-root orchid	*Corallorhiza maculata*	ST	mesic forests	2	NE U.S. and Appalachian Mtns. — Extant populations in Du Page (outside FRAA), Kane, McHenry, Will, and Winnebago cos.; formerly Cook (outside FRAA), Jo Daviess, La Salle (outside FRAA), and Ogle cos.
spotted pondweed	*Potamogeton pulcher*	SE	shallow water	1	E U.S. — Currently known in IL only from Kane Co.; formerly Jackson, Mason, and Menard cos.
spreading sedge	*Carex laxiculmis*	ST	mesic forests	6	N U.S. — Extant populations in Du Page, Kane, and Kendall cos. plus four other cos. in IL; formerly Fulton and Will cos.
star-flower	*Trientalis borealis*	ST	bogs, mesic sand forests	2	NE U.S. — Extant populations in Cook (probably outside FRAA), Lake, and McHenry cos., also Ogle Co.; formerly La Salle and Winnebago cos.
stiff pondweed	*Potamogeton strictifolius*	SE	calcareous lakes and ponds	1	N U.S. — Currently known in IL only from Lake Co.; formerly Cook and Will cos.
tall sunflower	*Helianthus giganteus*	SE	fens, sedge meadows	—	NE U.S. —Extant IL populations only in Cook Co.; formerly Kane, Kankakee, Tazewell, and Winnebago cos.
three-seeded bog sedge	*Carex trisperma*	SE	bogs	2	NE U.S. — Extant populations known in IL only from Lake Co., two populations.
tufted bulrush	*Scirpus cespitosus var. callosus*	SE	graminoid fens	3	NE U.S. — Known in IL only from Lake and McHenry cos., extant populations in both cos.
water arum	*Calla palustris*	SE	bogs	1	NE U.S. — Known in IL only from a single population at a bog in Lake Co.
water Marigold	*Megalodonta beckii (Bidens beckii,* Herkert 1991)	SE	ponds, lakes, sluggish streams	1	NE U.S. and the Pacific northwest. — Only one extant population in IL, Lake Co.; formerly Cook Co.
white camass	*Zigadenus venenosus var. gramineus (Zigadenus glaucus,Herkert 1991)*	SE	fens, gravel prairies	1	Great Lake region, south to the Appalachians Mtns. — Extant populations in Kane Co., also Jo Daviess Co.; formerly in Kankakee Co.

Table 13. Continued

Common Name	Scientific Name	Status	Habitat	EORs[1]	Range U.S., IL, and Fox River area
white cedar	*Thuja occidentalis*	ST	forested fen, seeps, sandstone/ limestone cliffs	3	NE U.S. — Extant populations in Kane, Lake, and La Salle cos.; formerly Cook and Tazewell cos.
white lady's slipper	*Cypripedium candidum*	SE	wet-mesic prairies, fen	16	N - central and NE U.S. — Extant populations in Cook, Du Page (outside FRAA), Kane, Kendall, Lake, and McHenry cos.; also Cass, Mason, and Winnebago cos.; *formerly 10 other counties.*
white-stemmed pondweed	*Potamogeton praelongus*	SE	cold water lakes	4	N U.S. and the Rocky Mtns. — Extant populations in Lake Co.; formerly Cook and McHenry cos.
woolly milkweed	*Asclepias otarioides (Asclepias lanuginosa, Herkert 1991)*	SE	dry gravel prairies	7	N - central U.S. — Extant populations in Cook, De Kalb, Jo Daviess, McHenry, Ogle, and Winnebago cos.; formerly Boone, Du Page, Kane, La Salle, Lee, and Will cos.
yellow birch	*Betula alleghaniensis*	SE	bogs and sand-stone outcrops	2	NE U.S. and the Appalachians. — Extant populations in Lake, Lee, and Ogle cos.; formerly from Du Page , Kane, and Winnebago cos.
yellow monkey flower	*Mimulus glabratus*	SE	springs, seeps	1	Central U.S. — Extant populations in Kendall Co., also Mason, Putnam, and Woodford cos.; formerly Kane and McHenry cos. and five other cos.
yellow-lipped ladies' tresses	*Spiranthes lucida*	SE	calcareous habitats	1	NE U.S. — One extant population in Kane Co; formerly Cook, Hancock, Lake, Tazewell, and Will cos.

[1] EORs = Element Occurance Records - indicates the number of reported sightings of each species.

Table 14. Species present in the FRAA on the unofficial watch list of species
(SU = Illinois status unknown [believed to be in peril], SC = Illinois special concern [not yet SE or ST, but in serious decline])

Comon Name	Scientific Name	Status	Habitat
butternut	*Juglans cinerea*	SC	mesic forests; floodplain forests
Canada blueberry	*Vaccinium myrtilloides*	SU	bogs
fireweed	*Epilobium angustifolium*	SU	bogs; dunes
sweet Indian plantain	*Cacalia suaveolens*	SU	calcareous fens
yellow lady's slipper	*Cypripedium pubescens*	SC	mesic forests

Disturbance, Habitat Quality, and Restoration Potential

In addition to habitat loss through conversion to agricultural and urban areas, and extraction of gravel and peat deposits, most remnant plant communities in the FRAA have experienced anthropogenic disturbances that have resulted in differing levels of degradation. The absence of landscape scale fires, fragmentation of once large expanses of natural habitat into small isolated fragments, and the introduction of non-native, exotic species into natural habitats, are other consequences typical 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 overgrazing by livestock (Dennis 1997) or deer (Anderson et al. 1995; Anderson 1997); however, degradation is often caused by the interaction of multiple factors.

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. 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 (Anderson 1982, Nuzzo 1986, Ebinger 1997, Robertson et al. 1997, Taft 1997).

Fragmentation is a process describing landscape patterns where habitat remnants become isolated by land conversions (Wilcove et al. 1986, Schwartz 1997). Fragmented habitats often undergo alterations in many environmental conditions. Increased surface area of edge compared to volume can result in changes in soil moisture conditions and levels of solar radiation, as well as increased opportunity for exotic species invasions (Luken 1997) and wind damage (Gelhausen et al., in review). High levels of fragmentation limit restoration potential of degraded sites since species immigration, needed to compensate for the local extirpations of plants with low population levels, is seriously challenged (Taft 1996, 1997). Fragmented habitats support fewer species and at lower population levels compared to less fragmented habitats. Species at lower population levels are prone to local extirpation. Native browsing animals, such as deer, can also have great impact in highly fragmented habitats (Anderson 1997), and the impact of overgrazing by livestock is exacerbated in habitat fragments (Dennis 1997).

Integrity is lowered not only by the loss of native species, but also by the introduction of **exotic** (non-native, adventive) **species**. Adventive taxa in a system may be sorting into disturbance or habitat niches that result in the replacement of native taxa (Solecki 1995, Luken 1997). 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 FRAA, including exotic species control measures, are offered in the "Summary and Recommendation" section of this chapter, following descriptions of

Natural Communities (also see Cole 1991; Glass 1991, 1992; Heidorn 1991; Illinois Nature Preserves Commission 1990; Kennay and Fell 1992; McKnight 1993; Nuzzo 1991; Solecki 1989, 1995, 1997; Thompson 1987).

Natural Areas and Nature Preserves

The Illinois Natural Areas Inventory (INAI) was conducted by the University of Illinois, the Natural Land Institute, and the Illinois Department of Conservation over a three-year period during the mid 1970s to document remaining significant and exceptional examples of the natural communities in Illinois (White 1978). The INAI established seven categories of natural areas based on significant features. The categories are: I - High-quality Natural Communities; II - Habitat for Endangered Species; III - Habitat for Relict Species; IV - Outstanding Geological Areas; V - Approved Natural Areas and Restoration Sites; VI - Unique Natural Areas; and VII - Outstanding Aquatic Areas. The INAI established a grading system to designate natural quality (White 1978; White 1981a, b, c). The natural quality of a natural community was graded from "A" (relatively stable or undisturbed) to "E" (very early successional or severely disturbed). Grade E was reserved for cropland or other highly developed lands. In general only "A" and "B" communities are designated as significant or exceptional features.

Within the FRAA, 118 sites qualify as high-quality, undegraded (Category I) natural areas for the INAI (Table 8). These include remnants of the natural communities in Table 15: dry-mesic and mesic upland forest (Grades A and B); dry-mesic, wet-mesic, and wet prairie (Grades A and B); dry and dry-mesic gravel prairie (Grades A and B); gravel hill prairie (Grade B); dry-mesic savanna (Grade B); marsh (Grade A and B); graminoid, low shrub, tall shrub and forested bog (Grades A and B); calcareous floating mat, graminoid fen, low shrub fen, tall shrub fen and forested fen (Grades A and B); sedge meadow (Grades A and B); calcareous seep (Grades A and B); lake and pond (Grades A and B); and dolomite cliff (Grade A).

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 about 236 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). A total of 47 Illinois Nature Preserves occur within the FRAA. Many nature preserves are quite small, representing mere fragments of once large natural communities; however, these are still important for conservation (Schwartz and van Mantgem 1997). Lying mostly at the borders of an expanding Greater Chicago area, the FRAA faces many problems in the urban/rural interface; Shafer (1997) discusses the design of nature Preserves in this context.

Tables 7 and 9 provide a listing by county and acreage of all natural areas and nature preserves present in the FRAA and surrounding area. The combined area for all natural areas in the FRAA is approximately 16,125.32 acres or 1.5% of the assessment area. Of this, 660.3 acres is Category 1, Grade A land and 4,845.6 acres is Category 1 Grade B land. The total area of Category 1 Grade A and B land is therefore 5,505.9 (Table 8), or about 0.5% of the FRAA. This percentage of undegraded land in the FRAA is considerably larger than the percentage given in the INAI (0.07%) for total land and water area found throughout Illinois that remains in a high-quality, relatively undisturbed condition (White 1978). It is also significant that throughout the state, the INAI found only 25,723 acres of Grades A and B (high quality, undegraded) terrestrial natural communities, 5,505 acres (21.4%), of which 5,505.9 occur within the FRAA. This indicates that the FRAA is a significant statewide repository of high quality natural areas.

Four state parks are located in the FRAA — Chain-O-Lakes (3,643 acres), McHenry Dam and Lake Defiance (1,608 acres), Shabbona Lake (1,735 acres), and Silver Springs (239 acres) totaling 7,225 acres, or 0.7% of the FRAA. No federally owned parks or refuges occur in the FRAA.

Terrestrial Natural Community Descriptions

This discussion of natural communities follows the classification system developed by the Illinois Natural Areas Inventory (White and Madany 1978). The natural communities within the FRAA (Table 15) were determined by examining data from several sources. These include descriptions of existing community types as well as plant communities inferred to have occurred prior to European settlement and large-scale alteration of the landscape. Botanical nomenclature follows Mohlenbrock (1986). Scientific names corresponding to the common names used in this text are in the summary species list for the FRAA (Appendix 1). These taxa are sorted by scientific name in Appendix 2.

Sources for these data include species lists from known community types found in INAI sites and descriptions of vegetation in publications and technical reports. Compared to other parts of Illinois, there are very few books or papers published in the scientific literature, recent or historic, that describe natural communities in northeastern Illinois, even though this is one of the most ecologically diverse and interesting parts of the state. The eastern part of the FRAA is barely included in Pepoon's *Flora of the Chicago Region* (1927). Much of the FRAA is included in the successor to Pepoon's book, Swink and Wilhelm (1994 and earlier editions). The chapter on "Natural Plant Communities" (Swink and Wilhelm 1994) contains a number of fascinating historical quotes as well as brief discussions and species lists for nine principal natural communities. Additional information can be gleaned from the discussion for individual species.

Table 15. Terrestrial natural communities known to occur or believed to have formally occurred in the Fox River Assessment Area[1].

FOREST
- **Upland forest**
  - dry-mesic upland forest
  - mesic upland forest
- **Floodplain forest**
  - mesic floodplain forest
  - wet-mesic floodplain forest
- **Flatwoods**
  - northern flatwoods

PRAIRIE
- **Prairie**
  - dry-mesic prairie
  - wet-mesic prairie
  - wet prairie
- **Gravel Prairie**
  - dry gravel prairie
  - dry-mesic gravel prairie
- **Hill prairie**
  - gravel hill prairie

SAVANNA
- **Savanna**
  - mesic savanna

WETLAND
- **Marsh**
  - marsh
- **Bog**
  - graminoid bog
  - low shrub bog
  - tall shrub bog
  - forested bog
- **Fen**
  - calcareous floating mat
  - graminoid fen
  - low shrub fen
  - forested fen
- **Sedge meadow**
  - sedge meadow
- **Seep & Spring**
  - seep
  - calcareous seep

LAKE & POND
- **Pond**
  - pond
- **Lake**
  - lake

PRIMARY
- **Cliff**
  - dolomite cliff community
  - sandstone cliff community

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

A detailed survey was made of natural areas in Kane County (Wilhelm 1978), which contains species lists and brief descriptions. In the back of Young (1986) is a chapter entitled "Introduction to Kane County Natural Areas," which contains species lists and brief but informative text for 37 areas, most of which occur in the FRAA. The general types of natural communities found in official Illinois Nature Preserves are given in *A Directory of Illinois Nature Preserves* (McFall and Karnes 1995). General descriptions of several natural areas of the FRAA can be found in Evers and Page (1977) and Jeffords et al. (1995). Additional published references are given below under specific communities.

Forest

Forests in the FRAA belong to the Prairie Peninsula Section in the Northern Division of the Oak-Hickory Forest Region (Braun 1950). As seen in Table 2, the amount of landcover varied considerably in different regions within the FRAA. Presettlement vegetation maps for Lake (Moran 1978) and De Kalb, Kane, and Du Page counties (Moran 1980) show that forest was essentially absent from western Lake County. In De Kalb,

Kane, and Du Page counties, forest was most frequent on the east sides of rivers and creeks, often extending several miles eastward from the waterways. This was noted by Parker (1835, quoted on page 41 in Swink and Wilhelm 1994) on an excursion along the west bank of the Fox River.

Prior to European settlement, landscape-scale fires generally moved from west to east, driven by the predominantly western prevailing winds. Land on the west sides of streams burned regularly, preventing the development of forests, while the streams, and the topographic relief associated with them, served as fire breaks, allowing the development of forest on their east sides. In the four counties studied by Moran (1978, 1980), most of the areas mapped as being in forest prior to European settlement (Anderson 1970, Iverson and Joselyn 1990) were in fact savanna. Similar trends were noted in a study using the Government Land Office survey witness tree data for three townships in Kane and Du Page counties (Bowles et al. 1994), concluding that prairies generally developed on level outwash or ground moraines, forest formed and persisted east of well-defined firebreaks, and savanna was found in areas of intermediate fire protection.

Today, forests likely cover more area within the FRAA than in 1820. Subsequent to European Settlement, landscape-scale fires were suppressed and oak savannas quickly developed into oak forests (Kilburn 1959, Nuzzo 1986, Packard and Mutel 1997b). See the discussion below on savannas.

General ecological problems frequently associated with forest communities include habitat degradation, fragmentation, the introduction of non-native plant species, and fire absence, especially in upland forests. A typical source of habitat degradation in forests is over-grazing, not only by domestic livestock but also by white-tailed deer which have increased substantially in numbers recently (Anderson 1997). This grazing often produces changes in forest compositional and structural characteristics. As in much of Illinois, grazing-sensitive species probably have been eliminated from many forest remnants in the FRAA. In contrast, species that increase with grazing often are abundant in over-grazed forest remnants (e.g., thorn-bearing taxa such as red haw, honey locust, Missouri gooseberry, and brambles). Some non-native species also increase in abundance with over-grazing, such as Osage orange, multiflora rose, bush honeysuckles, and garlic mustard, as well as certain weedy native species, such as coralberry and poison ivy. In many cases, the abundance of exotic species appears to be directly proportional to the historic grazing intensity. Recovery of these sites following cessation of grazing appears to be slow. Complete restoration may not be possible without intensive management including species reintroduction. Fire absence in upland forest communities typically results in compositional changes in more mesic sites (such as increase in abundance of sugar maple) and primarily structural changes in drier sites (such as increases in stem density of woody plants and shade). The result is often 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).

Within the FRAA and other parts of northeastern Illinois, non-native plant species are severe threats to the integrity of forest communities. In the herbaceous layer, the abundance of garlic mustard has increased dramatically in the past 20 years (Nuzzo 1991), and unfortunately the native spring woodland wildflowers in many areas largely have been eliminated by the spread of this species. The shrub layer can contain a number of non-native species, such as several different kinds of bush honeysuckles, multiflora rose, burning bush, European highbush cranberry, Japanese barberry, glossy buckthorn, and common buckthorn. The canopy layer can also include non-native tree species, such as Norway maple, black locust, and sometimes Osage orange.

Several Endangered and Threatened species of plants occur in forests in the FRAA. These include round-leaved shadbush, spreading sedge, spotted coral-root orchid, black-seeded rice grass, nodding trillium, ill-scented trillium, rock elm, and American dog violet (Table 13).

Forest subclasses in Illinois include upland forest, sand forest, floodplain forest, and flatwoods. All except sand forests occur in the FRAA. These forest types are characterized below.

Upland Forest

Of the 10.3% of the FRAA remaining as forest, about 0.22% (249 acres) is high-quality (Grades A and B) and undegraded (White 1978). Upland forest communities can be classified further by soil-moisture characteristics. *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, Taft et al. 1995). The following community types are known to occur in the FRAA.

Dry-mesic upland forest - This community type occurs in the FRAA on the upper slopes and ridges of the dissected terrain bordering the Fox River, and it is the most prevalent forest community Illinois. Characteristic canopy species are white oak, red oak, black oak, white ash, slippery elm, shagbark hickory, black walnut, and hackberry. Understory trees include black cherry, chokecherry, hop hornbeam, gray dogwood, red haw, and dotted hawthorn. Shrubs include downy arrowwood, elderberry, black haw, nannyberry, Missouri gooseberry, hazelnut, prickly ash, and blackberries. Woody vines may include poison ivy, Virginia creeper, grape honeysuckle, riverbank grape, and bittersweet. Herbs may include elm-leaved goldenrod, false Solomon's seal, hairy sweet Cicely, nodding fescue, Pennsylvania sedge, red trillium, shining bedstraw, and wild geranium. Exotic species in dry-mesic upland forest may include garlic mustard, Canada bluegrass, multiflora rose, various bush honeysuckles, and common buckthorn.

Within the FRAA, the total extent of this type is not known, but 48 acres of Grade A and 158 acres of Grade B dry-mesic upland forest have been identified (Table 8). This

represents about 0.18% of the remaining forest cover in the FRAA, 0.2% of the remaining upland forest in the FRAA, and 15.6% of the total high-quality dry-mesic upland forest remaining in Illinois (White 1978, Illinois Department of Natural Resources 1997).

Mesic upland forest - When soil moisture is sufficient, mesic upland forests develop. This type of forest has a dense canopy, an understory of shade-tolerant woody species, and a rich variety of spring woodland wildflowers. In the FRAA, mesic upland forest is only found in areas that are protected from fires. Characteristic canopy species include sugar maple, black maple, red oak, bur oak, and basswood. There is a rich mixture of other trees in this community, such as shagbark hickory, bitternut hickory, American elm, slippery elm, white oak, chinquapin oak, hackberry, black walnut, black cherry, white ash, and blue ash. Subcanopy species include red mulberry, blue beech, and hop hornbeam. Typical shrubs include elderberry, pawpaw, alternate-leaved dogwood, wahoo, black haw, bladdernut, chokecherry, American black current, and Missouri gooseberry. Woody vines include poison ivy, Virginia creeper, grape honeysuckle, and riverbank grape. Herbaceous species composition includes a rich assortment, particularly spring ephemerals, including yellow bellwort, bloodroot, blue cohosh, broadleaf goldenrod, columbine, Dutchman's breeches, enchanter's nightshade, false mermaid, hooked buttercup, late figwort, late goldenrod, liverleaf, nodding trillium, rattlesnake fern, red baneberry, smooth scouring rush, Solomon's seal, spotted touch-me-not, spring beauty, Solomon's seal, tall bellflower, toothwort, Virginia bluebells, Virginia waterleaf, white avens, white baneberry, wild balsam apple, wild ginger, wild licorice, wood anemone, and wild leek.

The major ecological problems associated with mesic upland forests are degradation from grazing and habitat fragmentation. Among the more abundant exotic species within mesic upland forest are garlic mustard, Norway maple, Amur honeysuckle, European highbush cranberry, multiflora rose, Japanese barberry, and common buckthorn. A total of 43 acres of this community type in the FRAA is recognized as having high ecological quality and is included in the INAI (Illinois Department of Natural Resorces 1997). This 43-acre total is about 0.04% of the remaining upland forest cover in the FRAA, and 1.2% of the total high-quality mesic upland forest remaining in Illinois (White 1978, Illinois Department of Natural Resorces 1997).

Floodplain Forest

Floodplain forests are characterized by edaphic conditions of poor drainage and slow permeability. Local areas of sand and gravel increase permeability. Floodplain forest communities in Illinois include *mesic, wet-mesic,* and *wet floodplain* forest and are classified according to characteristics of flooding. Wet floodplain forest occurs in the floodplain bordering rivers including the riverbank. Wet-mesic to mesic floodplain forests occur on low to high terraces, respectively. There are no high-quality floodplain forests in the FRAA, however degraded examples occur along the Fox River and its tributaries. Bottomland forests comprise about 9,100 acres (0.8%) of the assessment area (Table 4).

Ecological problems in floodplain forests 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 invasion by non-native plant species. Particularly troublesome non-native plant species in floodplain forests within the FRAA include white mulberry, spindle tree, garlic mustard, moneywort, multiflora rose, various bush honeysuckles; white willow and purple loosestrife are established locally along the banks of the Fox River. Rock elm, a state endangered species, is found in wet-mesic floodplain forests in Kane and Kendall counties.

Characteristic tree species of wet to wet-mesic floodplain forests in the FRAA include cottonwood, silver maple, box elder, sycamore, black walnut, butternut (rare),slippery elm, hackberry, Kentucky coffeetree (rare), honey locust, green ash, black willow, heart-leaved willow, and red haw. Basswood, bur oak, white oak, red oak, white ash, and Ohio buckeye are occasional to common in mesic floodplain forests. Shrubs include false indigo bush, American black currant, elderberry, prickly ash, and buttonbush. Woody vines include poison ivy, Virginia creeper, and riverbank grape. Often there is a rich diversity of spring woodland wildflowers in mesic and wet-mesic floodplain forests, mostly the same as those found in mesic upland forests (see list above). Also found in floodplain forests are bur cucumber, clearweed, common bur sedge, creeping lovegrass, cup plant, false nettle, fowl manna grass, giant ragweed, Ontario aster, rough avens, side-flowered aster, stickseed, stout wood reed, stinging nettle, tall water hemp, Virginia wild rye, white grass, and wood nettle. Glade mallow, rare in Illinois although not listed as endangered or threatened, occurs in open areas on floodplain terraces at several localities along the Fox River in McHenry and Kendall counties.

Northern Flatwoods

Flatwoods occur on level sites with a nearly impermeable subsoil horizon (claypan) (Byers et al. 1991, Taft et al. 1995). Soil moisture varies seasonably from very wet, due to a perched watertable, to very dry, and plants occurring in flatwoods are adapted to these conditions. The claypan limits plants from receiving soil moisture from capillary action and restricts rooting. Depressions may contain plant communities frequently found in ephemeral or seasonal ponds. Characteristic plants of northern flatwoods include swamp white oak, Hill's oak, American elm, false nettle, hop sedge, swamp oval sedge, fowl manna grass, white grass, blue lobelia, lion's foot, stout wood reed, and shinleaf. Dominant trees are white oak, red oak, and black cherry, and other trees include bur oak, black oak, shagbark hickory, green ash, American elm, and red ash. The herbaceous layer contains enchanters nightshade, false Solomon's seal, and Virginia creeper.

One acre of Grade B northern flatwoods occurs at Helm's Woods Nature Preserve in Kane County; lower quality flatwoods also occur in this preserve. Statewide, only 86 acres of high-quality northern flatwoods have been identified (White 1978, Illinois Department of Natural Resources 1997). An unusual type of northern flatwoods is found in Maramech Woods Nature Preserve in Kendall County.

Prairie

Prairies are a plant community dominated by herbaceous plants, especially grasses; trees are either absent or only widely scattered on the landscape. Illinois lies within an area called the "prairie peninsula," an eastward extension of prairies that borders deciduous forests and woodlands to the north, east, and south. This is part of the tallgrass prairie region, sometimes called the true prairie, with the landscape dominated by grasses such as big bluestem and Indian grass as well as a large number of other species of grasses and wildflowers, the latter called forbs. The vegetation sometimes reaches a height of 10 feet or more (Anderson 1991, Risser 1984, Risser et al. 1981, Robertson and Schwartz 1994, Robertson et al. 1997).

Tallgrass prairie is a recently developed ecosystem in North America, formed after the period of Pleistocene glaciation (Axelrod 1985). About 18,000 years ago, northeastern Illinois was covered by glaciers. As the glaciers melted, the land was covered at first with tundra-type vegetation, then by spruce forests. As the climate became warmer and drier, between 14,000 and 10,000 years ago, a cool-mesic hardwood forest with ash, oak, elm, maple, birch, and hickory trees replaced the spruce forest. About 8,300 years ago, the climate became substantially warmer and drier, and within the relatively short time of 500 to 800 years, forests in Illinois became restricted to protected sites, such as along stream banks, while prairies increased over the landscape. During the last 1,000 years, the climate has become slightly cooler and more moist, making conditions more favorable to trees.

Prairies developed and were maintained under the influence of three major stresses: climate, grazing, and fire. Occurring in the central part of North America, prairies are subject to extreme ranges of temperatures, with hot summers and cold winters. There are also great fluctuations of temperatures within growing seasons. Rainfall varies from year to year and within growing seasons as well. The prairie region is also subject to droughts. Usually there is a prolonged dry period during the summer months, and there are major droughts lasting for several years that occur every 30 years or so.

Prairie fires, started by Native Americans and by lightning, were common before European settlement. Many plant communities burned frequently, perhaps once every one to five years. These prairie fires moved rapidly across the landscape, but damaging heat from the fire did not penetrate the soil to any great extent. Fire kills most saplings of woody species, removes thatch aiding in some nutrient cycling, and if timed during the dormant season promotes early flowering spring species.

A considerable portion of the above-ground biomass of a prairie was consumed each year by the grazing of a wide range of browsing animals, such as bison, elk, deer, rabbits, and grasshoppers. This grazing was an integral part of the prairie ecosystem, and to grasslands in general. Grazing increases growth in prairies, recycles nitrogen through animal wastes, and the trampling by herds opens up habitat for plant species that prefer some disturbance of the soil.

Prairie plants have adapted to these stresses by largely being herbaceous perennials with underground storage/perennating structures, growing points slightly below ground level, and extensive, deep root systems. The tender growing points of prairie plants occur an inch or so below ground and are usually not injured by prairie fires. These underground growing points are also left unharmed by browsing animals. During droughts, the long roots of prairie plants are able to take up moisture from deep in the soil. The roots of prairie plants often extend deeper into the ground than the stems rise above it. For instance, the roots of big bluestem may be 7 feet or more deep, and switchgrass roots more than 11 feet deep. Some of the roots die and decompose each year, and this process has added large quantities of organic matter to the soil. This is one reason why the prairie soils are so fertile for agriculture. In agricultural terms, the tallgrass prairie sustains high productivity while building and maintaining soil (Chapman et al. 1990).

The tallgrass prairie is'"the most diverse repository of species in the Midwest [and] . . . habitat for some of the Midwest's rarest species" (Chapman et al. 1990). Yet, it is well known that North American grasslands, especially the tallgrass prairie, are among the most endangered habitats in the world (Klopatek et al. 1979, Crumpacker 1988, Chapman et al. 1990, Noss and Cooperrider 1994, Noss et al 1995). As noted by Chapman et al. (1990), the tallgrass prairie is 99% destroyed east of the Missouri River, and south and west of the Missouri River it is 85% destroyed. This led Noss et al (1995) to include the tallgrass prairie east of the Missouri on their list of "Critically Endangered Ecosystems" of the United States.

The Illinois Natural Areas Inventory (White 1978) recognizes six main subclasses of prairie: *prairie* (black soil, silt-loam prairie), **sand prairie, gravel prairie, dolomite prairie, hill prairie,** and **shrub prairie**. Further divisions are made based on soil moisture classes yielding 23 prairie community types in Illinois. Based on undegraded (Grades A and B) remnant prairies in the FRAA (White 1978, Illinois Department of Natural Resources), the following community types are present: *dry-mesic, wet-mesic,* and *wet prairie*; *dry* and *dry-mesic gravel prairie*; and *gravel hill prairie* (Table 15).

Considering the distribution of prairie and forest in Illinois at the time of European settlement (about 1820), much of the FRAA was tallgrass prairie. Based on Government Land Office survey records, around 1820, the area of the FRAA was about 31% prairie (about 341,320 acres). Today, high-quality (Grades A and B) prairies are very scarce in the FRAA, with a total of 35.1 acres for all prairie types (Table 8), or about 0.01% of the original extent. This rate of habitat destruction and degradation equals statewide trends where, coincidentally, also only 0.01% remains in a high-quality condition (White 1978).

Common ecological problems associated with prairie include fragmentation, fire absence, exotic species invasions, and habitat destruction and degradation. Small, isolated fragments tend to support many species at low population levels (thus prone to local extinction) too distant to be enhanced through natural mechanisms of species dispersal. Isolated prairies may also 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 prairie species. Fire absence can also lead to a severe invasion of exotic cool-season grasses like the ubiquitous species meadow fescue, smooth brome, and Kentucky bluegrass. Over-grazing by domestic stock typically degrades 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, result in loss of prairie species and opportunities for the establishment of weedy taxa. All of these combinations of factors, tend to result in loss of species diversity and ecological integrity for all prairie community types. The water regimes of mesic, wet-mesic, and wet prairies have often been altered by the installation, sometimes long ago, of drainage tile and/or drainage ditches in adjacent areas.

Prairie

This natural community category includes the typical "black-soil" prairies. Soils are generally deep and fine-textured, usually silt loam or clay loam derived from loess or glacial till or sometimes alluvium. The soils have a well developed, dark (often black) A horizon. Soil moisture ranges from dry to wet; within the FRAA the extant prairies are *dry-mesic, mesic, wet-mesic,* and *wet.*

Dry-mesic prairie - This habitat is often on slopes or on soil that is fairly well drained. The overall height of plants in late summer can exceed four feet, and the diversity of plant species is fairly high. Common grass species include little bluestem, big bluestem, prairie dropseed, long-haired panic grass, switch grass, Indian grass, side-oats grama, and porcupine grass. Characteristic forbs include bird's foot violet, black-eyed Susan, compass plant, cylindrical blazing star, downy gentian, drooping coneflower, toadflax, flowering spurge, glaucous white lettuce, grass-leaved goldenrod, hoary puccoon, heart-leaved cowbane, heath aster, New England aster, nodding lady's tresses, nodding wild onion, Ohio spiderwort, pale purple coneflower, prairie cinquefoil, prairie coreopsis, prairie dock, prairie milkweed, prairie phlox, purple prairie clover, rattlesnake master, rigid goldenrod, rosin weed, rough blazingstar, round-headed bush clover, saw-toothed sunflower, shooting star, showy goldenrod, showy tick trefoil, sky-blue aster, smooth blue aster, western sunflower, horsetail milkweed, wild bergamot, and wild strawberry. Shrubs include leadplant, New Jersey tea, prairie willow, smooth sumac, and pasture rose.

Typical ecological problems in remnants include fire absence (and subsequent woody plant encroachment) and exotic species invasion and establishment. Common exotic species include Kentucky bluegrass, Canada bluegrass, white and yellow sweet clovers, Queen Anne's lace, wild parsnip, and asparagus (Solecki 1995, 1997). A total of 3 acres of high-quality, undegraded dry-mesic prairie remains in the FRAA; this is about 5.1% of the remaining high-quality, undegraded dry-mesic prairie in Illinois (Table 8).

Mesic prairie- Undegraded mesic tall-grass prairies are among the most species-rich plant communities per unit area ("species density") in North America. Typical remnants contain from 15 to 30 species in a half-meter-square sampling quadrat. About 100 to 130 taxa of vascular plants can be found in small (5-acre) remnants. Most of the species found in dry-mesic prairies also occur in mesic prairies, except for perhaps the following: bird's foot violet, common blue violet, cylindrical blazing star, heart-leaved cowbane, and side-oats grama. Additional species include Culver's root, golden Alexanders, Indian paintbrush, prairie blazing star, purple meadow rue, prairie phlox, and white wild indigo. There are no high-quality, undegraded (Category I) examples of mesic prairie remaining in the FRAA, although lower quality remnants can be found. The state endangered bearded wheat grass occurs in this natural community (Table 13).

Wet-mesic prairie - This habitat is transitional between mesic and wet prairies and can include species that occur in each. Grass species include big bluestem, prairie cordgrass, switchgrass, blue-joint grass, Indian grass, and prairie brome. Characteristic forbs include balsam groundsel, closed gentian, grass-leaved goldenrod, marsh blazing star, cowbane, monkey flower, New England aster, nodding wild onion, panicled aster, prairie dock, smooth phlox, purple meadow rue, Riddell's goldenrod, saw-toothed sunflower, small yellow lady's slipper orchid, Turk's cap lily, water hemlock, white lady's slipper orchid, willow aster, winged loosestrife, and woundwort. Shrubs include pasture rose, swamp rose, prairie willow and sometimes pussy willow; the non-native common buckthorn and glossy buckthorn are major invaders of wet-mesic prairies in the FRAA.

There are 12.5 acres of high-quality, undegraded wet-mesic prairie in the FRAA representing 10.0% of the total Category 1 wet-mesic prairie extant in Illinois (Table 8). The state endangered prairie white-fringed orchid, white lady's slipper orchid, and the small yellow lady's slipper orchid occur in this natural community (Table 13).

Wet prairie - Surface water is present during the winter and spring, and the soil is nearly always saturated. The diversity of plant species is less than in other prairie communities, with species listed above under wet-mesic prairie occasionally found in wet prairies. Grasses include blue joint grass, prairie cord grass, as well as big bluestem. Forbs include blue flag, common boneset, Culver's root, cowbane, panicled aster, prairie Indian plantain, swamp saxifrage, water parsnip, winged loosestrife, woundwort. Shrubs include meadow sweet, swamp rose, prairie willow, and sometimes pussy willow; the non-native glossy buckthorn can invade wet prairies in the FRAA.

There is only 1 acre of high-quality wet prairie in the FRAA; this is 0.6% of the total undegraded wet prairie remaining in Illinois (Table 8). The state endangered American slough grass is found in this natural community (Table 13).

Gravel prairie

This category includes prairies that occur on gravel or very gravelly soil, and the soils are usually calcareous. Because the gravel provides rapid permeability, the soil moisture

classes are *dry, dry-mesic,* and *mesic*. Examples of *dry* and *dry-mesic* gravel prairie occur in the FRAA.

Dry gravel prairie - These prairies are on steep gravel slopes, the grasses average less than four feet in height, and in the FRAA they occur on kames and eskers. The dominant grasses are little bluestem and side-oats grama, with big bluestem, Indian grass, porcupine grass, prairie dropseed, and switch grass also frequent. Characteristic forbs and other species of this community include bird's foot violet, catfoot, common blue-eyed grass, few-flowered panic grass, fringed puccoon, heart-leaved cowbane, hoary vervain, pasque flower, pasture rose, plains buttercup, prairie blue-eyed grass, prairie bush clover, prairie cinquefoil, prairie smoke, purple prairie clover, purple oxalis, Seneca snakewort, showy goldenrod, silky aster, spike lobelia, stiff gentian, stiff sandwort, tall boneset, western sunflower, woolly milkweed, yellow flax, and yellow star grass. (Stynoff 1993, Stynoff and Hess 1986).

Within the FRAA are 12 acres of high-quality dry gravel prairie (Table 8); this comprises 65.2% of the undegraded dry gravel prairie identified in Illinois (White 1978, Illinois Department of Natural Resources 1997). Threatened and endangered species in this natural community include Hill's thistle, plains buttercup, woolly milkweed, and prairie bush clover (Table 13), the latter species also is listed by the U.S. Fish and Wildlife Service as a threatened species.

Dry-mesic gravel prairie - This community occurs on lower slope positions compared with dry gravel prairie and consequently has greater available soil moisture. Species typical of dry gravel prairie are usually present as well as scurf pea, small scullcap, and stiff aster. Some mesic prairie forbs also are frequent, such as Canada wild rye, compass plant, daisy fleabane, drooping coneflower, false dragonhead, feverfew, field goldenrod, flowering spurge, heath aster, hoary puccoon, lead plant, long-haired panic grass, lousewort, New Jersey tea, pasture rose, prairie blazing star, prairie cinquefoil, prairie coreopsis, prairie dock, prairie phlox, prairie violet, prairie willow, purple prairie clover, rattlesnake master, rigid goldenrod, rosin weed, rough blazing star, round-headed bush clover, Scribner's panic grass, shooting star, smooth blue aster, white prairie clover, and wild bergamot. Only one acre of high-quality (Grade B), dry-mesic gravel prairie occurs in the FRAA; this amount is 2.3% of the undegraded dry-mesic gravel prairie currently found in Illinois (Table 8).

Hill prairie

Hill prairies are grassland/forb communities that occur on slopes typically with exposure to the south and/or southwest. In Illinois, hill prairies appear intermittently along most of the western border of the state formed by the Mississippi River and along the Illinois River from north of Peoria south to its junction with the Mississippi. A few hill prairies also occur in east-central Illinois and other scattered localities. 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. *Loess, glacial drift, gravel,* and *sand hill prairies* have been recognized in Illinois (White and Madany 1978); only *gravel hill prairies* are present in the FRAA. Hill prairies often occur as openings within forest. During long periods of fire absence, hill prairies often decline in area and many have been eliminated or severely reduced in size due to encroachment of woody plants (McClain 1983, McClain and Anderson 1990, Robertson et al.1995, Schwartz et al. 1997b). The floristic composition of hill prairies is a combination of species that also occur in other prairie types (e.g., dry, black soil, sand, and gravel prairies) with only a few taxa largely restricted to hill prairies.

Gravel hill prairie - These prairies are similar to dry and dry-mesic gravel prairies, but the hill prairies occur as openings in a forest rather than as part of a continuous prairie. Similar plant species occur on gravel prairies and gravel hill prairies, although no endangered or threatened species are known to occur in this natural community within the FRAA. There are 5.6 acres of high-quality (Grade B) gravel hill prairie in the FRAA; this is 86.2% of all undegraded (Category 1) gravel hill prairie in Illinois.

Savanna

Savanna habitats occur throughout many parts of the North America. The Midwest, intermediate between the eastern forests and grasslands of the great plains, has the environmental conditions and fire history that supported many savanna like habitats (Anderson 1983, Delong and Hooper 1996, Nuzzo 1986, Taft 1997). Savannas are characterized by scattered, open-grown trees, with or without shrubs, and a continuous herbaceous ground cover typically dominated by graminoid species (grasses and sedges) and numerous forbs. Density and percent cover of trees varies and is intermediate between open prairie and closed woodland or forest. In this discussion, savannas are defined as having 10-50 mature trees per hectare or 10-50% canopy cover by trees (Bowles and McBride 1995); other figures are often used (see discussion in Delong and Hooper 1996). Midwestern savanna like habitats have several unifying characteristics. These include: 1) open-canopied structure (relative to closed forest); 2) canopy dominance by a few species of oaks; 3) a ground cover usually rich in species associated with tallgrass prairie; 4) a majority of floristic diversity contained in the ground-cover; and 5) dependence on fire and other disturbances for maintenance of diversity and stability.

Oak-dominated systems 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. This is called the "Prairie - Forest Continuum" by Packard and Mutel (1997b). The following recent quote is pertinent when discussing the savanna and forest communities at within the FRAA. According to Kline (1997) "The conspicuous trees of the savannas were the open-grown oaks, but another, less visible size class was well represented. The groves of large oaks

were surrounded by and intermingled with large numbers of oaks of a different size class - multistemmed grubs, mostly white and black oak, that were annually top-killed by fire, but whose roots continued to increase in size. These were the nascent oak woodlands and oak forests of the future, awaiting a break in the fire regime that would release them and change that part of the mosaic from sparse to dense trees. The widespread cessation of fire accompanying settlement allowed large numbers of these grubs to grow into even-aged oak woods - the last instance of widespread oak forest regeneration to take place in the region...."

The once widespread oak savannas have become one of the rarest plant communities (e.g., Curtis 1959, White 1978, Nelson 1987). Presently in the Midwest former savanna and open-woodland areas can still be recognized locally by the open form and low density of the oldest trees in a 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, and in these instances the ground cover is floristically degraded and dominated by non-native species. The suppression of fire, fragmentation, habitat degradation, and non-native species are primary ecological problems associated with savanna habitats. Some problem non-native species found in savannas include common buckthorn, common buckthorn, glossy buckthorn, burdock, and garlic mustard.

Three savanna subclasses are recognized in Illinois: **(silt-loam) savanna, sand savanna,** and **barren** (White and Madany 1978, Madany 1981); only the silt-loam savannas are known to occur in the FRAA. Prior to European settlement, savanna was a dominant feature of the landscape in the FRAA (Bowles and McBride 1995, Bowles et al. 1994, Moran 1978, 1980, Nuzzo 1986). Today, there is only one example of high-quality (Grade B) savanna in the FRAA, a 0.9 acre mesic savanna at Turner Lake Nature Preserve. A few areas of former savanna undoubtedly occur in the FRAA that could be restored or at least rehabilitated with prompt vegetation management (Apfelbaum and Haney 1991, Packard and Balaban 1994, Packard and Mutel 1997a). Due to limited floristic data, the descriptions of savanna compostion for the FRAA are based on characteristic species throughout the region of northeastern Illinois.

Savanna

The savanna community subclass is further distinguished by soil-moisture characteristics. Two savanna natural communities, *dry-mesic savanna* and *mesic savanna*, probably occurred in the FRAA. Compared with other habitat types, relatively few threatened and endangered plant species appear to be dependent on savanna habitats (Taft 1997). Floristically, savannas contain species of both prairie and open woodlands, though many taxa appear to reach their greatest frequency in transitional (ecotonal) savannas. A few plant species listed as endangered and threatened by the Illinois Endangered Species Protection Board (Herkert 1991) that may occur associated with savanna habitats in or near the FRAA are pale vetchling, ear-leaved foxglove, white lady's slipper orchid, and

prairie fringed orchid (Table 13), the latter taxon also is listed by the U.S. Fish and Wildlife Service as a threatened species.

Dry-mesic savanna - Characteristic tree species include Hill's oak, white oak, bur oak, black oak, and shagbark hickory. Shrubs include hazelnut, New Jersey tea, gray dogwood, common blackberry, and wild plum. Herb species include a rich assortment of graminoid and forb species from prairie, savanna, and open woodland habitats. The herbaceous layer is very similar to that found in dry-mesic prairies (see above). These species may also be present: bird's foot violet, pale vetchling, poke milkweed, savanna sedge, starry false Solomon's seal, and wild hyacinth.

Mesic savanna - Mesic savannas typically were associated with prairie groves on level to slightly rolling terraine. Mesic savannas also may have occurred as ecotonal areas between upland prairie and bottomland forest along riparian corridors. Mesic savannas are particularly dependent on recurrent fire for maintenance. 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 over-grazing) undegraded remnants, though formerly widespread, are among the rarest plant communities in the Midwest.

Characteristic tree species include bur oak, white oak, Hill's oak, and shagbark hickory. Shrubs include hazelnut, New Jersey tea, gray dogwood, common blackberry, and wild plum. The herbaceous layer is similar to that for mesic prairies (see above), and the following species may also be present: common carrion flower, Culver's root, prairie phlox, drooping coneflower, golden Alexanders, poke milkweed, prairie dock, purple milkweed, purple prairie clover, tall coreopsis, wild hyacinth, and woodland sunflower.

Wetland

The wetland community class includes natural communities that are flooded or have hydric soils with a vegetative cover. There are about 53,401 acres of wetland within the FRAA, about 4.9% of the assessment area (Table 5). The FRAA ranks 24th of 51 hydrological basins in the amount of natural wetlands (Suloway and Hubbell 1994). Wetland community types in the FRAA, following natural community classification of White and Madany (1978), include **floodplain forest, marsh, bog, fen, sedge meadow,** and **seep and spring**. Floodplain forests were described previously under the Forest community class. Wetlands in the FRAA are scattered throughout the assessment area with concentrations along the upper portions of the Fox River. About 5,228 acres of wetland (9.8% of the remaining wetland total) are recognized as high-quality and undegraded natural communities, mostly among the natural communities of lake, marsh, sedge meadow, floating mat, pond, and graminoide fen (Table 8). Lakes and Ponds are described in as a separate community class, according to White and Madany (1978).

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). In the marsh community subclass only one natural community, [typical] **marsh**, has been recognized within the FRAA. Typical marshes occur in glacial pot-holes, in river valleys, and on lake plains. Marshes characteristically have distinct zones depending on water depth and plant species are distributed in predictable ways among these zones. In general, the deeper the water, the lower the plant species diversity. A total of about 32,102 acres of emergent marsh vegetation (2.9% of the area), are reported for the FRAA (Suloway and Hubbell 1994). The contemporary distribution of marsh in the basin is widespread, because, following the recession of the Wisconsinin glaciation, numerous potholes, ponds, and lakes were left behind, scattered throughout the area.

Ecological problems in marshes include siltation, altered flooding regimes, invasion by non-native species, and over-abundance of aggressive, disturbance-tolerant native species. Siltation and altered flooding regime can reduce the integrity of a marsh. When changes in flooding dynamics result in increased frequency and/or duration of flooding, species intolerant to the new levels will decline and species tolerant of the new levels will increase. Increasers under conditions of siltation and increased flooding include reed canary grass, common cat-tail, river bulrush, and common reed. Many, perhaps most, marshes that remain in the FRAA are threatened by non-native species, especially purple loosestrife and glossy buckthorn (Havera and Suloway 1994, Havera et al. 1997).

Characteristic plant species of marshes in the FRAA include common bur reed, common arrowhead, bittersweet nightshade (introduced), common cattail, common reed, great bulrush, marsh purslane, northern bugle weed, red-rooted spike rush, reed canary grass, river bulrush, sweet flag, tufted loosestrife, water horsetail, and water smartweed. Occasional to common species include American black current, arrow-leaved aster, blue flag, blue joint grass, blunt spike rush, branched bur reed, bulblet water hemlock, common boneset, common horsetail, common reed, common water horehound, dark green bulrush, field mint, fox sedge, hazel dodder, manna grass, marsh bellflower, marsh yellow cress, cowbane, rice cutgrass, river bulrush, river sedge, salt marsh cockspur grass, scouring rush, sensitive fern, spotted Joe-Pye weed, swamp aster, swamp milkweed, swamp rose mallow, and water parsnip. Wood plants found in marshes include cottonwood, green ash, meadow sweet, pale dogwood, peach-leaved willow, petioled willow, and red-osier dogwood.

Bog

Bogs are acid peatlands and are an uncommon feature of the Northeastern Morainal Natural Division, with only 12 high-quality, undegraded remnants identified by the Illinois Natural Areas Inventory (White 1978). Bogs are much more common to the north of Illinois, and many plants reach their southern limits of midwestern distribution in

the bogs of northern Illinois. Consequently, a number of plants occurring in bogs are listed as endangered or threatened in Illinois (Taft and Solecki 1990).

Bogs develop in deep glacial depressions that have limited outward drainage; see Reichle (1969) for a detailed account of bog development. All bogs in Illinois evidently developed from fens in glacial potholes (Sheviak 1974) and are thus originally calcareous and become acidic only if sphagnum moss becomes established and dominant. Without constant recharge by mineralized ground water, hydrogen ion concentration increases among the sphagnum hummocks thus increasing acidity in the wetland. As discussed by Taft and Solecki (1990), these sites are characterized by the presence of several shrubs belonging to the heather family (Ericaceae). Most bogs in Illinois are peat-filled basins so that there is no longer an open pond. Volo Bog (Figure 11), a National Natural Landmark and Illinois Nature Preserve, is the only "classic" open-pond bog remaining in Illinois. Ecological problems typically associated with bogs include changes to the hydrological regimes, mining for peat, and invasion by non-native plant species, particularly glossy buckthorn. Four natural communities are represented within bogs in Illinois: **graminoid bog, low shrub bog, tall shrub bog,** and **forested bog** (White and Madany 1978), all of which occur in the FRAA.

Graminoid bog - This community is nearly always floating and can be considered the first stage in successional order for bogs. Several species of sphagnum mosses and sedges are co-dominant, with a number of other herbaceous species also present. Characteristic plants are bogbean, pitcher plant, and the round-leaved sundew. Other plant species include bog willow herb, bottlebrush sedge, common bur reed, common cattail, cotton sedge, Fraser's St. John's wort, grass-pink orchid, marsh cinquefoil, marsh fern, marsh skullcap, marsh St. John's wort, narrow-leaved woolly sedge, rusty cotton sedge, sensitive fern, smooth white violet, snake mouth, stiff bedstraw, three-way sedge, and water arum. Shrubs are uncommon but include American cranberry, dwarf birch, and leatherleaf. Some species, including American cranberry, bogbean, grass pink orchid, pitcher plant, round-leafed sundew, rusty cotton grass, snakemouth, and water arum, are state endangered or threatened. There is a total of 7.0 acres of high-quality graminoid bog in the FRAA. This comprises 72.2% of all undegraded habitat for this natural community in Illinois (Table 8).

Low-shrub bog - This community may or may not be floating, and there are two distinct layers, one of low shrubs and the other of mosses and herbaceous plants. Shrubs and subshrubs include leatherleaf, black huckleberry, and dwarf birch. Herbaceous plants include marsh cinquefoil, and bog bugbean. The following species, listed as state endangered or threatened are also found in low-shrub bogs: American cranberry, small cranberry, highbush blueberry, pitcher plant and the sedges *Carex brunnescens, C. trisperma,* and rusty cotton sedge. There are 29 acres of high-quality low shrub bog in the FRAA representing all (100%) of the undegraded low-shrub bog natural community in Illinois (Table 8). Ecological threats include invasion by tall-shrub species, including the non-native glossy buckthorn and tamarack (Taft and Solecki 1990).

Tall-shrub bog - White and Madany (1978) consider this as the climax condition for bogs in Illinois, and it occupies the most consolidated peat. The dominant plants are rather tall shrubs including black chokecherry, dwarf birch, inland shadbush, northern gooseberry, poison sumac, red osier dogwood, winterberry, and yellow birch. Herbaceous plants include Bebb's oval sedge, brownish sedge, cinnamon fern, Fraser's St. John's wort, marsh cinquefoil, royal fern, sensitive fern, smooth white violet, spinulose woodfern, and three-seeded bog sedge. The following are listed as endangered or threatened in Illinois: brownish sedge, inland shadbush, northern gooseberry, three seeded bog sedge, and yellow birch. There are 14 acres of high-quality, undegraded tall-shrub bog in the FRAA representing 14.7% of all the high-quality, undegraded tall shrub bog extant in Illinois (Table 8). Ecological problems include invasion by non-native species, particularly glossy buckthorn, and altered hydrology. Some sites were degraded by grazing.

Forested bog - This community is found on fairly well consolidated peat. Hummocks, (which tend to be more acid) and small depressions are characteristic (Reichle 1969, Sheviak 1974, Taft and Solecki 1990). There are two distinct strata, the tree stratum of American larch (a state threatened species) with a lower stratum of tall shrubs and saplings. This latter stratum contains American black currant, black huckleberry, Canada blueberry, dwarf birch, poison sumac, and winterberry. Herbaceous plants found in forested bogs include, cinnamon fern, cuckoo flower, and shining clubmoss. Some other trees in forested bog include black ash, paper birch, red maple, and silver maple. The following species listed as endangered or threatened in Illinois (Table 12) are also found in tall shrub bogs: bunchberry, highbush blueberry, dwarf raspberry, leatherleaf, northern gooseberry, brownish sedge, pink lady's slipper, showy lady's slipper, lady's slipper, small yellow, starflower, three-seeded bog sedge, water arum and yellow birch. A total of 99.0 acres of high-quality, undegraded forested bog occur in the FRAA representing all (100%) of the undegraded forested bog remaining in Illinois.

Fen

Bogs and fens are similar in that they are peatlands (peat accumulates when plant growth exceeds decomposition) and the peat in each community type typically is constantly saturated. In general, bogs are acidic, deficient in minerals, derive most nutrients from rainfall and runoff, and are in a basin which has limited drainage to the outside. Much of the upper horizon of peat is derived from sphagnum mosses while lower strata typically are composed of sedge peat. In contrast, fens usually are slightly to strongly calcareous, are constantly recharged with mineral-rich groundwater that has percolated through calcareous gravel in adjacent moraines, and most peat comes from sedges (see Bowles et al. 1996, Moran 1981, Sheviak and Haney 1973, Stynoff and Hess 1986, Stynoff 1993, Taft and Solecki 1990). Some fens occur within basins largely surrounded by moraines; typically, cool, calcareous, artesian ground water seeps up through the fen. Other fens form on level to slighly sloping areas where calcareous water seeps out of the bases of moraines. Floristically, these can resemble the seep natural community, however there is considerable peat deposition. Spring runs can be found within many fens, and grass-of-Parnassus, beaked spikerush, and marsh marigold are associated with this feature. Areas

of spring runs or where artesian ground water seeps into the fen can contain high levels of calcium carbonate, manganese, and sodium; these are called marl flats. Few species can tolerate the extreme conditions, a few that can include bush cinquefoil, fen star sedge, tufted hair grass, hair beak rush, Kalm's lobelia, swamp goldenrod, small-statured individuals of prairie dock, and beaked spikesedge.

Ecological problems associated with fens include grazing by domestic livestock, lowering of the water table caused by ditching and other drainage activities, and fire suppression. Some management recommendations have been suggested (Natural Resource Management Staff 1996) regarding burning brush piles in fens. Moran (1981) gives lists of herbaceous and woody species that increase with disturbances. Non-native species are also a major problem today, especially purple loosestrife and glossy buckthorn; the native gray dogwood is also increasing.

Within Illinois, fens are most common in the upper Fox River basin, and they frequently occur near gravelly moraines. Fens are often associated with strongly calcareous seeps, sedge meadows, marl flats, and marshes. Dry gravel and dry-mesic gravel prairies can be found on kames and eskers near fen formations. There are five fen communities in Illinois: **calcareous floating mat, graminoid fen, low shrub fen, tall shrub fen,** and **forested fen**. All of these except tall shrub fen occur in the FRAA.

Calcareous floating mat - This natural community is always a floating mat of sedge peat. Conditions are quite calcareous, and sphagnum mosses are usually absent, although they can form occasional pockets on the mat. A moderately tall layer of sedges and grasses dominates the mat. Dominant plants include blue joint grass, long-bracted tussock sedge, narrow-leaved woolly sedge, and swamp loosestrife. Some characteristic plants include beaked sedge, beaked spikesedge, bog willow, bogbean, common water horehound, cuckoo flower, hoary willow, and marsh cinquefoil.

In areas where both calcareous floating mats and graminoid fen occur, the dividing line between them is not clear. Consequently, many of the species listed below under graminoid fen can sometimes be found in calcareous floating mats. The following species that can occur in this natural community are listed as endangered or threatened in Illinois: cuckoo flower, hooded lady's tresses, pitcher plant, and small bladderwort. In the FRAA, there are 149 acres of high-quality, undegraded calcareous floating mat, representing 89.2% of the high-quality calcareous floating mat community type remaining in Illinois (Table 8).

Graminoid fen - In this community type, typically, the peat is formed on a slope at the edge of a moraine; more rarely, the peat forms as a raised island in a marsh or sedge meadow. In some instances, mesic prairie grasses are the dominant species, in other cases the dominants are sod-forming sedges (but not tussock forming sedges). Although the peat can be quite elevated, it resists decay due to the high levels of calcium and magnesium carbonate. Overall diversity of plant species can be quite high as a number of mesic prairie and wet prairie species occur in addition to typical fen species. Dominant

species include big bluestem, fen star sedge, Hayden's sedge, Indian grass, little bluestem, and prairie dropseed. Characteristic plants include bottlebrush sedge, grass-of-Parnassus, Kalm's lobelia, marsh blazing star, marsh marigold, marsh wild Timothy, Ohio goldenrod, and whorled loosestrife. In addition, the following species often occur: American bulrush, Buxbaum sedge, beaked sedge, Bebb's oval sedge, black-eyed Susan, bog bedstraw, bog willow herb, bristly sedge, common bog arrow grass, common mountain mint, common valerian, cotton sedge, cup plant, flat-stemmed spike rush, flat-topped aster, Fraser's St. John's wort, great bulrush, hooded lady's tresses, late goldenrod, marsh clubmoss, marsh fern, marsh skullcap, marsh vetchling, marsh wild Timothy, cowbane, northern bedstraw, northern bugle weed, pitcher plant, shrubby cinquefoil, small bladderwort, small fringed gentian, spotted Joe-Pye weed, swamp aster, swamp thistle, swamp wood betony, sweet grass, tall goldenrod, tufted loosestrife, and winged loosestrife.

Endangered and threatened species in this community are numerous (Table 12) including alder buckthorn, beaked sedge, bog bedstraw, common bog arrow grass, Crawe's sedge, false asphodel, few-flowered spikesedge, flat-leaved bladderwort, grass pink orchid, little green sedge, pitcher plant, Richardson's rush, showy lady's slipper, snake mouth, tall sunflower, tufted bulrush, white camass, and white lady's slipper. A total of 119 acres of undegraded graminoid fens occur within the FRAA representing about 89.5% of the high-quality (Category 1) graminoid fen habitats in Illinois (Table 8).

Low-shrub fen - This natural community is similar to graminoid fen, except that large, scarcely vegetated seepage areas with spring runs serve as fire breaks and low shrubs dominate. The dominant plants are fen star sedge and shrubby cinquefoil. Within the FRAA is 0.4 of an acre of high-quality, undegraded low-shrub fen representing the total area of this unique community type for Illinois (Table 8).

Forested fen - The typical forested fen occurs on fairly steep slopes. Tree cover is greater than 20%. Natural fire breaks are probably necessary for the development of this community. Dominant trees are black ash, American larch, and eastern white cedar. Characteristic plants are green orchid, skunk cabbage, marsh marigold, fowl manna grass, American black currant, bitternut, bulb bittercress, great Angelica, and spotted touch-me-not. Endangered and threatened species occurring in forested fen include eastern white cedar and dwarf raspberry (Table 12); purple avens and hemlock parsely formerly occurred in this habitat. Within the FRAA are 14.5 acres of high-quality forested fen representing nearly all (96.7%) of the undegraded remnants of forested fen in Illinois (Table 8). Wauconda Bog and Barrington Bog, both within the FRAA and considered here among the acreage figures for forested bog, are perhaps better classified as forested fen. Both sites, generally, lack sphagnum peat and are more circumneutral in pH reaction than typical bog habitats (Taft and Solecki 1990).

Sedge Meadow

Like bogs and fens, sedge meadows can occur on organic soils and sometimes include peat accumulation. The soil moisture is analogous to that of wet prairie. The diversity of plant species is generally low, and the structure and composition of this natural community is rather homogenous. The ecological integrity of most sedge meadow in the FRAA is threatened by invasive non-native plant species, especially purple loosestrife. Sedge meadows are also sensitive to lowering of the level of groundwater, caused by ditching.

The dominant plants in sedge meadow are common tussock sedge, river sedge, and blue joint grass. Other plants include blue flag, blue vervain, bog willow herb, bulblet water hemlock, Canada brome grass, common boneset, common cattail, common mountain mint, common water horehound, lady's thumb, downy willow herb, fowl manna grass, great angelica, great bulrush, late goldenrod, marsh bellflower, marsh fern, marsh fleabane, marsh St. John's wort, marsh vetchling, cowbane, mild water pepper, pale smartweed, prairie cord grass, purple meadow rue, red canary grass, rice cut grass, Riddell's goldenrod, rough avens, sawtooth sunflower, slender false foxglove, spotted Joe-Pye weed, swamp aster, swamp wood betony, swamp goldenrod, swamp milkweed, tall swamp marigold, white turtlehead, water parsnip, water smartweed, and winged loosestrife. Shrubs include pussy willow, red-osier dogwood, sandbar willow, and heart-leaved willow. The state endangered beaked sedge is one of the few endangered or threatened species found in sedge meadows (Table 12). There are 319 acres of high-quality sedge meadow in the FRAA representing 42.3% of the undegraded sedge meadow remaining in Illinois (Table 8).

Seep and Spring

Seeps are wetland communities characterized by a constant diffuse flow of ground water, typically from the lower portions of slopes of glacial moraines, ravines, and terraces (White and Madany 1978). The water chemistry of the ground water controls, to some extent species, composition and is influenced by the material it flows through. The Illinois Natural Areas Inventory (White 1978) identified about 30 high-quality seeps in the state. The majority of these seeps were in the Fox, Des Plaines, Illinois, and Vermilion river valleys. Many smaller and lower-quality seeps are frequent.

In Illinois, five different seep community types are recognized: **seeps (typical)** are circumneutral and occur where the ground water 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 ground water 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. Both *typical seeps* and *calcareous seeps* occur in the FRAA.

Ecological problems associated with seeps include degradation by over grazing and alterations to the watershed that influence ground water discharge. Non-native plant species that can be invasive are water cress and, in adjacent communities, purple loosestrife.

Seeps (typical) - The typical seep has water that is nearly neutral, or, as is mostly the case in the FRAA, slightly calcareous; this water is usually cold. Seeps can be open (informally called graminoid seep) or wooded (informally called forested seep). Typical seep plants include alternate-leaved dogwood, American black currant, black ash, bulb bittercress, bottlebrush sedge, cinnamon willow herb, clearweed, common horsetail, elderberry, fen star sedge, fowl manna grass, goldenglow, grass-of-Parnassus, great Angelica, hooked buttercup, marsh fern, marsh marigold, rice cut grass, scouring rush, side-flowered aster, skunk cabbage, spotted Joe-Pye weed, spotted touch-me-not, stout wood reed, swamp aster, swamp goldenrod, swamp saxifrage, swamp wood betony, tall bellflower, white turtlehead, turtlehead, wild sarsaparilla, willows, and wood anemone. Three state endangered plant species are known from forested seeps within the FRAA in Kendall County: American brooklime, false bugbane, and showy lady's slipper (Table 12). There are no high-quality (Category 1) seeps known from the FRAA.

Calcareous seep - This natural community is restricted in Illinois to the Wisconsinan till plain. The groundwater in this natural community is strongly calcareous, and tufa deposits (concentration of calcium carbonate) may form. In the FRAA, calcareous seeps are found at the bases of morainal systems and kames and eskers and often occur in association with fens. In typical seeps, peat does not form, however this distinction is not so clear with calcareous seeps. Many of the same plant species that occur in fens also occur in calcareous seeps. Plants found in calcareous seeps within the FRAA include American brooklime, beaked spike rush, ditch stonecrop, downy willow herb, false asphodel, grass-of-Parnassus, great Angelica, great bulrush, hair beak rush, marsh marigold, slender bog arrow grass, prairie dock, rice cut grass, short-fruited rush, shrubby cinquefoil, skunk cabbage, tufted bulrush, tufted hairgrass, twig rush, water parsnip, white beaked rush, winged loosestrife, and yellow monkey flower. Endangered and threatened species associated with calcareous seeps include American brooklime, beaked spike rush, false asphodel, tufted bulrush, white beaked rush, and yellow monkey flower (Table 12). Within the FRAA are 14.1 acres of high-quality calcareous seeps representing 58.5% of all undegraded calcareous seeps in Illinois (Table 8).

Lake and Pond

Lake and pond communities are open-water habitats, and natural lakes and ponds in northeastern Illinois are the result of the most recent glaciation. In the FRAA there is an abundance of natural ponds and lakes. Common plant species of aquatic habitats include American water plantain, arum-leaved arrowleaf, blue flag, common arrowhead, common bladderwort, common bur-reed, common cattail, common water plantain, common watermeal, coontail, dark green bulrush, eelgrass, ivy-leaved duckweed, grass-leaved

arrowhead, great bulrush, great duckweed, mare's tail, marsh yellow cress, marsh purslane, mermaid weed, mild water pepper, pickerel weed, rice cut grass, short-beaked arrowhead, slender naiad, small duckweed, southern naiad, spiked water milfoil, stiff arrowleaf, swamp milkweed, water cress (introduced), water shield, water smartweed, water star grass, waterweed, white water crowfoot, white water lily, yellow pond lily, and yellow water crowfoot.

Many species of pondweed occur in the FRAA, some of which are listed as endangered in Illinois (Table 12): comb pondweed, common pondweed, curly pondweed (non-native), fern pondweed, Fries' pondweed, grass-leaved pondweed, large-leaved pondweed, leafy pondweed, long-leaved pondweed, Richardson's pondweed, small pondweed, spotted pondweed, stiff pondweed), and white-stemmed pondweed. The ribbon-leaved pondweed (SE) and Vasey's pondweed (SE) are believed to be extirpated from Illinois.

Ecological problems with ponds and lakes include, drainage, degradation from livestock use, and siltation. Non-native plant species such as curly pondweed could become a problem.

Pond (natural) - Natural ponds include shallow-water wetlands less than 20 acres in size that are not excavated or impounded. They are usually shallow enough to allow rooted aquatic plants to grow across most of the area. All ponds in the FRAA are permanent ponds with water present all year. Ponds are distributed throughout most of Illinois. Those in the FRAA are of glacial origins. Within the FRAA are 184.4 acres of high-quality pond habitat representing 16.4% of all undegraded ponds in Illinois (Table 8).

Lake (natural) - Lakes are larger and deeper than ponds, thermal stratification is present in lakes but rarely in ponds; there is enough surface area for waves to develop to produce somewhere in the periphery a barren, wave swept shore, and at least the center of the lake is 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, and they are of frequent occurrence in the FRAA. There are 3,352 acres of high-quality lakes in the FRAA representing all (100%) of the undegraded natural lakes remaining in Illinois (Table 8).

Primary Habitats

The Primary class includes a wide variety of natural communities that all share the following characteristics: 1) soil is thin or absent with bedrock at or near the surface and 2) the communities are maintained at an early stage of primary succession. Main communities include glade, cliff, and lakeshore communities. No glades are present within the FRAA, however, small exposures of cliffs are present. Lakeshore was discussed briefly in the preceding section.

Cliff

Cliff communities occur on or near vertical faces of exposed bedrock or unconsolidated materials. Soils are mostly absent, and the plant communities are largely determined by the rock type. Aspect (the direction the cliff is facing) and amount of shade are also important. In Illinois, there are five natural cliff communities: **sandstone cliff, limestone cliff, dolomite cliff, sandstone overhang,** and **eroding bluff communities**. Only small amounts of dolomite cliff and sandstone cliff communities occur in the FRAA.

Dolomite cliff - This community is largely limited to stream valleys in northern Illinois. The pH of the dolomite is alkaline. Plants typical of dolomite cliffs include Bishop's cap, bladder fern, broadleaf goldenrod, clearweed, columbine, harebell, slender cliffbrake, smooth cliffbrake, smooth rock cress, and walking fern. There are 5.5 acres of high-quality, undegraded dolomite cliff in the FRAA (Table 8); figures are not available for the total amount of the dolomite cliff natural community in Illinois.

Sandstone cliff - In the lower Fox River valley in La Salle County, from Sheridan southward, sandstone cliffs locally border the Fox River. This is the only remaining place in Illinois where the state endangered red pine is naturally established. A few other plants observed on sandstone cliffs in La Salle County include harebell, blue skullcap, Canada yew, common polypody, downy arrowwood, elm-leaved goldenrod, false indigo bush, golden Alexanders, late figwort, leather flower, mouse-eared chickweed, ninebark, slender wild rye, small skullcap, small skullcap, snowberry, Solomon's seal, stalked water horehound, tall alumroot, Tennessee fragile fern, walking fern, white pine, wild petunia, and yellow stonecrop (introduced). This area has been little studied botanically, and it is likely that additional species not listed in Appendix 1 will be found here. The state threatened cliff goldenrod (*Solidago sciaphila*) grows in nearby Starved Rock State Park along the Illinois River and could also occur along the Fox River. Fameflower (*Talinum rugospermum*) is rare in Illinois and is known from along the Illinois River within one mile of the mouth of the Fox River.

Cultural Habitats

This class describes communities formed by anthropogenic activities and disturbances and includes **cropland, pastureland, successional fields, developed land, tree plantations, artificial lakes and ponds,** and **prairie reconstructions**. This is the major community class in the FRAA comprising about 84.3% of the total land area. No threatened or endangered species are known from cultural habitats in the FRAA. These areas impose some of the most challenging ecological problems for natural habitats in the FRAA (see discussion below). Two exceptions are the prairie reconstruction, termed prairie restoration by the INAI (White and Madany 1978), and efforts at wetland restoration. These are the only community types mentioned below (briefly) since they are the only examples in the Cultural community class of efforts to create natural communities.

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. The largest of these in the FRAA is at Fermilab in Batavia. Prairie reconstructions often are species-poor and strongly dominated by a few species. The total area of prairie reconstruction is unknown from within the FRAA. None have developed into communities that mimic undegraded tall-grass prairie in species richness or structure. [See McClain 1997, Packard and Mutel 1997a, and Schramm 1992.

Wetland restoration - Wetland restorations attempt to create a stable ecosystem that is functionally and compostionally similar to natural wetlands (Admiraal et al. 1997). In the implementation of Section 404 of the Federal Clean Water Act of 1972, wetland restorations or *de novo* wetland creations are one of the mitigation measures that can be mandated when natural wetlands are destroyed or seriously degraded. The same situation applies under the Illinois Interagency Wetland Policy Act of 1989. Consequently, there are many wetland restorations underway in Illinois. However, many so-called wetland restorations are simplistic and do not have the species diversity and ecological complexity of natural wetlands.

Summary and Recommendations

Trends in the Fox River Assessment Area among the terrestrial community classes of forest, savanna, and prairie indicate that habitat loss equals or exceeds statewide rates. The rate of habitat loss for wetlands and natural lakes and ponds is substantially less in the FRAA than statewide rates. The whole FRAA is of statewide significance today because there are a relatively large number of extant remnants of natural communities that are otherwise rare or absent in the rest of Illinois. Concomitantly, there are also a large number of state endangered and threatened plants species.

Despite the availability of a great deal of descriptive information regarding natural communities in the FRAA, there remain many knowledge gaps, particularly the distribution, abundance, qualitative condition, and ecological trends among remnants. This is particularly true for silt-loam prairies, formerly the most abundant community class in the FRAA. Though floristic information is available for the few remnants, there is a lack of quantitative data. Further, since remnants tend to have floristic differences (no two sites are the same), the fact that so little prairie remains suggests we have a poor resolution of the original (presettlement) species diversity for the FRAA. Particularly lacking are data on wet and mesic prairies, and the various savanna habitats, natural communities that formerly were common. Additional survey efforts in the FRAA may identify new populations of threatened or endangered species and noteworthy remnants of natural communities.

Many of the most challenging conservation issues in the FRAA are addressed primarily at the community and ecosystem levels. There are serious ecological problems that threaten the long-term maintenance of biodiversity in the FRAA. Throughout the natural community descriptions for the FRAA are consistent references to a set of related ecological problems. These are habitat fragmentation, habitat degradation, exotic species invasion, and, for several community types, fire absence. The following five steps are recommended as an approach for gaining further insights into the natural communities in the FRAA 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 critical qualitative standards of the INAI for undegraded and statewide-significant natural areas, contain regionally noteworthy and exceptional natural features. Many natural communities in the FRAA, although 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. Remnants among all community classes (e.g., forest, prairie, savanna, wetland, land and pond, and primary) need to be identified. For example, since no high-quality mesic prairie or floodplain forest habitats and little undegraded savanna remnants are known from the FRAA, identification of the degraded remnants is central to any recovery effort for these community types. Floristic Integrity Assessment, a method for evaluating the natural quality of habitat remnants that employs numerous parameters of community characteristics (including floristic inventory data and INAI grades), is a promising technique for distinguishing remnants of native vegetation that have restoration potential (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. 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, soil grading in railroad rights-of-way). 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 FRAA (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). A typical consequence is loss of species diversity. However, solutions to restoring biological connectivity and ecosystem-level process are extraordinarily complex and costly if the goal is to re-create corridors for all species among regional habitats. High levels of fragmentation may impose limits on maintaining or enhancing biodiversity in the long-term.

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 private woodland in Illinois that does not bear indications of past cattle grazing. The effects of over-grazing 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 are often 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 Illinois woodlands is a ground-cover and shrub flora dominated by common snakeroot, white snakeroot, buckbrush, Missouri gooseberry, blackberries (*Rubus* spp.), Virginia creeper, and the exotic garlic mustard. Usually, confounding influences such as grazing, increased shade, and siltation or other soil disturbances are involved.

Exotic species invasion can be considered both a species-level and a community-level problem. Some community-level management activities address more than one ecological problem. For example, garlic mustard invasion can be reversed with appropriately timed applications of fire (Nuzzo 1991, Schwartz and Heim 1996). Other serious exotic pests, such as purple loosestrife, require direct treatment or biological control (Thompson et al. 1987, Malecki et al. 1993). Exotic species known to pose severe ecological problems occur in the FRAA. Recommended control measures are summarized in Table 16.

Fire is an ecological force that historically influenced many aspects of natural communities in the FRAA. Many community types require fire for maintenance of community characteristics and diversity. Fire absence has resulted in changes in forest structure, composition, and diversity. Invasion of mesophytic species, such as sugar

maple, into oak-hickory forests is a statewide phenomenon related to fire absence. 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 dense 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.

Table 16. List of selected invasive exotic species known or suspected to occur in the Fox River Assessment Area and recommended eradication methods.

Species	Cut & Apply Stump-Treatmt Herbicide	Foliar Herbicide Application	Prescribed Fire	Cut &/or Hand Pull (get root)	Dig Root	Bio-Control	Cover w/ Black Plastic
Amur honeysuckle	X		X	X			
asparagus	X				X		
Autumn olive							
awnless brome grass		X					
black locust	X - Garlon 4						
Canadian bluegrass			X				
common buckthorn	X		X				
cut-leaved teasel		X			X		
Cypress spurge		?		X	X		
garlic mustard		X	X	X			
glossy buckthorn	X		X				
ground ivy		X	?	X			
Kentucky bluegrass			X				
meadow fescue		X	X		X		
moneywort		X	?				
motherwort		?		X	X		
multiflora rose	X						
orange day lily		X			X		X
Osage orange	X						
parsnip		X		X	X*		
periwinkle		X		X			
purple loosestrife		X		X		X	
Queen Anne's lace		X					
reed canary grass		X	X	X			
tree-of-heaven	X			X			
white mulberry	X						
white poplar	X		X				
white sweet clover			X	X			
yarrow		X		X			
yellow sweet clover			X	X			

[1] The recommended herbicide, typically, is Round-up (glyphosate) except for black locust (Solecki 1997).

[2] Asterisk (*) indicates plant has phototoxic properties and skin contact should be avoided.

A rich assemblage of spring wildflowers can still 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. Also, the spring flora often has been spared direct effects of cattle grazing because livestock, typically, have been rotated historically to fescue pastures during spring months. Infrequent application of prescribed fire appears unlikely to reverse these trends. Rather, a long-term program of repeated applications of prescribed fire is often necessary before compositional stability is achieved. 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 (Schwartz and Hermann 1997).

5. Application of appropriate vegetation management

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 (Taft et al. 1997) methods may provide a framework useful in measuring progress of each restoration activity.

BIRDS

Introduction

Information in this section is derived from standard references of Illinois, including the Illinois Natural Heritage Database (Illinois Department of Natural Resources 1997), 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 Fox River Assessment Area (FRAA) has an unusually diverse habitat mix for Illinois with significant natural lakes, grasslands, wetlands, and upland, riparian and floodplain forests as well as urban and agricultural forests. Typically in Illinois, forest habitats are chronically fragmented and will likely remain so for the foreseeable future; the FRAA is no exception. For many birds of forest habitats, these areas are often population "sinks" in which there is insufficient reproductive success to replace adults that die each year of natural causes. As a result, there are probably not many successful breeding populations of most species (Brawn and Robinson 1996). For this reason, wetland habitats should be the primary focus of conservation efforts in the region, especially those with adjacent upland grassland or forest habitats to buffer them from surrounding agricultural and residential areas. We know little, however, about the effects of fragmentation on wetland habitats. Similarly, intense focus should be placed on studies that examine migratory bird use of the limited habitats available in this region.

Bird species composition in the FRAA is typical of the northern tip of the state with the addition of a notably rich selection of wetland bird communities. At least 248 of the 299 species that regularly occur in the state (exclusive of vagrants) can be found in the area (Table 17). Of these 248 species, 152 breed or formerly bred there (Table 17). Of these, 50 are either locally extinct, or are rare during the breeding season (species with a "r" in Table 17), which suggests that some habitats may be in short supply in the FRAA. Several globally extinct species (Passenger Pigeon, *Ectopistes migratorius,* and Carolina Parakeet, *Conuropsis carolinensis*) formerly bred in the basin as did the locally extirpated Greater Prairie-Chicken (*Tympanuchus cupido*), Ruffed Grouse (*Bonasa umbellus*), and Yellow Rail (*Coturnicops noveboracensis*). Wild Turkeys have been reestablished in the FRAA.

The bird species that live in the FRAA 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 17). The following sections describe the bird communities typically found in the major habitat types of the FRAA, as well as the habitat-specific environmental problems and management solutions for bird communities in each habitat.

Table 17. Bird species that regularly occur in the Fox River Asessment Area. These are species that are likely to be present all or most years. This list excludes extinct species and 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]
Common Loon *Gavia immer*			Aq
Pied-billed Grebe - ST ***Podilymbus podiceps***	W		Aq W
Eared Grebe *Podiceps nigricollis*			Aq
Horned Grebe *Podiceps auritus*			Aq
Double-crested Cormorant - ST ***Phalarocorax auritus***	Aq^{r} W^{r}		Aq
American Bittern - SE ***Botaurus lentiginosus***	W^{r}		W
Least Bittern - SE ***Ixobrychus exilis***	W^{r}		W
Great Blue Heron *Ardea herodias*	Aq W Fs F	Aq W	Aq W
Great Egret - ST ***Ardea albus***	W^{r}		Aq W
Snowy Egret - SE ***Egretta thula***			W
Cattle Egret *Bubulcus ibis*	W^{r}		Ag G W
Green Heron *Butorides virescens*	A W Fs		Aq W Fs
Little Blue Heron - SE ***Egretta caerulea***			L W
Black-crowned Night-Heron - SE ***Nycticorax nycticorax***	W^{r} Fs^{r}	Fs W	
Yellow-crowned Night-Heron - ST ***Nycticorax violaceus***	W^{r} Fs^{r}		Fs
Tundra Swan *Cygnus columbianus*			Aq
Trumpeter Swan *Cygnus buccinator*			W Aq
Mute Swan *Cygnus olor*	Aq^{r} W^{r}		Aq
Greater White-fronted Goose *Anser albifrons*		L W	L W
Snow Goose *Chen caerulescens*		L C	L W C
Canada Goose *Branta canadensis*	W Ag Aq R	W Ag Aq R	W Ag Aq R

Table 17. Continued

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Wood Duck *Aix sponsa*	Fs W		Fs W
Green-winged Teal *Anas crecca*			W Aq
American Black Duck *Anas rubripes*	W[r]	Aq	W Aq
Mallard *Anas platyrhynchos*	W Aq	W Aq	W Aq
Northern Pintail *Anas acuta*	W[r]		W Aq
Blue-winged Teal *Anas discors*	W[r]		W Aq
Northern Shoveler *Anas clypeata*			W Aq
Gadwall *Anas strepera*			W Aq
American Wigeon *Anas americana*			W Aq
Canvasback *Aythya valisineria*			Aq
Redhead *Aythya americana*			Aq
Ring-necked Duck *Aythya collaris*			Aq W
Greater Scaup *Aythya marila*			Aq
Lesser Scaup *Aythya affinis*			Aq
Surf Scoter *Melanitta perspicillata*			Aq
Common Goldeneye *Bucephala clangula*		Aq	Aq
Bufflehead *Bucephala albeola*			Aq W
Hooded Merganser *Lophodytes cucullatus*	Fs[s]		Aq W
Common Merganser *Mergus merganser*		Aq	Aq
Red-breasted Merganser *Mergus serrator*			Aq
Ruddy Duck *Oxyura jamaicensis*	Aq[r] W[r]		Aq W
Turkey Vulture *Cathartes aura*	F G Ag Sav	F G C Fs Sav	F G Ag S Sav

Table 17. Continued

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Osprey - SE			Aq
Pandion haliaetus			
Bald Eagle - SE, FT	Aq	Ag Fs	Aq
Haliaeetus leucocephalus			
Northern Harrier - SE	G[r] W[r]	G Ag W	G Ag W
Circus cyaneus			
Sharp-shinned Hawk - SE	F[r]	F S R Fs Sav	F S R Fs Sav
Accipiter striatus			
Cooper's Hawk	F S	F S R Sav	F S R Sav
Accipiter cooperii			
Northern Goshawk		F S	F S
Accipiter gentilis			
Ruffed Grouse	F	F	F
Bonasa umbellas			
Red-shouldered Hawk - SE	Fs[r]	Fs	Fs
Buteo lineatus			
Broad-winged Hawk	F[r]		F
Buteo platypterus			
Red-tailed Hawk	F Ag G R S Sav	F Ag G R S Sav	F Ag G R S Sav
Buteo jamaicensis			
Rough-legged Hawk		Ag G	Ag G
Buteo lagopus			
Golden Eagle			F S G
Aquila chrysaetos			
American Kestrel	R Ag G S Sav	R Ag G S Sav	R Ag G S Sav
Falco sparverius			
Merlin			All
Falco columbarius			
Peregrine Falcon - SE, FE			All
Falco peregrinus			
Gray Partridge	Ag G S	Ag, G S	Ag G S
Perdix perdix			
* Ring-necked Pheasant	Ag G	Ag G	Ag G
Phasianus colchicus			
Wild Turkey	F S Fs Ag Sav	F S Fs Ag Sav	F S Fs Ag Sav
Meleagris gallopavo			
Northern Bobwhite	S G Ag Sav	S G Ag Sav	S G Ag Sav
Colinus virginianus			
Yellow Rail - SE			G W
Coturnicops noveboracensis			
Black Rail - SE	W[r]		G W
Laterallus jamaicensis			
King Rail - ST	W[r]		G W
Rallus elegans			

Table 17. Continued

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Virginia Rail *Rallus limicola*	W[r]		W G
Sora *Porzana carolina*		W	
Common Moorhen - ST ***Gallinula chloropus***			W Aq
American Coot *Fulica americana*	W[r]		W Aq
Sandhill Crane - SE ***Grus canadensis***	W[r]		W G Ag
Black-bellied Plover *Pluvialis squatarola*			Ag W
American Golden-Plover *Pluvialis dominicus*			Ag W G
Semipalmated Plover *Charadrius semipalmatus*			W
Killdeer *Charadrius vociferus*	Ag W R G		Ag W R G
American avocet Recurvirostra americana			W Aq
Greater Yellowlegs *Trings melanoleuca*			W
Lesser Yellowlegs *Tringa flavipes*			W
Solitary Sandpiper *Tringa solitaria*			W Aq
Willet *Catoptrophorus semipalmatus*			W
Spotted Sandpiper *Actitis macularia*	Aq[r]		W Aq[r]
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 mouri*			W
Least Sandpiper *Calidris minutilla*			W

Table 17. Continued

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
White-rumped Sandpiper *Calidris fuscicollis*			W
Baird's Sandpiper *Calidris bairdii*			W
Pectoral Sandpiper *Calidris melanotos*			Ag W G
Dunlin *Calidris alpina*			W Aq
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[r]		W G
American Woodcock *Scolopax minor*	Fs S		Fs S
Wilson's Phalarope - SE ***Phalaropus tricolor***	W[r]		W
Franklin's Gull *Larus pipixcan*			W Aq Ag
Bonaparte's Gull *Larus philadelphia*			Aq
Ring-billed Gull *Larus delawarensis*	W	W Aq Ag	W Aq Ag
Herring Gull *Larus argentatus*	W	Aq	W Aq Ag
Caspian Tern *Sterna caspia*			Aq
Common Tern - SE ***Sterna hirundo***			Aq
Forster's Tern - SE ***Sterna forsteri***	W[r]		Aq W
Black Tern - SE ***Chilidonias niger***	W[r]		W Aq
* Rock Dove *Columba livia*	R Ag	R Ag	R Ag
* Eurasian Collored Dove *Streptopelia decaocto*	R	R	R
Ringed Turtle Dove *Streptopelia risoria*	R	R	R
Mourning Dove *Zenaida macroura*	R Ag S W	R Ag S	R Ag S

Table 17. Continued

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
* Monk Parakeet *Myiopsitta monachas*	R[r]	R	R
Black-billed Cuckoo *Coccyzus erythropthalmus*	F S Fs		F S Fs Sav
Yellow-billed Cuckoo *Coccyzus americanus*	F S		F S
Barn Owl - SE ***Tyto alba***	Ag[r] G[r] Sav	Ag G Sav	Ag G Sav
Eastern Screech-Owl *Otus asio*	R S F Sav	R S F sav	R S F Sav
Great Horned Owl *Bubo virginianus*	F Ag R S G Sav	F Ag R S G Sav	F Ag R S G Sav
Snowy Owl *Nyctea scandiaca*		G Ag	
Barred Owl *Strix varia*	F Fs	F S	F S
Long-eared Owl - SE ***Asio otus***	F[r]	F S	F S
Short-eared Owl - SE ***Asio flammeus***	G[r]	G	G
Northern Saw-whet Owl *Aegolius acadicus*	F[r]	F S	F S
Common Nighthawk *Chordeiles minor*	R		R G Ag
Whip-poor-will *Caprimulgus vociferus*	F Sav		F Sav
Chimney Swift *Chaetura pelagica*	R F S Sav		R F S Ag Sav
Ruby-throated Hummingbird *Archilochus colubris*	F S R Fs Sav		F S R Fs Sav
Belted Kingfisher *Ceryle alcyon*	Aq	Aq	Aq
Red-headed Woodpecker *Melanerpes erythrocephalus*	F Fs R Ag Sav	F Fs Sav	F Fs Ag 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	F Fs R
Downy Woodpecker *Picoides pubescens*	F Fs S Sav	F Fs R S Sav	F Fs R S Sav
Hairy Woodpecker *Picoides villosus*	F Fs Sav	F Fs R S Sav	F Fs R S Sav
Northern Flicker *Colaptes auratus*	S F R Fs sav	S F R Fs Sav	S F R Fs Sav

Table 17. Continued

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Pileated Woodpecker *Dryocopus pileatus*	F Fs	F Fs	F Fs
Olive-sided Flycatcher *Contopus borealis*			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[r]		F S R Sav
Eastern Phoebe *Sayornis phoebe*	R Fs F		R Fs F
Great Crested Flycatcher *Myiarchus crinitus*	F Fs Sav		F Fs S Sav
Eastern Kingbird *Tyrannus tyrannus*	S G Ag Sav		S G Ag F Sav
Horned Lark *Eremophila alpestris*	Ag G	Ag G	Ag G
Purple Martin *Progne subis*	Aq R W G		Aq W G
Tree Swallow *Tachycineta bicolor*	Aq W Fs G		Aq W Fs G
Northern Rough-winged Swallow *Stelgidopteryx serripennis*	Aq W Fs G		Aq W G
Bank Swallow *Riparia riparia*	Aq W G		Aq W G
Cliff Swallow *Hirundo pyrrhonota*	Aq[r] W[r] G[r]		Aq W G
Barn Swallow *Hirundo rustica*	Ag R W Aq G		Ag R W Aq G S
Blue Jay *Cyanocitta cristata*	R F Fs S Ag Sav	R F Fs Ag Sav	R F Fs S Ag Sav
American Crow *Corvus brachyrhynchos*	All	All	All
Black-capped Chickadee *Parus atricapillus*	F S R Fs Sav	F S R Fs Sav	F S R Fs Sav
Tufted Titmouse *Parus bicolor*	F R Fs S Sav	F R Fs S Sav	F R Fs S Sav

Table 17. Continued

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Red-breasted Nuthatch *Sitta canadensis*	F[r]	R F	F R
White-breasted Nuthatch *Sitta carolinensis*	F R Fs Sav	F R Fs Sav	F R Fs Sav
Brown Creeper - ST ***Certhia americana***	F[r] 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[r] S[r]		R S
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
Marsh Wren *Cistothorus palustris*	W		W
Golden-crowned Kinglet *Regulus satrapa*		F Fs Sav	F Fs Sav
Ruby-crowned Kinglet *Regulus calendula*		F Fs	F Fs S Sav
Blue-gray Gnatcatcher *Polioptila caerulea*	F Fs S Sav		F Fs S Sav
Eastern Bluebird *Sialia sialis*	Ag G R S Sav	S F R Sav	S F Ag G R Sav
Veery - ST ***Catharus fuscescens***	F Fs		F Fs R S Sav
Gray-cheeked Thrush *Catharus minimus*			F Fs R S Sav
Swainson's Thrush *Catharus ustulatus*			F S R Fs Sav
Hermit Thrush *Catharus guttatus*		S F R Fs	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 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 Ag G Sav		S R Ag Sav

Table 17. Continued

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
American Pipit *Anthus rubescens*			Ag W G
Cedar Waxwing *Bombycilla cedrorum*	R S F Fs Sav	R S F Fs Sav	R S F Fs Sav
Northern Shrike *Lanius excubitor*		G S	
Loggerhead Shrike - ST ***Lanius ludovicianus***	G[r] S[r] Ag[r]	G S Ag	G S Ag
* European Starling *Sturnus vulgaris*	R Ag Fs G Sav	R Ag Fs G Sav	R Ag Fs G Sav
White-eyed Vireo *Vireo griseus*	S[r] Fs[r] F[r]		S Fs F
Bell's Vireo *Vireo bellii*	S[r]		S G
Solitary Vireo *Vireo solitarius*			F Fs S R Sav
Yellow-throated Vireo *Vireo flavifrons*	F Fs		F Fs R Sav
Warbling Vireo *Vireo gilvus*	S R Fs		S R F Fs
Philadelphia Vireo *Vireo phiadelphicus*			S F R Sav
Red-eyed Vireo *Vireo olivaceus*	F Fs		F Fs S R Sav
Blue-winged Warbler *Vermivora pinus*	S Fs		S F R Sav
Golden-winged Warbler *Vermivora chrysoptera*	S[r] F[r]		F S Fs R Sav
Tennessee Warbler *Vermivora peregrina*			F R S Fs S Sav
Orange-crowned Warbler *Vermivora celata*			S F R Sav
Nashville Warbler *Vermivora ruficapilla*			S F R Sav
Northern Parula *Parula americana*			F Fs R Sav
Yellow Warbler *Dendroica petechia*	S W		S W R Sav
Chestnut-sided Warbler *Dendroica pensylvanica*			S F Fs R Sav
Magnolia Warbler *Dendroica magnolia*			F S R Sav
Cape May Warbler *Dendroica tigrina*			R F S Sav

Table 17. Continued

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Black-throated Blue Warbler *Dendroica caerulescens*			F R Fs Sav
Yellow-rumped Warbler *Dendroica coronata*		F S Fs Sav	F S R Fs Sav
Black-throated Green Warbler *Dendroica virens*			F R Sav
Blackburnian Warbler *Dendroica fusca*			F Fs R Sav
Yellow-throated Warbler *Dendroica dominica*	F[r] Fs[r]		F Fs
Pine Warbler *Dendroica pinus*			F Fs Sav
Prairie Warbler *Dendroica discolor*			S
Palm Warbler *Dendroica palmarum*			Fs S F R W G Sav
Bay-breasted Warbler *Dendroica castanea*			F R Fs S Sav
Blackpoll Warbler *Dendroica striata*			F Fs R S Sav
Cerulean Warbler *Dendroica cerulea*	F[r] Fs[r]		F Fs R Sav
Black-and-white Warbler *Mniotilta varia*	F[r] Fs[r]		F R Fs S Sav
American Redstart *Setophaga ruticilla*	Fs		F Fs S R
Prothonotary Warbler *Protonotaria citrea*	Fs[r]		Fs
Worm-eating Warbler *Helmitheros vermivorus*	F[r]		F
Ovenbird *Seiurus aurocapillus*	F Sav		F R S Sav
Northern Waterthrush *Seiurus noveboracensis*			Fs W
Louisiana Waterthrush *Seiurus motacilla*	F		F Fs
Kentucky Warbler *Oporornis formosus*	F		F Fs Sav
Connecticut Warbler *Oporornis agilis*			S F Fs Sav
Mourning Warbler *Oporornis philadelphia*	Fs[r] S[r]		S F Fs Sav
Common Yellowthroat *Geothlypis trichas*	G Ag W S Sav		G Ag W S Sav

Table 17. Continued

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Hooded Warbler *Wilsonia citrina*	F[r]		F R Fs
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
Summer Tanager *Piranga rubra*	F Sav		F Sav
Scarlet Tanager *Piranga olivacea*	F Fs Sav		F Fs R Sav
Northern Cardinal *Cardinalis cardinalis*	R F Fs S Ag Sav	R F Fs S Ag Sav	R F Fs S Ag R Sav
Rose-breasted Grosbeak *Pheucticus ludovicianus*	F Fs S Sav		F Fs R S Sav
Blue Grosbeak *Guiraca caerulea*	S[r]		S
Indigo Bunting *Passerina cyanea*	F Fs S Sav		F Fs S Ag Sav
Dickcissel *Spiza americana*	G Ag		G Ag
Eastern Towhee *Pipilo erythrophthalmus*	S F Fs Sav	S F Sav	S F Fs R Sav
American Tree Sparrow *Spizella arborea*		S G Ag R W Sav	S G Ag R W Sav
Chipping Sparrow *Spizella passerina*	R S F		R F S Ag
Clay-colored Sparrow *Spizella pallida*	S[r]		S
Field Sparrow *Spizella pusilla*	S G Sav	S G W Sav	S G W Sav
Vesper Sparrow *Pooecetes gramineus*	Ag G		Ag G
Lark Sparrow *Chondestes grammacus*	G[r] Ag[r] Sav		Ag G Sav
Savannah Sparrow *Passerculus sandwichensis*	G		G
Grasshopper Sparrow *Ammodramus savannarum*	G		G
Henslow's Sparrow - SE ***Ammodramus henslowii***	G		G
Le Conte's Sparrow *Ammodramus leconteii*			G W

Table 17. Continued

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
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 G	R S W Ag G	R S W Ag G
Lincoln's Sparrow *Melospiza lincolnii*			S W Fs R Sav
Swamp Sparrow *Melospiza georgiana*	W	W Fs S G	S W Fs G
White-throated Sparrow *Zonotrichia albicollis*		R S F Fs Sav	R S F Fs Sav
White-crowned Sparrow *Zonotrichia leucophrys*		S R G	S R G
Harris' Sparrow *Zonotrichia querula*		S R	S R
Dark-eyed Junco *Junco hyematis*		R S F Fs G Ag Sav	R S F Fs G Ag Sav
Lapland Longspur *Calcarius lapponicus*		Ag G	Ag G
Smith's Longspur *Calcarius pictus*			G Ag
Snow Bunting *Plectrophenax nivalis*		Ag G	
Bobolink *Dolichonyx oryzivorus*	G		G W
Red-winged Blackbird *Agelaius phoeniceus*	W Ag R G S Sav	Ag G F Fs	W Ag R G S Sav
Eastern Meadowlark *Sturnella magna*	G Ag	G Ag	G Ag
Western Meadowlark *Sturnella neglecta*	G Ag	G Ag	G Ag
Yellow-headed Blackbird - SE ***Xanthocephalus xanthocephalus***	W[r]		W Ag G
Rusty Blackbird *Euphagus carolinus*		Fs Ag	R Ag Fs
Common Grackle *Quiscalus quiscula*	R W Fs F Ag	Ag R Sav	R Fs Ag
Brown-headed Cowbird *Molothrus ater*	All	Ag C R F Fs	All
Orchard Oriole *Icterus spurius*	S R W Sav		S R W Sav
Baltimore Oriole *Icterus galbula*	R F Fs S Sav		F Fs R S Sav

Table 17. Continued

Species[1,2]	Breeding[3,6,7]	Winter[4,6]	Migrant[5,6]
Purple Finch *Carpodacus purpureus*		F Fs R	F Fs R S Sav
* House Finch *Carpodicus mexicanus*	R S	R S	R S
Red Crossbill *Loxia curvirostra*		F R	F R
White-winged Crossbill *Loxia leucoptera*		F R	
Common Redpoll *Carduelis flammea*		G S R	
Pine Siskin *Carduelis pinus*	R[r] S[r] F[r]	R S F	R S F Sav
American Goldfinch *Carduelis tristis*	S R G	S R G F Fs Ag Sav	S R G F Fs Ag Sav
Evening Grosbeak *Coccothraustes vespertinus*		R F	R F
* House Sparrow *Passer domesticus*	R Ag	R Ag	R Ag

[1] Species in bold are: state threatened - ST, state endangered - SE, and/or federally endangered - FE.
[2] * designates 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:
Aq = Lakes, ponds, impoundments, rivers, larger streams
Ag = Row 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)
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 re-establishment in restored habitats.

Forest

Most of the remaining forest habitat is found along water; including rivers, around lakes, and adjacent to wetland complexes (Figure 7). Most data are from Chain-O-Lakes State Park (Hickman and Neal 1982) the Glacial Park—Nippersink Trail (Bohne 1985) areas, and Volo Bog (Hickman and Neal 1983).

Regularly Occuring Species

Typical species - Typical breeding species of forest habitats in the FRAA include Cooper's Hawk (rare but increasing), Wild Turkey (in the process of being reintroduced), Yellow-billed Cuckoo (erratic), Black-billed Cuckoo (erratic), Great Horned Owl, Barred Owl, Whip-poor-will, Chimney Swift, Ruby-throated Hummingbird, Red-headed Woodpecker, Red-bellied Woodpecker, Downy Woodpecker, Hairy Woodpecker, Northern Flicker, Pileated Woodpecker, Eastern Wood-Pewee, Acadian Flycatcher, Great Crested Flycatcher, Blue Jay, Black-capped Chickadee, Tufted Titmouse, White-breasted Nuthatch, Carolina Wren (population fluctuates depending upon winter weather), House Wren, Blue-gray Gnatcatcher, Veery (state threatened - SE), Wood Thrush, American Robin, Yellow-throated Vireo, Red-eyed Vireo, Ovenbird, Louisiana Waterthrush, Scarlet Tanager, Northern Cardinal, Rose-breasted Grosbeak, Indigo Bunting, and Brown-headed Cowbird. Rarer forest species that also nest within the FRAA include Broad-winged Hawk, Cerulean Warbler (Chain-O-Lakes State Park), Northern Saw-whet Owl (mostly nests north of Illinois), Least Flycatcher (especially in more open forests including willows in Chain-O-Lakes State Park), Red-breasted Nuthatch (northern species that occasionally nests in coniferous woods), Brown Creeper (ST) (mainly in floodplain forest), Yellow-throated Warbler (southern species at the northern edge of its range mainly associated with sycamores), Black-and-white Warbler (large forests only), Kentucky Warbler (also a southern species), Hooded Warbler (mostly a southern species), Canada Warbler (northern species), Summer Tanager (southern), and Baltimore Oriole (mostly in more open forests). This mix of northern and southern species is typical of northern Illinois, which lies at the transition between more southern (Carolinian) and northern forest types.

There are few stands of pine in this area. Pines are not native to the FRAA, and pine plantations have unusual bird communities. In addition to more generalized forest species, pine plantations in central Illinois occasionally attract nesting Long-eared Owls (state endangered - SE) [also in winter], Solitary Vireos, Pine Siskins, Yellow-bellied Sapsuckers, Golden-crowned Kinglets, Red-breasted Nuthatches, Yellow-throated Warblers, and Black-throated Green Warblers. Chipping Sparrows are often the most abundant species nesting in pine plantations. In winter, pines attract winter finches (e.g., crossbills, Pine Siskin), Yellow-bellied Sapsuckers, and Red-breasted Nuthatches.

Threatened and endangered species - Several state threatened and endangered species occur in forests in the area. Long-eared Owls (SE) breed occasionally in riparian woodlots as does the Brown Creeper (ST), which probably mainly occurs in forested wetlands (see below). The Sharp-shinned Hawk (SE) has nested occasionally. Veeries (ST) appear to be common nesters in most woodlots in the area, especially in Glacial Park, Volo Bog, the Bartlett Landfill, and Chain-O-Lakes State Park. The FRAA may be one of the major breeding areas for Veeries in the state.

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.

Population Dynamics and Management

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

Remarkably, in spite of low productivity, many species nest commonly in regional woodlots and are not obviously declining. This strongly suggests that their populations are being "rescued" by the settlement of individuals from much larger forest tracts outside of the region, or even outside of the state (Brawn and Robinson 1996). Therefore, to understand the population dynamics of breeding forest birds, it is necessary to monitor both population size and nesting success. Previous research on this subject in Illinois (Robinson et al., *in press*) suggests that the best candidates for forest restoration are tracts that are, or can be 500 acres or larger. Few forests in the FRAA are large enough to escape extreme levels of parasitism and predation. As will be described below, savanna restoration may be the best strategy for many sites given the high value of oaks to migrant birds (Graber and Graber 1983) and as source of mast and the fact that most forest tracts are too small to have anything but maximal rates of nest predation and brood parasitism.

Wetland

Although historically Wetlands may have accounted for over 30% of some counties in the FRAA, only about 4.9% (about 53,400 acres) remains in the area today (Figure 8, Table 5). Despite these losses, wetlands do still represent the most significant avian habitat in the area, providing valuable habitat to a rich assemblage of bird species.

Regularly Occuring Species

Typical species - In wetland habitats of the FRAA, typical species include the Pied-billed Grebe (ST), Great Blue Heron, Great Egret (ST), Green Heron, Canada Goose, Wood Duck, Mallard, Virginia Rail, Sora, Killdeer, American Woodcock, Ruby-throated Hummingbird [forested], Belted Kingfisher, Red-headed Woodpecker [forested], Northern Flicker [forested], Acadian Flycatcher [forested], Willow Flycatcher [shrubby], Purple Martin, Tree Swallow, Northern Rough-winged Swallow, Barn Swallow, Sedge Wren, Marsh Wren, Blue-gray Gnatcatcher [forested], Veery [forested], Gray Catbird [shrubby], Warbling Vireo [forested], Yellow Warbler [shrubby], Cerulean Warbler [forested], American Redstart [forested], Common Yellowthroat, Song Sparrow, Swamp Sparrow, Red-winged Blackbird, Common Grackle, and Baltimore Oriole. Rarer species include the Cattle Egret, American Black Duck, Northern Pintail, Blue-winged teal, Northern Shoveler, Hooded Merganser [forested], Ruddy Duck, Bald Eagle, American Coot, Spotted Sandpiper, Common Snipe, Ring-billed and Herring Gulls, Prothonotary Warbler, Mourning Warbler, and Canada Warbler. Alder Flycatchers may occasionally breed along the edges of bogs.

Threatened and endangered species - State threatened and endangered species abound in the wetland habitats of the FRAA; indeed, this is one of the major areas in the state for rare wetland species. There is a large number of records of breeding Pied-billed Grebes (ST), Double-crested Cormorants (ST), Least Bitterns (SE), Great Egrets (ST), Black-crowned Night Herons (SE), Yellow-crowned Night Herons (ST), Northern Harriers (SE), Red-shouldered Hawks (SE), Common Moorhens (ST), Forster's Terns (SE), Veerys (ST) [forested], Marsh Wrens (ST), and Yellow-headed Blackbirds (ST). Less common breeders include American Bitterns (SE), Bald Eagles (SE), King Rails (ST), Sandhill Cranes (SE), Wilson's Phalaropes (SE) and Brown Creepers (ST) [forested]. Notable sites for all these species include Chain-O-Lakes State park and Volo Bog as well as numerous other small marshes. There are several colonies of Forster's Terns, Great Egrets, and Black-crowned Herons. The Chain-O-Lakes area has one of the state's largest concentration of Sandhill Cranes. Black Rails (SE) and Yellow Rails (SE) formerly nested in wetlands in this area. Management and protection of wetland habitats for these species should be the highest avian conservation priority in the FRAA.

Exotic species - The only non-native wetland species is the Mute Swan, which breeds locally.

Population Dynamics and Management

Currently, the main problem for birds inhabiting wetlands is habitat loss and suburban encroachment. Some forested wetland species likely suffer from the same problems with fragmentation that affect forest species (cowbird parasitism and nest predation). We know little, however, about the effects of fragmentation on other wetland habitats. In fact, there have been no published studies of the population dynamics and nesting success

of wetland birds in the region. Potentially, wetland species are more resistant to fragmentation, which may make this habitat a good target for conservation efforts in this landscape. Wetland habitats are also used heavily by migrating waterfowl, shorebirds, rails and long-legged waders (herons, bitterns, and egrets). These habitats therefore have the potential to be important stopover sites for birds during migration. Wetland conservation should be the highest priority in the region for birds for reasons outlined above.

Savanna

Savanna habitats were once widespread in the Midwest. However, in recent decades as fire has become effectively suppressed, savanna habitats have been greatly altered through vegetative change. In addition to these changes, much of the savanna area has been lost to development and agriculture. As a result of these factors, savannas have become one of the rarest plant communties in the region (see section on "Savannas" in the Natural Vegetation Communities chapter of this report).

Regularly Occuring Species

Typical species - Savannas share many species with forest habitats. Perhaps the most typical species of savannas would be Whip-poor-will, Red-headed Woodpecker, Great Crested Flycatcher, Eastern Wood-Pewee, Least Flycatcher [rare, but often associated with open woodlands], Blue Jay, House Wren, American Robin, Eastern Bluebird, Blue-gray Gnatcatcher, Yellow-throated Vireo, Baltimore Oriole, Summer Tanager, Rose-breasted Grosbeak, Indigo Bunting, American Goldfinch, Lark Sparrow, Field Sparrow, and Chipping Sparrow. Of these species, the Summer Tanager may be the most specialized to savannas at this latitude. Other forest species remain common in savannas, including the Wild Turkey, Great Horned Owl, Ruby-throated Hummingbird, Northern Flicker, Red-bellied, Downy, and Hairy Woodpeckers, Carolina Chickadee, Tufted Titmouse, White-breasted Nuthatch, House Wren, Brown-headed Cowbird, Scarlet Tanager, and Northern Cardinal. The open, park like structure of some savannas also attracts some species that are more characteristic of grassland habitats, such as the Red-tailed Hawk. For many of these species, Illinois contains a significance portion of their global population.

Threatened and endangered species - None of the species inhabiting savannas in this area are threatened or endangered, although the Barn Owl (SE) may have been a bird of very open savannas. Veeries (ST) sometimes nest in savanna habitats (Hickman and Neal, 1982, 1985).

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

Population dynamics and Mangement

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, unpubl. data). Many of the species that are most abundant in savannas are resistant to cowbids (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). The partial dependence of the Cerulean Warbler on oaks may suggest that managemant practices such as burning that help maintain oaks will favor this rapidly declining species (Vanderah 1995). A detailed study of the effects of savanna restoration on bird populations, ecology, and nesting success is underway in adjaent watersheds (J.D. Brawn, unpubl. data). This study should be fully applicable to savannas in the FRAA.

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 FRAA, with only about 34 acres remaining in high-quality condition (see the section on "Natural Vegetation Communities" and Table 8 in the Introduction of this report). Many bird species that historically lived in prairies are, however, also able to live in grassland habitat, such as hay fields, and sometimes pastures. These habitats are also relatively uncommon in the FRAA. There are only about 185,943 acres of "grassland" in the assessment area (17% of the land area), and most of this habitat occurs as narrow strips along the edges of country roads (Figure 6). Nonetheless, although patches of available grassland habitat in the FRAA 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 Occuring Species

Typical species - In the FRAA, typical prairie/grassland species include a subset of those found on larger grasslands throughout the state: Red-tailed Hawk, American Kestrel, Northern Bobwhite, Ring-necked Pheasant, Eastern Kingbird, Willow Flycatcher [shrubs], Horned Lark [recently burned], Barn Swallow, Brown Thrasher [shrubs], Sedge Wren, Bell's Vireo [shrubs], Common Yellowthroat, Eastern Meadowlark, Western Meadowlark, Red-winged Blackbird, Dickcissel, Savannah Sparrow, Song Sparrow, Grasshopper Sparrow, Vesper Sparrow, Field Sparrow, Bobolink, and American Goldfinch (see Table 17 for a more complete list of grassland species found in the FRAA).

Threatened and endangered species - Currently, the Upland Sandpiper (ST), Short-eared Owl (SE), Northern Harrier (SE), Loggerhead Shrike (ST), and Henslow's Sparrow (SE) are the only endangered grassland species known to breed in the area.

Exotic species - Three introduced species are found in the grasslands of the FRAA. The Ring-necked Pheasant, which is native to Asia, was first released in Illinois in about 1890 (Bohlen and Zimmerman 1989) and they continue to be released. Gray Partridges have also been introduced, but are much less abundant than pheasants. European Starlings feed in grasslands following grazing, mowing, or burning.

Population Dynamics and Management

Certain species, such as the Grasshopper Sparrow and Bobolink, have declined precipitously as grasslands have been converted to row crops (Herkert 1991). Currently, prairie remnants and other grassland habitats are probably too small to sustain regular breeding populations and successful nesting of most prairie species. For example, the Short-eared Owl is highly area-sensitive and will require larger grasslands than exist currently to maintain a regular breeding population. Recently (1996) Henslow's Sparrows (SE) have bred in Conservation Reserve Program (CRP) fields in the area (A. Capparella, pers. comm.). This species is also area-sensitive and requires taller, ranker grass that has not recently been burned (Herkert 1994). King Rails (ST) and Northern Harriers (SE) would also be good candidates for re-establishment in restored grasslands. Upland Sandpipers (ST) nest in nearby areas, but they require mowing, grazing, or burning to keep the grass short. Upland Sandpipers are also area-sensitive and likely require larger grassland areas than are currently available. Other rare or locally extirpated species that would be likely to increase rapidly if grasslands were restored include Sedge Wren, Loggerhead Shrike (ST), Bobolink, and Lark Sparrow [sandy areas]. Because the currently available grassland is decreasing, prairie restoration and enhancement will be needed to attract grassland birds.

Removal of woody vegetation may also be beneficial. Shrub removal would likely negatively affect Bell's Vireos, but this species can also be managed in game areas or in prairie remnants that are too small to be useful for grassland birds. Other 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, Yellow-breasted Chat) 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 eta l. (1993) for grassland management should be followed. In particular, dense, tall stands of prairie grasses are rarely used by grassland birds and should be avoided.

Migrant birds use grasslands as stopover habitat, especially Smith's and Lapland Longspurs, various rails, bitterns, American Golden Plovers, and Pectoral Sandpipers.

Lakes, Ponds, Impoundments, Creeks, and Rivers

There are several natural lakes and ponds in the FRAA, as well as a number of impoundments. Open water accounts for 1.5% (16,176 acres) of the FRAA. Relative to the rest of the state, the creeks and rivers of the FRAA are in relatively good health (see the "Aquatic Biota" section of this report) and there are 18 biologically significant stream segments in the area. Nonetheless, as with several other habitats in the FRAA, creeks and rivers have been greatly altered and suffer from several forms of degredation.

Regularly Occuring Species

Typical species - All of the habitats covered under this heading offer a common habitat feature for birds - open, permanent water and a littoral zone. Spotted Sandpipers may occasionally breed around lakes, ponds, and impoundments. Common Grackles, Red-winged Blackbirds, and Song Sparrows likely nest along ponds, especially those with gradual shorelines and some emergent vegetation (e.g., cat-tails) along the edge. Barn Swallows, Cliff Swallow, Purple Martins, and Tree Swallows forage over the open-water habitats as long as nest sites are available. Green Herons often nest along ponds lined with dense, woody vegetation.

Among the species found along creeks and rivers are the following: Canada Goose, Mallard, Wood Duck [forested], Cooper's Hawk [forested corridors], Great Blue Heron, Green Heron [forested], Killdeer, Great Horned Owl [forested], Barred Owl [forested], Belted Kingfishers, Eastern Phoebe [especially near bridges], Willow Flycatcher [shrubby margins], Barn Swallow, Northern Rough-winged Swallow, House Wren [in woody debris], Cedar Waxwing, Warbling Vireo [woody corridors, especially cottonwoods and willows], Yellow Warbler [shrubby corridors], Yellow-throated Warbler [sycamore-lined natural levees], Common Yellowthroat [grassy and shrubby streamsides]. Common Grackle, Red-winged Blackbird, Orchard Oriole [willow-lined streams], Baltimore Oriole [woody corridors], Indigo Bunting, Song Sparrow [shrubby steamsides].

Threatened and endangered species - Forster's Terns (SE) breed at Chain-O-Lakes State Park. Double-crested Cormorants (ST) also nest in several sections of the FRAA.

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 they are becoming increasingly more common.

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. 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.

We lack data on populations and nesting success of birds in riparian corridors of varying widths and of their use by migrants. However, increasing the amount of woody riparian corridor habitat should enhance populations of many species, and would help restore natural hydrology. Restoring the hydrology would, in turn, improve wetland habitat in the floodplain, both in woody backwaters and in oxbows. It would also be interesting to measure the movements of migrants along corridors to determine if they act as flyways.

Cultural Habitats: Cropland

Agricultural areas generally provide poor habitat for most birds — plant diversity in cropland is much lower than in the original habitats. However, it is still important to consider the role of agricultural habitats for supporting bird populations. In the FRAA much of the land has been usurped for crop production.

Regularly Occuring Species

Typical species - Cropland bird communities in the FRAA have the same bird species that are common statewide in this structurally simple habitat: Mallard, Red-tailed Hawk, American Kestrel, Ring-necked Pheasant, Killdeer, Rock Dove, Mourning Dove, Great Horned Owl, Eastern Phoebe [farmsteads], Horned Lark, Barn Swallow, American Crow, Eastern Bluebird (where nest boxes are provided), Loggerhead Shrike (ST), European Starlings, House Sparrow, Common Grackle, Brown-headed Cowbird, Red-winged Blackbird, Vesper Sparrow, and Field Sparrow. Some species characteristic of recently burned and heavily grazed, dry grasslands have adapted to croplands, including the Horned Lark and Vesper Sparrow.

Threatened and endangered species - The Loggerhead Shrike (ST) is the only threatened or endangered species typically found in croplands of the FRAA. This species also requires spiny hedgerows for nesting and, as a result, is becoming increasingly rare in the area.

Exotic species - Introduced species thrive in the agricultural habitats of the FRAA. In fact, four of the most abundant species in the cropland of the FRAA, Ring-necked Pheasant, Rock Dove, European Starling and House Sparrow, were all introduced from Europe or Asia. Gray Partridges have also been established in the FRAA.

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 Henslow's, Grasshopper, and Savannah Sparrows.

Intensively farmed areas offer little in the way of stopover habitat except around farmsteads and flooded fields which are used by large numbers of shorebirds (especially Lesser Golden Plover and Pectoral Sandpipers). In winter, flocks of Snow Buntings and Lapland Longspurs join the resident Horned Larks, and Rough-legged Hawks that forage over some fields.

Cultural Habitat: Successional Fields

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

Regularly Occuring Species

Typical species - Successional habitats dominated by forbs, shrubs, and saplings offer rich habitat for many breeding birds. Typical species include Northern Bobwhite, Ring-necked Pheasant, American Woodcock (wet areas), Mourning Dove, Yellow-billed Cuckoo, Black-Billed Cuckoo, Ruby-throated Hummingibrd, Northern Flicker, Downy Woodpecker, Eastern Kingbird, Willow Flycatcher [wet thickets], Blue jay, Carolina Chickadee, House Wren, Carolina Wren, Gray Catbird, Brown Thrasher, American Robin, Eastern Bluebird, Blue-gray Gnatcatcher, Cedar Waxwing, White-eyed Vireo [rare this far north] Bell's Vireo [very young thickets], Yellow Warbler, Chestnut-sided Warbler, Common Yellowthroat, Yellow-breasted Chat, Red-winged Blackbird, Orchard Oriole, Baltimore Oriole [older thickets], Orchard Oriole, Northern Cardinal, Rose-breasted Grosbeak [older thickets], Indigo Bunting, House Finch, American Goldfinch, Eastern Towhee, Lark Sparrow [sandy soild, open thickets], Field Sparrow, and Song Sparrow. Successional habitats add greatly to local diversity, although only a few of these species have nationally declining populations (Yellow-breasted Chat, Field Sparrow, Golden-winged Warbler, Blue-winged Warbler). Kentucky Warblers and Wood

Thrushes also nest in late-successional thickets. Occasionally, northern species nest in successional thickets, including Canada and Mourning Warblers and the Clay-colored Sparrow.

Threatened and endangered species - No threatened or endangered species are known to depend on successional habitats in the FRAA.

Exotic species - Ring-necked Pheasants can be abundant in early successional fields. House Finches are native to the western United States, but since a captive population was released on Long Island in the 1940s they have spread westward and are now common in the FRAA, where they often breed in successional fields.

Population Dynamics and Management

Successional habitats add greatly to local diversity and at least a few species that are declining nationally and have few or no remaining natural habitats (e.g., Prairie Warbler, Yellow-breasted Chat), or are rare in Illinois (e.g., Bell's Vireo, Lark Sparrow), use this habitat extensively. For some of these species, Illinois may contain a significant portion of their global population (e.g., Orchard Oriole, Bell's Vireo). For these reasons, maintaining successional vegetation may be an important part of a conservation strategy in the FRAA.

Shrubland birds are presently the object of intensive study in another part of the state (S.K. Robinson, E.J. Heske, and J.D. Brawn, in progress). The information gathered from this study will help land managers to design management strategies that will benefit both game and nongame species and provide relatively stable habitat for some declining species. Nest predation rates in successional fields are very high for most, but not all species, whereas brood parasitism levels are low for all but a few species. Most species have adaptations that enable them to cope with nest predation (aggressive nest defense, rapid renesting following losses of nests to predators, a long nesting season allowing many nesting attempts) and cowbird parasitism (abandonment of parasitized nests, inappropriate diet for cowbird nestlings, ejection of cowbird eggs, long or late nesting season that continues after cowbirds stop parasitizing nests in mid-July). As a result, most species do not appear to be in real trouble. The exceptions mostly include neotropical migrants that have a short breeding season and are parasitized (Yellow-breasted Chat, Orchard Oriole). It appears that even relatively small shrublands (<5 acres) can provide habitat for many shrubland species because of their resistance to parasitism and nest predation.

Shrublands are also very heavily used by migrating species, especially when mingled with scattered trees. Shrubland-preferring migrants include Black-billed Cuckoo, Northern Saw-whet Owl [mainly in evergreens], Yellow-bellied Flycatcher, Alder Flycatcher, Least Flycatcher, Philadelphia Vireo, Golden-winged Warbler, Orange-crowned Warbler, Chestnut-sided Warbler, Mourning Warbler, Connecticut Warbler, Wilson's Warbler, Canada Warbler, and Lincoln's Sparrow. Shrubland habitats therefore provide real benefits to migrant birds and greatly increase local biodiversity.

Cultural Habitats: Developed Land

Residential and urban areas represent 17.3% of the FRAA. These areas, scattered with lawns, parks, and other manicured vegetation, offer suitable breeding habitat for relatively few bird species.

Regularly Occuring Species

Typical Species - Typical breeding species include 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 Woodpecker ["urban forests"], Eastern Wood-Pewee, Eastern Phoebe, Barn Swallow, Purple Martin, Blue Jay, American Crow, Black-capped Chickadee, Tufted Titmouse, White-breasted Nuthatch, House Wren, Carlina Wren, Gray Catbird, Brown Thrasher, American Robin, Eastern Bluebird [farmsteads], European Starling, Warbling Vireo, Common Yellowthroat, House Sparrow, Common Grackle, Brown-headed Cowbird, Baltimore Oriole, Northern Cardinal, House Finch, American Goldfinch, Chipping Sparrow, and Song Sparrow.

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

Threatened and endangered species - Now that the Bewick's Wren is absent from the region, there are no threatened or endangered species found in residential or urban areas other than the Loggerhead Shrike (ST), which often forages in mowed grass of rural farmsteads.

Exotic species - 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 in developed areas. Monk Parakeets, Eurasian Collared Doves, and Ringed Turtle Doves are all rare established nesters in some residential and urban areas.

Population Dynamics and Mangement

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. However, more data are needed because 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.

Although not well suited to support many native breeding birds, developed land such as tree-lined residential areas can be very important for migrating landbirds. These species 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.

Overall Habitat Quality, Management Issues, and Concerns

For breeding birds, we recommend the following strategies for improving habitats:

Forests - Most upland forest sites in the FRAA are small and have little potential to be enlarged sufficiently to create tracts large enough to avoid extremely high levels of nest predation and brood parasitism. For these areas, restoration of native plant communities coupled with judicious consideration of the needs of migrant birds (some shrubby areas and oak trees) might be the best management strategy. Forest restoration efforts should be concentrated in areas that have the potential to contain at least a 500-acre core. Upland forests should be managed to maintain oaks and floodplain forests should contain sycamores.

Grasslands - Where possible, grasslands should be at least 100 acres, should be burned or mowed on a schedule that leaves some areas unmanaged for at least three years, and should contain small wetlands. Woody vegetation should be kept to a minimum.

Wetlands - The FRAA contains remarkably rich wetland bird communities and a diverse array of both northern and southern species. Wetland conservation should clearly be of the highest priority in the FAA because of relatively large populatiosn of many state threatened and endangered species. Grassland restoration, especially around existing

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

Shrublands - These habitats can be managed simultaneously for game and nongame birds.

Developed and agricultural areas - 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. Any plantings that add cover and nest sites should be encouraged, especially to provide habitat during the nonbreeding season.

Mammals

Introduction

Information in this section has been compiled primarily from range maps and known records in Hoffmeister (1989), the Illinois Natural Heritage Database (Illinois Department of Natural Resources 1997), and mammal surveys along the Fox River in Kane County (Hofmann 1996) and at Poplar Creek Forest Preserve in western Cook County (Sliwinski 1994). Taxonomy follows Wilson and Reeder (1993).

Mammal species known or likely to occur in the Fox River Assessment Area (FRAA) are listed in Table 18. The 44 species in this table represent approximately 74% of the 58-60 mammal species that currently occur in Illinois (Hoffmeister 1989). The population status of these species in the FRAA is unknown; therefore, designations in Table 18 are projections based on their status in other parts of Illinois. Of the nine mammal species listed as threatened and endangered in Illinois (Illinois Endangered Species Protection Board 1994), only one, the state endangered river otter (*Lontra canadensis*), has been recorded within the FRAA (Illinois Department of Natural Resources 1997). This species has been included in Table 18 even though there are no records within the last 10 years. Blackball Mine (at Pecumsaugan Creek/Blackball Mine Nature Preserve) in La Salle County is used as a hibernaculum by federally endangered Indiana bats (*Myotis sodalis*) and a migrating Indiana bat was collected in Chicago (Cook County) in 1928 (Hoffmeister 1989); however, there are no records of this species occurring as far north as the FRAA during the summer (Gardner et al. 1996). The state threatened bobcat (*Lynx rufus*) has been observed south of the FRAA at Pecumsaugan Creek/Blackball Mine Nature Preserve (Illinois Department of Natural Resources 1997) and there is some potential for bobcats to occur in the southern portion of the FRAA.

Forest

Typical Species

Mammal species known or likely to occur in the FRAA that are restricted to forested habitats include the hoary bat, silver-haired bat, eastern chipmunk, gray and fox squirrels, southern flying squirrel, woodland vole, and gray fox. Species that are primarily associated with forested habitats but also occur in other habitats include the red bat, white-footed mouse, and raccoon. All other species of bats use forested habitats extensively, although many roost in caves, abandoned mines, or buildings. Some species, such as the eastern cottontail, woodchuck, and white-tailed deer, require wooded habitat at certain times of the year or specialize in the use of forest edges. Additional habitat generalists typically found in forests in the FRAA are listed in Table 18.

Table 18. Mammal species known or likely to occur in the Fox River Assessment Area[1].

Common name[2]	Order *Scientific Name*	Habitat[3]	Population status[4,5]
Marsupials:	Didelphimorphia		
Virginia opossum	*Didelphis virginiana*	W, G, F	C
Insectivores:	Insectivora		
masked shrew	*Sorex cinereus*	W, G, F (mesic)	C
pygmy shrew	*Sorex hoyi*	W, G, F (mesic)	R
northern short-tailed shrew	*Blarina brevicauda*	W, G, F	C
least shrew	*Cryptotis parva*	G	C?
eastern mole	*Scalopus aquaticus*	G, F	C
Bats:	Chiroptera		
little brown bat	*Myotis lucifugus*	F, caves, buildings	C
northern long-eared bat	*Myotis septentrionalis*	F, caves, buildings	C
silver-haired bat	*Lasionycteris noctivagans*	F, caves (hibernation)	U?
eastern pipistrelle	*Pipistrellus subflavus*	F, caves, buildings	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	C
Rodents:	Rodentia		
eastern chipmunk	*Tamias striatus*	F	C
woodchuck	*Marmota monax*	G, F (edges)	C
thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*	G	C
Franklin's ground squirrel	*Spermophilus franklinii*	G	U?
gray squirrel	*Sciurus carolinensis*	F, urban	C
fox squirrel	*Sciurus niger*	F	C
southern flying squirrel	*Glaucomys volans*	F	C
beaver	*Castor canadensis*	W	C
western harvest mouse	*Reithrodontomys megalotis*	G	C
deer mouse	*Peromyscus maniculatus*	G	C
white-footed mouse	*Peromyscus leucopus*	W, G, F (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
* Norway rat	*Rattus norvegicus*	buildings	C
* house mouse	*Mus musculus*	G, buildings	C
meadow jumping mouse	*Zapus hudsonius*	W, G, F	U?
Carnivores:	Carnivora		
coyote	*Canis latrans*	W, G, F	C
red fox	*Vulpes vulpes*	W, G, F	C
gray fox	*Urocyon cinereoargenteus*	F	U?
raccoon	*Procyon lotor*	W, G, F	C
least weasel	*Mustela nivalis*	G	U?

Table 18. Continued

Common name[2]	Order *Scientific Name*	Habitat[3]	Population status[4,5]
long-tailed weasel	*Mustela frenata*	W, G, F	C
mink	*Mustela vison*	W, G (mostly W)	C
badger	*Taxidea taxus*	G	U
striped skunk	*Mephitis mephitis*	W, G, F	C
river otter (SE)	***Lontra canadensis***	**W**	**R**
Even-toed ungulates:	Artiodactyla		
white-tailed deer	*Odocoileus virginianus*	W, G, F	C

[1] Compiled from range maps and known records reported in Hoffmeister (1989), Illinois Department of Natural Resources (1997), Hofmann (1996), and Sliwinski (1994).
[2] Bold type indicates a state endangered (SE) species; * = exotic 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.

Most species of mammals associated with forests are not restricted to one type of forest (i.e., upland, floodplain, or flatwoods) and use a variety of forest types seasonally or opportunistically. However, species that hibernate (woodchucks, eastern chipmunks) or are primarily fossorial (woodland voles) need well-drained, uninundated soils. Gray fox are more abundant in upland forests than swamps, but also may be abundant in bottomland forests (Hoffmeister 1989). Fox squirrels are more strongly associated with upland forests, but gray squirrels can be abundant in both upland and floodplain forests. Gray squirrels require extensive tracts of forest, whereas fox squirrels can occupy open forests, woodlots, and fencerows (Hoffmeister 1989). Gray squirrels, however, also occur in many urban areas, including those in the FRAA (e.g. Elgin, Aurora; Nixon et al. 1978). Tree squirrels, flying squirrels, and chipmunks tend to be most abundant in forests with a heavy component of mast-producing trees such as oaks and hickories. Raccoons are most abundant in forest tracts with proximity to water (Hoffmeister 1989).

Threatened and Endangered Species

A bobcat was sighted at Pecumsaugan Creek/Blackball Mine Nature Preserve in La Salle County in 1993 (Illinois Department of Natural Resources 1997). This nature preserve is within 20 km of the southern edge of the FRAA. It is possible that bobcats could occur in the riparian corridor along the Fox River in the southern part of the FRAA and conservation efforts might increase the potential for bobcats to use this portion of the FRAA.

Habitat Requirements and Distribution of Listed Forest-dwelling Species

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). Male bobcats in Missouri have annual home ranges of 46 to 72 km^2 and female ranges cover 13 to 31 km^2 (Schwartz and Schwartz 1981). Rhea (1982) identified areas greater than 259 km^2 with more than 50% forest cover and good interspersion of open areas, streams, and rocky terrain as optimal habitat for viable breeding populations of bobcats. According to these criteria, the best potential breeding habitat in Illinois is located in the Shawnee Hills region, along the lower Illinois River, and in the northwestern corner of the state. There are recent bobcat records for 24 counties, most of which are in southern and northwestern Illinois (Illinos Department of Natural Resources 1997).

Exotic Species

The Norway rat and house mouse are the only known exotic mammals in the area. The Norway rat, in particular, is strongly associated with human structures. Both species may be found in woodlots in proximity to human structures, but neither is generally considered a forest species. These species are now so widespread that they are part of the mammalian fauna throughout the United States. Not much can be done to rectify this situation and it is not one for concern. Domestic mammals, such as house pets, frequently cause problems for wildlife. Free ranging and feral house cats (*Felis sylvsetris*), in particular, can have severe negative impacts on native songbirds and small mammals (Warner 1985, Coleman and Temple 1996). However, it is not clear how extensively they forage in the interior of forests.

Information Gaps

Data on the population status of several forest-dwelling species are not available. Additional information on the distribution and abundance of the silver-haired bat, hoary bat, evening bat, woodland vole, and gray fox would be valuable. Because forest habitat is fragmented and reduced in area in much of the FRAA, it would be valuable to assess the ability of forest species to maintain viable populations and to disperse between remaining forested tracts, especially those in an urban landscape.

Enhancement and Restoration Potential

Protecting both upland and floodplain forested tracts and maintaining dispersal corridors such as forested riparian zones could enhance the suitability of the FRAA as habitat for gray fox and bobcat. Managing forests to maintain large snags with exfoliating bark or cavities would provide roosting habitat for forest-dwelling bats and den sites for other mammals, including the southern flying squirrel.

Wetland

Typical Species

Mammal species occurring in the FRAA whose life history requires wetland habitats include the beaver, muskrat, mink, and, perhaps, river otter. In addition, all species of bats found in the FRAA would use wetland areas, primarily as foraging habitat. The masked, pygmy, and northern short-tailed shrews and meadow jumping mouse use wetlands extensively in addition to grasslands. Other habitat generalists that use wetlands are listed in Table 18. Because the same subset of mammal species found in the FRAA is likely to be associated with lakes, ponds, impoundments, creeks, and rivers as well as marshes, bogs, and fens, this section should serve as a report on mammals in mesic habitats in general. Small mammals such as the northern short-tailed shrew and meadow jumping mouse may be found in mesic areas without standing water, whereas the larger mammals such as the river otter, beaver, and muskrat require open water (still or moving) habitats.

Threatened and Endangered Species

There are two records for the state-endangered river otter within the FRAA: an otter was sighted near Batavia (Fabyan and Kaneville roads) in 1981 and two otters were observed on an iceflow in the Fox River below the Elgin dam in 1986 (Illinois Department of Natural Resources 1997). The lack of more recent records in the area suggests that these individuals were transients. The Natural Heritage Database (Illinois Department of Natural Resources 1997) includes other recent otter records in the vicinity of the FRAA (McHenry, Du Page, and La Salle counties) and there is the potential for migrants from Wisconsin to occur on the Fox River. The upper portion of the FRAA in McHenry and Kane counties is highly developed (although with considerable greenspace along the Fox River) and may be of limited suitability for resident river otters. The lower portion of the river in Kendall and La Salle counties flows through rural areas and might be more suitable for this species.

Habitat Requirements and Distributions of Listed and Rare Wetland Species

River otter — River otters occupy a variety of aquatic habitats, from coastal swamps and marshes to high mountain lakes (Toweill and Tabor 1982). They are abundant in estuaries, the lower reaches of rivers, and the tributaries and lakes of unpolluted river systems, but scarce in densely populated areas, especially if the water is polluted (Toweill and Tabor 1982). In Illinois, river otters have been found in shallow lakes, sloughs, cypress swamps, rivers, streams, drainage ditches, and ponds (Anderson 1982, Anderson and Woolf 1984). Habitat used by river otters in northwestern Illinois has the following characteristics: isolation from the main river channel (providing a relatively stable water level), extensive riparian forest (or emergent herbaceous vegetation), the persistence of open water during winter, good water quality (and healthy fish populations), the presence of suitable den sites (e.g. beaver lodges, log piles, exposed tree roots), and minimal human disturbance (Anderson and Woolf 1984). The shape of river otter home ranges is determined by the type of habitat and their size is influenced by prey abundance, topography, weather conditions, and the individual's reproductive status (Melquist and Hornocker 1983). At the Lamine River Wildlife Area in Missouri otter home ranges were 11-78 km in length (Erickson et al. 1984). Only a portion of the range is used at any time; activity centers are located in areas with abundant food and suitable shelter and are changed frequently (Melquist and Hornocker 1983). River otters may travel long distances, 160 km or more, in search of suitable habitat (Jackson 1961). Recent river otter records exist for 35 Illinois counties (Illinois Department of Natural Resources 1997). The main breeding populations of river otters inhabit the backwaters and tributaries of the Mississippi River in Jo Daviess, Carroll, Whiteside, and Rock Island counties in northwestern Illinois (Anderson 1995). Smaller populations also occur in the Cache and Big Muddy river systems of southern Illinois and the numbers of reports along the Rock River and the middle portion of the Mississippi River have been increasing (Anderson 1995).

The pygmy shrew, although not listed as threatened or endangered in Illinois, is called the "rarest of the shrews in Illinois" (Hoffmeister 1989). It has been collected recently in Cook and McHenry counties (Sliwinski 1994). This species' range includes the northeastern corner of Illinois (Jones and Birney 1988), but until recently only one specimen had been collected — near Palatine (Cook County) in 1949 (Sanborn and Tibbitts 1949). The number of pygmy shrew records probably is limited because these very small mammals are not readily captured in snap traps or live traps (recent specimens were collected in pitfall traps). Throughout its range this species occupies a variety of mesic habitats with extensive ground cover, including bogs, swamps, forests, and grassland (Kurta 1995). There is insufficient information to describe its habitat preferences in Illinois, although it may be associated with sedge meadows and grasslands (Sliwinski 1994).

Exotics

House mice occasionally can be found in wetland habitats. This species is so widespread that it is now part of the mammalian fauna throughout the United States. There is not much that can be done to alter this situation and it is not one for concern. Free ranging and feral house cats, however, can sometimes have severe impacts on native songbirds and small mammals, and they may occasionally forage in or around wetland habitats.

Information Gaps

Many wetlands, especially emergent wetlands, currently exist as isolated habitat patches. The ability of wetland-associated mammals to disperse between such wetlands should be examined. The distribution, habitat requirements, and abundance of the (apparently) rare pygmy shrew should be investigated and the Fox River should be monitored for river otters. Beaver have been increasing in abundance throughout the state. The status of beaver populations in the FRAA and their impact on the physical structure of riparian systems should be evaluated.

Enhancement and Restoration Potential

Reduction of silt and chemical runoff into wetland habitats will improve their ability to attract and support river otters. The preservation (and, if necessary, restoration) of riparian forest along the Fox River is also necessary to provide suitable habitat for river otters.

Grassland

Typical Species

Mammal species likely to occur in the FRAA that are restricted to grassland include the least shrew, thirteen-lined and Franklin's ground squirrels, western harvest mouse, deer mouse, meadow vole, prairie vole, least weasel, and badger. Other species strongly associated with grasslands include the masked shrew, northern short-tailed shrew, eastern cottontail, woodchuck, southern bog lemming, and meadow jumping mouse. Additional species that use grasslands include the habitat generalists listed in Table 18.

Most grassland species of mammals are not restricted to native or undisturbed grassland habitat. Rather, the structure of rights-of-way, small grain fields, agricultural field edges, pastures, old fields, prairie restorations, and similar constructed or disturbed sites provides suitable habitat for many of these species. Thirteen-lined ground squirrels are most abundant in short grasses, whereas Franklin's ground squirrels are found in grasses of intermediate height (Hoffmeister 1989). Both species prefer areas that provide an unobstructed view; thus, tall grasses are inhabited rarely. The masked shrew, meadow

jumping mouse, and, to a lesser extent, the meadow vole generally prefer more mesic grasslands (Hoffmeister 1989). Eastern cottontails and woodchucks are most abundant where grassland habitat occurs in proximity to other habitat types and may be considered edge species. Other species use a variety of grassland habitats opportunistically.

Threatened and Endangered Species

None of the mammal species primarily associated with grasslands in the FRAA is listed as threatened or endangered in Illinois.

Exotics

The Norway rat and house mouse are strongly associated with human structures, but both species may be found in grasslands in proximity to such structures. The house mouse in particular can sometimes reach substantial numbers in grasslands near buildings. These species are now so widespread that they are part of the mammalian fauna throughout the United States. Not much can be done to alter this situation and it is not one for concern. On the other hand, domesticated pets, particularly free ranging and feral housecats, can have severe negative impacts on grassland-nesting songbirds, rabbits, and possibly other small mammals.

Information Gaps

Additional information on the distribution and population status of the Franklin's ground squirrel, meadow jumping mouse, and least weasel would be useful. Franklin's ground squirrel, in particular, appears to have become uncommon throughout much of its former range in Illinois. The status of the badger in Illinois was recently investigated by Warner and Ver Steeg (1995), but population status in the FRAA should be determined more precisely. Although the red fox is not strictly a grassland species, it is most often associated with grasslands and other open habitats. There are suggestions that recent increases in the abundance of coyotes could have negatively affected populations of red fox, and the status of red fox populations in the FRAA should be evaluated.

Enhancement and Restoration Potential

Restored grasslands could provide valuable sites for re-introductions of Franklin's ground squirrels in areas where they no longer occur. Prairie restoration, coupled with the preservation of native prairie and other grassland habitats, would provide additional habitat for badger and red fox.

Amphibians and Reptiles

Introduction

Information in this section has been compiled from range maps in Smith (1961), the Illinois Natural Heritage Database (Illinois Department of Natural Resources 1997), the Illinois Amphibian and Reptile Vouchered Database (a 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 Fox River Assessment Area (FRAA), but Phillips's (1995) amphibian and reptile survey for the environmental impact statement associated with five proposed Fox River bridges included a large piece of the upper FRAA. The FRAA contains portions of three of Smith's (1961) 11 Herpetofaunal Divisions for the state; Northeastern Mesic Woodlands, Prairie, and Woodlands of the Grand Prairie.

Amphibian and reptile species that are known or likely to occur in the FRAA are listed in Table 19. These 14 amphibian species and 22 reptile species represent 35% of the amphibian species and 37% of the reptile species of the state. No threatened or endangered species are currently known to occur in the FRAA. The state endangered eastern massasauga, *Sistrurus catenatus,* was recorded from Cortland Township, De Kalb County just outside of the FRAA boundary sometime around 1850. Beltz (1992) considered this population extirpated, probably as a result of the draining of prairie wetlands. The state threatened Kirtland's Snake, *Clonophis kirtlandii*, was recorded just east of the FRAA in Du Page County in 1989. It is possible that it exists in the FRAA. There are no breeding populations of exotic amphibian or reptile species in the FRAA and no distribution or abundance data are available for amphibians and reptiles in the area.

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. Reptiles are usually found in close proximity to aquatic habitats because they can find an abundance of prey items in these productive habitats.

Forest

Typical Species

Amphibian species of the FRAA that are typical of forested habitats include the Eeastern newt and both species of gray treefrog. As outlined above, amphibians also require

aquatic habitats for breeding. All three of these species breed in forested wetlands and upland forested ponds. Among the reptiles of the FRAA, the milk snake and brown snake are typical of forested areas.

Enhancement and Restoration Potential

Maintaining small, temporary, fishless ponds in forests of the FRAA would benefit almost all of the reptiles and amphibians of the FRAA 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 FRAA and the state. A good example of this type of habitat can be found at Burr Woods Marsh Natural Area in Kane County.

Wetland

Typical Species

As outlined above, all amphibians of the FRAA require some type of aquatic habitat for breeding and wetlands fill this need for most amphibians. The bullfrog and northern leopard frog complete their entire life cycle in aquatic habitats, including wetlands. These species may also be found in ponds, lakes, creeks, and rivers. Among the reptiles of the FRAA, only Blanding's turtle is restricted to wetlands. Other species such as the plains garter snake and common garter snake are typical wetland inhabitants, but are also found in other habitats.

Information Gaps

It would be especially informative to document the distribution and abundance of the tiger salamander in the FRAA because we have several historical accounts of this species to use as a comparison. It would also be helpful to document whether Kirtland's snake occurs in the wetlands of the FRAA.

Enhancement and Restoration Potential

Restoration of prairie wetlands in the FRAA would benefit a variety of amphibians and reptiles and enhance the suitability of the FRAA as habitat for Kirtland's snake. A good example of wet prairie habitat can be found at Lyons Prairie and Marsh Nature Preserve in Lake County.

Table 19. Amphibian and reptile species known or likely to occur in the Fox River Assessment Area, with an indication of habitat preference and relative abundance.

Common Name[1,2]	*Scientific Name*	Habitat[3]	Abundance[4]
Amphibians			
blue-spotted salamander	*Ambystoma laterale*	F,W	U
tiger salamander	*Ambystoma tigrinum*	W,P,L	U
eastern newt	*Notophthalmus viridescens*	F,W	U
mudpuppy	*Necturus maculosus*	L,R	U
American toad	*Bufo americanus*	U	C
cricket frog	*Acris crepitans*	L,R	C
western chorus frog	*Pseudacris triseriata*	U	C
Cope's gray treefrog	*Hyla chrysoscelis*	F,W	C
eastern gray treefrog	*Hyla versicolor*	F,W	C
spring peeper	*Pseudacris crucifer*	F,W	U
bullfrog	*Rana catesbeiana*	U	C
green frog	*Rana clamitans*	U	C
pickerel frog	*Rana palustris*	F,W	?
northern leopard frog	*Rana pipiens*	F,W,P	U
Reptiles			
snapping turtle	*Chelydra serpentina*	W,L,R	C
musk turtle	*Sternotherus odoratus*	L	U
painted turtle	*Chrysemys picta*	W,L,R	C
Blanding's turtle	*Emydoidea blandingii*	W	U
slider	*Trachemys scripta*	W,L	R
map turtle	*Graptemys geographica*	L,R	U
false map turtle	*Graptemys pseudogeographica*	L,R	U
spiny softshell turtle	*Apalone spinifer*	W,L,R	U
six-lined racerunner	*Cnemidophorus sexlineatus*	P	R
eastern hognose snake	*Heterodon platirhinos*	F,W,P	U
racer	*Coluber constrictor*	U	C
smooth green snake	*Opheodrys vernalis*	W,P	U
fox snake	*Elaphe vulpina*	W,P,C	C
milk snake	*Lampropeltis triangulum*	F,W,P	U
plains garter snake	*Thamnophis radix*	U	C
common garter snake	*Thamnophis sirtalis*	U	C
brown snake	*Storeria dekayi*	U	C
red-bellied snake	*Storeria occipitomaculata*	F,W	U
Graham's crayfish snake	*Regina grahamii*	W,L	U
queen snake	*Regina septemvittata*	R	U
northern water snake	*Nerodia sipedon*	W,L,R	C
massasauga ST	*Sistrurus catenatus*	F,W,P	X

[1] Nomenclature follows Collins (1990) unless noted.

[2] Bold type indicates a state threatened species (ST).

[3] Habitats: F = forest, W = wetland, P = prairie and savanna, L = lakes, ponds, impoundments, R = rivers & creeks, C = cultural, U = ubiquitous (all habitats).

[4] Abundance: C = common, U = uncommon, R = rare, X = extirpated, ? = status uncertain.

Prairie

Typical Species

Of the amphibian species listed in Table 19, the tiger salamander and western chorus frog are typical of prairie habitats in the FRAA. The tiger salamander requires fishless ponds and wetlands for breeding. Because of the destruction and degradation of these habitats, the tiger salamander has declined drastically in the FRAA. The striped 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 FRAA that are typical of prairie habitats include the smooth green snake and Plains garter snake. Of these grassland species, the smooth green snake is most dependent on native grassland while the Plains garter snake can tolerate more disturbed habitats such as mowed right-of-way, pasture, oldfield, and agricultural edge. Other species such as the fox snake and brown snake can be found in grasslands of the FRAA. They too can tolerate disturbed grassland habitats.

Information Gaps

It would be especially informative to document the distribution and abundance of the tiger salamander in the FRAA because we have several historical accounts of this species to use as a comparison. It would also be helpful to document whether Kirtland's snake occurs in the remnant prairies of the FRAA.

Enhancement and Restoration Potential

Restoring native prairie, especially wet prairie, in the FRAA would benefit a variety of amphibians and reptiles and enhance suitability of the FRAA as habitat for Kirtland's snake, smooth green snake and tiger Salamander. A good example of wet prairie habitat can be found at Lyons Prairie and Marsh Nature Preserve in Lake County.

Lakes, Ponds, and Impoundments

Typical Species

Of the amphibian species listed in Table 19, the bullfrog and cricket frog are typical of lakes, ponds, and impoundments in the FRAA. The tiger salamander requires fishless ponds and wetlands for breeding. Because of the destruction and degradation of these habitats, the tiger salamander has declined drastically in the FRAA. The cricket frog and bullfrog have developed strategies for co-existing with fish and are usually more widely distributed than the tiger salamander. However, over the last five years the cricket frog

appears to have declined throughout the northern third of the state, including the FRAA. Among the reptiles of the FRAA the snapping turtle, painted turtle, common garter snake, and northern water snake are typical of lakes, ponds, and impoundments.

Information Gaps

Information on the distribution and abundance of the cricket frog in the FRAA is extremely important to establish the extent to which this small frog has declined in northern Illinois. To date, we have only anecdotal data on this species. See the section on "Overall Habitat Quality and Management Concerns" for details on collecting distribution data for the cricket frog.

Enhancement and Restoration Potential

Restoration of fishless, forested ponds in upland areas would benefit the blue-spotted salamander, tiger salamander, spring peeper, and eastern newt. A good example of this type of habitat can be found at Burr Woods Marsh Natural Area in Kane County. 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 FRAA would benefit a variety of amphibians and reptiles, especially the cricket frog, and enhance suitability of the FRAA as habitat for Kirtland's snake.

Creeks and Rivers

Typical Species

Of the amphibian species listed in Table 19, the cricket frog and bullfrog are typical of creeks and rivers in the FRAA. However, as noted above, the cricket frog appears to be almost entirely extirpated from the FRAA. Among the reptiles of the FRAA, the snapping turtle, spiny softshell, and northern water snake are typical of creeks and rivers. Of these species, the map turtle is most dependent on creeks and rivers.

Information Gaps

Information on the distribution and abundance of the cricket frog in the FRAA is extremely important in establishing the extent to which this small frog has declined in northern Illinois. To date, we have only anecdotal data on this species. See the section describing "Overall Habitat Quality and Management Concerns" for details on collecting distribution data for the cricket frog.

Enhancement and Restoration Potential

Restoring the riparian zone along creeks and rivers in the FRAA would benefit a variety of amphibians and reptiles and enhance suitability of the FRAA as habitat for the cricket frog.

Cultural Habitats

Typical Species

Of the amphibian species listed in Table 19, the American toad, western chorus frog, and bullfrog are typical of cultural habitats in the FRAA. These species can be found in cropland, pasture, successional field, developed land, and tree plantations providing adequate breeding sites (ditches, flooded fields, stock tanks, remnant marshes) are present. Among the reptiles of the FRAA, the racer, fox snake, Plains garter snake, common garter snake, brown snake, and northern water snake are typical of cultural habitats in the FRAA.

Enhancement and Restoration Potential

Small stock ponds and farm ponds can provide important breeding sites for amphibians of the FRAA if the ponds are fish free. Most of these ponds are not capable of supporting sport fisheries so this does not present a conflict between amphibian conservation and recreation opportunities. Because the species listed above are not sensitive to moderate habitat fragmentation, they can maintain viable populations in small, remnant patches of natural habitat. For example, the American toad, western chorus frog, and bullfrog do well in patches of cat-tail 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.

Overall Habitat Quality and Management Concerns

Overall, opportunities for amphibians and reptiles in the FRAA are poor. Compared to pre-settlement, the present landscape of the FRAA lacks a significant amount of native prairie, especially wet prairie, and wooded upland ponds. These losses and the fragmentation of the remaining habitats are potential reasons the cricket frog may be extirpated from the FRAA. This may also explain the absence (or scarcity) of Kirtland's snake in the FRAA. Other habitats whose decline or disappearance in the FRAA since European settlement has severely affected amphibians and reptiles include marshes and sedge meadows.

The most critical management concern for the FRAA Partnership is habitat destruction and fragmentation. Natural habitats in the FRAA are typically found in small patches separated from each other by agricultural or developed land and this will continue as development pressure mounts. Habitat connectedness is important for amphibians because they usually travel long distances between their breeding and non-breeding habitats. For example, the American toad spends most of its time in upland habitats such as forests or prairies but migrates to lowland areas for breeding. Reptiles require habitat connections because many species move to upland retreats for winter hibernation.

The disappearance of the cricket frog may be the first symptom of a wider problem associated with habitat degradation. As stated above, it is important to rigorously document the decline of the cricket frog in the FRAA. This can be done by conducting surveys at locations that were known to harbor cricket frogs prior to about 1985. A few such locations are: 2 miles west of Sandwich along Somonauk Creek, De Kalb County; Silver Springs State Park, Kendall County; Volo Bog State Natural Area. Lake County; and IL Route 31 at Nippersink Creek, McHenry County. Because most of these locations have not experienced obvious habitat destruction or alteration, it is not possible to suggest specific management recommendations for the cricket frog at this time. However, as research into the decline continues, specific recommendations may be forthcoming.

Terrestrial Insects: Butterflies and Skippers

Introduction

The information presented in this section has been compiled from distributional records in Irwin and Downey (1973), Ebner (1970), Shull (1987), the season summaries published by the Lepidopterists' Society, and from range maps in Opler and Malikul (1992). The insect fauna of the Fox River Assessment Area (FRAA) is well known, perhaps as well-known as any area of Illinois. This reflects the long-term activities of resident naturalists and the proximity of FRAA to the greater Chicago area where many amateur and professional entomologists have resided.

The butterflies and skippers known to have been collected in eight counties (Cook, DeKalb, DuPage, Kane, Kendall, Lake, LaSalle, McHenry) of the FRAA are listed in Table 20 along with species considered by the writer to be of likely or possible occurrence. There is no published source of information regarding the population status of the butterflies and skippers of the FRAA.

Typical Species

The distributions of the butterflies and skippers of a geographic area are tied to the distributions of the host plants and nectar sources of each species. Few species are rigidly habitat specific as adults. On the contrary, wandering adults are often observed far removed from their larval feeding sites. Thus, for example, forest species can be observed in prairies, savannas, wetlands, and in areas of cultivation and disturbance.

Forest Butterflies and Skippers

Two typical forest species whose caterpillars feed on understory shrubs are the Giant Swallowtail on prickly ash and wafter ash and the Spring Azure on dogwoods. The Northern Pearly Eye, whose larvae feed on bottle brush grass and sea oats, and the Appalachian Eyed Brown, whose larvae feed on sedges, can be expected. Among the skippers, Juvenal's Dusky Wing, feeding on oaks, is likely to be encountered.

Prairie Butterflies and Skippers

Many records of prairie butterflies are available for the FRAA. Among those to be expected are the Dione Copper on docks, the Eastern Tailed Blue on legumes, the Gorgone Checkerspot on sunflowers, and the Monarch on milkweeds. Among skippers the Black Dash and the Tawny Edged Skipper should occur.

Wetland Butterflies and Skippers

Among the wetland butterflies to be expected are the Acadian Hairstreak and the Viceroy, both willow feeders as larvae, and the Bronze Copper and the Purplish Copper, both feeders on docks. The Eyed Brown, a sedge feeder, will occur in undisturbed areas. The Least Skipper, a grass feeder, typically occurs in wetland areas.

Savanna Butterflies and Skippers

Few, if any FRAA species, are likely to be restricted in distribution to savannas. Several species, however, are often encountered in savanna situations. These include three butterflies, namely, Edwards Hairstreak on scrub oak, the Little Copper on sour dock, and the Regal Fritillary on birdsfoot violet. Also to the expected, is the Silver Spotted Skipper on legumes.

Cultural Butterflies and Skippers

Many butterflies and skippers are commonly found in disturbed areas, cultivated areas, and in urban and suburban developments. Indeed, some such as the Cabbage Butterfly and the Alfalfa Butterfly have pest status. Both certainly occur in the FRAA. Species of broad host range, such as the Painted Lady, occur commonly in cities and towns, as does the Tiger Swallowtail, which feeds on a wide variety of commonly cultivated trees and shrubs. Among the skippers, the Common Sooty Wing, feeding on amaranths and lambs quarters, occurs in yards and gardens.

Information Gaps

Of the 80 species of butterflies with known or likely occurrence in FRAA, 75 have been recorded in the eight counties treated in Table 20. There exist 321 county records of the 640 possible. This level of available information for the region as a whole is probably unsurpassed in Illinois. However, two counties (DeKalb and Kendall) are very poorly known and would benefit from butterfly surveys. In the skippers, 41 species of 45 deemed likely, have been recorded, but again DeKalb and Kendall counties are very poorly known. These counties should be surveyed for skippers. For the area taken as a whole, 133 of 360 county records are available.

The known (or possible in some cases) occurrence in FRAA of several little-known species of rare or sporadic appearance provide important opportunities to gain information concerning the population status of those species and to develop sound management practices to protect their habitats. Such target species would include Swamp Metallmark, Frosted Elfin, Regal Fritillary, Eyed Brown, Appalachian Eyed Brown, and Leonard's Skipper. Because of the widespread use of fire as a tool of management in the habitats of these species, particular attention should be paid to the effect of that management practice on populations of these species.

Table 20. Butterflies and skippers known (+) or likely (-) to occur in the Fox River Assessment Area[1].

Species[2,3,4]	Habitat	CO	DE	DU	KA	KE	LA	LS	MH[6]
Pipe Vine Swallowtail									
Battus philenor	F	+	-	-	-	-	+	+	-
Black Swallowtail									
Papilio polyxenes	P,C	+	-	-	+	-	+	+	+
Giant Swallowtail									
Papilio cresphontes	F	+	-	+	+	-	-	+	+
Tiger Swallowtail									
Papilio glaucus	F,C	+	-	-	-	-	+	+	+
Spicebush Swallowtail									
Papilio troilus	F	+	-	-	-	-	-	+	-
Zebra Swallowtail									
Eurytides marcellus	F	+	-	-	-	-	+	+	-
Checkered White									
Pontia protodice	F,C	+	+	+	+	-	+	+	+
* Cabbage Butterfly									
Pieris rapae	F,C	+	-	+	+	-	+	+	+
* Alfalfa Butterfly									
Colias eurytheme	P,C	+	+	+	+	-	+	+	-
Clouded Sulphur									
Colias philodice	P,C	+	+	+	+	-	+	+	+
Dog Face									
Colias cesonia	W,C	+	-	-	+	-	+	+	-
Cloudless Sulphur									
Phoebis sennae	W,C	+	-	-	-	-	-	+	-
Little Sulphur									
Eurema lisa	P,C	+	+	+	-	+	+	+	-
Sleepy Orange									
Eurema nicippe	W,C	+	-	-	+	-	+	+	-
Dainty Sulphur									
Nathalis iole	P,C	+	-	-	+	-	-	+	-
Olympia Marble									
Euchloe olympia	S	+	-	-	-	-	+	-	-
Swamp Metalmark (SE)									
Calephelis mutica	W	-	-	-	+	-	-	-	-
Coral Hairstreak									
Satyrium titus	P,C	+	-	+	+	+	+	+	-
Striped Hairstreak									
Satyrium liparops	F,W	+	-	+	+	-	-	+	-
Banded Hairstreak									
Satyrium calanus	F,P,S	+	-	+	+	-	+	+	+
Hickory Hairstreak									
Satyrium caryaevorum	F	-	-	-	-	-	-	-	-
Edwards' Hairstreak									
Satyrium edwardsii	S	+	-	+	+	-	+	+	+

Table 20. Continued

Species [2,3,4]	Habitat	CO	DE	DU	KA	KE	LA	LS	MH[6]
Acadian Hairstreak									
Satyrium acadica	W	+	-	+	+	-	+	-	+
Red-banded Hairstreak									
Calycopsis cecrops	P,C	+	-	-	-	-	-	-	-
Hoary Elfin (SE)									
Incisalia polia	FS	+	-	-	-	-	+	-	-
Frosted Elfin									
Incisalia irus	P,S	-	-	-	-	-	+	-	-
Henry's Elfin									
Incisalia henrici	F	-	-	-	-	-	-	-	-
Eastern Pine Elfin									
Incisalia niphon	F,C	-	-	-	-	-	-	-	-
Olive Hairstreak									
Mitourea gyrnea	P,C	+	-	-	-	-	-	+	-
Southern Hairstreak									
Fixenia favonius	F,W	-	-	-	-	-	-	-	-
White-Hairstreak									
Parrhasius m-album	F	+	-	-	-	-	-	-	-
Gray Hairstreak									
Strymon melinus	F,P,C	+	-	+	+	-	+	+	+
Bronze Copper									
Lycaena hyllus	W	+	+	+	+	-	+	+	+
Dione Copper									
Lycaena dione	P	+	-	+	+	-	+	+	-
Purplish Copper									
Lycaena helloides	W	+	-	+	+	-	+	+	+
Little Copper									
Lycaena phlaeas	P,S,C	+	-	+	+	-	+	+	+
Marine Blue									
Leptotes marina	P,C	+	-	-	-	-	-	-	-
Reakirt's Blue									
Hemiargus isola	P,S,C	+	-	-	+	-	+	-	-
Melissa Blue (FE)									
Lycaeides melissa	P,S,C	-	-	-	-	-	+	-	-
Eastern Tailed Blue									
Everes comyntas	P,C	+	+	+	+	-	+	+	+
Silvery Blue									
Glaucopsyche lygdamus	F	+	-	-	+	-	+	-	+
Spring Azure									
Celastrina argiolus	F,C	+	+	+	+	-	+	+	+
Dusky Blue									
Celastrina ebenina	F	-	-	-	-	-	-	-	-
Harvester									
Feniseca tarquinius	F,W	+	-	+	+	-	-	+	-

Table 20. Continued

Species [2,3,4]	Habitat	CO	DE	DU	KA	KE	LA	LS	MH[6]
American Snout									
Libytheana carenenta	F,W	+	-	+	+	-	-	+	-
Goatweed Butterfly									
Anaea andria	F,C	+	-	-	-	-	+	+	-
Hackberry Butterfly									
Asterocampa celtis	F,W,C	+	-	+	+	-	-	+	-
Tawny Emperor									
Asterocampa clyton	F,W,C	+	-	-	+	-	-	+	-
Red-spotted Purple									
Liminitis arthemis	F	+	+	+	+	-	+	+	+
Viceroy									
Liminitis archippus	W	+	-	+	+	-	+	+	+
Red Admiral									
Vanessa atalanta	F,C	+	-	+	+	-	+	+	+
American Painted Lady									
Vanessa virginiensis	F,P,C	+	-	+	+	-	+	+	+
Painted Lady									
Vanessa cardui	F,P,S,C	+	-	+	+	-	+	+	+
Buckeye									
Junonia coenia	P,W,C	+	-	+	+	-	+	+	-
Compton Tortoise Shell									
Nymphalis vau-album	F	+	-	-	+	-	+	-	-
Milbert's Tortoise Shell									
Nymphalis milberti	F,W,C	+	-	-	+	-	+	+	+
Mourning Cloak									
Nymphalis antiopa	F,C	+	-	+		-	+	+	+
Question Mark									
Polygonia interrogationis	F,C	+	-	+	-	-	+	+	+
Hop Merchant									
Polygonia comma	F,C	+	-	-	-	-	+	+	+
Gray Comma									
Polygonia progne	F,W	+	-	-	+	-	+	+	-
Silvery Checkerspot									
Chlosyne nycteis	F,C	+	-	+	+	-	+	+	+
Gorgone Checkerspot									
Chlosyne gorgone	P	-	-	-	-	-	-	+	-
Harris Checkerspot									
Chlosyne harrisii	P,W	-	-	-	+	-	-	-	-
Pearl Crescent									
Phyciodes tharos	F,P,S,C	+	-	+	+	-	+	+	+
Tawny Crescent									
Phyciodes batesii	P,W,C	-	-	-	-	-	-	+	-
Baltimore									
Euphydryas phaeton	W	+	-	+	+	-	+	-	-

Table 20. Continued

Species [2,3,4]	Habitat	CO	DE	DU	KA	KE	LA	LS	MH[6]
Silver-bordered Fritillary									
Boloria selene	P,W	+	-	-	+	-	+	+	+
Meadow Fritillary									
Boloria bellona	P,W	+	-	-	+	-	+	+	+
Regal Fritillary									
Speyeria idalia	P,S	+	-	+	+	-	+	+	+
Atlantis Fritillary									
Speyeria altantis	F,W,C	+	-	-	-	-	-	-	-
Great Spangled Fritillary									
Speyeria cybele	W,P,C	+	-	+	+	-	+	+	+
Aphrodite									
Speyeria aphrodite	W,P,C	+	-	+	+	-	+	-	+
Variegated Fritillary									
Euptoieta claudia	C	+	-	+	+	-	+	+	+
Gulf Fritillary									
Agraulis vanillae	C	-	-	-	+	-	-	-	-
Monarch									
Danaus plexippus	P,S,W,C	+	-	-	+	-	+	+	+
Northern Pearly Eye									
Enodia anthedon	F,W	+	-	+	+	-	+	+	+
Eyed Brown									
Satyrodes eurydice	W	+	-	-	+	-	+	-	+
Appalachian Eyed Brown									
Satyrodes appalachia	F,W	+	-	-	-	-	+	-	-
Little Wood Satyr									
Megisto cymela	F,P	+	-	+	+	-	+	+	+
Common Wood Nymph									
Cercyonis pegala	P,S,W,C	+	+	+	+	-	+	+	+
Eufala Skipper									
Lerodea eufala	C	-	-	-	+	-	-	-	-
Pepper and Salt Skipper									
Ambylscirtes hegon	F	+	-	-	-	-	-	+	+
Roadside Skipper									
Ambylscirtes vialis	F,C	-	-	-	-	-	-	-	-
Dusted Skipper									
Atrytonopsis hianna	P,S	+	-	-	-	-	-	-	-
Dion Skipper									
Euphyes dion	W	+	-	-	-	-	-	+	-
Black Dash									
Euphyes conspicuus	P,W	+	-	+	+	+	+	-	-
Two-spotted Skipper									
Euphyes bimacula	W	+	-	-	+	-	+	-	-
Dun Skipper									
Euphyes vestris	P,W,C	+	-	-	+	-	+	+	-

Table 20. Continued

Species[2,3,4]	Habitat	CO	DE	DU	KA	KE	LA	LS	MH[6]
Mulberry Wing									
Poanes massasoit	W,C	+	-	-	+	-	+	-	-
Hobomok Skipper									
Poanes hobomok	F	+	-	+	+	-	-	+	+
Zabulon Skipper									
Poanes zabulon	F	+	-	-	-	-	-	+	-
Broad Winged Skipper									
Poanes viator	W	+	-	-	-	-	+	-	+
Byssus Skipper									
Prolema byssus	P	-	-	-	-	-	-	+	-
Delaware Skipper									
Atrytone delaware	P,W,C	+	-	-	+	-	+	+	-
Sachem									
Atalapodes campestris	C	+	-	-	+	-	-	+	-
Little Glassy Wing									
Pompeius verna	C	+	-	+	+	-	+	+	+
Northern Broken Dash									
Wallengrenia egerement	C	+	-	-	+	-	+	+	+
Peck's Skipper									
Polites peckius	C	+	-	+	+	-	+	+	+
Tawney-edged Skipper									
Polites themistocles	P,C	+	-	+	+	-	+	+	+
Crossline Skipper									
Polites origenes	P,C	+	-	-	-	-	+	+	-
Long Dash									
Polites mystic	P,W	+	-	-	-	-	+	-	+
Ottoe Skipper (ST)									
Hesperia ottoe	P	-	-	-	-	-	+	-	-
Dakota Skipper									
Hesperia dacotae	P	+	-	-	-	-	-	-	-
Indian Skipper									
Hesperia sassacus	F,P,C	+	-	-	-	-	-	-	-
Leonard's Skipper									
Hesperia leonardus	P	+	-	-	-	-	-	-	-
Cobweb Skipper									
Hesperia metea	P,C	-	-	-	-	-	-	-	-
Fiery Skipper									
Hylephila phyleus	C	+	-	-	+	-	+	+	-
* European Skipper									
Thymelicus lineola	W,C	+	-	-	-	-	-	+	-
Poweshiek Skipperling									
Oarisma poweshiek	W	-	-	-	-	-	-	-	-
Least Skipper									
Ancyloxypha numitor	W	+	-	+	+	-	+	+	+

Aquatic Biota

Introduction

The 1,720-square mile drainage basin of the Fox River Assessment Area (FRAA) lies entirely within the limits of Wisconsinan glaciation. As the Wisconsinan Glacier began to recede northward, tremendous quantities of meltwater, called the Fox River Torrent, swept southward, causing a rapid downcutting of the valley. Remnants of this river torrent exist as the present day Fox River (Langbein and Ferencak, 1988). Many glacial lakes are found in the basin, formed either by interlaced moranic ridges that produce cups or kettles within which lakes are formed, or by large chunks of ice that broke off the glacier, were buried in the upper basin, and melted to form lakes.

The Fox River, a low gradient stream (0.45 m/km [0.28 ft/mi]), is the third largest tributary of the Illinois River; it is approximately 296 km in length and drains an area of 673,400 ha. From its source near Milwaukee, Wisconsin, it flows in a southerly direction for 120 km before reaching the Illinois border northwest of Antioch. In Illinois, it continues to flow in a southerly direction through Lake County, entering and flowing through the Fox Chain-O-Lakes region (Grass Lake, Fox Lake, Nippersink Lake, and Pistakee Lake), then continuing as a stream in McHenry County, flowing in a southerly direction back into Lake County, then back again into McHenry County, then through Kane and Kendall counties, and finally through LaSalle County (Figure 1) where it enters the Illinois River at Ottawa. Major tributaries (and their respective gradients) of the Fox River basin include Boone Creek (1.06 m/km [0.66 ft/mi]), Dutch Creek (3.96 m km [2.60 ft/mi]), Nippersink Creek (2.39 m km [1.48 ft/mi]), Flint Creek (2.29 m km [1.42 ft/mi]), and Big Rock Creek - all low to medium-gradient streams (Brigham, McCormick, and Wetzel 1978).

A large number of glacial lakes sit on tributaries of the Fox River (Figure 9) and over 200 islands are found in the Fox River between McHenry and Ottawa, Illinois. Between the Illinois-Wisconsin state line and Algonquin, Illinois, the main channel of the Fox is ill-defined as it passes through a series of lakes and marshes. From Algonquin to Aurora the valley is narrow, sharply defined by bluffs, and the floodplain is narrow or absent. The floodplain broadens below Aurora.

All of Kendall County and parts of Kane, McHenry, Lake, Cook, DuPage, DeKalb, Will, and LaSalle counties are included in the FRAA. The basin comprises two natural divisions: the Northeastern Moranial found in the northern half of the basin and the Grand Prairie in the southern part (Schwegman, 1973) (Figure 3). Soils range from moderately thick loess on Wisconsinan till to gravel, sand, and silty clay loams (Iverson,

Table 20. Continued

Species[2,3,4]	Habitat	CO	DE	DU	KA	KE	LA	LS	MH[6]
Common Sooty Wing									
Pholisora catullus	C	+	-	+	+	-	+	-	+
Grizzled Skipper									
Pyrgus centaureae	F,C	+	-	-	-	-	-	-	-
Checkered Skipper									
Pyrgus communis	C	+	-	-	+	-	+	+	+
Dreamy Dusky Wing									
Erynnis icelus	F,S	+	-	-	-	-	+	-	+
Sleepy Dusky Wing									
Erynnis brizo	F	+	-	-	-	-	+	+	+
Wild Indigo Dusky Wing									
Erynnis baptisiae	P,C	+	-	-	-	-	+	-	-
Mottled Dusky Wing									
Erynnis martialis	F,P	+	-	-	-	-	-	+	+
Horace's Dusky Wing									
Erynnis horatius	F	+	-	-	-	-	+	+	-
Juvenal's Dusky Wing									
Erynnis juvenalis	F	+	-	-	-	-	-	+	+
Columbine Dusky Wing									
Wrynnis lucilius	F	-	-	-	-	-	+	-	-
Scalloped Sooty Wing									
Staphylus hayhursti	F,C	-	-	-	-	-	-	-	-
Southern Cloudy Wing									
Thorybes bathyllus	F	+	-	+	-	+	+	+	-
Northern Cloudy Wing									
Thorybes pylades	F	+	-	+	+	-	+	+	+
Hoary Edge									
Acholaris lyciades	F	-	-	-	-	-	-	-	+
Silver-spotted Skipper									
Epargyreus clarus	P,S,C	+	-	+	+	-	+	+	+

[1] Sources of data for this table are listed in the reference section of this report.
[2] Scientific and common names follow Opler and Malikul (1992).
[3] Order of treatment follows Irwin and Downey (1973), except that skippers follow butterflies.
[4] Bold type indicates a state endangered species (SE); state threatened (ST); federally endangered (FE); * = Introduced species.
[5] Habitats: F = forest, P = prairie, S = savanna, W = wetland, C = cultural.
[6] County names: CO = Cook, DE = DeKalb, DU = DuPage, KA = Kane, KE = Kendall, LA = Lake, LS = LaSalle, MH = McHenry.

1987). The landforms range from land-locked ponds with gravel bottoms to marshes, wet prairies, peat bogs, and dry prairies.

The Fox River basin can be divided into three zones—Northern, Central, and Southern. The Northern zone has numerous lakes and recreational areas, smaller populated communities, and dairy lands. The Central zone is comprised of industries, urban areas, agriculture, and timber lands. The Southern zone has a smaller human population and is more scenic than the Central zone.

The average width of the river in Illinois is 325 feet. The substrate is variable with gravel and cobble in shallow areas, and sand and silt in deep areas. There are 15 dams on the Fox, most of them occurring near Elgin. The water in the upper reaches is usually clear; in the lower reaches it is often turbid.

The Fox River basin supports a large diversity of aquatic species. Known from the basin are 96 species of fishes, 32 species of mussels, and 14 species of malacostracans (large crustaceans). Because of the large number of glacial lakes, several fishes are found in the Fox River basin and nowhere else in Illinois. Because of their restricted ranges and degradation of habitats and water quality, several endangered and threatened species occur in the basin. With improvements in water quality and habitat protection, populations of endangered or threatened species could increase, and natural communities could become reestablished in areas where they have been eliminated or altered.

The FRAA also supports a moderate diversity of other aquatic macroinvertebrate species. Unfortunately, existing data on the distribution and natural community associations of these species are inadequate to summarize typical, unique, or rare species, or to identify exotic species. Few extensive surveys of aquatic macroinvertebrate populations have been conducted in the FRAA.

Common Species

Ninety-six species of fishes are known from the region (Tables 21 and 22). The lakes are dominated by emerald shiners, sand shiners, blackchin shiners, bluntnose minnows, blackstripe topminnows, tadpole madtoms, bluegills, pumpkinseeds, Iowa darters, and least darters. Some lakes also have large populations of starhead topminnows, banded killifish, and yellow perch. Common fishes in creeks and rivers are sand shiners, common shiners, central stonerollers, bluntnose minnows, bullheads, grass pickerel, white suckers, green sunfish, fantail darters, and johnny darters. Headwaters contain large populations of southern redbelly dace and, where heavily vegetated, brook sticklebacks, and least darters.

Thirty-two species of mussels were found in the drainage (Tables 23 and 24). Today only about 20 species survive. The most common mussels found in the area lakes are the giant

floater and fat mucket. Most mussel species have been eliminated from the mainstream of the Fox River. A few species can occasionally still be found, including the giant floater, white heelsplitter, mapleleaf, plain pocketbook, and fragile papershell.

Fourteen species of crayfishes, isopods, and amphipods are found in the basin (Tables 25 and 26). The most common crayfish is the virile crayfish, which usually is found over rocky substrates or around woody debris or vegetation. The northern clearwater crayfish also is common in clean rocky stream habitats, but is being displaced by the introduced rusty crayfish. The most common crayfish in the lakes is the White River crawfish. The most common isopod is *Caecidotea intermedia*, which lives in rocky areas and on woody debris. The most common amphipods are *Hyalella azteca*, which is found on vegetation, usually filamentous algae growing on rocks or logs, and *Gammarus pseudolimnaeus*, which lives in spring-fed headwaters. None of the 14 species of crusteceans known from the basin is considered threatened or endangered.

In general, the aquatic macroinvertebrate populations of the FRAA appear to be as diverse as those of many other watersheds in Illinois that have been surveyed in a similar manner. A list of aquatic macroinvertebrate taxa known or thought likely to occur within the Fox River Assessment Area is presented in Table 27; this information is based upon records from one or more of the Fox River basin drainages and/or on records from other aquatic habitats within the counties located in the FRAA. Most of these species are considered relatively common in Illinois; none are considered threatened or endangered.

Although many of the species listed in Table 27 are known to occur in both standing and running water, the paucity of accessible historical records and limited recent information for taxa known to occur within the FRAA make it difficult to associate most taxa with specific habitat types, such as headwaters, larger streams, small or medium reaches of rivers, or with standing water habitats such as ponds, lakes, and reservoirs. Most of the recent records of aquatic macroinvertebrates from the Fox River basin come from assessments of aquatic resources conducted by INHS personnel for the Illinois Department of Transportation. Records for the species listed in Table 27 are Illinois Natural History Survey Collection records.

Table 21. Freshwater fishes recorded from the Fox River Assessment Area[1].

Family *Scientific Name*[2,3]	Common Name	Headwaters	Creeks	Small Rivers	Medium Rivers	Standing Water
Petromyzontidae						
Lampetra appendix	American brook lamprey		X	X		
Lepisosteidae						
Lepisosteus osseus	longnose gar				X	
Amiidae						
Amia calva	bowfin				X	X
Clupeidae						
Dorosoma cepedianum	gizzard shad			X	X	X
Cyprinidae						
Campostoma anomalum	central stoneroller	X	X	X		
Campostoma oligolepis	largescale stoneroller		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
Hybognathus hankinsoni	brassy minnow	X	X			
Hybognathus nuchalis	Mississippi silvery minnow		X	X	X	
Luxilus chrysocephalus	striped shiner	X	X	X	X	
Luxilus cornutus	common shiner		X	X	X	
Lythrurus umbratilis	redfin shiner		X	X	X	
Nocomis biguttatus	hornyhead chub		X	X		
Notemigonus crysoleucas	golden shiner			X	X	X
***Notropis anogenus* - SE**	**pugnose shiner**					X
Notropis atherinoides	emerald shiner				X	
Notropis dorsalis	bigmouth shiner		X	X	X	
***Notropis heterodon* - ST**	**blackchin shiner**					X
***Notropis heterolepis* - SE**	**blacknose shiner**		X	X		
Notropis hudsonius	spottail shiner				X	X
Notropis ludibundus	sand shiner		X	X	X	
Notropis rubellus	rosyface shiner		X	X	X	
***Notropis texanus* - SE**	**weed shiner**		X			
Notropis volucellus	mimic shiner				X	
Opsopoeodus emiliae	pugnose minnow		X	X		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	
Rhinichthys atratulus	blacknose dace	X	X			
* *Scardinius erythrophthalmus*	rudd			X		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	
Erimyzon oblongus	creek chubsucker	X	X	X		
Erimyzon sucetta	lake chubsucker		X			X
Hypentelium nigricans	northern hog sucker		X	X	X	

Table 21. Continued

Family *Scientific Name*[2,3]	Common Name	Headwaters	Creeks	Small Rivers	Medium Rivers	Standing Water
Ictiobus cyprinellus	bigmouth buffalo				X	
Minytrema melanops	spotted sucker		X	X		
Moxostoma anisurum	silver redhorse			X	X	
***Moxostoma carinatum* - ST**	**river redhorse**			X	X	
Moxostoma duquesnei	black redhorse		X	X	X	
Moxostoma erythrurum	golden redhorse		X	X	X	
Moxostoma macrolepidotum	shorthead redhorse			X	X	
***Moxostoma valenciennesi* - SE**	**greater redhorse**				X	
Ictaluridae						
Ameiurus melas	black bullhead		X	X	X	X
Ameiurus natalis	yellow bullhead		X	X	X	X
Ameiurus nebulosus	brown bullhead					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		
Pylodictis olivaris	flathead catfish			X	X	X
Esocidae						
Esox americanus	grass pickerel	X	X	X		X
Esox lucius	northern pike			X	X	X
Umbridae						
Umbra limi	central mudminnow		X			X
Salmonidae						
Oncorhynchus mykiss	rainbow trout		X	X		
Salmo trutta	brown trout		X	X		
Atherinidae						
Labidesthes sicculus	brook silverside			X	X	X
Fundulidae						
***Fundulus diaphanus* - ST**	**banded killifish**					X
Fundulus dispar	starhead topminnow		X			X
Fundulus notatus	blackstripe topminnow		X	X	X	
Gasterosteidae						
Culaea inconstans	brook stickleback	X	X			X
Cottidae						
Cottus bairdi	mottled 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	
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

Table 21. Continued

Family *Scientific Name*[2,3]	Common Name	Headwaters	Creeks	Small Rivers	Medium Rivers	Standing Water
Pomoxis annularis	white crappie		X	X	X	X
Pomoxis nigromaculatus	black crappie		X	X	X	X
Percidae						
Etheostoma caeruleum	rainbow darter	X	X	X	X	
***Etheostoma exile* - SE**	**Iowa darter**	X	X			X
Etheostoma flabellare	fantail darter	X	X	X		
Etheostoma microperca	least darter	X	X			X
Etheostoma nigrum	johnny darter	X	X	X	X	
Etheostoma spectabile	orangethroat darter	X	X	X		
Etheostoma zonale	banded darter		X	X	X	
Perca flavescens	yellow perch		X	X		X
Percina caprodes	logperch		X	X	X	
Percina maculata	blackside darter	X	X	X	X	
Percina phoxocephala	slenderhead darter		X	X	X	
Stizostedion vitreum	walleye			X	X	

[1] Data from the Illinois Natural History Survey fish collection.
[2] Bold type indicates a state endangered species (SE); state threatened (ST); * = non-native species.
[3] Total number of species = 96 (94 native, 2 introduced).

Table 22. Freshwater fishes recorded from the Fox River Assessment Area, by habitat[1].

Family *Scientific Name*[2,3]	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
Petromyzontidae						
Lampetra appendix	American brook lamprey	X	X			
Lepisosteidae						
Lepisosteus osseus	longnose gar				X	
Amiidae						
Amia calva	bowfin			X	X	
Clupeidae						
Dorosoma cepedianum	gizzard shad		X			X
Cyprinidae						
Campostoma anomalum	central stoneroller	X	X			
Campostoma oligolepis	largescale stoneroller	X	X			
Cyprinella lutrensis	red shiner		X	X		
Cyprinella spiloptera	spotfin shiner		X	X		
Cyprinella whipplei	steelcolor shiner		X	X		
* *Cyprinus carpio*	common carp			X	X	
Hybognathus hankinsoni	brassy minnow			X		
Hybognathus nuchalis	Mississippi silvery minnow		X	X		
Luxilus chrysocephalus	striped shiner		X	X		
Luxilus cornutus	common shiner		X	X		
Lythrurus umbratilis	redfin shiner		X	X		
Nocomis biguttatus	hornyhead chub		X	X		

Table 22. Continued

Family *Scientific Name*[2,3]	Common Name	Streams Riffles	Runs	Pools	Standing Water Littoral	Open Water
Notemigonus crysoleucas	golden shiner			X	X	X
***Notropis anogenus* - SE**	**pugnose shiner**				X	
Notropis atherinoides	emerald shiner			X		
Notropis dorsalis	bigmouth shiner		X	X		
***Notropis heterodon* - ST**	**blackchin shiner**				X	
***Notropis heterolepis* - SE**	**blacknose shiner**			X		
Notropis hudsonius	spottail shiner			X	X	X
Notropis ludibundus	sand shiner		X	X		
Notropis rubellus	rosyface shiner		X	X		X
***Notropis texanus* - SE**	**weed shiner**		X	X		
Notropis volucellus	mimic shiner		X	X		
Opsopoeodus emiliae	pugnose minnow			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		
Rhinichthys atratulus	blacknose dace	X	X			
* *Scardinius erythrophthalmus*	rudd			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		
Erimyzon oblongus	creek chubsucker		X	X		
Erimyzon sucetta	lake chubsucker			X		
Hypentelium nigricans	northern hog sucker	X	X			
Ictiobus cyprinellus	bigmouth buffalo			X		
Minytrema melanops	spotted sucker			X		
Moxostoma anisurum	silver redhorse		X	X		
***Moxostoma carinatum* - ST**	**river redhorse**		X	X		
Moxostoma duquesnei	black redhorse		X	X		
Moxostoma erythrurum	golden redhorse		X	X		
Moxostoma macrolepidotum	shorthead redhorse		X	X		
***Moxostoma valenciennesi* - SE**	**greater redhorse**		X	X		
Ictaluridae						
Ameiurus melas	black bullhead			X	X	
Ameiurus natalis	yellow bullhead			X	X	
Ameiurus nebulosus	brown bullhead				X	
Ictalurus punctatus	channel catfish		X	X	X	
Noturus exilis	slender madtom	X				
Noturus flavus	stonecat	X				
Noturus gyrinus	tadpole madtom		X	X		
Pylodictis olivaris	flathead catfish			X	X	
Esocidae						
Esox americanus	grass pickerel			X	X	
Esox lucius	northern pike			X	X	

Table 22. Continued

Family *Scientific Name*[2,3]	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
Umbridae						
Umbra limi	central mudminnow			X	X	
Salmonidae						
Oncorhynchus mykiss	rainbow trout		X	X		
Salmo trutta	brown trout		X	X		
Atherinidae						
Labidesthes sicculus	brook silverside			X	X	X
Fundulidae						
***Fundulus diaphanus* - ST**	**banded killifish**				X	
Fundulus dispar	starhead topminnow				X	
Fundulus notatus	blackstripe topminnow			X		
Gasterosteidae						
Culaea inconstans	brook stickleback			X	X	
Cottidae						
Cottus bairdi	mottled sculpin	X				
Moronidae						
Morone chrysops	white bass			X		X
Morone mississippiensis	yellow bass			X	X	
Centrarchidae						
Ambloplites rupestris	rock bass			X		
Lepomis cyanellus	green sunfish			X		X
Lepomis gibbosus	pumpkinseed			X		
Lepomis gulosus	warmouth			X	X	
Lepomis humilis	orangespotted sunfish			X		
Lepomis macrochirus	bluegill			X	X	
Lepomis megalotis	longear sunfish			X		
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						
Etheostoma caeruleum	rainbow darter	X				
***Etheostoma exile* - SE**	**Iowa darter**			X	X	
Etheostoma flabellare	fantail darter	X				
Etheostoma microperca	least darter		X	X	X	
Etheostoma nigrum	johnny darter		X	X		
Etheostoma spectabile	orangethroat darter	X		X		
Etheostoma zonale	banded darter	X				
Perca flavescens	yellow perch			X	X	
Percina caprodes	logperch		X	X		
Percina maculata	blackside darter			X		
Percina phoxocephala	slenderhead darter	X	X			
Stizostedion vitreum	walleye			X		

[1] Data from the Illinois Natural History Survey fish collection.

[2] Bold type indicates a state endangered species (SE); state threatened (ST); * = non-native species.

[3] Total number of species = 96 (94 native, 2 introduced).

Table 23. Freshwater mussels recorded from the Fox River Assessment Area[1].

Family Sub-family *Scientific Name*[2,3]	Common Name	Headwaters/ Creeks	Small Rivers	Medium Rivers	Standing Water
Unionidae					
Anodontinae					
Alasmidonta marginata	elktoe		X	X	
***Alasmidonta viridis* - SE**	**slippershell mussel**	X	X		
Anodontoides ferussacianus	cylindrical papershell	X	X		X
Lasmigona complanata	white heelsplitter	X	X	X	X
Lasmigona compressa	creek heelsplitter	X	X		
Lasmigona costata	flutedshell		X	X	
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	
Cyclonaias tuberculata	purple wartyback			X	
***Elliptio dilatata* - ST**	**spike**		X	X	
Fusconaia flava	Wabash pigtoe		X	X	
***Plethobasus cyphyus* - SE**	**sheepnose**			X	
Pleurobema sintoxia	round pigtoe		X	X	
Quadrula metanevra	monkeyface			X	
Quadrula pustulosa	pimpleback		X	X	
Quadrula quadrula	mapleleaf		X	X	
Tritogonia verrucosa	pistolgrip		X	X	
Lampsilinae					
Actinonaias ligamentina	mucket		X	X	
Lampsilis cardium	plain pocketbook		X	X	
***Lampsilis fasciola* - SE**	**wavy-rayed lampmussel**		X	X	
Lampsilis siliquoidea	fatmucket		X	X	X
Leptodea fragilis	fragile papershell		X	X	
Ligumia recta	black sandshell			X	
Obovaria olivaria	round hickorynut			X	
Potamilus alatus	pink heelsplitter		X	X	
Potamilus ohiensis	pink papershell		X	X	
Toxolasma parvus	lilliput	X	X	X	X
Truncilla donaciformis	fawnsfoot			X	
Venustaconcha ellipsiformis	ellipse		X	X	
***Villosa iris* - SE**	**rainbow**		X	X	

[1] Data from the Illinois Natural History Survey mollusk collection and other museum collections.
[2] Bold type indicates a state endangered species (SE); state threatened (ST).
[3] Total number of species = 32.

Table 24. Freshwater mussels recorded from the Fox River Assessment Area, by habitat[1].

Family Sub-family *Scientific Name*[2,3]	Common Name	Streams			Standing Water
		Riffles	Runs	Pools	Littoral Zone
Unionidae					
Anodontinae					
Alasmidonta marginata	elktoe	X	X		
***Alasmidonta viridis* - SE**	**slippershell mussel**	X	X		
Anodontoides ferussacianus	cylindrical papershell		X	X	X
Lasmigona complanata	white heelsplitter		X	X	X
Lasmigona compressa	creek heelsplitter	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	
Cyclonaias tuberculata	purple wartyback	X	X		
***Elliptio dilatata* - ST**	**spike**	X	X		
Fusconaia flava	Wabash pigtoe	X	X		
***Plethobasus cyphyus* - SE**	**sheepnose**	X	X		
Pleurobema sintoxia	round pigtoe	X	X		
Quadrula metanevra	monkeyface	X	X		
Quadrula pustulosa	pimpleback	X	X		
Quadrula quadrula	mapleleaf	X	X	X	
Tritogonia verrucosa	pistolgrip	X	X		
Lampsilinae					
Actinonaias ligamentina	mucket	X	X		
Lampsilis cardium	plain pocketbook	X	X	X	
***Lampsilis fasciola* - SE**	**wavy-rayed lampmussel**		X	X	
Lampsilis siliquoidea	fatmucket	X	X	X	X
Leptodea fragilis	fragile papershell	X	X	X	
Ligumia recta	black sandshell	X	X		
Obovaria olivaria	round hickorynut	X	X		
Potamilus alatus	pink heelsplitter	X	X	X	
Potamilus ohiensis	pink papershell	X	X	X	
Toxolasma parvus	lilliput	X	X	X	X
Truncilla donaciformis	fawnsfoot	X	X		
Venustaconcha ellipsiformis	ellipse	X	X		
***Villosa iris* - SE**	**rainbow**	X	X		

[1] Data from the Illinois Natural History Survey mollusk collection and other museum collections.
[2] Bold type indicates a state endangered species (SE); state threatened (ST).
[3] Total number of species = 32.

Table 25. Freshwater crustaceans recorded from the Fox River Assessment Area[1].

ORDER Family *Scientific Name*[2,3]	Common Name	Headwaters	Creeks	Small Rivers	Medium Rivers	Standing Water
ISOPODA (Isopods)						
Asellidae						
Caecidotea brevicauda		X				
Caecidotea forbesi		X				X
Caecidotea intermedia		X	X	X	X	
AMPHIPODA (Amphipods)						
Crangonyctidae						
Crangonyx gracilis						X
Crangonyx pseudogracilis						X
Gammaridae						
Gammarus pseudolimnaeus		X				
Hyalellidae						
Hyalella azteca		X	X	X	X	X
DECAPODA (Crayfishes & shrimps)						
Cambaridae						
Procambarus acutus	White River crawfish		X	X	X	X
Procambarus gracilis	prairie crayfish			burrower		
Orconectes immunis	calico crayfish	X	X	X	X	X
Orconectes propinquus	clearwater crayfish		X	X	X	
Orconectes virilis	virile crayfish		X	X	X	X
* *Orconectes rusticus*	rusty crayfish		X	X	X	X
Cambarus diogenes	devil crawfish			burrower		

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

[2] * = non-native species.

[3] Total number of species = 14 (13 native, 1 introduced).

Table 26. Freshwater crustaceans recorded from the Fox River Assessment Area, by habitat[1].

ORDER Family *Scientific Name*[2,3]	Common Name	Streams			Standing Water	
		Riffles	Runs	Pools	Littoral	Open Water
ISOPODA (Isopods)						
Asellidae						
Caecidotea brevicauda		X				
Caecidotea forbesi					X	
Caecidotea intermedia		X		X		
AMPHIPODA (Amphipods)						
Crangonyctidae						
Crangonyx gracilis				X	X	
Crangonyx pseudogracilis					X	
Gammaridae						
Gammarus pseudolimnaeus		X				
Hyalellidae						
Hyalella azteca		X	X	X	X	
DECAPODA (Crayfishes & shrimps)						
Cambaridae						
Procambarus acutus	White River crawfish			X	X	
Procambarus gracilis	prairie crayfish			burrower		
Orconectes immunis	calico crayfish			X	X	
Orconectes propinquus	clearwater crayfish	X				
* *Orconectes rusticus*	rusty crayfish	X			X	
Orconectes virilis	virile crayfish	X	X		X	
Cambarus diogenes	devil crawfish			burrower		

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

[2] * = non-native species.

[3] Total number of species = 14 (13 native, 1 introduced).

Table 27. Aquatic macroinvertebrates, exclusive of the Crustacea and unionoidean Mollusca, recorded from the Fox River Assessment Area[1].

Phylum NEMATODA - Nematode Worms
species indeterminate

Phylum NEMATOMORPHA - Horsehair Worms
Parachordodidae
species indeterminate

Phylum BRYOZOA - Moss Animacules
Phylactolaemata
Plumatellidae
species indeterminate

Phylum TURBELLARIA - Flatworms
Tricladida
Planariidae
Dugesia tigrina

Phylum ANNELIDA - Segmented Worms
Class APHANONEURA - Suction-Feeding Worms
Aeolosomatida
Aeolosomatidae
species indeterminate
Class BRANCHIOBDELLAE - Crayfish Worms
Branchiobdellida
Cambarincolidae
species indeterminate

Class OLIGOCHAETA - Oligochaete Worms
Haplotaxida
Haplotaxidae
Haplotaxis gordioides
Lumbriculida
Lumbriculidae
species indeterminate
Tubificida
Enchytraeidae
species indeterminate
Naididae
Arcteonais lomondi
Chaetogaster diaphanus
Dero digitata
Dero nivea
Nais communis
Nais pardalis
Nais variabilis
Ophidonais serpentina
Pristina leidyi
Slavina appendiculata
Stylaria lacustris
Tubificidae
Aulodrilus pigueti
Branchiura sowerbyi
Ilyodrilus templetoni
Limnodrilus cervix
Limnodrilus claparedianus
Limnodrilus hoffmeisteri
Quistadrilus multisetosus
Tubifex tubifex
Lumbricidae
Eisenia foetida
Class HIRUDINEA - Leeches
Rhynchobdellida
Glossiphoniidae
Helobdella triserialis
Helobdella stagnalis
Placobdella multilineata
Placobdella ornata
Placobdella parasitica
Gnathobdellida
Hirudinidae
Haemopis marmorata
Haemopis terrestris
Pharyngobdellida
Erpobdellidae
Erpobdella punctata

Phylum ARTHROPODA - Arthropods
Class ARACHNIDA
Hydrachnida - Aquatic Mites
species indeterminate
Class INSECTA - Insects
Ephemeroptera - Mayflies
Baetidae
Baetis fontinalis ?
Baetis intercalaris
Baetis tricaudatus
Callibaetis ferrugineus
Callibaetis skokianus
Caenidae
Americaenis ridens
Ephemerellidae

Table 27. Continued

Eurylophella lutulenta
Ephemeridae
Hexagenia limbata
Hexagenia rigida
Heptageniidae
Leucrocuta maculipennis
Nixe inconspicua
Stenacron interpunctatum
Stenonema femoratum
Stenonema mediopunctatum
Stenonema pulchellum
Stenonema terminatum
Leptohyphidae
Tricorithodes peridius
Polymitarcidae
Ephoron album
Potamanthidae
Anthopotamus sp.
Potamanthus verticis
Siphlonuridae
Isonychia rufa
Trichorythidae
Trichorythodes sp.

Order Odonata - Damselflies and Dragonflies

Zygoptera - Damselflies
Calopterygidae
Calopteryx maculata
Hetaerina americana
Coenagrionidae
Anomolagrion hastatum
Argia tibialis
Argia moesta
Enallagma antennatum
Enallagma aspersum
Enallagma basidens
Enallagma carunculatum
Enallagma civile
Enallagma ebrium
Enallagma exsulans
Enallagma geminatum
Enallagma hageni
Enallagma vesperum
Ischnura posita
Ischnura verticalis
Corduliidae
Epitheca spinigera
Neurocordulia obsoleta
Somatochlora linearis
Lestidae
Lestes congener
Lestes disjunctus
Lestes dryas
Lestes forcipatus
Lestes rectangularis
Lestes unguiculatus
Lestes vigilax

Anisoptera - Dragonflies
Aeshnidae
Aeshna canadensis
Aeshna clepsydra
Aeshna constricta
Aeshna umbrosa
Anax junius
Boyeria vinosa
Cordulegasteridae
Cordulegaster diastatops
Cordulegaster obliquus
Gomphidae
Dromogomphus spinosus
Gomphus furcifer
Gomphus graslinellus
Gomphus notatus
Gomphus spicatus
Gomphus spiniceps
Gomphus vastus
Ophiogomphus rupinsulensis
Libellulidae
Celithemis elisa
Celithemis eponina
Erythemis simplicicollis
Ladona julia
Leucorrhinia intacta
Libellula luctuosa
Libellula pulchella
Libellula semifasciata
Libellula vibrans
Pachydiplax longipennis
Perithemis tenera
Plathemis lydia
Sympetrum costiferum
Sympetrum internum
Sympetrum obtrusum
Sympetrum rubicundulum
Tramea lacerata

Table 27. Continued

Macromiidae
Didymops transversa
Macromia illinoiensis
Macromia pacifica
Plecoptera - Stoneflies
Capniidae
Allocapnia granulata
Allocapnia vivipara
Paracapnia angulata
Chloroperlidae
Haploperla brevis
Leuctridae
Leuctra tenuis
Nemouridae
Amphinemura delosa
Amphinemura varshava ?
Nemoura trispinosa
Perlidae
Acroneuria frisoni
Acroneuria internata
Agnetina flavescens
Attaneuria ruralis
Perlesta placida complex
Perlodidae
Isoperla bilineata
Clioperla clio
Taeniopterygidae
Strophopteryx fasciata
Taeniopteryx burksi
Taeniopteryx nivalis
Heteroptera - True Bugs
Belostomidae
Belostoma flumineum
Benacus griseus
Lethocerus americanus
Corixidae - Water Boatmen
Corisella edulis
Hesperocorixa obliqua
Hesperocorixa vulgaris
Palmacorixa buenoi
Palmacorixa nana
Ramphocorixa acuminata
Sigara alternata
Sigara grossolineata
Sigara hubbelli
Trichocorixa calva
Trichocorixa kanza
Trichocorixa naias
Gerridae - Pond Skaters
Aquarius remigis
Trepobates sp.
Nepidae - Water Scorpions
Nepa apiculata
Ranatra fusca
Ranatra kirkaldyi
Ranatra nigra
Notonectidae - Backswimmers
Buenoa margaratacea
Notonecta irrorata
Notonecta raleighi
Notonecta undulata
Pleidae
Neoplea striola
Veliidae - Little Water Striders
Microvelia sp.
Lepidoptera - Butterflies & Moths
Pyralidae
Acentria sp.
Coleoptera - Beetles
Dytiscidae
Agabus sp.
Coptotomus sp.
Graphoderes librus
Hydaticus piceus
Hydroporus undulatus
Hydrovatus sp.
Laccophilus maculosus
Laccophilus proximus
Coptotomus lenticus
Coptotomus longulus
Elmidae
Optioservus fastiditus
Stenelmis crenata
Haliplidae
Anacaena limbata
Peltodytes duodecimpunctatus
Peltodytes edentulus
Peltodytes lengi
Peltodytes pedunculatus
Peltodytes sexmaculatus
Haliplus blanchardi
Haliplus borealis
Haliplus connexus
Haliplus cribrarius

Table 27. Continued

Haliplus immaculicollis
Haliplus longulus
Haliplus subguttatus
Haliplus triopsis
Peltodytes edentulus
Hydrophilidae
Enochrus ochraceus
Hydrochara obtusata
Hydrochus granulatus
Hydrochus pseudosquamifer
Hydrochus rutipes
Hydrochus squamifer
Hydrophilus triangularis
Paracymus confluens
Paracymus despectus
Paracymus subcupreus
Tropisternus blatchleyi modestus
Tropisternus glaber
Tripisternus lateralis nimbatus
Tripisternus mixtus
Tropisternus natator
Trichoptera - Caddisflies
Glossosomatidae
Glossosoma intermedium
Helichopsychidae
Helicopsyche borealis
Hydropsychidae
Ceratopsyche bronta
Ceratopsyche slossonae
Cheumatopsyche analis
Cheumatopsyche aphanta
Cheumatopsyche campyla
Cheumatopsyche lasia
Diplectrona modesta
Hydropsyche aerata
Hydropsyche arinale
Hydropsyche betteni
Hydropsyche bidens
Hydropsyche cuanis
Hydropsyche orris
Hydropsyche placoda
Macrostemum zebratum
Potamyia flava
Hydroptilidae
Agraylea multipunctata
Hydroptila angusta
Hydroptila consimilis
Hydroptila hamata
Mayatrichia ayama
Ochrotrichia aegerfasciella
Ochrotrichia cristata
Oxyethira serrata
Lepidostomatidae
Lepidostoma libum
Leptoceridae
Ceraclea alagma
Ceraclea cancellata
Ceraclea diluta
Ceraclea tarsipunctata
Ceraclea trasanversa
Leptocerus americanus
Mystacides interjecta
Mystacides sepulchralis
Nectopsyche albida
Nectopsyche diarina
Nectopsyche exquisita
Oecetis cinerascens
Oecetis immobilis
Oecetis inconspicua
Oecetis osteni
Triaenodes injustus
Triaenodes tardus
Limnephilidae
Anabolia consocius
Hesperophylax designatus
Leptophylax gracilis
Limnephilus rhombicus
Molannidae
Molanna blenda
Molanna uniophila
Philopotamidae
Chimarra obscura
Wormaldia moestus
Phryganeidae
Agrypmia vestita
Banksiola crotchi
Phryganea cinerea
Phryganea sayi
Ptilostomis ocellifera
Ptilostomis semifasciata
Polycentropodidae
Cyrnellus fraternus
Nyctophylax vestitus
Polycentropus cinereus

Table 27. Continued

Polycentropus glacialis
Polycentropus interruptus
Rhyacophilidae
Rhyacophila vibox
Rhyacophila vulgaris ?
Uenoidae
Neophylax concinnus
Diptera - Flies
Ceratopogonidae
Ceratopogoninae
Bezzia albidorsata
Bezzia setulosa
Clinohelea bimaculata
Jenkinshelea albaria
Johannsenomyia argentata
Mallochohelea caudelli
Mallochohelea flavidula
Nilobezzia schwarzi
Palpomyia illinoisensis
Palpomyia subasper
Palpomyia tibialis
Sphaeromias longipennis
Forcipomyiinae
Atrichopogon peregrinus
Forcipomyia brevipennis
Dasyheleinae
Dasyhelea mutabilis
Chironomidae
Tanypodinae
Ablabesmyia illinoensis
Ablabesmyia monilis
Alotanypus venustus
Clinotanypus pinguis
Coelotanypus concinnus
Procladius culiciformis
Psectrotanypus dyari
Psectrotanypus johnsoni
Orthocladinae
Cricotopus sp.
Pseudosmittia sp.
Chironominae
Microtendipes pedellus
Natarsia sp.
Paraphaenocladius sp.
Polypedilum sp.
Stenochironomus pulchripennis
Stenochironomus taeniapennis
Stictochironomus flavicingula
Culicidae
Anopheles sp.
Culex sp.
Simuliidae
Simulium sp.
Stratiomyidae
species indeterminate
Syrphidae
Eristalis sp.
Tabanidae
species indeterminate
Tipulidae
Helius sp.
Limonia sp.

Phylum MOLLUSCA - Mollusks (not including Unionidae)
Gastropoda - Snails
Ancylidae
species indeterminate
Lymnaeidae
Stagnicola sp.
Physidae
Physa sp.
Physella sp.
Planorbidae
Gyraulus sp.
Helisoma sp.
Valvatidae
Valvata tricarinata
Pelecypoda - Bivalve Mollusks
Sphaeriidae
Musculium sp.

[1] Data are from the Illinois Natural History Survey Insect and Annelida collections, and literature cited in this document.

Threatened and Endangered Fishes

State endangered (SE) fishes known from this region are the *weed shiner*, last observed in 1901, the *pugnose shiner* observed in 1992, *blacknose shiner* observed in 1993, *greater redhorse* observed in 1996, and *Iowa darter* observed in 1993. State threatened (ST) fishes are the *blackchin shiner* observed in 1993, *river redhorse* observed in 1991, and *banded killifish* observed in 1990. It is doubtful that the *weed shiner* (SE) still exists in the region since none have been seen since 1901.

The *pugnose shiner* (SE) is one of the most endangered fishes in Illinois and is known to maintain populations only in Deep Lake (observed in 1985), Cross Lake (1990), and East Loon Lake (1990), all of which are in Lake County, and in Elizabeth Lake, which is in McHenry County (1992). Cross Lake supports a large population of pugnose shiners; East Loon, Deep, and Elizabeth lakes support smaller populations.

The *blackchin shiner* (ST) also has an extremely restricted distribution in Illinois and is found only in the Fox River system. Populations are known in Cross Lake (1986), Wooster Lake (1990), Sullivan Lake (1985), Deep Lake (1985), Cedar Lake (1990), East Loon Lake (1985), Elizabeth Lake (1993), and Nippersink Creek (1992).

The *blacknose shiner* (SE) was once widespread in Illinois but now persists in only a few localities, including lakes in the Fox River system. Recent records are available from Cross Lake (1986), East Loon Lake (1984), Wooster Lake (1990), Cedar Lake (1990), all in Lake County, and Elizabeth Lake in McHenry County (1993).

The *river redhorse* (ST) and *greater redhorse* (SE) maintain populations in the Fox River in Kendall and Kane counties (1996). The greater redhorse is known at only two other localities in Illinois. The river redhorse occurs elsewhere in Illinois but only in the Vermilion and Kankakee river systems.

The *banded killifish* (ST) maintains populations in several of the same lakes inhabited by the blackchin and blacknose shiners, including Cross Lake (1990), Deep Lake (1985), East Loon Lake (1984), and Cedar Lake (1990), all in Lake County.

The *Iowa darter* (SE) is found in Cross Lake (1986), Cedar Lake (1990), and Turner Lake (1990), all in Lake County, and in Elizabeth Lake in McHenry County (1993).

Threatened and Endangered Mussels

Ninety miles of the Fox River from the Wisconsin state line to Ottawa, Illinois, were surveyed for mussels in 1911 by John A. Eldridge of the U.S. Bureau of Fisheries (Eldridge 1914). The Illinois portion of the Fox was also sampled by M.R. Matteson of the University of Illinois in 1957-58. No comprehensive mussel survey of the streams of this system have been conducted and no recent data are available to allow a basinwide

assessment of the fauna. Five special status species are known from the drainage including one state threatened (*spike*) and four state endangered species (*slippershell mussel, sheepnose, wavy-rayed lampmussel,* and *rainbow*).

Historical locations for the *slippershell* (SE) include the Fox River at Dundee (pre-1919), Oswego (date unknown), and Algonquin (pre-1919). Recent records for shells include Little Rock Creek near Plano (1986), and Blackberry Creek near Sugar Grove (1988). Three live slippershells were found by biologists with the McHenry County Forest Preserve District in Nippersink Creek near Wonder Lake in McHenry County in 1995. These are the only recent live records for slippershells in the drainage.

Although formerly widespread and abundant in the Fox River drainage, the *spike* (ST) has all but been eliminated from the river. A live spike was collected by Illinois Department of Natural Resource biologists in the Fox River below McHenry dam in 1988. Numerous weathered dead and subfossil shells can be found throughout the basin, however finding live spikes is rare.

A single record of the *sheepnose* (SE) from "Dundee, Illinois" is present in the collections of the Chicago Academy of Sciences. No live individuals have been collected in over 50 years and it is likely extirpated from the drainage.

Four specimens of the *wavy-rayed lampmussel* (SE) labeled "Dundee" are in the collections of the Chicago Academy of Sciences. These specimens are also referred to by Baker (1906) in his paper on the Mollusca of Illinois. This species is largely restricted to the Wabash River drainage in Illinois. No other wavy-rayed lampmussels have ever been collected in the Fox River and this species is considered extirpated from the drainage.

Historical locations for the rainbow (SE) include the Fox River at Elgin (pre-1919), Geneva (pre-1878), Dundee (pre-1919), Oswego (date unknown), Yorkville (pre-1918), and Algonquin (pre-1919). Recently, weathered-dead shells have been found in the Fox River at Geneva and South Elgin (1987), and Montgomery (1995), North Branch Nippersink Creek near Richmond (1991), and Nippersink Creek near Spring Grove (1996). No live individuals have been collected in over 50 years and the status of the species in the drainage is unknown.

Other than the mussels mentioned above, the current literature discussing federal and state listed threatened and endangered species, species under consideration for such listing, or other species considered rare or of special concern (Herkert 1992, 1994; Illinois Endangered Species Protection Board 1994; U.S. Department of Interior, Fish and Wildlife Service 1995, 1996) does not include any aquatic macroinvertebrate species other than unionid mussels known or thought likely to occur in the FRAA.

Non-native Species

The common carp, *Cyprinus carpio,* has been introduced in the Fox River drainage. 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 species 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.

The rusty crayfish and the zebra mussel are two other non-native species that are having major impacts on aquatic communities in Illinois. The rusty crayfish is rapidly expanding its range and becoming common in the Fox River system (Taylor and Redmer 1996). Once established the rusty crayfish outcompetes native crayfishes, and in the Fox River basin is rapidly displacing the ecologically similar White River crawfish. Less information is available on the zebra mussel, but it also is expected to have negative impacts on native Illinois species, particularly native mussels. Although it is common in other parts of Illinois, the Asian clam, *Corbicula fluminea,* has not been reported from the Fox River drainage.

Of the aquatic macroinvertebrate taxa known or thought likely to occur in the FRAA, (Table 27), none is thought to have been introduced.

Information Gaps

The FRAA has been moderately well-studied with respect to fishes, crayfishes, and mussels. However, additional survey work, especially in the smaller tributaries, would better define the limits of some of the mussels and small species of fishes, and possibly uncover additional populations of the state threatened and endangered 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.

Major groups of aquatic macroinvertebrates known to occur in the FRAA (Table 27) have not been as well studied as fishes, mussels, and crustaceans. Historical as well as recent faunal studies for aquatic macroinvertebrates occurring in Illinois include those for Coleoptera (beetles) (Wooldridge 1967, W. Brigham, unpublished), Ephemeroptera (mayflies) (Burks 1953), Plecoptera (stoneflies) (Frison 1935), Trichoptera (caddisflies) (Ross 1944), Hemiptera (true bugs) (Lauck 1959), Diptera (Malloch 1915a,b), and Annelida (segmented worms) (Wetzel 1992).

There are extensive historical and recent collections of aquatic macroinvertebrates deposited in the permanent Illinois Natural History Survey Collections. However, not much of this information is 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 of historical material with that obtained during more recent collections could be made to determine 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 1990) describes water quality conditions for designated uses including aquatic life, swimming, drinking water, recreation, secondary contact, and fish consumption based on a wide variety of biotic and abiotic monitoring programs. They rated, 55% of the river miles of the Fox River as "Full Support," (water quality meets the needs of all designated uses protected by applicable water quality standards). The remaining stream miles, located from McHenry to Aurora, which is the most urbanized portion of the basin, were rated as "Partial Support/Minor Impairment," (water quality has been impaired, but only to a minor degree). Urban runoff and municipal wastewater discharges are the major sources of water quality degradation.

The Biological Stream Characterization (Hite and Bertrand 1989) rated Buck Creek as an "A" Stream (Unique Aquatic Resource). The Fox River mainstem near its mouth, from the Illinois state line to Grass Lake, and from Big Rock Creek to Mission Creek was rated as a "B" Stream (Highly Valued Aquatic Resource). Tributaries to the Fox River rated as "B" Streams include Squaw Creek, Boone Creek, Waubansee Creek, Rob Roy Creek, Somonauk Creek, Nippersink Creek from the North Branch to its mouth, Tyler Creek from its headwaters to just before the town of Elgin, Mill Creek upstream from Moose Heart Lake to its mouth, Big Rock Creek from Battle Branch to its mouth, and Indian Creek from Sutphens Run to its mouth. The remaining miles of the mainstem are rated as a "C" Stream (Moderate Aquatic Resource).

Using fishes as biological indicators, Smith (1971) rated the Fox River as "Good" to "Excellent" with domestic and industrial pollution identified as a problem. The river's tributaries have a wide variety of habitats and high species diversity. Although some of the glacial lakes still maintain relatively intact ecosystems and high species diversity, many have been ruined by overdevelopment of the surrounding landscape, pollution, and stocking of game fishes.

Biologically Significant Streams and Lakes

Eighteen lakes and streams of the Fox River basin were recognized as biologically significant (Page et al. 1992) because of the presence of threatened or endangered species, or their high mussel and fish diversity. These 18 bodies of water provide the best opportunities in the basin for the protection of large numbers of native aquatic species.

1. Fox River, Morgan Creek to confluence with the Illinois River, Kendall/LaSalle counties. This stretch of the Fox River is a medium-sized river. The substrate is bedrock, overlain in some areas with boulders or mixtures of sand and gravel. Habitats include swift, boulder/gravel riffles, smooth flowing runs, quiet sand-bottomed backwaters, and silt-bottomed pools. Depths range from six inches in some of the shallow riffles to four feet in the main channel. The greater redhorse and the river redhorse, two rare fishes that require rocky substrate, are found, and possibly reproduce, in this stretch of the river.

2. North Branch Nippersink Creek from Wisconsin border to Nippersink Creek, McHenry County. The North Branch of Nippersink Creek is a small natural stream with a mostly sand and gravel substrate that supports a population of the creek heelsplitter. The riparian zone is 10-50 feet wide and consists of trees and grasses. (The waste treatment plant for Richmond and a golf course, two potential sources of degradation, are upstream).

3. Cedar Lake, Lake Villa, Lake County. Cedar Lake is one of the largest glacial lakes in Lake County. The depth varies from only inches along the shore to 35 feet near the middle; the water is very clear. The only heavy residential development is on the northwest side of the lake. Cedar Lake is of excellent quality and a good candidate for preservation; however the introduced, water milfoil (a submerged aquatic plant) first appeared in the lake five years ago and has formed large dense beds and in some areas is choking out other plants. Potential threats to the habitat are the spread of water milfoil, increased recreational use by motorboats, and a new housing development to the north. Four endangered plant species—water marigold, white-stemmed pondweed, fern pondweed, and grass-leaved pondweed—and four threatened/endangered fish species—blackchin shiner, blacknose shiner, banded killifish, and Iowa darter—are present. A small part of the lake is preserved within Cedar Lake Bog Nature Preserve.

4. Cross Lake, Wisconsin and Illinois state line, Lake County. Cross Lake is a border lake located in both Wisconsin and Illinois. Maximum depth is 35 feet. Heavy residential development surrounds the southern portion of the lake. The pugnose shiner, blackchin shiner, blacknose shiner, banded killifish, and Iowa darter, all state threatened or endangered fishes, are present. The population of the pugnose shiner, a species that is in decline throughout its entire range, is the largest in Illinois.

5. Deep Lake, Lake County. Deep Lake is one of the state's deepest lakes and has a maximum depth of over 50 feet. Less than half of the land surrounding the lake has been developed, with the eastern shore showing the most development. Vascular aquatic vegetation is abundant. The lake supports populations of the state endangered white-

stemmed pondweed and the state-threatened/endangered fishes, pugnose shiner (SE), blackchin shiner (ST), and banded killifish (ST).

6. East Loon Lake, Lake County. East Loon Lake has a maximum depth of 25 feet and receives the drainage of both Deep and Sun lakes. Residential development is heavy on the east while West Loon Lake borders on the west. The pugnose shiner, blackchin shiner (ST), blacknose shiner (SE), and banded killifish (ST) are present in small populations.

7. Sullivan Lake, Lake County. Sullivan Lake, a natural pothole slough, is fairly clear with a mud bottom. The lake is shallow (to 10 feet) and a small cat-tail island occupies the center of the lake. Residential development is light. Aquatic vegetation is abundant and includes grass-leaved pondweed. The blackchin shiner (ST), is known to be present in the lake.

8. Wooster Lake, Wilson, Lake County. Wooster Lake, surrounded by heavy residential development, has a maximum depth of 30 feet. The blackchin shiner (ST), and the blacknose shiner (SE) are present.

9. Turner Lake, Chain O' Lakes State Park, McHenry County. Turner Lake, which is within Chain O' Lakes State Park, is owned by the State of Illinois. Turner Lake Fen Nature Preserve, an example of the wetlands associated with the glacial lakes and ponds of northeastern Illinois, borders the south and west shorelines of the lake and provides habitat for the Iowa darter (SE).

10. Buck Creek. Rated as an "A" Stream (Unique Aquatic Resource) by the Biological Stream Characterization (Hite and Bertrand, 1989).

The remaining BSS sections were recognized as such because of the presence of several threatened and endangered plants. For a more detailed discussion of these plants see the section on "Threatened and Endangered Species" in the "Natural Vegetation Community" section of this report. Scientific names of plants are given in Appendix 1.

11. Unnamed tributary to Fox River at Yorkville, Kendall County. This intermittent tributary of the Fox River is a fast moving, natural stream about five feet wide with a substrate of cobble, gravel, and sand. It is recognized as a BSS segment because of the the state endangerd heart-leaved plantain, occurs on gravel bars on the banks and in the stream. The width of the riparian zone on the east bank is narrow, surrounded by mowed lawns and a housing development. The owners mow up to the heart-leaved plantain site on the east bank. The riparian vegetation on the west side is typical mesic floodplain forest with the herbs, Joe Pye weed, sneezeweed, and blue lobelia. Also, common on the west bank are seep springs which empty into this small intermittent tributary, populated by skunk cabbage and marsh marigold.

12. West Loon Lake, Lake County. West Loon Lake has some residential development on the north and south. Maximum depth is 40 feet. Aquatic vascular vegetation is abundant with white-stemmed pondweed (SE) and grass-leaved pondweed (SE) present.

13. Bangs Lake, Wauconda, Lake County. Bangs Lake is surrounded by the town of Wauconda. Recreational use is fairly heavy with water-skiing, swimming, and fishing the most notable activities. Large beds of aquatic vegetation are present, including white-stemmed pondweed (SE) and grass-leaved pondweed (SE).

14. Lily Lake, Lakemoor, McHenry County. Lily Lake is a peat lake. Residential development occurs only on the east and west shores. Vascular aquatic vegetation beds are found in the west and north. A sand beach grades into the lake on the east side and has little vegetation. White water lily and yellow pond lily form large beds throughout the lake. The average depth is two to five feet and small peat islands are common in the middle. Fern pondweed (SE), and grass-leaved pondweed (SE), are present.

15. Round Lake, Round Lake Park, Lake County. Round Lake is surrounded by residential development. The water is very turbid and debris litters the lake. There is some residential drainage into the lake. Although few vascular aquatic plant beds were found, grass-leaved pondweed (SE), is present.

16. Crystal Lake, Crystal Lake, McHenry County. Crystal Lake is surrounded by residential development. Maximum depth is 30 feet. Grass-leaved pondweed (SE), is present.

17. McCullom Lake, McHenry County. McCullom Lake was constructed in the late 1800s by damming a slough area northeast of McHenry, Illinois. The lake is surrounded by residential development. Grass-leaved pondweed (SE), is present.

18. Grays Lake, Grayslake, Lake County. Residential development surrounds Grays Lake. In the early 1960s Grays Lake had large quantities of vascular aquatic vegetation, including several endangered species. Although the lake still contains large quantities of aquatic vegetation, the only state endangered species now present is grass-leaved pondweed. Water milfoil, which the residents attempt to control, chokes the lake.

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, mottled sculpin, and many species of amphipods, isopods, and crayfishes. A few streams in the FRAA that contatin these communities include Tyler, Rob Roy, and Big Rock.

Stream desiccation is thought to be primarily an effect of the artificially extreme fluctuations in water levels that follow tiling of fields for agriculture. The rapid drainage of surrounding land increases the intensity and prolongs the duration of low-flow once the water has moved downstream. A drought that historically would have had the impact of decreasing the flow in a stream can now lead to a dry stream bed.

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 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 of a stream to enhance drainage of the surrounding land. The straightening converts the diversity of habitats in a stream to one continuous straight channel that supports few species. Because of their sedentary nature mussels are particularly susceptible to the effects of channelization.

Potential Management Strategies for Aquatic Species

Management strategies for aquatic ecosystems must consider each watershed on an individual basis. Attempting to correct problems locally without consideration of

upstream activities and downstream implications will result in partial, and probably temporary, improvement.

Correction of some factors that have led to stream habitat fragmentation in past decades is relatively easy. Important initiatives include 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 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 or commercial fishing, and usually governmental agencies have been responsible for the introductions. We now know that non-native species alter ecosystems, and the long-term effect of any introduction is likely to be negative rather than an improvement.

Given the opportunity, streams will restore themselves and, often, the best approach to restoration may be to encourage restoration of the native vegetation of the drainage basin (especially in 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.

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Appendix 1

Incomplete list of vascular plants known from the Fox River Assessment Area with notes on their habitat associations[1,2].

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
absinth*	*Artemisia absinthium**							x
adder's mouth orchid-EX	***Malaxis uniflora-EX***	up						
adder's-tongue fern	*Ophioglossum vulgatum*	up			fn,ss			
alder buckthorn - SE	***Rhamnus alnifolia - SE***				bg,fn			
alfalfa*	*Medicago sativa**		hp,pr					x
alkali grass*	*Puccinellia distans**							x
Allegheny shadblow	*Amelanchier laevis*	up						
Alsike clover*	*Trifolium hybridum**		hp,pr					x
alternate-leaved dogwood	*Cornus alternifolia*	up,fp			ss			
American bindweed	*Calystegia sepium*		pr,hp		sm,fn,ss,ma			x
American black currant	*Ribes americanum*	up,fp	pr		sm,ma,bg, fn,ss			
American brooklime - SE	***Veronica americana - SE***				sw,ss			
American bulrush	*Scirpus americanus*				ma,fm			
American bur reed - SE	***Sparganium americanum - SE***				ma	x		
American cranberry	***Vaccinium macrocarpon - SE***				bg			
American dog violet - ST	***Viola conspersa - ST***	up,fl						
American dragonhead*	*Dracocephalum parviflorum**							x
American elm	*Ulmus americana*	up,**fp, FL**			sm			
American gromwell	*Lithospermum latifolium*	up						
American hop	*Humulus lupulus*	fp						
American larch - ST	***Larix laricina - ST***				**BG,fn**			
American lotus	*Nelumbo lutea*				ma	x		
American mountain ash - SE,EX	***Sorbus americana - SE,EX***				bg			
American pennyroyal	*Hedeoma pulegioides*	up						x
American slough grass - SE	***Beckmannia syzigachne - SE***		pr					
American spikenard	*Aralia racemosa*	up						
American vetch	*Vicia americana*	up	pr					x
American water plantain	*Alisma plantago-aquatica* var. *americana*				ma	x		
Amur honeysuckle*	*Lonicera maackii**	up,fp			ss			
androsace	*Androsace occidentalis*		pr				x	
anise-root	*Osmorhiza longistylis*	up	hp					
annual bedstraw	*Galium aparine*	**up**,fp			sm			

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
annual bluegrass*	*Poa annua**							x
annual fleabane	*Erigeron annuus*	up	hp					x
annual foxtail	*Alopecurus carolinianus*							x
arrow arum	*Peltandra virginica*				sw,fn	x		
arrow grass - SE, EX	***Scheuchzeria palustris var. americana - SE, EX***				bg,sm			
arrowleaf aster	*Aster sagittifolius*	up						
arrowleaf tearthumb	*Polygonum sagittatum*	up			ma			
arrow-leaved violet	*Viola sagittata*	up						
arum-leaved arrowleaf	*Sagittaria cuneata*				ma	x		
ascending morning-glory*	*Evolvulus pilosus*							x
asparagus*	*Asparagus officinalis**		hp					x
Aunt Lucy	*Ellisia nyctelea*	up,fp						
autumn bent grass	*Agrostis perennans*	up						
autumn olive*	*Elaeagnus umbellata**	up						x
autumn willow - SE	***Salix serissima - SE***				ma,bg,fn			
awl-fruited sedge	*Carex tribuloides*				sm,			
awned graceful sedge	*Carex davisii*	up						
awnless brome grass*	*Bromus inermis**		hp					x
baby's breath*	*Gypsophila paniculata**							x
baby's breath*	*Gypsophila scorzonerifolia**							x
bachelor's buttons*	*Centaurea cyanus**							x
balsam groundsel	*Senecio pauperculus*		pr		fn			x
balsam poplar - SE	***Populus balsamifera - SE***		pr		bg			
barnyard grass*	*Echinochloa crus-galli**							x
basswood	*Tilia americana*	UP, fp		x	ss			
bastard toadflax	*Comandra umbellata*	up	pr,gp,hp					
beach wormwood	*Artemisia campestris*		gp				x	
beaked sedge - SE	***Carex rostrata - ST***				sm,fn			
beaked spikesedge - ST	***Eleocharis rostellata - ST***				fn,ss			
bearded wheat grass - SE	***Agropyron trachycaulum* var. *unilaterale - SE***		pr					
bearded wheat*	*Triticum aestivum**							x
beard-tongue*	*Penstemon cobaea**							x
Bebb willow	*Salix bebbiana*		pr		sm,bg			
Bebb's oval sedge	*Carex bebbii*		pr		ma,bg, fn			
beech wood sedge	*Carex laxiflora*	up						
beggar's lice*	*Lappula echinata**							x
Bicknell sedge	*Carex bicknellii*		pr					
biennial gaura	*Gaura biennis*							x
biennial wormwood*	*Artemisia biennis**							x
big bluestem	*Andropogon gerardii*		pr,gp,hp	x	fn			
big tooth aspen	*Populus grandidentata*	up						x
bird's foot violet	*Viola pedata*		hp,pr,gp	x				

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
birds-foot trefoil*	*Lotus corniculatus**							x
birthwort	*Aristolochia serpentaria*	up						
Bishop's cap	*Mitella diphylla*	up					x	
bitter cress	*Cardamine pensylvanica*		pr					
bitter dock*	*Rumex obtusifolius**	fp						x
bitternut hickory	*Carya cordiformis*	fp, up						
bittersweet	*Celastrus scandens*	up	gp	x				
bittersweet nightshade*	*Solanum dulcamara**	fp	gp		sm,ma,bg, ss			
black ash	*Fraxinus nigra*	fp,up	pr		sm,bg,fn,ss			
black bindweed*	*Polygonum convolvulus**							x
black cherry	*Prunus serotina*	**up,fl**	hp	x				x
black chokeberry	*Aronia melanocarpa*				ma,bg			
black gramma	*Brachyletrum erectum*	up						
black haw	*Viburnum prunifolium*	up			ss			
black huckleberry	*Gaylussacia baccata*			x	**BG**			
black locust *	*Robinia pseudoacacia**	up						x
black maple	*Acer nigrum*	**up,fp**						
black medic*	*Medicago lupulina**		hp					x
black mustard*	*Brassica nigra**							x
black nightshade	*Solanum ptycanthum*		hp					x
black oak	*Quercus velutina*	**UP**		**x**				
black poplar*	*Populus nigra**							x
black raspberry	*Rubus occidentalis*	up	hp		bg		x	
black snakeroot	*Sanicula canadensis*	up	pr					
black snakeroot	*Sanicula marilandica*	up						
black swallow-wort*	*Cynanchum nigrum**							ct
black walnut	*Juglans nigra*	up,fp		x	ss			
black willow	*Salix nigra*	fp			sm			
blackberry lily*	*Belamcanda chinensis**		hp					x
black-eyed Susan	*Rudbeckia hirta*		pr		sm,fn			
black-seeded rice grass - ST	***Oryzopsis racemosa - ST***	up		x				
bladder campion*	*Silene cucubalus**		hp					x
bladder fern	*Cystopsis bulbifera*						x	
bladdernut	*Staphylea trifolia*	up						
blanket flower*	*Gaillardia pulchella**							x
bloodroot	*Sanguinaria canadensis*	up						
blue ash	*Fraxinus quadrangulata*	**up**						
blue beech	*Carpinus caroliniana*	up						
blue cohosh	*Caulophyllum thalictroides*	up						
blue flag	*Iris shrevei*		pr		sm,ma,bg, fn	x		
blue joint grass	*Calamagrostis canadensis*	fp	**PR**		**SM,ma, fn**			
blue leaf willow	*Salix glaucophylloides var. glaucophylla*				sm,fn	x		
blue lettuce*	*Lactuca tatarica**							x

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
blue lobelia	*Lobelia siphilitica*	**up,FL**			fm,ss			
blue skullcap	*Scutellaria lateriflora*				sm,ma,bg		x	
blue vervain	*Verbena hastata*				**SM,ma**			
blue wild indigo*	*Baptisia australis**		pr					x
blue-eyed Mary	*Collinsia verna*	up						
blueweed*	*Echium vulgare**							x
blunt spike rush	*Eleocharis obtusa*				ma	x		
blunt-scaled wood sedge	*Carex albursina*	up						
bog bedstraw - ST	***Galium labradoricum - ST***				bg,fn			
bog clearweed	*Pilea fontana*				sm,ss			
bog Rosemary - EX	***Andromeda glaucophylla - EX***				bg			
bog willow	*Salix pedicellaris var. hypoglauca*				bg,fn,sm			
bog willow herb	*Epilobium leptophyllum*				sm,ma,fn			
bogbean	*Menyanthes trifoliata var. minor*				bg			
Boston ivy*	*Parthenocissus tricuspidata**							x
bottlebrush grass	*Elymus hystrix*	up						
bottlebrush sedge	*Carex lurida*				ma,bg,fn			
bouncing bet*	*Saponaria officinalis**							x
box elder	*Acer negundo*	**up,FP**	gp		ss			
bracken fern	*Pteridium aquilinum var. latiusculum*			x				x
bracted green orchid	*Coeloglossum viride*	up						
bracted plantain	*Plantago aristata*							x
branched bur reed	*Sparganium androcladum*				ma	x		
bristle-stalked sedge	*Carex leptalea*				bg,fn,ss			
bristly catbrier	*Smilax hispida*	fp						x
bristly crowfoot	*Ranunculus pensylvanicus*				ma,fn			
bristly foxtail*	*Setaria verticillata**							x
bristly locust*	*Robinia hispida**			x				x
bristly sarsaparilla - EX	***Aralis hispida - EX***				bg			
bristly sedge	*Carex comosa*				ma,fn			
bristly sunflower	*Helianthus hirsutus*	up						
broadleaf goldenrod	*Solidago flexicaulis*	up			ss		x	
broad-leaved bluets	*Hedyotis purpurea*							
broad-leaved panic grass	*Dichanthelium latifolium*	up						
broad-leaved woolly sedge	*Carex lanuginosa (C. pellita)*		pr		sm,ma,fn			
brome grass	*Bromus purgans*	up	pr					
brome grass*	*Bromus marginatus**							x
bronze fern	*Botrychium dissectum* var. *obliquum*	up						
brook flat sedge	*Cyperus rivularis*							
broom sedge	*Carex scoparia*		pr		ma			
broomcorn millet*	*Panicum miliaceum**							x
brown knotweed*	*Centaurea jacea**							x

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
brown spike rush	*Rhynchospora capitellata*				ma			
brown-eyed Susan	*Rudbeckia triloba*		pr		ma			x
brownish sedge - SE	***Carex brunnescens var. sphaerostachya - SE***				bg			
buckhorn plantain*	*Plantago lanceolata**		hp					x
buckthorn*	*Rhamnus davurica**	up						x
buckwheat*	*Fagopyrum esculentum**							x
buffalo burr*	*Solanum cornutam**							x
buffalo currant*	*Ribes odoratum**							x
buffalo grass*	*Buchloë dactyloides**							x
bugle weed	*Lycopus virginicus*		pr		sm,fn,ma			
bulb bittercress	*Cardamine bulbosa*		pr		sm,ma,fn,ss			
bulblet water hemlock	*Cicuta bulbifera*				sm,ma			
bull thistle*	*Cirsium vulgare**							x
bulrush - SE	***Scirpus hattorianus - SE***		pr					
bunchberry - SE	***Cornus canadensis - SE***				bg			
bur cucumber	*Sicyos angulatus*	fp,fl,up						
bur oak	*Quercus macrocarpa*	**UP**	pr	x	ss			
burning bush*	*Euonymus alatus**	up						
burweed*	*Iva xanthifolia**							x
bush clover	*Lespedeza intermedia*	up	pr					
bush honeysuckle*	*Lonicera muendeniensis**	up,fl						x
bushy pinweed	*Lechea striata*		gp					
butter-and-eggs*	*Linaria vulgaris**							x
butterfly weed	*Asclepias tuberosa* ssp. *interior*		pr	x				x
butternut	*Juglans cinerea*	up,fp						
button weed*	*Abutilon theophrasti**							x
buttonbush	*Cephalanthus occidentalis*	fp				x		
buttonbush dodder	*Cuscuta cephalanthi*				ma,fn			
Buxbaum sedge	*Carex buxbaumii*		pr		sm,ma,fn			
California poppy*	*Eschscholtzia californica**							x
Canada blueberry	*Vaccinium myrtilloides*				bg			
Canada bluegrass*	*Poa compressa**	up	pr,gp,hp		sm			
Canada brome grass	*Bromus ciliatus*				ma,sm			
Canada goldenrod	*Solidago canadensis*		**PR**					
Canada hawkweed	*Hieracium canadense*	up	pr					
Canada thistle*	*Cirsium arvense**		hp					x
Canada wild rye	*Elymus canadensis*		pr,gp,hp		sm			x
Canada yew	*Taxus canadensis*						x	x
Canadian milk vetch	*Astragalus canadensis*		pr					
Canadian rush	*Juncus canadensis*				ma,bg	x		
Canadian St. John's-wort	*Hypericum canadense*	fl						
cancer-root	*Conopholis americana*	up		x				
candle anemone	*Anemone cylindrica*		pr,hp					

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
capitate croton	*Croton capitatus*						x	x
caraway*	*Carum carvi**							x
cardinal flower	*Lobelia cardinalis*				ma			x
carpet bugle*	*Ajuga reptans**							x
carpet weed*	*Mollugo verticillata**							x
cat briers	*Smilax rotundifolia*	up						
catfoot	*Gnaphalium obtusifolium*		hp,gp					x
catnip*	*Nepeta cataria**		gp,hp					x
cat's ear*	*Hypochaeris radicata**							x
Celandine*	*Chelidonium majus**	up						
charlock*	*Brassica kaber**							x
cheat grass*	*Bromus tectorum**				ss			x
chickory*	*Cichorium intybus**		hp					x
chickweed	*Stellaria longifolia*				sm,bg			
chinquapin oak	*Quercus prinoides var. acuminata*	up			ss			
chives*	*Allium schoenoprasum**							x
chokecherry	*Prunus virginiana*	**up**	hp	x	ss			
Christmas fern	*Polystichum acrostichoides*	up						
cinnamon fern	*Osmunda cinnamomea*				ma,bg,ss			
cinnamon willow herb	*Epilobium coloratum*				sm,ma,ss,fn			
city goosefoot*	*Chenopodium urbicum**							x
clammy chickweed*	*Cerastium glomeratum**							x
clammy ground cherry	*Physalis heterophylla*		hp					x
clammy hedge hyssop	*Gratiola neglecta*					x		x
clammyweed	*Polanisia dodecandra*		gp					x
clearweed	*Pilea pumila*	fp,up			sm,ss		x	
cliff goldenrod - ST	***Solidago sciaphila - ST***						x	
closed gentian	*Gentiana andrewsii*		pr		sm			
cockspur thorn	*Crataegus crus-galli*	up	hp		ma			
columbine	*Aquilegia canadensis*	up			ss		x	
comb pondweed	*Potamogeton pectinatus*					x		
common alkanet*	*Anchusa officinalis**							x
common arrowleaf	*Sagittaria latifolia*				sm,ma,ss	x		
common barberry*	*Berberis vulgaris**							x
common barley*	*Hordeum vulgare**							x
common beggar ticks	*Bidens frondosa*				sm			x
common beggar ticks	*Bidens vulgata*							x
common blackberry	*Rubus allegheniensis*	up	hp	x				
common bladderwort	*Utricularia vulgaris*				ma	x		
common blue violet	*Viola pratincola*	fp	pr		sm			
common blue-eyed grass	*Sisyrinchium albidum*		pr,gp,hp					
common bog arrow grass - SE	***Triglochin maritima - SE***				fn			
common boneset	*Eupatorium perfoliatum*		pr		SM,ma,fn,ss			

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
common buckthorn*	*Rhamnus cathartica**	up,fp	pr,hp		sm,ma,bg			
common bur reed	*Sparganium eurycarpum*				sm,ma,bg	x		
common bur sedge	*Carex grayi*	fp						
common burdock*	*Arctium minus**	up	hp					
common carrion flower	*Smilax lasioneuron*	up		x				x
common cattail	*Typha latifolia*				sm,MA,fn,bg	x		
common chickweed*	*Stellaria media**							x
common cinquefoil	*Potentilla simplex*	up	pr	x				x
common cocklebur	*Xanthium strumarium var. canadensis*	fp						x
common crab grass*	*Digitaria sanguinalis**							x
common day flower*	*Commelina communis**							x
common dodder	*Cuscuta gronovii*				sm,ma			
common flax*	*Linum usitatissimum**							x
common forget-me-not*	*Myosotis scorpioides**	fp			sm			
common foxtail*	*Setaria viridis **							x
common gaura	*Gaura longiflora*	up	pr					x
common goat's-beard*	*Tragopogon pratensis**							x
common hemp nettle*	*Galeopsis tetrahit**							x
common hemp*	*Cannabis sativa**							x
common horehound*	*Marrubium vulgare**							x
common horsetail	*Equisetum arvense*	up	pr,hp		sm,ma,fn, ss			
common hound's-tongue*	*Cynoglossum officinale**							ct
common ironweed	*Vernonia fasciculata*		pr		ma			x
common mallow*	*Malva neglecta**							x
common matrimony vine*	*Lycium barbarum**							x
common milkweed	*Asclepias syriaca*		gp,**hp**		sm			x
common morning glory*	*Ipomoea purpurea**							x
common mountain mint	*Pycnanthemum virginianum*		hp		sm,fn			x
common mouse-ear chickweed*	*Cerastium vulgatum**				bg			x
common mugwort*	*Artemisia vulgaris**							x
common nettle	*Urtica dioica*	fp						
common peppergrass	*Lepidium virginicum*							x
common periwinkle*	*Vinca minor**							x
common phlox	*Phlox divaricata ssp. laphamii*	up						
common plantain*	*Plantago major**		pr					x
common polypody	*Polypodium virginianum*						x	
common pondweed	*Potamogeton natans*					x		
common ragweed	*Ambrosia artemisiifolia*		pr,hp					x
common reed	*Phragmites australis*				sm,MA	x		
common satin grass	*Muhlenbergia frondosa*	up,fp			sm			
common smartweed*	*Polygonum hydropiper**					x		x
common snakeroot	*Sanicula gregaria*	up	pr					
common sow thistle*	*Sonchus oleraceus**							x

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
common speedwell*	*Veronica officinalis**							x
common St. John's-wort*	*Hypericum perforatum**		hp					x
common star-of-Bethlehem*	*Ornithogalum umbellatum**		pr					x
common stichwort*	*Stellaria graminea**							x
common stiff sedge	*Carex tetanica*		hp		fn			
common sunflower*	*Helianthus annus**							x
common teasel*	*Dipsacus sylvestris**		pr					x
common tussock sedge	*Carex stricta*				**sm**,fn,ss			
common valerian	*Valeriana edulis ssp. ciliata*		pr		fn			
common water horehound	*Lycopus americanus*				sm,ma,fn			
common water plantain	*Alisma plantago-aquatica var. parviflorum*				ma	x		
common watermeal	*Wolffia columbiana*					x		
common woodfern	*Dryopteris intermedia*	up						
common woodsia	*Woodsia obtusia*	up						
common yarrow*	*Achillea millefolium**		hp					x
compass plant	*Silphium laciniatum*		pr,gp,**hp**					
coontail	*Ceratophyllum demersum*				ma	x		
coralberry*	*Symphoricarpos orbiculatus**	up,fp						x
cord root sedge - SE	***Carex chordorrhiza - SE***				bg			
corn speedwell*	*Veronica arvensis**	up						x
corn*	*Zea mays**							x
cotton sedge	*Eriophorum angustifolium*				ma,fn,bg			
cottonwood	*Populus deltoides*	**FP**			ma	x		
cow herb*	*Vaccaria pyramidata**							x
cow parsnip	*Heracleum lanatum*	up, fp						x
cowbane	*Oxypolis rigidior*		pr		sm,ma,fn			
crack willow*	*Salix fragilis**							x
Crawe's sedge - ST	***Carex crawei - ST***				fn			
Crawford's oval sedge - SE	***Carex crawfordii - SE***				ma			
cream wild indigo	*Baptisia leucophaea*		pr					x
creeping buttercup*	*Ranunculus repens**				ma			x
creeping Charlie*	*Glechoma hederacea**	fp	hp		bg			x
creeping love grass	*Eragrostis hypnoides*	fp						
creeping vervain	*Verbena bracteata*							x
creeping yellow cress*	*Rorippa sylvestris**	fp						
crested dock	*Rumex mexicanus*							x
crested oval sedge	*Carex cristatella*				ma			
crested rye grass*	*Lolium perenne**							x
crown vetch*	*Coronilla varia**		pr,hp					x
cuckoo flower - SE	***Cardamine pratensis var. palustris - SE***				ma,bg,fn			
Culver's root	*Veronicastrum virginicum*		pr,hp	x	sm			x
cup plant	*Silphium perfoliatum*	fp			sm,fn			

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
curly dock*	*Rumex crispus**		pr,hp					x
curly pondweed*	*Potamogeton crispus**					x		
curly-styled wood sedge	*Carex convoluta*	up						
curly-styled wood sedge	*Carex rosea*	up						
cursed crowfoot	*Ranunculus sceleratus*				ma,bg	x		
cut leaved nightshade*	*Solanum triflorum**							x
cut-leaved teasel*	*Dipsacus laciniatus**		pr					x
cylindrical blazing star	*Liatris cylindracea*		**pr,gp,hp**					
Cyprus spurge*	*Euphorbia cyparissias**		pr					x
daisy fleabane	*Erigeron strigosus*	up	pr,gp,hp					
Dalmatian toadflax*	*Linaria genistifolia ssp. dalmatica**							x
dandelion*	*Taraxacum officinale**		pr,hp		fn			
dark green bulrush	*Scirpus atrovirens*				sm,ma,ss	x		
Depthford pink*	*Dianthus armeria**		hp					x
devils-claw*	*Proboscidea louisianica**	fl						
dewberry	*Rubus flagellaris*	up	hp					
dill*	*Anethum graveolens**							x
ditch stonecrop	*Penthorum sedoides*				sm,bg,ss	x		
dog mustard*	*Erucastrum gallicum**							x
dogfennel*	*Anthemis cotula**							x
dotted hawthorn	*Crataegus punctata*	up						x
dotted smartweed	*Polygonum punctatum*	fp			sm			x
downy arrowwood	*Viburnum rafinesquianum*	up					x	
downy gentian	*Gentiana puberulenta*		pr,gp					
downy Solomon's seal	*Polygonatum pubescens*	up						
downy willow herb - ST	***Epilobium strictum - ST***				bg,ss,sm			
downy-blue violet	*Viola sororia*	up	hp		ss			
drooping coneflower	*Ratibida pinnata*		pr,gp,**hp**	x				
Drummond's aster	*Aster drummondii*	up						
Drummond's rock cress - EX	***Arabis drummondii - EX***		pr					
Dudley's rush	*Juncus dudleyi*		pr		sm,fn			
Dutchman's breeches	*Dicentra cucullaria*	up						
dwarf bindweed	*Calystegia spithamaea*		pr					
dwarf birch	*Betula pumila*				**BG**,fn,ma			
dwarf honeysuckle	*Diervilla lonicera*	up					x	
dwarf raspberry - ST	***Rubus pubescens - ST***	fp,fl			bg,fn			
ear-leaved foxglove ST	***Tomanthera auriculata - ST***		pr					
early buttercup	*Ranunculus fascicularis*	up						
early figwort	*Scrophularia lanceolata*	up		x				
early goldenrod	*Solidago juncea*		hp	x				x
early horse gentian	*Triosteum aurantiacum*	up		x				
early meadow rue	*Thalictrum dioicum*	up			ss			
eastern white cedar - ST	***Thuja occidentalis - ST***				fn		x	

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
ebony spleenwort	*Asplenium platyneuron*	up						
eelgrass	*Vallisneria americana*					x		
elacampane*	*Inula helenium**							x
elderberry	*Sambucus canadensis*	fp,up	hp		sm,bg,ss			x
elm-leaved goldenrod	*Solidago ulmifolia*	up					x	
enchanter's nightshade	*Circaea lutetiana ssp. canadensis*	up,fl		x	ss			
erect knotweed	*Polygonum erectum*							x
European bellflower*	*Campanula rapunculoides**							x
European highbush cranberry*	*Viburnum opulus**	up,fp	pr		ss			
European water milfoil*	*Myriophyllum spicatum**					x		
evening campion*	*Lychnis alba**							x
evening primrose	*Oenothera biennis*		hp,pr					x
everlasting	*Antennaria plantaginifolia*	up	hp					
everlasting pea*	*Lathyrus latifolius**							x
fall coral-root	*Corallorhiza odontorhiza*	up		x				
fall witch grass	*Leptoloma cognatum*		pr					x
false asphodel - ST	***Tofieldia glutinosa - ST***				fn,ss			
false aster	*Boltonia asteroides*				ma			
false boneset	*Brickellia eupatorioides*		pr,gp					
false buckwheat	*Polygonum scandens*	fp						x
false bugbane - SE	***Cimicifuga racemosa - SE***				ss			
false chervil*	*Anthriscus sylvestris**							x
false dandelion	*Krigia biflora*		pr	x				
false dragonhead	*Physostegia virginiana*		pr,gp,hp		sm,ma			
false foxglove	*Agalinis purpurea*		pr			x		
false indigo bush	*Amorpha fruticosa*	fp			sm		x	
false lily-of-the-valley	*Maianthemum canadense var. interius*	up		x				
false loosestrife	*Ludwigia polycarpa*					x		x
false mermaid	*Floerkea proserpinacoides*	up						
false nettle	*Boehmeria cylindrica*	**FL**			sm,ma		x	
false nettle	*Boehmeria cylindrica* var. *drummondiana*	fp						
false penny	*Trichostema brachiatum*	up	pr		ss			
false pimpernel	*Lindernia dubia*	fp						
false red top	*Tridens flavus*							x
false rue anenome	*Isopyrum biternatum*	up						
false Solomon's seal	*Smilacina racemosa*	**UP**,fl			sm,ss			
false sunflower	*Heliopsis helianthoides*		pr,hp					x
fat-hen saltbush*	*Atriplex patula**							x
fen panicled sedge	*Carex prairea*				sm,bg,fn			
fen star sedge	*Carex sterilis*				ma,fn,ss			
fern flat sedge	*Cyperus filiculmis*		pr					x
fern pondweed	***Potamogeton robbinsii - SE***					x		

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
fescue oval sedge	*Carex festucacea*		pr	x			x	
fetid marigold*	*Dyssodia papposa**							x
feverfew	*Parthenium integrifolium*		gp,pr					x
few-flowered panic grass	*Dichanthelium oligosanthes*		hp,gp					
few-flowered spikesedge - SE	***Eleocharis pauciflora - SE***				fn			
few-fruited gray sedge	*Carex oligocarpa*				fn,ss			
few-seeded sedge - SE	***Carex oligosperma - SE***				bg			
field bindweed*	*Convolvulus arvensis**		hp					x
field garlic*	*Allium vineale**							x
field goldenrod	*Solidago nemoralis*		gp,hp					x
field milkwort	*Polygala sanguinea*		pr					x
field mint	*Mentha arvensis var. villosa*				sm,ma,bg			
field mustard*	*Brassica rapa**							x
field penny cress*	*Thlaspi arvense **							x
field peppergrass*	*Lepidium campestre**							x
field thistle	*Cirsium discolor*		pr,hp					x
fire weed	*Erechtites hieracifolia*				ma			
firepink	*Silene virginica*	up						
fireweed	*Epilobium augustifolium*				bg			
flat-leaved bladderwort - SE	***Utricularia intermedia - SE***				bg,fn	x		
flat-stemmed	*Potamogeton zosteriformis*					x		
flat-stemmed spike rush	*Eleocharis elliptica var. compressa*		pr					x
flat-topped aster	*Aster umbellatus*				ma,fn,sm			
flax-leaved aster	*Aster linariifolius*		hp	x				
fleshy hawthorn	*Crataegus succulenta*	up						
flowering spurge	*Euphorbia corollata*		**PR,gp,hp**	x				x
flower-of-an-hour*	*Hibiscus trionum**							x
fog-fruit	*Phyla lanceolata*					x		x
forked aster - ST	***Aster furcatus - ST***	up						
fowl blue grass	*Poa palustrus*				sm,ma			
fowl manna grass	*Glyceria striata*	**FL**,fp			sm,fn,ss			
fox sedge	*Carex vulpinoidea*		pr		sm,ma			x
foxglove beard-tongue	*Penstemon digitalis*	up						x
foxtail barley*	*Hordeum jubatum**							x
foxtail dalea*	*Dalea leporina**							x
fragile fern	*Cystopsis fragilis*	up						
fragrant coneflower	*Rudbeckia subtomentosa*	up	pr					x
fragrant ladies' tresses	*Spiranthes magnicamporum*		pr					
fragrant sumac	*Rhus aromatica*	up	gp					
Fraser's St. John's-wort	*Triadenum fraseri*		pr		sm,bg,fm			
Fries' pondweed	*Potamogeton friesii*					x		
fringed loosestrife	*Lysimachia ciliata*	fp			sm			
fringed puccoon	*Lithospermum incisum*		gp,hp					

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
frost grape	*Vitis vulpina*	up	gp					
frosted hawthorn	*Crataegus pruinosa*	up						x
frostweed	*Helianthemum bicknellii*	up	hp					
fumitory*	*Fumaria officinialis**							x
galingale	*Cyperus aristatus*							
garden columbine*	*Aquilegia vulgaris**							x
garden heliotrope*	*Valeriana officinalis**							x
garden loosestrife*	*Lysimachia vulgrais**							x
garden phlox*	*Phlox paniculata**	fp						x
garlic mustard*	*Alliaria petiolata**	up,fp	hp	x	ss		x	
geat duckweed	*Spirodela polyrhiza*				ma	x		
giant chickweed*	*Myosoton aquaticum**							x
giant foxtail*	*Setaria faberi**							x
giant ragweed	*Ambrosia trifida*	fp	hp		sm			x
giant St. John's-wort	*Hypericum pyramidatum*		pr		sm,fn			
giant wild rice	*Zizania aquatica*	fp			sm,ma			
ginseng	*Panax quinquefolius*	up						
glade mallow	*Napaea dioica*	fp						
glade onion*	*Allium canadense* var. *mobilense**							x
glaucous campion*	*Silene cserei**		hp					x
glaucous white lettuce	*Prenanthes racemosa*		pr					
globe thistle*	*Echinops spaerocephalus**							x
glossy buckthorn*	*Rhamnus frangula**		pr		sm,ma,**BG**,fn			
glossy-leaf aster	*Aster firmus*		pr					
goat's beard*	*Tragopogon dubius**		hp					x
golden Alexanders	*Zizia aurea*		pr	x			x	
golden buttons*	*Tanacetum vulgare**							x
golden ragwort	*Senecio aureus*		pr		ma,fn			
golden sedge - SE	***Carex aurea - SE***			x	sm			
goldendock	*Rumex maritimus var. fueginus*					x		x
goldenglow	*Rudbeckia laciniata*	fp,up			ss			
goldenseal	*Hydrastis canadensis*	up						
Goldie's fern	*Dryopteris goldiana*	up						
goose grass*	*Eleusine indica**							x
goosefoot	*Chenopodium standleyanum*							x
gourd*	*Lamium amplexicaule**							x
graceful sedge	*Carex gracillima*	up						
grape fern	*Botrychium campestre*	New to Illinois, John Duerr, gravel pit, Kane Co.						
grape honeysuckle	*Lonicera prolifera*	up			ss		x	x
grape hyacinth*	*Muscari botryoides**							x
grass pink orchid - ST	***Calopogon tuberosus - ST***				bg,fn			
grass sedge	*Carex jamesii*	up			ss			
grass-leaved goldenrod	*Euthamia graminifolia*		pr		sm,fn			x

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
grass-leaved pondweed - SE	***Potamogeton gramineus - SE***					x		
grass-of-Parnassus	*Parnassia glauca*				sm,fn,ma,ss			
gray bog sedge - SE	***Carex cannescens var. disjuncta - SE***				bg			
gray dogwood	*Cornus racemosa*	up	hp	x	sm,bg			
gray germander	*Teucrium canadense var. boreale*		hp		sm,fn		x	
gray sedge	*Carex amphibola*	up						
great angelica	*Angelica atropurpurea*				sm,fn,ss,ma			
great bulrush	*Scirpus acutus*				sm,ma,ss,fn			
great burdock*	*Arctium lappa**			x				x
great white lettuce	*Prenanthes crepidinea*	fp						
green amaranth	*Amaranthus hybridus*							x
green ash	*Fraxinus pennsylvanica* var. *subintegerrima*	fp,fl			ma			
green dragon	*Arisaema dracontium*	fp						
green milkweed	*Asclepias viridiflora*		gp,hp					
green orchid	*Platanthera hyberborea var. huronensis*				fn,sm			
green thread	*Thelesperma gracile**							x
green-fruited bur reed - SE	***Sparganium chlorocarpum - SE***					x		
green-headed fox sedge	*Carex conjuncta*	up	pr					
green-stemmed Joe-Pye-weed	*Eupatorium purpureum*	up						
ground cherry	*Physalis virginiana*		hp					
groundnut	*Apios americana*				sm,ma			
gumweed*	*Grindelia squarrosa**							x
hackberry	*Celtis occidentalis*	**up,fp**						
hair beak rush	*Rhynchospora capillacea*				ma,fn,ss			
hair grass	*Agrostis hyemalis*				ma			
hairy aster	*Aster pilosus*		pr,hp				x	x
hairy beard-tongue	*Penstemon hirsutus*		gp					
hairy bitter cress*	*Cardamine hirsuta**							x
hairy brome*	*Bromus commutatus**							x
hairy hawkweed	*Hieracium longipilum*		pr					x
hairy hawkweed	*Hieracium scabrum*	up		x				
hairy hedge nettle	*Stachys tenuifolia var. hispida*		pr		sm			
hairy marsh yellow cress - SE	***Rorippa islandica var. hispida - SE***					x		
hairy mountain mint	*Pycnanthemum pilosum*	up	pr					
hairy panic grass	*Dichanthelium villosissimum var. praecocius*		hp					
hairy rock cress	*Arabis hirsuta*						x	
hairy sweet Cicely	*Osmorhiza claytonii*	**up**						
hairy wood sedge	*Carex hirtifolia*			x				
hairy-fruited lake sedge	*Carex trichocarpa*				sm,fn			
hairy-leaved lake sedge	*Carex atherodes*				sm,ma			

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
harbinger-of-spring	*Erigenia bulbosa*	up						
hardy catalpa*	*Catalpa speciosa**							x
harebell	*Campanula rotundifolia*		hp	x			x	
Hayden's sedge	*Carex haydenii*				sm,fn			
hazel dodder	*Cuscuta coryli*		pr		ma			
hazelnut	*Corylus americana*	up	pr,gp,hp	x				
heartleaf plantain - SE	***Plantago cordata - SE***				sw			
heart-leaved meadow parsnip	*Zizia aptera*		gp,hp,pr		sm			
heart-leaved skullcap	*Scutellaria ovata*	up						
heart-leaved willow	*Salix rigida*	fp			sm			
heath aster	*Aster ericoides*		pr,gp,**hp**					
hedge mustard*	*Sisymbrium officinale**							x
hedge parsley*	*Torilis japonica**							x
helleborine*	*Epipactis helleborine**	up						
hemlock parsley - SE	***Conioselinum chinense - SE***				fn,ss			
high mallow*	*Malva sylvestris**							x
highbush blueberry - SE	***Vaccinium corymbosum - SE***				bg			
highbush cranberry	*Viburnum recognitum*	up						
Hill's oak	*Quercus ellipsoidalis*	**FL**		x				x
Hill's thistle - ST	***Cirsium pumilum - ST (C. hillii)***		pr,gp,hp					
hoary alyssum*	*Berteroa incana**							x
hoary puccoon	*Lithospermum canescens*		pr,gp,hp	x				
hoary vervain	*Verbena stricta*		hp,gp					x
hoary willow	*Salix candida*				ma,bg,fn			
hog peanut	*Amphicarpa bracteata*	up	pr					
hog peanut	*Amphicarpa bracteata* var. *comosa*	fp			ss			
hollyhock*	*Alcea rosea**							x
honewort	*Cryptotaenia canadensis*	up,fp						
honey locust	*Gleditsia triacanthos*	up,fp						
hooded ladies' tresses - SE	***Spiranthes romanzoffiana - SE***				fn			
hooked buttercup	*Ranunculus recurvatus*	up			ss			
hop hornbeam	*Ostrya virginiana*	up						
hop sedge	*Carex lupulina*	**FL**			bg			
horned bladderwort - SE	***Utricularia cornuta - SE***				bg,fn			
horned pondweed	*Zannichellia palustris*					x		
horse gentian	*Triosteum perfoliatum*	up		x				
horse-nettle	*Solanum carolinense*		hp					x
horseradish*	*Armoracia rusticana**							x
horsetail milkweed	*Asclepias verticillata*		pr,hp					x
horseweed	*Conyza canadensis*							x
hybrid lady's slipper orchid	*Cypripedium X andrewsii*		pr					
Illinois bundleflower	*Desmanthus illinoensis*		pr					x
Illinois pondweed	*Potamogeton illinoensis*					x		

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
Illinois tick trefoil	*Desmodium illinoense*		gp,hp					x
ill-secented trillium - SE	***Trillium erectum - SE***	up	pr					
Indian grass	*Sorghastrum nutans*		pr,gp,hp		fn			
Indian hemp	*Apocynum cannabinum*							x
Indian hemp	*Apocynum sibiricum*		pr,hp		sm			x
Indian mustard*	*Brassica juncea**							x
Indian paintbrush	*Castilleja coccinea*	fp	pr					
Indian pipe	*Monotropa uniflora*	up		x	bg			
Indian strawberry	*Duchnesia indica*							x
Indian tobacco	*Lobelia inflata*	up						x
inland sedge	*Carex interior*		pr		sm,fn			
inland shadbush - SE	***Amelanchier interior - SE***	up			bg			
intermediate scouring rush	*Equisetum X ferrissii*				ma			
interrupted fern	*Osmunda claytoniana*	up	pr		ss			
Iowa crab	*Malus ioensis*	up						
Italian millet*	*Setaria italica**							x
ivy-leaved duckweed	*Lemna trisulca*				**MA**	x		
ivy-leaved morning glory*	*Ipomoea hederacea**							x
Jack pine*	*Pinus banksiana**	up						
Jack-in-the-pulpit	*Arisaema triphyllum*	up						
Jacob's ladder	*Polemonium reptans*	up						
Japanese barberry*	*Berberis thunbergii**	up			ss			x
Japanese brome*	*Bromus japonicus**							x
Japanese honeysuckle*	*Lonicera japonica**	up,fp						x
Japanese knotweed*	*Polygonum cuspidatum**							x
Jerusalem artichoke	*Helianthus tuberosus*	up,fp						
Jerusalem oak*	*Chenopodium botrys**							x
Jimpson weed*	*Datura stramonium**							x
jointed rush	*Juncus nodosus*				fn	x		
June grass	*Koeleria macrantha*		pr					
Juneberry	*Amelanchier arborea*	up						
Kalm's lobelia	*Lobelia kalmii*				sm,fn,ma			
Kentucky bluegrass*	*Poa pratensis**	up	pr,hp		sm,fn			x
Kentucky coffeetree	*Gymnocladus dioica*	fp						
Kentucky wisteria*	*Wisteria macrostachya**	fp						x
king devil*	*Hieracium caespitosum**							x
knobbed hop sedge	*Carex lupuliformis*			x	ma			
knotsheath sedge	*Carex retrorsa*	fp			fn			
knotty-leaved rush	*Juncus acuminatus*				ma	x		
knotweed	*Polygonum ramosissimum*							x
knotweed*	*Polygonum aviculare**							x
lady fern	*Athyrium angustum*	up						
lady's thumb*	*Polygonum persicaria**							x
lamb's quarters*	*Chenopodium album**							x

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
lance-leaved loosestrife	*Lysimachia lanceolata*	up						
large twayblade	*Liparis liliifolia*	up						
large white trillium	*Trillium grandiflorum*	up		x				
large yellow fox sedge	*Carex annectens*				ma			
large-flowered beard-tongue	*Penstemon grandifloris**							
large-fruited black snakeroot	*Sanicula trifoliata*	up			ss			
large-leaved pondweed	*Potamogeton amplifolius*					x		
large-seeded hawthorn	*Crataegus flabellata*	up						
late boneset	*Eupatorium serotinum*	up						x
late figwort	*Scrophularia marilandica*	up			ss		x	
late goldenrod	*Solidago gigantea*	up	pr		sm,fn,ss,ma			
leadplant	*Amorpha canescens*		pr,gp,**hp**					
leafcup	*Polymnia canadensis*	up			ss			
leafy pondweed	*Potamogeton foliosus*					x		
leafy prairie clover - SE,FT,EX	***Dalea foliosa - SE,FT,EX***		gp					x
leafy spurge*	*Euphorbia esula**							x
leather flower	*Clematis pitcheri*						x	
leatherleaf - ST	***Chamaedaphne calyculata - ST***				**BG**			
leatherwood	*Dirca palustris*	fp					x	
leathery knotweed	*Polygonum achoreum*							x
Leconte's violet	*Viola affinis*	fl	pr					
lesser panicled sedge	*Carex diandra*		pr		fn			
lesser twayblade	*Liparis loeselii*	fp			sm,ma			
lily-of-the-valley*	*Convallaria majalis**	up						x
lion's foot	*Prenanthes alba*	**up,FL**						
lion's tail*	*Leonurus marrubiastrum**							x
little barley	*Hordeum pusillum*							x
little blue stem	*Schizachyrium scoparium*		pr,gp,hp		fn			x
little green sedge - SE	***Carex viridula - SE***				fn	x		
little pussy toes	*Antennaria neglecta*		pr,hp					x
live-forever*	*Sedum purpureum**							x
liverleaf	*Hepatica nobilis var. acuta*	up			ss			
long-awned bracted sedge	*Carex gravida*		hp					
long-beaked sedge	*Carex sprengelii*	up						
long-bracted tussock sedge	*Carex substricta (C. aquitalis* var. *altior)*				sm,ma,fn			
long-fruited oval sedge	*Carex albolutescens*	up						
long-haired panic grass	*Dichanthelium leibergii*		pr,gp,hp	x				x
long-headed coneflower*	*Ratibida columnifera**							x
long-leaved bluets	*Hedyotis longifolia*	up	pr					x
long-leaved pondweed	*Potamogeton nodosus*					x		
long-stalked hummock sedge	*Carex pedunculata*	up						
loose-headed bracted sedge	*Carex sparganioides*	up,fp			ss			
lopseed	*Phryma leptostachya*	up						

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
Louisiana sagebrush	*Artemisia ludoviciana*							x
lousewort	*Pedicularis canadensis*		gp,pr,hp	x				
love grass*	*Eragrostis minor**							x
low calamint	*Calamintha arkansana*				fn,ss			
low flat sedge	*Cyperus diandrus*	fp				x		x
low nut rush	*Scleria verticillata*				ma,ss			
low shadbush	*Amelanchier humilis*	up						
low water parsnip	*Berula erecta*				ma			
madwort*	*Asperugo procumbens**							x
Mahaleb cherry*	*Prunus mahaleb**							x
maidenhair fern	*Adiantum pedatum*	up						
manna grass	*Glyceria septentrionalis*				sm,ma,bg	x		
maple-leaved arrowwood	*Viburnum acerifolium*	up		x				
maple-leaved goosefoot*	*Chenopodium gigantospermum**							x
marbleseed	*Onosmodium hispidissimum*		pr					
March blue violet	*Viola obliqua*				sm,fn			
mare's tail	*Hippuris vulgaris*					x		
marginal fern	*Dryopteris marginalis*	up						
marsh bellflower	*Campanula aparinoides*				ma,sm			
marsh bellflower	*Campanula uliginosa*				sm,ma,fn			
marsh blazing star	*Liatris spicata*		pr		fn			
marsh bluegrass	*Poa paludigena*				bg			
marsh cinquefoil	*Potentilla palustris*				ma,bg,fn			
marsh club moss	*Selaginella apoda*				sm,fn,ma			
marsh fern	*Thelypteris palustris var. pubescens*				sm,bg,fn,ma,ss		x	
marsh fleabane	*Erigeron philadelphicus*		pr,hp		sm,ss			
marsh marigold	*Caltha palustris*				ma,fn,ss			
marsh muhly*	*Muhlenbergia racemosa**							x
marsh purslane	*Ludwigia palustris var. americana*	fp			ma	x		
marsh skullcap	*Scutellaria galericulata*				sm,ma,bg,fn			
marsh speedwell - ST	***Veronica scutellata - ST***				ma	x		
marsh St. John's wort	*Triadenum virginicum*				sm,bg			
marsh valerian - SE	***Valeriana stichensis ssp. uliginosa - SE***				ma,fn			
marsh vetchling	*Lathyrus palustris*		pr		sm,fn			
marsh wild Timothy	*Muhlenbergia glomerata*				sm,fn,ma			
marsh yellow cress	*Rorippa islandica var. fernaldiana*				ma	x		
matted spike rush	*Eleocharis intermedia*				sm	x		
Maximilian sunflower*	*Helianthus maximilianii**							x
mayapple	*Podophyllum peltatum*	up						
meadow anenome	*Anemone canadensis*		pr,hp					x
meadow fescue*	*Festuca pratensis**	fl						x

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
meadow foxtail*	*Alopecurus pratensis**							x
meadow grass*	*Poa trivialis**		pr					x
meadow parsnip	*Thaspium trifoliatum*	up	pr		ss			
meadow rose	*Rosa blanda*	up			sm			x
meadow sedge	*Carex granularis*		pr		ss			
meadow sweet	*Spiraea alba*		pr		ma			
Mead's stiff sedge	*Carex meadii*		hp,gp					
mermaid weed	*Proserpinaca palustris*					x		
mild water pepper	*Polygonum hydropiperoides*				sm,ma	x		
milk spurge	*Chamaesyce supina*							x
millet grass- SE	***Milium effusum - SE***	up						
Missouri goldenrod	*Solidago missouriensis*		pr,gp					x
Missouri gooseberry	*Ribes missouriense*	up	hp		ss			
Missouri gourd*	*Cucurbita foetidissima**							ct
Missouri ironweed	*Vernonia missurica*		pr,hp					x
moneywort*	*Lysimachia nummularia**	fp	pr		ss			
monkey flower	*Mimulus ringens*		pr		sm,ma	x		
moonseed	*Menispermum canadense*	up						
Morrow's honeysuckle*	*Lonicera morrowi**	up,fp			bg,ss			
mossy stonecrop*	*Sedum acre**							x
moth mullein*	*Verbascum blattaria**							x
motherwort*	*Leonurus cardiaca**	up	hp					x
mouse-ear chickweed	*Cerastium nutans var. brachypodum*						x	x
mouse-eared chickweed	*Cerastium arvense*	up					x	
muhly	*Muhlenbergia sylvatica*	up			ss			
mullein foxglove	*Dasistoma macrophylla*	up						
multiflora rose*	***Rosa multiflora****	**fp, up**	**hp**		**sm,bg**			
musk thistle*	*Carduus nutans**		hp					x
nannyberry	*Viburnum lentago*	up	pr		sm,bg			
narrow-leaved arrowleaf	*Sagittaria graminea*				sw	x		
narrow-leaved cattail*	*Typha angustifolia**				**SM,MA**			
narrow-leaved oval sedge	*Carex tenera*		pr	x				
narrow-leaved spleenwort	*Athyrium pynocarpon*	up						
narrow-leaved vervain	*Verbena simplex*		pr					
narrow-leaved vetch*	*Vicia sativa**							x
narrow-leaved woolly sedge	*Carex lasiocarpa*		pr		fn,bg			
needle grass*	*Stipa comata**		pr					x
needle spike rush	*Eleocharis acicularis*				sm	x		
New England aster	*Aster novae-angliae*		pr		sm			x
New Jersey tea	*Ceanothus americanus*		pr,gp,hp	x				x
New York fern - SE, EX	***Thelypteris noveboracensis - SE,EX***	up			ss			
night flowering catchfly*	*Silene noctiflora**		hp					x

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
nimble will	*Muhlenbergia schreberi*							x
ninebark	*Physocarpus opulifolius*	up,fp					x	
nipplewort*	*Lapsana communis**							x
nodding beggar ticks	*Bidens cernua*				sm,ma	x		
nodding fescue	*Festuca obtusa*	up						
nodding ladies' tresses	*Spiranthes cernua*		pr		ma			
nodding mouse-ear chickweed	*Cerastium nutans*							x
nodding spurge	*Chamaesyce maculata*							x
nodding trillium - SE	***Trillium cernuum var. macranthum - SE***	up						
nodding wild onion	*Allium cernuum*		pr,hp				x	
northern bedstraw	*Galium boreale*		pr		sm,bg,fn			
northern blue violet	*Viola septentrionalis*	up,fp						
northern bog violet	*Viola nephrophylla*				sm			
northern bugle weed	*Lycopus uniflorus*				ma,fn			
northern gooseberry - SE	***Ribes hirtellum - SE***				bg,fn			
northern reed grass	*Calamagrostis inexpansa var. brevior*							
northern willow herb	*Epilobium ciliatum*				sm,bg,fn			
Norway maple*	*Acer platanoides**	up						x
nut grass	*Cyperus esculentus*							x
oak-leaved goosefoot*	*Chenopodium glaucum**							x
oats*	*Avena sativa**							x
Ohio buckeye	*Aesculus glabra*	up,fp						
Ohio goldenrod	*Solidago ohioensis*				sm,fn,ma			
Ohio spiderwort	*Tradescantia ohiensis*	up	**pr**					
Ontario aster	*Aster ontarionis*	fp			sm			
orange day lily*	*Hemerocallis fulva**		pr					x
orange hawkweed*	*Hieracium aurantiacum**							x
orchard grass*	*Dactylis glomerata**	up	hp					x
Osage orange*	*Maclura pomifera**	up						x
ostrich fern	*Matteuccia struthiopteris*	up,fp						
oval ladies tresses	*Spiranthes ovalis*	up						
oval milkweed - SE, EX	***Asclepias ovalifolia - SE, EX***		pr					
ox-eye daisy*	*Leucanthemum vulgare**							x
pagoda plant	*Blephilia ciliata*		pr					
pagoda plant	*Blephilia hirsuta*	fp						
pale alyssum*	*Alyssum alyssoides**							x
pale dock	*Rumex altissimus*	fp						x
pale dogwood	*Cornus obliqua*	fp			sm,ma,bg			
pale gentian	*Gentiana alba*	up	pr					
pale Indian plantain	*Cacalia atriplicifolia*		pr					
pale purple coneflower	*Echinacea pallida*		pr,gr,hp					
pale smartweed	*Polygonum lapathifolium*				sm	x		x

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
pale sunflower	*Helianthus decapetalus*	up						
pale touch-me-not	*Impatiens pallida*	up						
pale vetchling - ST	***Lathyrus ochroleucus - ST***			x				x
pale-leaved sunflower	*Helianthus strumosus*	up	hp					x
Palmer's amaranth*	*Amaranthus palmeri**							x
panic grass	*Dichanthelium acuminatum var. fasciculatum*		hp, pr					
panic grass	*Dichanthelium acuminatum var. lindheimeri*	up						
panicled aster	*Aster simplex*		pr		sm			
paper birch	*Betula papyrifera*	up			bg			
partridge pea	*Cassia fasciculata*		pr					
pasque-flower	*Pulsatilla patens* ssp. *multifida*		gp					
pasture rose	*Rosa carolina*		pr,gp,hp	x				x
path rush	*Juncus tenuis*							x
patience dock*	*Rumex patientia**							x
paw paw	*Asimina triloba*	up			ss			
peach-leaved willow	*Salix amygdaloides*	fp			ma	x		
pear*	*Pyrus communis**							
pellitory	*Parietaria pensylvanica*	up						
peppergrass*	*Lepidium densiflorum**							x
peppergrass*	*Lepidium perfoliatum**							x
Peruvian daisy*	*Galinsoga parviflora**							x
Peruvian daisy*	*Galinsoga quadriradiata**							x
petioled sunflower*	*Helianthus petiolaris**							x
petioled willow	*Salix petiolaris*		pr		sm,ma,fn			
pickerel weed	*Pontederia cordata*					x		
pin cherry	*Prunus pensylvanica*							x
pin clover*	*Erodium cicutarium**							x
pin oak	*Quercus palustris*	up,fl						
pineapple weed*	*Matricaria matricarioires**							x
pink lady's slipper - SE	***Cypripedium acaule - SE***	up			BG,fn			
pinweed - SE	***Lechea intermedia - SE***		pr	x				
pitcher plant - SE	***Sarracenia purpurea - SE***				bg,fn			
plains buttercup - ST	***Ranunculus rhomboideus - ST***		hp,gp					
plains oval sedge	*Carex brevior*	up			sm			
plains three-awned grass	*Arisitda oligantha*							x
plume grass*	*Miscanthus sacchariflorus**							x
plumeless thistle*	*Carduus acanthoides**							x
pointed tick trefoil	*Desmodium glutinosum*	up		x				
poison hemlock*	*Conium maculatum**				ma			x
poison ivy	*Toxicodendron radicans*	up,fp	hp		sm,ss			
poison sumac	*Toxicodendron vernix*				bg			
poke milkweed	*Asclepias exaltata*	up		x				

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
pokeweed	*Phytolacca americana*	up			ma			x
poppy mallow	*Callirhoë triangulata*		pr	x				
poppy mallow*	*Callirhoë involucrata**							x
porcupine grass	*Stipa spartea*		**gp,hp**,pr					
porcupine sedge	*Carex hystricina*				sm,fn			
poverty oat grass	*Danthonia spicata*	up						x
prairie alumroot	*Heuchera richardsonii var. grayana*	up	pr					
prairie blazing star	*Liatris pycnostachya*		pr,gp,hp					
prairie blue-eyed grass	*Sisyrinchium campestre*		gp					
prairie brome	*Bromus kalmii*		pr,gp					
prairie bush clover - SE, FT	***Lespedeza leptostachya - SE, FT***		hp,gp					
prairie cinquefoil	*Potentilla arguta*		gp,hp,**pr**					
prairie cord grass	*Spartina pectinata*		**PR**		sm			
prairie coreopsis	*Coreopsis palmata*		**pr,gp,hp**					
prairie dandelion - SE,EX	***Microseris cuspidata - SE,EX***		gp,hp					
prairie dock	*Silphium terebinthinaceum*		**PR**,gp,hp	x	ss			x
prairie dodder	*Cuscuta pentagona*		pr, hp					
prairie dropseed	*Sporobolus heterolepis*		**PR**,gr,hp		fn			
prairie gray sedge	*Carex conoidea*		pr					
prairie hummock sedge	*Carex richardsonii*		hp					
prairie Indian plantain	*Cacalia plantaginea*		pr					
prairie lily	*Lilium philadelphicum var. andinum*		pr					
prairie milkweed	*Asclepias sullivantii*		pr					
prairie panic grass	*Dichanthelium depauperatum*	up						
prairie parsley	*Polytaenia nuttallii*		hp					
prairie phlox	*Phlox pilosa*		pr,gp,hp	x				
prairie rose	*Rosa setigera*	up	pr		sm			
prairie satin grass	*Muhlenbergia cuspidata*		hp					
prairie smoke	*Geum triflorum*		pr,gr					
prairie sundrops	*Oenothera pilosella*		pr					
prairie sunflower	*Helianthus rigidus*		pr,gp,**hp**					
prairie violet	*Viola pedatifida*		pr,gp,hp	x				
prairie white-fringed orchid - SE, FT	***Platanthera leucophaea - SE, FT***		pr					
prairie willow	*Salix humilis*		pr,hp,gp					x
prickly ash	*Zanthoxylum americanum*	up						
prickly gooseberry	*Ribes cynosbati*	up			ss			
prickly lettuce*	*Lactuca serriola**		hp					x
prickly pear	*Opuntia humifusa*			x				
prickly sedge	*Carex stipata*				sm,ma,ss			
privet*	*Ligustrum obtusifolium**	up						x
privet*	*Ligustrum vulgare**	up						x
prostrate amaranth*	*Amaranthus graecizans**							x

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
puffsheath dropseed	*Sporobolus neglectus*							x
puncture weed*	*Tribulus terrestris**							x
purple amaranth*	*Amaranthus cruentus**							
purple avens - EX	***Geum rivale - EX***				fn			
purple coneflower	*Echinacea purpurea*		pr	x				
purple cress	*Cardamine douglasii*	up			fn			
purple dead nettle*	*Lamium purpureum**							x
purple flowering raspberry - SE	***Rubus odoratus - SE***				sm,fn			
purple giant hyssop	*Agastache scrophulariaefolia*	up						
purple loosestrife*	*Lythrum salicaria**	fp			sm,**ma**,bg,fn	x		
purple meadow rue	*Thalictrum dasycarpum*		pr		sm,fn,ss			x
purple milkweed	*Asclepias purpurascens*		pr	x				
purple milkwort	*Polygala polygama var. obtusata*		gp	x				
purple oxalis	*Oxalis violacea*		hp,gp					
purple prairie clover	*Dalea purpurea*		**pr,gp,hp**	x				
purple rocket	*Iodanthus pinnatifidus*	fp						
purple rocket*	*Chorispora tenella**							x
Purpus' birch	*Betula X purpusii*	fp			bg			
purslane speedwell	*Veronica peregrina*							x
purslane*	*Portulaca oleracea**							x
pussy willow	*Salix discolor*		pr		sm,fn,ss,ma			
quack grass*	*Agropyron repens**		hp					x
quaking aspen	*Populus tremuloides*		pr		bg			
Queen Anne's lace*	*Daucus carota**		hp,pr					x
queen-of-the-meadow*	*Filipendula ulmaria**							x
queen-of-the-prairie - ST,EX	***Filipendula rubra - ST,EX***				fn			
ragged fringed orchid - EX	***Platanthera lacera - EX***				bg			
raspberry*	*Rubus idaeus**							x
rattlesnake fern	*Botrychium virginianum*	up			ss			
rattlesnake master	*Eryngium yuccifolium*		pr,gp,hp					
rattlesnake plantain	*Goodyera pubescens*	up						
red ash	*Fraxinus pennsylvanica* var. *pennsylvanica*	fp,fl			ma			
red baneberry	*Actaea rubra*	up			ss			
red birch	*Betula nigra*	fp						
red bulrush	*Scirpus pendulus*		pr		ma			
red campion*	*Lychnis diocia**							x
red cedar	*Juniperus virginiana*	up			ss		x	
red clover*	*Trifolium pratense**		hp					x
red haw	*Crataegus mollis*	fp,up	hp					x
red honeysuckle	*Lonicera dioica*	up						
red maple	*Acer rubrum*	fp			bg			
red mulberry	*Morus rubra*	up,fp						

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
red oak	*Quercus rubra*	UP,fl		x				
red orache*	*Atriplex rosea**							x
red pine - SE	***Pinus resinosa - SE***						x	
red top	*Agrostis alba*		pr,hp		sm,bg			x
red trillium	*Trillium recurvatum*	up	pr		ss			
red-berried elder - ST	***Sambucus pubens - ST***	fp			bg			
redbud	*Cercis canadensis*	up						
red-osier dogwood	*Cornus stolonifera*	up	pr		sm,BG,fn,ma			
red-rooted sedge	*Cyperus erythrorhizos*					x		x
red-rooted spike rush	*Eleocharis erythropoda*				ma	x		
red-stalked plantain	*Plantago rugelii*							x
reed canary grass*	*Phalaris arundinacea**				sm,ma,bg			
reed manna grass	*Glyceria grandis*				ma			
ribbon-leaved pondweed - EX	***Potamogeton eiphydrus - EX***					x		
rice cutgrass	*Leersia oryzoides*				sm,ma,bg, fn,ss	x		
Richardson's pondweed	*Potamogeton richardsonii*					x		
Richardson's rush - SE	***Juncus alpinus - SE***				fn	x		
Riddell's goldenrod	*Solidago riddellii*		pr		sm,fn,ma			
rigid goldenrod	*Solidago rigida*		**PR,gp,hp**					
river bulrush	*Scirpus fluviatilis*				sm,ma			
river sedge	*Carex lacustris*				sm,ma			
riverbank grape	*Vitis riparia*	up,fp	hp		sm			
riverbank sedge	*Carex emoryi*				sm			
riverbank wild rye	*Elymus riparius*	up						
Robin's plantain	*Erigeron pulchellus*	up						
rock cress	*Arabis shortii* var. *phalacrocarpa*	up						
rock elm - SE	***Ulmus thomasii - SE***	fp						
rocket*	*Hesperis matronalis**							x
rope dodder	*Cuscuta glomerata*		pr		sm,ss			
rose verbena*	*Glandularia canadensis**	up						x
rosinweed	*Silphium integrifolium*		pr,gp,hp					
rough avens	*Geum laciniatum*	fp			sm			x
rough bedstraw	*Galium asprellum*				sm,ma			
rough blazing star	*Liatris aspera*		pr,**gp,hp**					x
rough buttonweed*	*Diodia teres**							x
rough cinquefoil	*Potentilla norvegica*		hp					x
rough dropseed	*Sporobolus asper*		pr					x
rough false foxglove	*Agalinis aspera*		pr					
rough pennyroyal	*Hedeoma hispida*		hp				x	
rough pigweed*	*Amaranthus retroflexus**							x
rough water horehound	*Lycopus aspera*				sw	x		
rough-clustered sedge	*Carex cephalophora*	up						

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
rough-leaf goldenrod	*Solidago patula*				sm,fn,ss	x		
rough-stemmed false foxglove	*Agalinis gattingeri*		pr	x				
round fruited St. John's-wort	*Hypericum sphaerocarpum*		pr				x	x
round-headed bush clover	*Lespedeza capitata*		**PR,gp,hp**					
round-leaved bittersweet*	*Celastrus orbiculatus**	up						x
round-leaved dogwood	*Cornus rugosa*	up						
round-leaved shadbush - SE	***Amelanchier sanguinea - SE***	up						
round-leaved sundew - SE	***Drosera rotundifolia - SE***				**BG**			
round-lobed liverleaf	*Hepatica nobilis var. obtusa*	up						
royal fern	*Osmunda regalis var. spectabilis*	fp			bg,ss			
rue anenome	*Thalictrum thalictroides*	up						
rugose rose*	*Rosa rugosa**							x
rush aster	*Aster borealis*				fn,ma			
Russian olive*	*Elaeagnus augustifolius**							x
rusty cotton grass - SE	***Eriophorum virginicum - SE***				**BG**			
rusty nut sedge	*Cyperus ferruginescens*	fp			sm			
rye*	*Secale cereale**							x
salt grass*	*Distichlis stricta**							x
salt marsh cockspur grass	*Echinochloa walteri*				ma	x		
salt meadow grass*	*Leptochloa fascicularis**		pr					x
salt spurrey*	*Spergularia media**							x
sand bracted sedge	*Carex muhlenbergii*		pr	x				
sand bur	*Cenchrus longispinus*		pr					x
sand dropseed	*Sporobolus cryptandrus*		pr					
sand milkweed	*Asclepias amplexicaulis*		hp					
sand primrose	*Oenothera rhombipetala*		hp					
sand St. John's-wort	*Hypericum majus*				ma	x		x
sandbar love grass	*Eragrostis frankii*					x		x
sandbar willow	*Salix exigua*	fp			sm			
Sandberg's birch	*Betula X sandbergii*	up			bg			
sandwort	*Moehringia lateriflora*	up	pr					
Sartwell sedge	*Carex sartwellii*		pr		sm,fn			
sassafras	*Sassafras albidum*	up		x				x
savanna sedge	*Carex pensylvanica*	up		x	ss			
saw-toothed sagebrush	*Artemisia serrata*	up						
saw-toothed sunflower	*Helianthus grosseserratus*		**PR**,hp		sm			x
scarlet hawthorn	*Crataegus coccinea*	up						x
Schweinitz flat sedge	*Cyperus schweinitzii*		pr	x		x		
scotch pine*	*Pinus sylvestris**							x
scouring rush	*Equisetum hyemale var. affine*		hp		ma,ss			x
scratch grass	*Muhlenbergia asperifolia*							x
Scribner's panic grass	*Dichanthelium oligosanthes var. scribnerianum*		gp,**hp**					
scurf pea	*Psoralea tenuiflora*		gp					

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
seaside crowfoot - SE,EX	***Ranunculus cymbalaria - SE,EX***				wet soil			
self-heal *	*Prunella vulgaris**		pr					x
Seneca snakeroot	*Polygala senega*		pr,gp,hp					
sensitive briar*	*Schrankia nuttallii**		pr,gp					
sensitive fern	*Onoclea sensibilis*	up			sm,ma,bg			
sessile trillium	*Trillium sessile*	up						
sessile-flowered yellow cress	*Rorippa sessiliflora*					x		
shagbark hickory	*Carya ovata*	**up**,fl		x				
shepherd's purse*	*Capsella bursa-pastoris**							x
shield fern	*Dryopteris cristata*				sm,ma			
shingle oak	*Quercus imbricaria*	up						
shining bedstraw	*Galium concinnum*	**up**						
shining clubmoss	*Lycopodium lucidulum*				bg			
shinleaf	*Pyrola elliptica*	up		x				
shooting star	*Dodecatheon meadia*	up	pr,gp,hp					
short-awned foxtail	*Alopecurus aequalis*				ma	x		
short-beaked arrowleaf	*Sagittaria brevirostra*				ma	x		
short-fruited rush	*Juncus brachycephalus*				sm,ss	x		
shortleaf sedge - SE	***Carex disperma - SE***				bg			
Short's aster	*Aster shortii*	up					x	
showy campion	*Silene nivea*	up,fp			fn			
showy goldenrod	*Solidago speciosa*		gp,hp,pr	x				x
showy lady's slipper - SE	***Cypripedium reginae - SE***				bg,fn			
showy orchis	*Galearis spectabilis*	up						
showy tick trefoil	*Desmodium canadense*		pr,hp					
shrubby cinquefoil	*Potentilla fruticosa*				fn			
Siberian elm*	*Ulmus pumila**							x
Siberian sqill*	*Scilla sibirica**							x
sicklepod	*Arabis canadensis*	up						
side-flowered aster	*Aster lateriflorus*	fp			ss			
side-oats grama	*Bouteloua curtipendula*		**gp,hp**					
silky aster	*Aster sericeus*		**gp,hp**					
silky willow	*Salix sericea*				bg			
silver maple	*Acer saccharinum*	fp			bg,ss			
silver sedge*	*Carex praegracilis**							x
silverweed	*Potentilla anserina*					x		
silvery cinquefoil*	*Potentilla argentea**		hp					x
skunk cabbage	*Symplocarpus foetidus*	fp			sm,fn,ss,ma			
sky-blue aster	*Aster azureus*	up	gp,hp,pr	x				
sleepy catchfly	*Silene antirrhina*		hp					x
slender bog arrow-grass - SE	***Triglochin palustris - SE***				fn			
slender bulrush	*Scirpus heterochaetus*				sm			
slender cliffbrake	*Cryptogramma stelleri*						x	
slender corydalis*	*Corydalis micrantha**							x

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
slender false foxglove	*Agalinis tenuifolia*				sm,fn			x
slender knotweed	*Polygonum tenue*		hp					x
slender ladies' tresses	*Spiranthes lacera*	up		x				
slender muhly	*Muhlenbergia tenuiflora*	up					x	
slender naiad	*Najas flexilis*					x		
slender sandwort - SE	***Arenaria patula - SE***		pr					
slender wheat grass	*Agropyron trachycaulum*		pr					x
slender wild rye	*Elymus villosus*	up					x	
slender wood sedge	*Carex gracilescens*	up						
slenderleaf collomia*	*Collomia linearis**							x
slippery elm	*Ulmus rubra*	**up,FP**			ss			
small bedstraw	*Galium trifidium*				ma			
small bladderwort - SE	***Utricularia minor - SE***				bg,fn	x		
small bur reed - EX	***Sparganium minimum - EX***					x		
small cottonweed*	*Frolichia gracilis**						x	
small cranberry - SE	***Vaccinium oxycoccos - SE***				**bg**			
small duckweed	*Lemna minor*				sm,ma	x		
small enchanter's nightshade - SE,EX	***Circaea alpina -SE,EX***						x	
small love grass	*Eragrostis pectinacea*							x
small pondweed	*Potamogeton pusillus*					x		
small skullcap	*Scutellaria leonardii*		gp, hp				x	
small snapdragon*	*Chaenorrhinum minus**							x
small sundrops - SE	***Oenothera perennis - SE***		hp					x
small white morning glory*	*Ipomoea lacunosa**							x
small yellow lady's slipper - SE	***Cypripedium parviflorum - SE***		pr	x	bg			
small yellow sedge - SE	***Carex cryptolepis - SE***		pr		fn			
small-flowered crowfoot	*Ranunculus abortivus*	fp			sm			x
small-flowered gaura*	*Gaura parviflora**		pr					x
small-fringed gentian	*Gentianopsis procera*				sm,fn			
small-fruited agrimony	*Agrimonia parviflora*	fp			ma			
Small's spike rush	*Eleocharis smallii*				ma,bg			
smartweed	*Polygonum pensylvanicum*		hp					x
smartweed dodder	*Cuscuta polygonorum*				sm,ma			
Smith's bulrush - SE	***Scirpus smithii - SE***				bg,fn			
smooth beard-tongue	*Penstemon calycosus*	up						
smooth blue aster	*Aster laevis*		pr,gp,**hp**					x
smooth cliffbrake	*Pellaea glabella*						x	
smooth crab grass*	*Digitaria ischaemum**							x
smooth false foxglove	*Aureolaria flava*	up		x				
smooth ground cherry	*Physalis subglabrata*		pr,hp					x
smooth hedge nettle	*Stachys tenuifolia*	fp						
smooth orach*	*Atriplex glabriuscula**							x
smooth phlox	*Phlox glaberrima ssp. interior*		pr					
smooth pigweed*	*Amaranthus powellii**							x

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
smooth rock cress	*Arabis laevigata*	up			ss		x	
smooth sand sedge	*Cyperus houghtonii*			x				x
smooth scouring rush	*Equisetum laevigatum*	up	pr		ss			
smooth sow thistle*	*Sonchus arvensis var. glabrescens**							x
smooth sow thistle*	*Sonchus arvensis**		hp					x
smooth sumac	*Rhus glabra*	up	hp,gp,pr	x				
smooth white violet	*Viola macloskeyi ssp. pallens*				bg			
smooth yellow violet	*Viola pubescens*	up						
smooth-sheathed fox sedge	*Carex laevivaginata*				fn,ss			
snake mouth - SE	***Pogonia ophioglossoides - SE***				bg,fn			
sneezeweed	*Helenium autumnale*		pr		sm,ss			
snowberry	*Symphoricarpos albus var. laevigatus*							x
snowberry - SE	***Symphoricarpos albus var. albus - SE***						x	
snow-on-the-mountain*	*Euphorbia marginata**							x
soapwort gentian	*Gentiana saponaria*							
soft agrimony	*Agrimonia pubescens*	up						
soft rush	*Juncus effusus*				ma	x		
soft-stemmed bulrush	*Scirpus tabernaemontanii*				sm,fn,ma			
Solomon's seal	*Polygonatum commutatum*	up	hp				x	
sorghum*	*Sorghum bicolor**							x
sour dock*	*Rumex acetosella**		pr					x
southern lady fern	*Athyrium asplenioides*	up						
southern naiad	*Najas guadalupensis*					x		
soybean*	*Glycine max**							x
sparrow weed*	*Thymelaea passerina**							x
speckled alder	***Alnus incana* ssp. *rugosa* - SE**				bg			
speedwell*	*Veronica agrestis**							x
spicebush	*Lindera benzoin*	up						
spike lobelia	*Lobelia spicata*		PR,gp					x
spiked water milfoil	*Myriophyllum exalbescens*					x		
spikerush sedge*	*Carex stenophylla var. enervis**		pr					x
spindle tree*	*Euonymus europaeus**	fp						
spinulose woodfern	*Dryopteris carthusiana*	up			bg			
spiny sow thistle*	*Sonchus asper**							x
spotted centaurea*	*Centaurea maculosa**							x
spotted coral-root orchid - ST	***Corallorhiza maculata - ST***	up						
spotted dead nettle*	*Lamium maculatum**							x
spotted Joe-Pye weed	*Eupatorium maculatum*		pr		sm,ma,fn, ss			
spotted pondweed - SE	***Potamogeton pulcher - SE***					x		
spotted St. John's-wort	*Hypericum punctatum*	up						
spotted touch-me-not	*Impatiens capensis*	up			sm,bg,fn,ma, ss			

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
spreading dogbane	*Apocynum androsaemifolium*	up	pr					
spreading oval sedge	*Carex normalis*		pr		sm,ma			
spreading sedge - ST	***Carex laxiculmis - ST***	up						
spreading witch grass	*Panicum dichotomiflorum*							x
spring beauty	*Claytonia virginica*	up		x				
spurge	*Chamaesyce glyptosperma*							x
squirrel corn	*Dicentra canadensis*	up						
staghorn sumac	*Rhus typhina*	up				x		
stalked water horehound	*Lycopus rubellus*	fp				x	x	
star flower - ST	***Trientalis borealis - ST***				bg			
starry catchfly	*Silene stellata*	up	pr,hp					
starry false Solomon's seal	*Smilacina stellata*	up	pr,hp	x	ss			
stickseed	*Hackelia virginiana*	fp						
stiff arrowleaf	*Sagittaria rigida*				sw	x		
stiff aster	*Solidago ptarmicoides*		gp,hp					
stiff bedstraw	*Galium tinctorium*				ma,fn,bg			
stiff gentian	*Gentianella quinquefolia*		hp,gp		sm,fn			
stiff pondweed	***Potamogeton strictifolius - SE***					x		
stiff sandwort	*Minuartia stricta*		gp					
stout blue-eyed grass	*Sisyrinchium angustifolium*	up						
stout wood reed	*Cinna arundinacea*	fp,up, FL			ss			
straw-colored flat sedge	*Cyperus strigosus*				ma			x
sugar maple	*Acer saccharum*	UP						
sulfur cinquefoil*	*Potentilla recta**		hp					x
Sullivant's orange coneflower	*Rudbeckia fulgida var. sullivantii*	fp			ma,ss			
summer cypress*	*Kochia scoparia**							x
summer grape	*Vitis aestivalis*	up						
sunshine rose*	*Rosa arkansana**							x
swamp aster	*Aster puniceus*		pr		sm,ma,fn, ss			
swamp beggar ticks	*Bidens connata*				sm,ma	x		
swamp buttercup	*Ranunculus septentrionalis*	fp			sm,fn,ss			
swamp candle	*Lysimachia terrestris*				ma,bg,fn			
swamp dock	*Rumex verticillatus*	fp			sm,ma			
swamp goldenrod	*Solidago uliginosa*				sm,bg,fn,ss			
swamp loosestrife	*Decodon verticillatus*				ma,fn		x	
swamp marigold	*Bidens aristosa*				ma			
swamp milkweed	*Asclepias incarnata*				SM,ma,ss			
swamp oval sedge	*Carex muskingumensis*	fl						
swamp rose	*Rosa palustris*		pr		ma,bg,sw			
swamp rose mallow	*Hibiscus moscheutos*				ma			
swamp saxifrage	*Saxifraga pensylvanica*		pr		sm,ma,ss			
swamp thistle	*Cirsium muticum*			pr	sm,fn			

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
swamp tickseed	*Bidens tripartita*				ma			
swamp white oak	*Quercus bicolor*	FL						
swamp wood betony	*Pedicularis lanceolata*	up			sm,ma,fn,ss			
sweet brier*	*Rosa eglanteria**				sm			x
sweet flag	*Acorus americanus*				sm,ma			
sweet grass	*Hierochloë odorata*		pr		ma,fn	x		
sweet gum*	*Liquidambar styraciflua**	up						
sweet Indian plantain	*Cacalia suaveolens*				fn			
sweet William	*Phlox maculata*		pr		sw,ma,bg			
sweet William catchfly*	*Silene armeria**		hp					x
sweet-scented bedstraw	*Galium triflorum*	up			sm,bg			
switchgrass	*Panicum virgatum*		pr,hp					
sycamore	*Platanus occidentalis*	fp						
tall agrimony	*Agrimonia gryposepala*	up			ss			
tall alumroot	*Heuchera americana var. hirsuticaulis*						x	
tall anemone	*Anemone virginiana*	up	pr,gp		sm			
tall bellflower	*Campanula americana*	up,fp		x	ss			
tall blue lettuce	*Lactuca biennis*	fp						
tall boneset	*Eupatorium altissimum*		gp		sm			x
tall buttercup*	*Ranunculus acris**							x
tall coreopsis	*Coreopsis tripteris*	up	pr	x				
tall goldenrod	*Solidago altissima*		hp		sm			x
tall hedge mustard*	*Sisymbrium loeselii**							x
tall ironweed	*Vernonia gigantea*	fp						
tall oat grass	*Arrhenatherum elatius*							x
tall sunflower - SE	***Helianthus giganteus - SE***				sm,fn			
tall swamp marigold	*Bidens coronata*				sm			
tall thistle	*Cirsium altissimum*							x
tall water hemp	*Amaranthus tuberculatus*	fp			ma	x		
tamarisk waterhemp	*Amaranthus rudis*	fp			ma	x		
tansy mustard	*Descurainia pinnata ssp. brachycarpa*						x	x
Tartarian honeysuckle*	*Lonicera tatarica**	up,fp	hp		sm			x
Tennessee fragile fern	*Cystopsis X tennesseensis*						x	
thicket creeper	*Parthenocissus inserta*	up						
three-seeded bog sedge - SE	***Carex trisperma - SE***				bg			
three-seeded mercury	*Acalypha rhomboidea*	fp						x
three-way sedge	*Dulichium arundinaceum*				bg,ma			
thyme-leaved sandwort*	*Arenaria serpyllifolia**							x
thyme-leaved speedwell*	*Veronica serphyllifolia**							x
tick trefoil	*Desmodium cuspidatum*	up						
tick trefoil	*Desmodium glabellum*	up		x				
tickseed coreopsis	*Coreopsis lanceolata*		pr,gp					

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
Timothy*	*Phleum pratense**		hp					x
tomato*	*Lycopersicum esculentum**							x
toothed cress	*Arabis shortii*	fp						
toothwort	*Dentaria laciniata*	up			ss			
Torrey rush	*Juncus Torreyi*				ma			x
tower mustard	*Arabis glabra*		pr					
treacle mustard*	*Erysimum repandum**							x
tree-of-heaven*	*Ailanthus altissima**							x
trumpet creeper	*Campsis radicans*							x
tuberous vetchling*	*Lathyrus tuberosus**							x
tufted bulrush - SE	***Scirpus cespitosus var. callosus - SE***		pr		fn,ss			
tufted hairgrass	*Deschampsia caespitosa var. glauca*				ss			
tufted loosestrife	*Lysimachia thrysiflora*				sm,ma,bg,fn			
tumble grass	*Eragrostis spectabilis*		hp	x				x
tumble mustard*	*Sisymbrium altissimum**							x
tumbleweed	*Amaranthus albus*							x
Turk's cap lily	*Lilium michiganense*		pr		sm,fn,ss			
twig rush	*Cladium mariscoides*				bg,fn,ss			
twin flower - EX	***Linnaea borealis - EX***				bg			
twin leaf	*Jeffersonia diphylla*	up						
twisted yellow-eyed grass	*Xyris torta*	fp						
Tyrol knapweed*	*Centaurea dubia**							x
upright smilax	*Smilax ecirrhata*	up						
Vasey's pondweed - SE,EX	***Potamogeton vaseyi - SE,EX***					x		
Vasey's rush - SE,EX	***Juncus vaseyi - SE,EX***				sm			
vegetable oyster*	*Tragopogon porrifolius**							x
veiny pea	*Lathyrus venosus var. intonsus*	up	pr					
Venus' looking-glass	*Triodanis perfoliata*							x
violet bush clover	*Lespedeza violacea*	up						
Virginia bluebells	*Mertensia virginica*	up						
Virginia chainfern - EX	***Woodwardia virginica - EX***				bg			
Virginia creeper	*Parthenocissus quinquefolia*	up,fp,fl	hp	x	sm,ss			
Virginia knotweed	*Polygonum virginianum*	up						
Virginia spiderwort	*Tradescantia virginiana*	up	pr					
Virginia waterleaf	*Hydrophyllum virginianum*	up,fp	hp		sm			
Virginia wild rye	*Elymus virginicus*	fp			sm			x
virgin's bower	*Clematis virginiana*	up			ss			
viscid grass-leaved goldenrod	*Euthamia gymnospermoides*		pr					
wafer ash	*Ptelea trifoliata*	up			ss			
wahoo	*Euonymus atropurpureus*	fp						
walking fern	*Asplenium rhizophyllum*						x	
wall rocket*	*Diplotaxis muralis**		hp					

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
water arum - SE	***Calla palustris - SE***				bg			
water cress*	*Nasturtium officinale**				sm,ss,ma		lp	
water dock	*Rumex orbiculatus*				sm	x		
water hemlock	*Cicuta maculata*		pr		sm,ss,ma			
water horsetail	*Equisetum fluviatile*				ma			x
water marigold - SE	***Megalodonta beckii - SE***					x		
water milfoil	*Myriophyllum heterophyllum*					x		
water parsnip	*Sium suave*		pr		sm,**ma**,bg,ss			
water shield	*Brasenia schreberi*					x		
water smartweed	*Polygonum amphibium*				sm,ma	x		
water speedwell	*Veronica catenata*				ma	x		
water star grass	*Zosterella dubia*				ma	x		
water willow	*Justicia americana*	fp						
waterleaf	*Hydrophyllum appendiculatum*	up						
watermelon*	*Citrullus vulgaris**							x
waterweed	*Elodea canadensis*					x		
waxy meadow rue	*Thalictrum revolutum*		pr		ma,ss			
wayfaring tree*	*Viburnum lantana**	up						x
wedge grass	*Sphenopholis obtusata var. major*		pr					x
wedge-fruited oval sedge	*Carex suberecta*		pr		sm,fn			
western ragweed	*Ambrosia psilostachya*							x
western sunflower	*Helianthus occidentalis*		pr,**gp,hp**					
western wallflower*	*Erysimum inconspicum**							x
western wheat grass*	*Agropyron smithii**							x
western wild lettuce - SE,EX	***Lactuca ludoviciana - SE,EX***		pr					
white adder's mouth - EX	***Malaxis brachypoda - EX***				fn			
white ash	*Fraxinus americana*	**up**,fp	hp	x	ss			
white avens	*Geum canadense*	up			ss			
white baneberry	*Actaea pachypoda*	up			ss			
white beaked rush - ST	***Rhynchospora alba - ST***				bg,fn,ss			
white bedstraw*	*Galium mollugo**							x
white camass - SE	***Zigadenus venenosus var. gramineus - SE***		hp		fn		x	
white clover*	*Trifolium repens**							x
white grass	*Leersia virginica*	fp,**FL**			sm,ss			
white lady's slipper - SE	***Cypripedium candidum - SE***		pr	x	fn			
white mulberry*	*Morus alba**	up,fp	hp					x
white mustard*	*Brassica hirta**							x
white oak	*Quercus alba*	**UP**,fl,fp		**x**	bg			
white pine	*Pinus strobus*	up					x	
white poplar*	*Populus alba**							x
white prairie clover	*Dalea candida*		gp,hp					
white snakeroot	*Eupatorium rugosum*	up			ss			

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
white sweet clover*	*Melilotus alba**		**PR,gp,hp**					x
white trillium	*Trillium flexipes*	up						
white trout lily	*Erythronium albidum*	up		x				
white turtlehead	*Chelone glabra*				sm,fn,ss,ma			
white vervain	*Verbena urticifolia*		hp					x
white water lily	*Nymphaea tuberosa*				ma	x		
white water-crowfoot	*Ranunculus trichophyllus*					x		
white wild indigo	*Baptisia lactea*	up	hp,pr		ma			
white willow*	*Salix alba**	fp			sm			x
white-haired panic grass	*Dichanthelium villosissimum*		hp					
white-stemmed pondweed - SE	***Potamogeton praelongus - SE***					x		
Whitlow grass	*Draba reptans*		hp					
whorled loosestrife	*Lysimachia quadrifolia*		pr		sm,fn,ma			
whorled milkwort	*Polygala verticillata*		pr					x
wild balsam apple	*Echinocystis lobata*	fp			ss			
wild bean	*Strophostyles leiosperma*		pr					
wild bergamot	*Monarda fistulosa*	up	pr,gp,**hp**		sm			x
wild chervil	*Chaerophyllum procumbens*	up						
wild cranesbill	*Geranium carolinianum*	up						x
wild four-o'clock*	*Mirabilis nyctaginea**	up						x
wild garlic	*Allium canadense*	up,fp	gp					x
wild geranium	*Geranium maculatum*	**up**,fp	pr,hp		sm,ss			
wild ginger	*Asarum canadense*	up,fp			ss			
wild hyacinth	*Camassia scilloides*		pr	x				
wild leek	*Allium tricoccum*	up			ss			
wild lettuce	*Lactuca canadensis*		pr					x
wild licorice	*Galium circaezans*	up			ss			
wild licorice*	*Glycyrrhiza lepidota**							x
wild madder	*Galium obtusum*	up,fp	pr		sm,bg			
wild parsnip*	*Pastinaca sativa**		pr,hp					x
wild petunia	*Ruellia humilis*		pr,hp,gp				x	
wild plum	*Prunus americana*	up	hp					
wild poinsettia*	*Poinsettia dentata**							x
wild sarsaparilla	*Aralia nudicaulis*	up		x	ss			
wild senna	*Cassia hebecarpa*				fn			
wild strawberry	*Fragaria virginiana*	fp,up	pr		sm			x
wild sweet potato vine	*Ipomoea pandurata*	fp						x
wild yam	*Dioscorea villosa*	up,fp						
willow	*Salix X subsericea*				ss			
willow aster	*Aster praealtus*		pr		ma,fn			
winged loosestrife	*Lythrum alatum*		pr		sm,ma,bg,fn, ss			
winged pigweed	*Cycloloma atriplicifolium*			x				ct
winter grape	*Vitis cinerea*	fp		x				

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
winter vetch*	*Vicia villosa**							x
winterberry	*Ilex verticillata*				ma,bg			
wirestem grass	*Muhlenbergia mexicana*	fp			fn			
wiry panic grass	*Panicum flexile*				sm,ss			
witch grass	*Panicum capillare*							x
witch Hazel	*Hamamelis virginiana*	up						
wolfberry*	*Symphoricarpos occidentalis**							x
wood anemone	*Anemone quinquefolia*	up			ss			
wood nettle	*Laportea canadensis*	fp,up			ss			
wood rush	*Luzula multiflora*	up		x				
wood sage	*Teucrium occidentale*							x
wood sheathing dropseed	*Sporobolus vaginiflorus*		pr					x
wood sorrel	*Oxalis stricta*		pr,hp					x
wood vetch	*Vicia caroliniana*	up	pr					
woodland bluegrass	*Poa sylvestris*	up						
woodland brome grass	*Bromus pubescens*	up						
woodland goldenrod	*Solidago caesia*	up,fp						
woodland lettuce	*Lactuca floridana*	up						
woodland sunflower	*Helianthus divaricatus*	up		x				
wool grass	*Scirpus cyperinus*				ma,bg			
woolly milkweed - SE	***Asclepias otarioides - SE*** ***(Asclepias lanuginosa)***		gp					
woolly mullein*	*Verbascum thapsus**		hp				x	x
woundwort	*Stachys palustris var. homotricha*		pr					x
Yankee blackberry	*Rubus pensylvanicus*	up			bg,fn			x
yellow avens	*Geum aleppicum*				bg,fn			
yellow bellwort	*Uvularia grandiflora*	up		x				
yellow birch - SE	***Betula alleghaniensis - SE***				bg			
yellow dog-tooth violet	*Erythronium americanum*	up						
yellow false foxglove	*Aureolaria grandiflora* var. *pulchra*	up		x				
yellow flax	*Linum sulcatum*		hp,gp					
yellow foxtail*	*Setaria glauca**		hp					
yellow giant hyssop	*Agastache nepetoides*	up						
yellow iris*	*Iris pseudacorus**	fp					x	
yellow ironweed	*Verbesina alternifolia*	fp			ss			
yellow lady's-slipper orchid	*Cypripedium pubescens*	up						
yellow monkey flower - SE	***Mimulus glabratus var. fremontii - SE***				ss			
yellow pimpernel	*Taenidia integerrima*	up		x				
yellow pond lily	*Nuphar luteum ssp. macrophyllum*				ma	x		
yellow rocket*	*Barbarea vulgaris**		pr,hp		sm			x
yellow star grass	*Hypoxis hirsuta*		pr,gp,hp					

Appendix 1. Continued

Common Name[3,4]	Scientific Name[3,4]	Forest	Prairie	Savanna	Wetland	Lake & Pond	Primary	Cultural
yellow stonecrop*	*Sedum sarmentosum**						x	
yellow sweet clover*	*Melilotus officinalis**		**PR**,hp					x
yellow water crowfoot	*Ranunculus flabellaris*				sm,ma	x		
yellow-lipped ladies' tresses - SE	***Spiranthes lucida - SE***				fn			

[1] Dominant species codes in each community are designated by bold upper case letters; sub dominant species codes in bold lower case letters.

[2] Habitat codes for each community are as follows:

FOREST:
- up = upland forest
- fp = floodplain forest
- fl = flatwoods

PRAIRIE:
- pr = prairie
- hp = hill prairie
- gp = gravel prairie

WETLAND:
- sm = sedge meadow
- ma = marsh
- bg = bog
- fn = fen
- ss = seep and spring
- sw = shallow water

CULTURAL:
- ct = cultural

[3] Bold indicates species that are: ST = State threatened; SE = State endangered; FT = Federally threatened; EX = extirpated species.

[4] * = introduced species.

Appendix 2

Plant species from the Fox River Assessment Area, listed by scientific name.

Scientific Name[1,2]	Common Name[1,2]
*Abutilon theophrasti**	button weed*
Acalypha rhomboidea	three-seeded mercury
Acer negundo	box elder
Acer nigrum	black maple
*Acer platanoides**	Norway maple*
Acer rubrum	red maple
Acer saccharinum	silver maple
Acer saccharum	sugar maple
*Achillea millefolium**	common yarrow*
Acorus americanus	sweet flag
Actaea pachypoda	white baneberry
Actaea rubra	red baneberry
Adiantum pedatum	maidenhair fern
Aesculus glabra	Ohio buckeye
Agalinis aspera	rough false foxglove
Agalinis gattingeri	rough-stemmed false foxglove
Agalinis purpurea	false foxglove
Agalinis tenuifolia	slender false foxglove
Agastache nepetoides	yellow giant hyssop
Agastache scrophulariaefolia	purple giant hyssop
Agrimonia gryposepala	tall agrimony
Agrimonia parviflora	small-fruited agrimony
Agrimonia pubescens	soft agrimony
*Agropyron repens**	quack grass*
*Agropyron smithii**	western wheat grass*
Agropyron trachycaulum	slender wheat grass
***Agropyron trachycaulum* var. *unila* - SE**	**bearded wheat grass - SE**
Agrostis alba	red top
Agrostis hyemalis	hair grass
Agrostis perennans	autumn bent grass
*Ailanthus altissima**	tree-of-heaven*
*Ajuga reptans**	carpet bugle*
*Alcea rosea**	hollyhock*
Alisma plantago-aquatica var. *americana*	American water plantain
Alisma plantago-aquatica var. *parviflora*	common water plantain
*Alliaria petiolata**	garlic mustard*
Allium canadense	wild garlic
Allium canadense var. *mobilense**	glade onion*
Allium cernuum	nodding wild onion
*Allium schoenoprasum**	chives*
Allium tricoccum	wild leek
*Allium vineale**	field garlic*
***Alnus incana* ssp. *rugosa* - SE**	speckled alder
Alopecurus aequalis	short-awned foxtail
Alopecurus carolinianus	annual foxtail
*Alopecurus pratensis**	meadow foxtail*
*Alyssum alyssoides**	pale alyssum*
Amaranthus albus	tumbleweed
*Amaranthus cruentus**	purple amaranth*
*Amaranthus graecizans**	prostrate amaranth*
Amaranthus hybridus	green amaranth
*Amaranthus palmeri**	Palmer's amaranth*
*Amaranthus powellii**	smooth pigweed*
*Amaranthus retroflexus**	rough pigweed*
Amaranthus rudis	tamarisk waterhemp
Amaranthus tuberculatus	tall water hemp
Ambrosia artemisiifolia	common ragweed
Ambrosia psilostachya	western ragweed
Ambrosia trifida	giant ragweed
Amelanchier arborea	Juneberry
Amelanchier humilis	low shadbush
***Amelanchier interior* - SE**	**inland shadbush - SE**
Amelanchier laevis	Allegheny shadblow
***Amelanchier sanguinea* - SE**	**round-leaved shadbush -SE**
Amorpha canescens	leadplant
Amorpha fruticosa	false indigo bush
Amphicarpa bracteata	hog peanut
Amphicarpa bracteata var. *comosa*	hog peanut
*Anchusa officinalis**	common alkanet*
***Andromeda glaucophylla* - EX**	**bog Rosemary - EX**
Andropogon gerardii	big bluestem
Androsace occidentalis	androsace
Anemone canadensis	meadow anenome
Anemone cylindrica	candle anemone
Anemone quinquefolia	wood anemone
Anemone virginiana	tall anemone
*Anethum graveolens**	dill*
Angelica atropurpurea	great Angelica
Antennaria neglecta	little pussy toes
Antennaria plantaginifolia	everlasting
*Anthemis cotula**	dogfennel*
*Anthriscus sylvestris**	false chervil*
Apios americana	groundnut

Appendix 2. Continued

Scientific Name[1,2]	Common Name[1,2]
Apocynum androsaemifolium	spreading dogbane
Apocynum cannabinum	Indian hemp
Apocynum sibiricum	Indian hemp
Aquilegia canadensis	columbine
*Aquilegia vulgaris**	garden columbine*
Arabis canadensis	sicklepod
Arabis drummondii - EX	**Drummond's rock cress - EX**
Arabis glabra	tower mustard
Arabis hirsuta	hairy rock cress
Arabis laevigata	smooth rock cress
Arabis shortii	toothed cress
Arabis shortii var. *phalacrocarpa*	rock cress
Aralia nudicaulis	wild sarsaparilla
Aralia racemosa	American spikenard
Aralis hispida - EX	**bristly sarsaparilla - EX**
*Arctium lappa**	great burdock*
*Arctium minus**	common burdock*
Arenaria patula - SE	**slender sandwort - SE**
*Arenaria serpyllifolia**	thyme-leaved sandwort*
Arisaema dracontium	green dragon
Arisaema triphyllum	Jack-in-the-pulpit
Arisitda oligantha	plains three-awned grass
Aristolochia serpentaria	birthwort
*Armoracia rusticana**	horseradish*
Aronia melanocarpa	black chokeberry
Arrhenatherum elatius	tall oat grass
*Artemisia absinthium**	absinth*
*Artemisia biennis**	biennial wormwood*
Artemisia campestris	beach wormwood
Artemisia ludoviciana	Louisiana sagebrush
Artemisia serrata	saw-toothed sagebrush
*Artemisia vulgaris**	common mugwort*
Asarum canadense	wild ginger
Asclepias amplexicaulis	sand milkweed
Asclepias exaltata	poke milkweed
Asclepias incarnata	swamp milkweed
Asclepias otarioides - SE	**woolly milkweed - SE**
Asclepias ovalifolia - SE, EX	**oval milkweed - SE, EX**
Asclepias purpurascens	purple milkweed
Asclepias sullivantii	prairie milkweed
Asclepias syriaca	common milkweed
Asclepias tuberosa ssp. *interior*	butterfly weed
Asclepias verticillata	horsetail milkweed
Asclepias viridiflora	green milkweed
Asimina triloba	paw paw
*Asparagus officinalis**	asparagus*
*Asperugo procumbens**	madwort*
Asplenium platyneuron	ebony spleenwort
Asplenium rhizophyllum	walking fern
Aster azureus	sky-blue aster
Aster borealis	rush aster
Aster drummondii	Drummond's aster
Aster ericoides	heath aster
Aster firmus	glossy-leaf aster
Aster furcatus - ST	**forked aster - ST**
Aster laevis	smooth blue aster
Aster lateriflorus	side-flowered aster
Aster linariifolius	flax-leaved aster
Aster novae-angliae	New England aster
Aster ontarionis	Ontario aster
Aster pilosus	hairy aster
Aster praealtus	willow aster
Aster puniceus	swamp aster
Aster sagittifolius	arrowleaf aster
Aster sericeus	silky aster
Aster shortii	Short's aster
Aster simplex	panicled aster
Aster umbellatus	flat-topped aster
Astragalus canadensis	Canadian milk vetch
Athyrium angustum	lady fern
Athyrium asplenioides	southern lady fern
Athyrium pynocarpon	narrow-leaved spleenwort
*Atriplex glabriuscula**	smooth orach*
*Atriplex patula**	fat-hen saltbush*
*Atriplex rosea**	red orache*
Aureolaria flava	smooth false foxglove
Aureolaria grandiflora	yellow false foxglove
*Avena sativa**	oats*
*Baptisia australis**	blue wild indigo*
Baptisia lactea	white wild indigo
Baptisia leucophaea	cream wild indigo
*Barbarea vulgaris**	yellow rocket*
Beckmannia syzigachne - SE	**American slough grass - SE**
*Belamcanda chinensis**	blackberry lily*
*Berberis thunbergii**	Japanese barberry*
*Berberis vulgaris**	common barberry*
*Berteroa incana**	hoary alyssum*
Berula erecta	low water parsnip
Betula alleghaniensis - SE	**yellow birch - SE**
Betula nigra	red birch
Betula papyrifera	paper birch
Betula pumila	dwarf birch
Betula X *purpusii*	Purpus' birch
Betula X *sandbergii*	Sandberg's birch
Bidens aristosa	swamp marigold
Bidens cernua	nodding beggar ticks
Bidens connata	swamp beggar ticks
Bidens coronata	tall swamp marigold
Bidens frondosa	common beggar ticks

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Bidens tripartita	swamp tickseed
Bidens vulgata	common beggar ticks
Blephilia ciliata	pagoda plant
Blephilia hirsuta	pagoda plant
Boehmeria cylindrica	false nettle
Boehmeria cylindrica var. *drummondi*	false nettle
Boltonia asteroides	false aster
Botrychium campestre	grape fern
Botrychium dissectum var. *obliquum*	bronze fern
Botrychium virginianum	rattlesnake fern
Bouteloua curtipendula	side-oats grama
Brachyletrum erectum	black gramma
Brasenia schreberi	water shield
*Brassica hirta**	white mustard*
*Brassica juncea**	Indian mustard*
*Brassica kaber**	charlock*
*Brassica nigra**	black mustard*
*Brassica rapa**	field mustard*
Brickellia eupatorioides	false boneset
Bromus ciliatus	Canada brome grass
*Bromus commutatus**	hairy brome*
*Bromus inermis**	awnless brome grass*
*Bromus japonicus**	Japanese brome*
Bromus kalmii	prairie brome
*Bromus marginatus**	brome grass*
Bromus pubescens	woodland brome grass
Bromus purgans	brome grass
*Bromus tectorum**	cheat grass*
*Buchloë dactyloides**	buffalo grass*
Cacalia atriplicifolia	pale Indian plantain
Cacalia plantaginea	prairie Indian plantain
Cacalia suaveolens	sweet Indian plantain
Calamagrostis canadensis	blue joint grass
Calamagrostis inexpansa var. *brevior*	northern reed grass
Calamintha arkansana	low calamint
Calla palustris - SE	**water arum - SE**
*Callirhoë involucrata**	poppy mallow*
Callirhoë triangulata	poppy mallow
Calopogon tuberosus - ST	**grass pink orchid - ST**
Caltha palustris	marsh marigold
Calystegia sepium	American bindweed
Calystegia spithamaea	dwarf bindweed
Camassia scilloides	wild hyacinth
Campanula americana	tall bellflower
Campanula aparinoides	marsh bellflower
*Campanula rapunculoides**	European bellflower*
Campanula rotundifolia	harebell
Campanula uliginosa	marsh bellflower
Campsis radicans	trumpet creeper
*Cannabis sativa**	common hemp*
*Capsella bursa-pastoris**	shepherd's purse*
Cardamine bulbosa	bulb bittercress
Cardamine douglasii	purple cress
*Cardamine hirsuta**	hairy bitter cress*
Cardamine pensylvanica	bitter cress
Cardamine pratensis var. palustris - SE	**cuckoo flower -SE**
*Carduus acanthoides**	plumeless thistle*
*Carduus nutans**	musk thistle*
Carex albolutescens	long-fruited oval sedge
Carex albursina	blunt-scaled wood sedge
Carex amphibola	gray sedge
Carex annectens	large yellow fox sedge
Carex atherodes	hairy-leaved lake sedge
Carex aurea - SE	**golden sedge - SE**
Carex bebbii	Bebb's oval sedge
Carex bicknellii	Bicknell sedge
Carex brevior	plains oval sedge
Carex brunnescens var. sphaerostac	**brownish sedge - SE**
Carex buxbaumii	Buxbaum sedge
Carex cannescens var. disjuncta - SE	**gray bog sedge - SE**
Carex cephalophora	rough-clustered sedge
Carex chordorrhiza - SE	**cord root sedge - SE**
Carex comosa	bristly sedge
Carex conjuncta	green-headed fox sedge
Carex conoidea	prairie gray sedge
Carex convoluta	curly-styled wood sedge
Carex crawei - ST	**Crawe's sedge - ST**
Carex crawfordii - SE	**Crawford's oval sedge - SE**
Carex cristatella	crested oval sedge
Carex cryptolepis - SE	**small yellow sedge - SE**
Carex davisii	awned graceful sedge
Carex diandra	lesser panicled sedge
Carex disperma - SE	**shortleaf sedge - SE**
Carex emoryi	riverbank sedge
Carex festucacea	fescue oval sedge
Carex gracilescens	slender wood sedge
Carex gracillima	graceful sedge
Carex granularis	meadow sedge
Carex gravida	long-awned bracted sedge
Carex grayi	common bur sedge
Carex haydenii	Hayden's sedge
Carex hirtifolia	hairy wood sedge
Carex hystricina	porcupine sedge
Carex interior	inland sedge
Carex jamesii	grass sedge
Carex lacustris	river sedge

Appendix 2. Continued.

Scientific Name[1,2]	Common Name[1,2]
Carex laevivaginata	smooth-sheathed fox sedge
Carex lanuginosa (C. pellita)	broad-leaved woolly sedge
Carex lasiocarpa	narrow-leaved woolly sedge
Carex laxiculmis - ST	**spreading sedge - ST**
Carex laxiflora	beech wood sedge
Carex leptalea	bristle-stalked sedge
Carex lupuliformis	knobbed hop sedge
Carex lupulina	hop sedge
Carex lurida	bottlebrush sedge
Carex meadii	Mead's stiff sedge
Carex muhlenbergii	sand bracted sedge
Carex muskingumensis	swamp oval sedge
Carex normalis	spreading oval sedge
Carex oligocarpa	few-fruited gray sedge
Carex oligosperma - SE	**few-seeded sedge - SE**
Carex pedunculata	long-stalked hummock sedge
Carex pensylvanica	savanna sedge
*Carex praegracilis**	silver sedge*
Carex prairea	fen panicled sedge
Carex pseudo-cyperus	false bristly sedge
Carex retrorsa	knotsheath sedge
Carex richardsonii	prairie hummock sedge
Carex rosea	curly-styled wood sedge
Carex rostrata - ST	**beaked sedge - SE**
Carex sartwellii	Sartwell sedge
Carex scoparia	broom sedge
Carex sparganioides	loose-headed bracted sedge
Carex sprengelii	long-beaked sedge
*Carex stenophylla var. enervis**	spikerush sedge*
Carex sterilis	fen star sedge
Carex stipata	prickly sedge
Carex stricta	common tussock sedge
Carex suberecta	wedge-fruited oval sedge
Carex substricta	long-bracted tussock sedge
Carex tenera	narrow-leaved oval sedge
Carex tetanica	common stiff sedge
Carex tribuloides	awl-fruited sedge
Carex trichocarpa	hairy-fruited lake sedge
Carex trisperma - SE	**three-seeded bog sedge - SE**
Carex viridula - SE	**little green sedge - SE**
Carex vulpinoidea	fox sedge
Carpinus caroliniana	blue beech
*Carum carvi**	caraway*
Carya cordiformis	bitternut hickory
Carya ovata	shagbark hickory
Cassia fasciculata	partridge pea
Cassia hebecarpa	wild senna
Castilleja coccinea	Indian paintbrush
*Catalpa speciosa**	hardy catalpa*
Caulophyllum thalictroides	blue cohosh
Ceanothus americanus	New Jersey tea
*Celastrus orbiculatus**	round-leaved bittersweet*
Celastrus scandens	bittersweet
Celtis occidentalis	hackberry
Cenchrus longispinus	sand bur
*Centaurea cyanus**	bachelor's buttons*
*Centaurea dubia**	Tyrol knapweed*
*Centaurea jacea**	brown knotweed*
*Centaurea maculosa**	spotted centaurea*
Cephalanthus occidentalis	buttonbush
Cerastium arvense	mouse-eared chickweed
*Cerastium glomeratum**	clammy chickweed*
Cerastium nutans	nodding mouse-ear chickweed
Cerastium nutans var. brachypodum	mouse-ear chickweed
*Cerastium vulgatum**	common mouse-ear chickweed*
Ceratophyllum demersum	coontail
Cercis canadensis	redbud
*Chaenorrhinum minus**	small snapdragon*
Chaerophyllum procumbens	wild chervil
Chamaedaphne calyculata - ST	**leatherleaf - ST**
Chamaesyce glyptosperma	spurge
Chamaesyce maculata	nodding spurge
Chamaesyce supina	milk spurge
*Chelidonium majus**	Celandine*
Chelone glabra	white turtlehead
*Chenopodium album**	lamb's quarters*
*Chenopodium botrys**	Jerusalem oak*
*Chenopodium gigantospermum**	maple-leaved goosefoot*
*Chenopodium glaucum**	oak-leaved goosefoot*
Chenopodium standleyanum	goosefoot
*Chenopodium urbicum**	city goosefoot*
*Chorispora tenella**	purple rocket*
*Cichorium intybus**	chickory*
Cicuta bulbifera	bulblet water hemlock
Cicuta maculata	water hemlock
Cimicifuga racemosa - SE	**false bugbane - SE**
Cinna arundinacea	stout wood reed
Circaea alpina -SE,EX	**small enchanter's nightshade - SE,EX**
Circaea lutetiana ssp. canadensis	enchanter's nightshade
Cirsium altissimum	tall thistle
*Cirsium arvense**	Canada thistle*
Cirsium discolor	field thistle
Cirsium muticum	swamp thistle
Cirsium pumilum - ST (C. hillii)	**Hill's thistle - ST**
*Cirsium vulgare**	bull thistle*
*Citrullus vulgaris**	watermelon*
Cladium mariscoides	twig rush
Claytonia virginica	spring beauty
Clematis pitcheri	leather flower

Appendix 2. Continued

Scientific Name[1,2]	Common Name[1,2]
Clematis virginiana	virgin's bower
Coeloglossum viride	bracted green orchid
Collinsia verna	blue-eyed Mary
*Collomia linearis**	slenderleaf collomia*
Comandra umbellata	bastard toadflax
*Commelina communis**	common day flower*
Conioselinum chinense - SE	**hemlock parsley - SE**
*Conium maculatum**	poison hemlock*
Conopholis americana	cancer-root
*Convallaria majalis**	lily-of-the-valley*
*Convolvulus arvensis**	field bindweed*
Conyza canadensis	horseweed
Corallorhiza maculata - ST	**spotted coral-root orchid - ST**
Corallorhiza odontorhiza	fall coral-root
Coreopsis lanceolata	tickseed coreopsis
Coreopsis palmata	prairie coreopsis
Coreopsis tripteris	tall coreopsis
Cornus alternifolia	alternate-leaved dogwood
Cornus canadensis - SE	**bunchberry - SE**
Cornus obliqua	pale dogwood
Cornus racemosa	gray dogwood
Cornus rugosa	round-leaved dogwood
Cornus stolonifera	red-osier dogwood
*Coronilla varia**	crown vetch*
*Corydalis micrantha**	slender corydalis*
Corylus americana	hazelnut
Crataegus coccinea	scarlet hawthorn
Crataegus crus-galli	cockspur thorn
Crataegus flabellata	large-seeded hawthorn
Crataegus mollis	red haw
Crataegus pruinosa	frosted hawthorn
Crataegus punctata	dotted hawthorn
Crataegus succulenta	fleshy hawthorn
Croton capitatus	capitate croton
Cryptogramma stelleri	slender cliffbrake
Cryptotaenia canadensis	honewort
*Cucurbita foetidissima**	Missouri gourd*
Cuscuta cephalanthi	buttonbush dodder
Cuscuta coryli	hazel dodder
Cuscuta glomerata	rope dodder
Cuscuta gronovii	common dodder
Cuscuta pentagona	prairie dodder
Cuscuta polygonorum	smartweed dodder
Cycloloma atriplicifolium	winged pigweed
*Cynanchum nigrum**	black swallow-wort*
*Cynoglossum officinale**	common hound's-tongue*
Cyperus aristatus	galingale
Cyperus diandrus	low flat sedge
Cyperus erythrorhizos	red-rooted sedge
Cyperus esculentus	nut grass
Cyperus ferruginescens	rusty nut sedge
Cyperus filiculmis	fern flat sedge
Cyperus houghtonii	smooth sand sedge
Cyperus rivularis	brook flat sedge
Cyperus schweinitzii	Schweinitz flat sedge
Cyperus strigosus	straw-colored flat sedge
Cypripedium acaule - SE	**pink lady's slipper - SE**
Cypripedium candidum - SE	**white lady's slipper - SE**
Cypripedium parviflorum - SE	**small yellow lady's slipper - SE**
Cypripedium pubescens	yellow lady's-slipper orchid
Cypripedium reginae - SE	**showy lady's slipper - SE**
Cypripedium X andrewsii	hybrid lady's slipper orchid
Cystopsis bulbifera	bladder fern
Cystopsis fragilis	fragile fern
Cystopsis X tennesseensis	Tennessee fragile fern
*Dactylis glomerata**	orchard grass*
Dalea candida	white prairie clover
Dalea foliosa - SE,FT,EX	**leafy prairie clover - SE,FT,EX**
*Dalea leporina**	foxtail dalea*
Dalea purpurea	purple prairie clover
Danthonia spicata	poverty oat grass
Dasistoma macrophylla	mullein foxglove
*Datura stramonium**	Jimpson weed*
*Daucus carota**	Queen Anne's lace*
Decodon verticillatus	swamp loosestrife
Dentaria laciniata	toothwort
Deschampsia caespitosa var. glauca	tufted hairgrass
Descurainia pinnata ssp. brachycarpa	tansy mustard
Desmanthus illinoensis	Illinois bundleflower
Desmodium canadense	showy tick trefoil
Desmodium cuspidatum	tick trefoil
Desmodium glabellum	tick trefoil
Desmodium glutinosum	pointed tick trefoil
Desmodium illinoense	Illinois tick trefoil
*Dianthus armeria**	Depthford pink*
Dicentra canadensis	squirrel corn
Dicentra cucullaria	Dutchman's breeches
Dichanthelium acuminatum var. fasciculatum	panic grass
Dichanthelium acuminatum var. lindheimeri	panic grass
Dichanthelium depauperatum	prairie panic grass
Dichanthelium latifolium	broad-leaved panic grass
Dichanthelium leibergii	long-haired panic grass
Dichanthelium oligosanthes	few-flowered panic grass
Dichanthelium oligosanthes var. scribnerii	Scribner's panic grass
Dichanthelium villosissimum	white-haired panic grass

Appendix 2. Continued

Scientific Name[1,2]	Common Name[1,2]
Dichanthelium villosissimum var. praecocius	hairy panic grass
Diervilla lonicera	dwarf honeysuckle
*Digitaria ischaemum**	smooth crab grass*
*Digitaria sanguinalis**	common crab grass*
*Diodia teres**	rough buttonweed*
Dioscorea villosa	wild yam
*Diplotaxis muralis**	wall rocket*
*Dipsacus laciniatus**	cut-leaved teasel*
*Dipsacus sylvestris**	common teasel*
Dirca palustris	leatherwood
*Distichlis stricta**	salt grass*
Dodecatheon meadia	shooting star
Draba reptans	Whitlow grass
*Dracocephalum parviflorum**	American dragonhead*
Drosera rotundifolia - SE	**round-leaved sundew - SE**
Dryopteris carthusiana	spinulose woodfern
Dryopteris cristata	shield fern
Dryopteris goldiana	Goldie's fern
Dryopteris intermedia	common woodfern
Dryopteris marginalis	marginal fern
Duchnesia indica	Indian strawberry
Dulichium arundinaceum	three-way sedge
*Dyssodia papposa**	fetid marigold*
Echinacea pallida	pale purple coneflower
Echinacea purpurea	purple coneflower
*Echinochloa crus-galli**	barnyard grass*
Echinochloa walteri	salt marsh cockspur grass
Echinocystis lobata	wild balsam apple
*Echinops spaerocephalus**	globe thistle*
*Echium vulgare**	blueweed*
*Elaeagnus augustifolius**	Russian olive*
*Elaeagnus umbellata**	autumn olive*
Eleocharis acicularis	needle spike rush
Eleocharis elliptica var. compressa	flat-stemmed spike rush
Eleocharis erythropoda	red-rooted spike rush
Eleocharis intermedia	matted spike rush
Eleocharis obtusa	blunt spike rush
Eleocharis pauciflora - SE	**few-flowered spikesedge - SE**
Eleocharis rostellata - ST	**beaked spikesedge - ST**
Eleocharis smallii	Small's spike rush
*Eleusine indica**	goose grass*
Ellisia nyctelea	Aunt Lucy
Elodea canadensis	waterweed
Elymus canadensis	Canada wild rye
Elymus hystrix	bottlebrush grass
Elymus riparius	riverbank wild rye
Elymus villosus	slender wild rye
Elymus virginicus	Virginia wild rye
Epilobium augustifolium	fireweed
Epilobium ciliatum	northern willow herb
Epilobium coloratum	cinnamon willow herb
Epilobium leptophyllum	bog willow herb
Epilobium strictum - ST	**downy willow herb - ST**
*Epipactis helleborine**	helleborine*
Equisetum arvense	common horsetail
Equisetum fluviatile	water horsetail
Equisetum hyemale var. affine	scouring rush
Equisetum laevigatum	smooth scouring rush
Equisetum X ferrissii	intermediate scouring rush
Eragrostis frankii	sandbar love grass
Eragrostis hypnoides	creeping love grass
*Eragrostis minor**	love grass*
Eragrostis pectinacea	small love grass
Eragrostis spectabilis	tumble grass
Erechtites hieracifolia	fire weed
Erigenia bulbosa	harbinger-of-spring
Erigeron annuus	annual fleabane
Erigeron philadelphicus	marsh fleabane
Erigeron pulchellus	Robin's plantain
Erigeron strigosus	daisy fleabane
Eriophorum angustifolium	cotton sedge
Eriophorum virginicum - SE	**rusty cotton grass - SE**
*Erodium cicutarium**	pin clover*
*Erucastrum gallicum**	dog mustard*
Eryngium yuccifolium	rattlesnake master
*Erysimum inconspicum**	western wallflower*
*Erysimum repandum**	treacle mustard*
Erythronium albidum	white trout lily
Erythronium americanum	yellow dog-tooth violet
*Eschscholtzia californica**	California poppy*
*Euonymus alatus**	burning bush*
Euonymus atropurpureus	wahoo
*Euonymus europaeus**	spindle tree*
Eupatorium altissimum	tall boneset
Eupatorium maculatum	spotted Joe-Pye weed
Eupatorium perfoliatum	common boneset
Eupatorium purpureum	green-stemmed Joe-Pye-weed
Eupatorium rugosum	white snakeroot
Eupatorium serotinum	late boneset
Euphorbia corollata	flowering spurge
*Euphorbia cyparissias**	Cyprus spurge*
*Euphorbia esula**	leafy spurge*
*Euphorbia marginata**	snow-on-the-mountain*
Euthamia graminifolia	grass-leaved goldenrod
Euthamia gymnospermoides	viscid grass-leaved goldenrod
Evolvulus pilosus	ascending morning-glory*
*Fagopyrum esculentum**	buckwheat*
Festuca obtusa	nodding fescue
*Festuca pratensis**	meadow fescue*

Appendix 2. Continued

Scientific Name[1,2]	Common Name[1,2]
Filipendula rubra - ST,EX	**queen-of-the-prairie - ST,EX**
*Filipendula ulmaria**	queen-of-the-meadow*
Floerkea proserpinacoides	false mermaid
Fragaria virginiana	wild strawberry
Fraxinus americana	white ash
Fraxinus nigra	black ash
Fraxinus pennsylvanica var. *pennsylvanica*	red ash
Fraxinus pennsylvanica var. *subintegerrima*	green ash
Fraxinus quadrangulata	blue ash
*Frolichia gracilis**	small cottonweed*
*Fumaria officinialis**	fumitory*
*Gaillardia pulchella**	blanket flower*
Galearis spectabilis	showy orchis
*Galeopsis tetrahit**	common hemp nettle*
*Galinsoga parviflora**	Peruvian daisy*
*Galinsoga quadriradiata**	Peruvian daisy*
Galium aparine	annual bedstraw
Galium asprellum	rough bedstraw
Galium boreale	northern bedstraw
Galium circaezans	wild licorice
Galium concinnum	shining bedstraw
Galium labradoricum - ST	**bog bedstraw - ST**
*Galium mollugo**	white bedstraw*
Galium obtusum	wild madder
Galium tinctorium	stiff bedstraw
Galium trifidium	small bedstraw
Galium triflorum	sweet-scented bedstraw
Gaura biennis	biennial gaura
Gaura longiflora	common gaura
*Gaura parviflora**	small-flowered gaura*
Gaylussacia baccata	black huckleberry
Gentiana alba	pale gentian
Gentiana andrewsii	closed gentian
Gentiana puberulenta	downy gentian
Gentiana saponaria	soapwort gentian
Gentianella quinquefolia	stiff gentian
Gentianopsis procera	small-fringed gentian
Geranium carolinianum	wild cranesbill
Geranium maculatum	wild geranium
Geum aleppicum	yellow avens
Geum canadense	white avens
Geum laciniatum	rough avens
Geum rivale - EX	**purple avens - EX**
Geum triflorum	prairie smoke
*Glandularia canadensis**	rose verbena*
*Glechoma hederacea**	creeping Charlie*
Gleditsia triacanthos	honey locust
Glyceria grandis	reed manna grass
Glyceria septentrionalis	manna grass
Glyceria striata	fowl manna grass
*Glycine max**	soybean*
*Glycyrrhiza lepidota**	wild licorice*
Gnaphalium obtusifolium	catfoot
Goodyera pubescens	rattlesnake plantain
Gratiola neglecta	clammy hedge hyssop
*Grindelia squarrosa**	gumweed*
Gymnocladus dioica	Kentucky coffeetree
*Gypsophila paniculata**	baby's breath*
*Gypsophila scorzonerifolia**	baby's breath*
Hackelia virginiana	stickseed
Hamamelis virginiana	witch hazel
Hedeoma hispida	rough pennyroyal
Hedeoma pulegioides	American pennyroyal
Hedyotis longifolia	long-leaved bluets
Hedyotis purpurea	broad-leaved bluets
Helenium autumnale	sneezeweed
Helianthemum bicknellii	frostweed
*Helianthus annus**	common sunflower*
Helianthus decapetalus	pale sunflower
Helianthus divaricatus	woodland sunflower
Helianthus giganteus - SE	**tall sunflower - SE**
Helianthus grosseserratus	saw-toothed sunflower
Helianthus hirsutus	bristly sunflower
*Helianthus maximilianii**	Maximilian sunflower*
Helianthus occidentalis	western sunflower
*Helianthus petiolaris**	petioled sunflower*
Helianthus rigidus	prairie sunflower
Helianthus strumosus	pale-leaved sunflower
Helianthus tuberosus	Jerusalem artichoke
Heliopsis helianthoides	false sunflower
*Hemerocallis fulva**	orange day lily*
Hepatica nobilis var. acuta	liverleaf
Hepatica nobilis var. obtusa	round-lobed liverleaf
Heracleum lanatum	cow parsnip
*Hesperis matronalis**	rocket*
Heuchera americana var. hirsuticauli	tall alumroot
Heuchera richardsonii var. grayana	prairie alumroot
Hibiscus moscheutos	swamp rose mallow
*Hibiscus trionum**	flower-of-an-hour*
*Hieracium aurantiacum**	orange hawkweed*
*Hieracium caespitosum**	king devil*
Hieracium canadense	Canada hawkweed
Hieracium longipilum	hairy hawkweed
Hieracium scabrum	hairy hawkweed
Hierochloë odorata	sweet grass
Hippuris vulgaris	mare's tail
*Hordeum jubatum**	foxtail barley*

Appendix 2. Continued

Scientific Name[1,2]	Common Name[1,2]
Hordeum pusillum	little barley
*Hordeum vulgare**	common barley*
Humulus lupulus	American hop
Hydrastis canadensis	goldenseal
Hydrophyllum appendiculatum	waterleaf
Hydrophyllum virginianum	Virginia waterleaf
Hypericum canadense	Canadian St. John's-wort
Hypericum majus	sand St. John's-wort
*Hypericum perforatum**	common St. John's-wort*
Hypericum punctatum	spotted St. John's-wort
Hypericum pyramidatum	giant St. John's-wort
Hypericum sphaerocarpum	round fruited St. John's-wort
*Hypochaeris radicata**	cat's ear*
Hypoxis hirsuta	yellow star grass
Ilex verticillata	winterberry
Impatiens capensis	spotted touch-me-not
Impatiens pallida	pale touch-me-not
*Inula helenium**	elacampane*
Iodanthus pinnatifidus	purple rocket
*Ipomoea hederacea**	ivy-leaved morning glory*
*Ipomoea lacunosa**	small white morning glory*
Ipomoea pandurata	wild sweet potato vine
*Ipomoea purpurea**	common morning glory*
*Iris pseudacorus**	yellow iris*
Iris shrevei	blue flag
Isopyrum biternatum	false rue anenome
*Iva xanthifolia**	burweed*
Jeffersonia diphylla	twin leaf
Juglans cinerea	butternut
Juglans nigra	black walnut
Juncus acuminatus	knotty-leaved rush
Juncus alpinus - SE	**Richardson's rush - SE**
Juncus brachycephalus	short-fruited rush
Juncus canadensis	Canadian rush
Juncus dudleyi	Dudley's rush
Juncus effusus	soft rush
Juncus nodosus	jointed rush
Juncus tenuis	path rush
Juncus Torreyi	Torrey rush
Juncus vaseyi - SE,EX	**Vasey's rush - SE,EX**
Juniperus virginiana	red cedar
Justicia americana	water willow
*Kochia scoparia**	summer cypress*
Koeleria macrantha	June grass
Krigia biflora	false dandelion
Lactuca biennis	tall blue lettuce
Lactuca canadensis	wild lettuce
Lactuca floridana	woodland lettuce
Lactuca ludoviciana - SE,EX	**western wild lettuce - SE,EX**
*Lactuca serriola**	prickly lettuce*
*Lactuca tatarica**	blue lettuce*
*Lamium amplexicaule**	gourd*
*Lamium maculatum**	spotted dead nettle*
*Lamium purpureum**	purple dead nettle*
Laportea canadensis	wood nettle
*Lappula echinata**	beggar's lice*
*Lapsana communis**	nipplewort*
Larix laricina - ST	**American larch - ST**
*Lathyrus latifolius**	everlasting pea*
Lathyrus ochroleucus - ST	**pale vetchling - ST**
Lathyrus palustris	marsh vetchling
*Lathyrus tuberosus**	tuberous vetchling*
Lathyrus venosus var. intonsus	veiny pea
Lechea intermedia - SE	**pinweed - SE**
Lechea striata	bushy pinweed
Leersia oryzoides	rice cutgrass
Leersia virginica	white grass
Lemna minor	small duckweed
Lemna trisulca	ivy-leaved duckweed
*Leonurus cardiaca**	motherwort*
*Leonurus marrubiastrum**	lion's tail*
*Lepidium campestre**	field peppergrass*
*Lepidium densiflorum**	peppergrass*
*Lepidium perfoliatum**	peppergrass*
Lepidium virginicum	common peppergrass
*Leptochloa fascicularis**	salt meadow grass*
Leptoloma cognatum	fall witch grass
Lespedeza capitata	round-headed bush clover
Lespedeza intermedia	bush clover
Lespedeza leptostachya - SE,FT	**prairie bush clover - SE, FT**
Lespedeza violacea	violet bush clover
*Leucanthemum vulgare**	ox-eye daisy*
Liatris aspera	rough blazing star
Liatris cylindracea	cylindrical blazing star
Liatris pycnostachya	prairie blazing star
Liatris spicata	marsh blazing star
*Ligustrum obtusifolium**	privet*
*Ligustrum vulgare**	privet*
Lilium michiganense	Turk's cap lily
Lilium philadelphicum var. andinum	prairie lily
*Linaria genistifolia ssp. dalmatica**	Dalmatian toadflax*
*Linaria vulgaris**	butter-and-eggs*
Lindera benzoin	spicebush
Lindernia dubia	false pimpernel
Linnaea borealis - EX	**twin flower - EX**
Linum sulcatum	yellow flax
*Linum usitatissimum**	common flax*
Liparis liliifolia	large twayblade
Liparis loeselii	lesser twayblade
*Liquidambar styraciflua**	sweet gum*

Appendix 2. Continued

Scientific Name[1,2]	Common Name[1,2]
Lithospermum canescens	hoary puccoon
Lithospermum incisum	fringed puccoon
Lithospermum latifolium	American gromwell
Lobelia cardinalis	cardinal flower
Lobelia inflata	Indian tobacco
Lobelia kalmii	Kalm's lobelia
Lobelia siphilitica	blue lobelia
Lobelia spicata	spike lobelia
*Lolium perenne**	crested rye grass*
Lonicera dioica	red honeysuckle
*Lonicera japonica**	Japanese honeysuckle*
*Lonicera maackii**	Amur honeysuckle*
*Lonicera morrowi**	Morrow's honeysuckle*
*Lonicera muendeniensis**	bush honeysuckle*
Lonicera prolifera	grape honeysuckle
*Lonicera tatarica**	Tartarian honeysuckle*
*Lotus corniculatus**	birds-foot trefoil*
Ludwigia palustris var. americana	marsh purslane
Ludwigia polycarpa	false loosestrife
Luzula multiflora	wood rush
*Lychnis alba**	evening campion*
*Lychnis diocia**	red campion*
*Lycium barbarum**	common matrimony vine*
*Lycopersicum esculentum**	tomato*
Lycopodium lucidulum	shining clubmoss
Lycopus americanus	common water horehound
Lycopus asperá	rough water horehound
Lycopus rubellus	stalked water horehound
Lycopus uniflorus	northern bugle weed
Lycopus virginicus	bugle weed
Lysimachia ciliata	fringed loosestrife
Lysimachia lanceolata	lance-leaved loosestrife
*Lysimachia nummularia**	moneywort*
Lysimachia quadrifolia	whorled loosestrife
Lysimachia terrestris	swamp candle
Lysimachia thrysiflora	tufted loosestrife
*Lysimachia vulgrais**	garden loosestrife*
Lythrum alatum	winged loosestrife
*Lythrum salicaria**	purple loosestrife*
*Maclura pomifera**	Osage orange*
Maianthemum canadense var. interius	false lily-of-the-valley
Malaxis brachypoda - EX	**white adder's mouth - EX**
Malaxis uniflora - EX	**adder's mouth orchid-EX**
Malus ioensis	Iowa crab
*Malva neglecta**	common mallow*
*Malva sylvestris**	high mallow*
*Marrubium vulgare**	common horehound*
*Matricaria matricarioires**	pineapple weed*
Matteuccia struthiopteris	ostrich fern
*Medicago lupulina**	black medic*
*Medicago sativa**	alfalfa*
Megalodonta beckii - SE	**water marigold - SE**
*Melilotus alba**	white sweet clover*
*Melilotus officinalis**	yellow sweet clover*
Menispermum canadense	moonseed
Mentha arvensis var. villosa	field mint
Menyanthes trifoliata var. minor	bogbean
Mertensia virginica	Virginia bluebells
Microseris cuspidata - SE,EX	**prairie dandelion - SE,EX**
Milium effusum - SE	**millet grass- SE**
Mimulus glabratus var. fremontii - SE	**yellow monkey flower - SE**
Mimulus ringens	monkey flower
Minuartia stricta	stiff sandwort
*Mirabilis nyctaginea**	wild four-o'clock*
*Miscanthus sacchariflorus**	plume grass*
Mitella diphylla	Bishop's cap
Moehringia lateriflora	sandwort
*Mollugo verticillata**	carpet weed*
Monarda fistulosa	wild bergamot
Monotropa uniflora	Indian pipe
*Morus alba**	white mulberry*
Morus rubra	red mulberry
Muhlenbergia asperifolia	scratch grass
Muhlenbergia cuspidata	prairie satin grass
Muhlenbergia frondosa	common satin grass
Muhlenbergia glomerata	marsh wild Timothy
Muhlenbergia mexicana	wirestem grass
*Muhlenbergia racemosa**	marsh muhly*
Muhlenbergia schreberi	nimble will
Muhlenbergia sylvatica	muhly
Muhlenbergia tenuiflora	slender muhly
*Muscari botryoides**	grape hyacinth*
*Myosotis scorpioides**	common forget-me-not*
*Myosoton aquaticum**	giant chickweed*
Myriophyllum exalbescens	spiked water milfoil
Myriophyllum heterophyllum	water milfoil
*Myriophyllum spicatum**	European water milfoil*
Najas flexilis	slender naiad
Najas guadalupensis	southern naiad
Napaea dioica	glade mallow
*Nasturtium officinale**	water cress*
Nelumbo lutea	American lotus
*Nepeta cataria**	catnip*
Nuphar luteum ssp. macrophyllum	yellow pond lily
Nymphaea tuberosa	white water lily
Oenothera biennis	evening primrose
Oenothera perennis - SE	**small sundrops - SE**
Oenothera pilosella	prairie sundrops

Appendix 2. Continued

Scientific Name[1,2]	Common Name[1,2]
Oenothera rhombipetala	sand primrose
Onoclea sensibilis	sensitive fern
Onosmodium hispidissimum	marbleseed
Ophioglossum vulgatum	adder's-tongue fern
Opuntia humifusa	prickly pear
*Ornithogalum umbellatum**	common star-of-Bethlehem*
Oryzopsis racemosa - ST	**black-seeded rice grass - ST**
Osmorhiza claytonii	hairy sweet Cicely
Osmorhiza longistylis	anise-root
Osmunda cinnamomea	cinnamon fern
Osmunda claytoniana	interrupted fern
Osmunda regalis var. spectabilis	royal fern
Ostrya virginiana	hop hornbeam
Oxalis stricta	wood sorrel
Oxalis violacea	purple oxalis
Oxypolis rigidior	cowbane
Panax quinquefolius	ginseng
Panicum capillare	witch grass
Panicum dichotomiflorum	spreading witch grass
Panicum flexile	wiry panic grass
*Panicum miliaceum**	broomcorn millet*
Panicum virgatum	switchgrass
Parietaria pensylvanica	pellitory
Parnassia glauca	grass-of-Parnassus
Parthenium integrifolium	feverfew
Parthenocissus inserta	thicket creeper
Parthenocissus quinquefolia	Virginia creeper
*Parthenocissus tricuspidata**	Boston ivy*
*Pastinaca sativa**	wild parsnip*
Pedicularis canadensis	lousewort
Pedicularis lanceolata	swamp wood betony
Pellaea glabella	smooth cliffbrake
Peltandra virginica	arrow arum
Penstemon calycosus	smooth beard-tongue
*Penstemon cobaea**	beard-tongue*
Penstemon digitalis	foxglove beard-tongue
*Penstemon grandifloris**	large-flowered beard-tongue
Penstemon hirsutus	hairy beard-tongue
Penthorum sedoides	ditch stonecrop
*Phalaris arundinacea**	reed canary grass*
*Phleum pratense**	Timothy*
Phlox divaricata ssp. laphamii	common phlox
Phlox glaberrima ssp. interior	smooth phlox
Phlox maculata	sweet William
*Phlox paniculata**	garden phlox*
Phlox pilosa	prairie phlox
Phragmites australis	common reed
Phryma leptostachya	lopseed
Phyla lanceolata	fog-fruit
Physalis heterophylla	clammy ground cherry
Physalis subglabrata	smooth ground cherry
Physalis virginiana	ground cherry
Physocarpus opulifolius	ninebark
Physostegia virginiana	false dragonhead
Phytolacca americana	pokeweed
Pilea fontana	bog clearweed
Pilea pumila	clearweed
*Pinus banksiana**	Jack pine*
Pinus resinosa - SE	**red pine - SE**
Pinus strobus	white pine
*Pinus sylvestris**	scotch pine*
Plantago aristata	bracted plantain
Plantago cordata - SE	**heartleaf plantain - SE**
*Plantago lanceolata**	buckhorn plantain*
*Plantago major**	common plantain*
Plantago rugelii	red-stalked plantain
Platanthera hyberborea var. huronen	green orchid
Platanthera lacera - EX	**ragged fringed orchid - EX**
Platanthera leucophaea - SE, FT	**prairie white-fringedorchid - SE, FT**
Platanus occidentalis	sycamore
*Poa annua**	annual bluegrass*
*Poa compressa**	Canada bluegrass*
Poa paludigena	marsh bluegrass
Poa palustrus	fowl blue grass
*Poa pratensis**	Kentucky bluegrass*
Poa sylvestris	woodland bluegrass
*Poa trivialis**	meadow grass*
Podophyllum peltatum	mayapple
Pogonia ophioglossoides - SE	**snake mouth - SE**
*Poinsettia dentata**	wild poinsettia*
Polanisia dodecandra	clammyweed
Polemonium reptans	Jacob's ladder
Polygala polygama var. obtusata	purple milkwort
Polygala sanguinea	field milkwort
Polygala senega	seneca snakeroot
Polygala verticillata	whorled milkwort
Polygonatum commutatum	Solomon's seal
Polygonatum pubescens	downy Solomon's seal
Polygonum achoreum	leathery knotweed
Polygonum amphibium	water smartweed
*Polygonum aviculare**	knotweed*
*Polygonum convolvulus**	black bindweed*
*Polygonum cuspidatum**	Japanese knotweed*
Polygonum erectum	erect knotweed
*Polygonum hydropiper**	common smartweed*
Polygonum hydropiperoides	mild water pepper
Polygonum lapathifolium	pale smartweed
Polygonum pensylvanicum	smartweed
*Polygonum persicaria**	lady's thumb*

Appendix 2. Continued

Scientific Name[1,2]	Common Name[1,2]
Polygonum punctatum	dotted smartweed
Polygonum ramosissimum	knotweed
Polygonum sagittatum	arrowleaf tearthumb
Polygonum scandens	false buckwheat
Polygonum tenue	slender knotweed
Polygonum virginianum	Virginia knotweed
Polymnia canadensis	leafcup
Polypodium virginianum	common polypody
Polystichum acrostichoides	Christmas fern
Polytaenia nuttallii	prairie parsley
Pontederia cordata	pickerel weed
*Populus alba**	white poplar*
Populus balsamifera - SE	**balsam poplar - SE**
Populus deltoides	cottonwood
Populus grandidentata	big tooth aspen
*Populus nigra**	black poplar*
Populus tremuloides	quaking aspen
*Portulaca oleracea**	purslane*
Potamogeton amplifolius	large-leaved pondweed
*Potamogeton crispus**	curly pondweed*
Potamogeton eiphydrus - EX	**ribbon-leaved pondweed - EX**
Potamogeton foliosus	leafy pondweed
Potamogeton friesii	Fries' pondweed
Potamogeton gramineus - SE	**grass-leaved pondweed - SE**
Potamogeton illinoensis	Illinois pondweed
Potamogeton natans	common pondweed
Potamogeton nodosus	long-leaved pondweed
Potamogeton pectinatus	comb pondweed
Potamogeton praelongus - SE	**white-stemmed pondweed - SE**
Potamogeton pulcher - SE	**spotted pondweed - SE**
Potamogeton pusillus	small pondweed
Potamogeton richardsonii	Richardson's pondweed
Potamogeton robbinsii - SE	**fern pondweed**
Potamogeton strictifolius - SE	**stiff pondweed**
Potamogeton vaseyi - SE,EX	**Vasey's pondweed - SE,EX**
Potamogeton zosteriformis	flat-stemmed
Potentilla anserina	silverweed
*Potentilla argentea**	silvery cinquefoil*
Potentilla arguta	prairie cinquefoil
Potentilla fruticosa	shrubby cinquefoil
Potentilla norvegica	rough cinquefoil
Potentilla palustris	marsh cinquefoil
*Potentilla recta**	sulfur cinquefoil*
Potentilla simplex	common cinquefoil
Prenanthes alba	lion's foot
Prenanthes crepidinea	great white lettuce
Prenanthes racemosa	glaucous white lettuce
*Proboscidea louisianica**	devils-claw*
Proserpinaca palustris	mermaid weed
*Prunella vulgaris**	self-heal *
Prunus americana	wild plum
*Prunus mahaleb**	Mahaleb cherry*
Prunus pensylvanica	pin cherry
Prunus serotina	black cherry
Prunus virginiana	chokecherry
Psoralea tenuiflora	scurf pea
Ptelea trifoliata	wafer ash
Pteridium aquilinum var. latiusculum	bracken fern
*Puccinellia distans**	alkali grass*
Pulsatilla patens ssp. *multifida*	pasque-flower
Pycnanthemum pilosum	hairy mountain mint
Pycnanthemum virginianum	common mountain mint
Pyrola elliptica	shinleaf
*Pyrus communis**	pear*
Quercus alba	white oak
Quercus bicolor	swamp white oak
Quercus ellipsoidalis	Hill's oak
Quercus imbricaria	shingle oak
Quercus macrocarpa	bur oak
Quercus palustris	pin oak
Quercus prinoides var. acuminata	chinquapin oak
Quercus rubra	red oak
Quercus velutina	black oak
Ranunculus abortivus	small-flowered crowfoot
*Ranunculus acris**	tall buttercup*
Ranunculus cymbalaria - SE,EX	**seaside crowfoot - SE,EX**
Ranunculus fascicularis	early buttercup
Ranunculus flabellaris	yellow water crowfoot
Ranunculus pensylvanicus	bristly crowfoot
Ranunculus recurvatus	hooked buttercup
*Ranunculus repens**	creeping buttercup*
Ranunculus rhomboideus - ST	**plains buttercup - ST**
Ranunculus sceleratus	cursed crowfoot
Ranunculus septentrionalis	swamp buttercup
Ranunculus trichophyllus	white water-crowfoot
*Ratibida columnifera**	long-headed coneflower*
Ratibida pinnata	drooping coneflower
Rhamnus alnifolia - SE	**alder buckthorn - SE**
*Rhamnus cathartica**	common buckthorn*
*Rhamnus davurica**	buckthorn*
*Rhamnus frangula**	glossy buckthorn*
Rhus aromatica	fragrant sumac
Rhus glabra	smooth sumac
Rhus typhina	staghorn sumac
Rhynchospora alba - ST	**white beaked rush - ST**
Rhynchospora capillacea	hair beak rush
Rhynchospora capitellata	brown spike rush
Ribes americanum	American black currant
Ribes cynosbati	prickly gooseberry

Appendix 2. Continued

Scientific Name[1,2]	Common Name[1,2]
Ribes hirtellum - SE	**northern gooseberry - SE**
Ribes missouriense	Missouri gooseberry
*Ribes odoratum**	buffalo currant*
*Robinia hispida**	bristly locust*
*Robinia pseudoacacia**	black locust *
Rorippa islandica var. fernaldiana	marsh yellow cress
Rorippa islandica var. hispida - SE	**hairy marsh yellow cress - SE**
Rorippa sessiliflora	sessile-flowered yellow cress
*Rorippa sylvestris**	creeping yellow cress*
*Rosa arkansana**	sunshine rose*
Rosa blanda	meadow rose
Rosa carolina	pasture rose
*Rosa eglanteria**	sweet brier*
*Rosa multiflora**	multiflora rose*
Rosa palustris	swamp rose
*Rosa rugosa**	rugose rose*
Rosa setigera	prairie rose
Rubus allegheniensis	common blackberry
Rubus flagellaris	dewberry
*Rubus idaeus**	raspberry*
Rubus occidentalis	black raspberry
Rubus odoratus - SE	**purple flowering raspberry - SE**
Rubus pensylvanicus	Yankee blackberry
Rubus pubescens - ST	**dwarf raspberry - ST**
Rudbeckia fulgida var. sullivantii	Sullivant's orange cone flower
Rudbeckia hirta	black-eyed Susan
Rudbeckia laciniata	goldenglow
Rudbeckia subtomentosa	fragrant coneflower
Rudbeckia triloba	brown-eyed Susan
Ruellia humilis	wild petunia
*Rumex acetosella**	sour dock*
Rumex altissimus	pale dock
*Rumex crispus**	curly dock*
Rumex maritimus var. fueginus	goldendock
Rumex mexicanus	crested dock
*Rumex obtusifolius**	bitter dock*
Rumex orbiculatus	water dock
*Rumex patientia**	patience dock*
Rumex verticillatus	swamp dock
Sagittaria brevirostra	short-beaked arrowleaf
Sagittaria cuneata	arum-leaved arrowleaf
Sagittaria graminea	narrow-leaved arrowleaf
Sagittaria latifolia	common arrowleaf
Sagittaria rigida	stiff arrowleaf
*Salix alba**	white willow*
Salix amygdaloides	peach-leaved willow
Salix bebbiana	Bebb willow
Salix candida	hoary willow
Salix discolor	pussy willow
Salix exigua	sandbar willow
*Salix fragilis**	crack willow*
Salix glaucophylloides var. glaucophy	blue leaf willow
Salix humilis	prairie willow
Salix nigra	black willow
Salix pedicellaris var. hypoglauca	bog willow
Salix petiolaris	petioled willow
Salix rigida	heart-leaved willow
Salix sericea	silky willow
Salix serissima - SE	**autumn willow - SE**
Salix X subsericea	willow
Sambucus canadensis	elderberry
Sambucus pubens - ST	**red-berried elder - ST**
Sanguinaria canadensis	bloodroot
Sanicula canadensis	black snakeroot
Sanicula gregaria	common snakeroot
Sanicula marilandica	black snakeroot
Sanicula trifoliata	large-fruited black snakeroot
*Saponaria officinalis**	bouncing bet*
Sarracenia purpurea - SE	**pitcher plant - SE**
Sassafras albidum	sassafras
Saxifraga pensylvanica	swamp saxifrage
Scheuchzeria palustris var. america	**arrow grass - SE, EX**
Schizachyrium scoparium	little blue stem
*Schrankia nuttallii**	sensitive briar*
*Scilla sibirica**	Siberian squill*
Scirpus acutus	great bulrush
Scirpus americanus	American bulrush
Scirpus atrovirens	dark green bulrush
Scirpus cespitosus var. callosus - SE	**tufted bulrush - SE**
Scirpus cyperinus	wool grass
Scirpus fluviatilis	river bulrush
Scirpus hattorianus - SE	**bulrush - SE**
Scirpus heterochaetus	slender bulrush
Scirpus pendulus	red bulrush
Scirpus smithii - SE	**Smith's bulrush - SE**
Scirpus tabernaemontanii	soft-stemmed bulrush
Scleria verticillata	low nut rush
Scrophularia lanceolata	early figwort
Scrophularia marilandica	late figwort
Scutellaria galericulata	marsh skullcap
Scutellaria lateriflora	blue skullcap
Scutellaria leonardii	small skullcap
Scutellaria ovata	heart-leaved skullcap
*Secale cereale**	rye*

Appendix 2. Continued

Scientific Name[1,2]	Common Name[1,2]
*Sedum acre**	mossy stonecrop*
*Sedum purpureum**	live-forever*
*Sedum sarmentosum**	yellow stonecrop*
Selaginella apoda	marsh club moss
Senecio aureus	golden ragwort
Senecio pauperculus	balsam groundsel
*Setaria faberi**	giant foxtail*
*Setaria glauca**	yellow foxtail*
*Setaria italica**	Italian millet*
*Setaria verticillata**	bristly foxtail*
*Setaria viridis **	common foxtail*
Sicyos angulatus	bur cucumber
Silene antirrhina	sleepy catchfly
*Silene armeria**	sweet William catchfly*
*Silene cserei**	glaucous campion*
*Silene cucubalus**	bladder campion*
Silene nivea	showy campion
*Silene noctiflora**	night flowering catchfly*
Silene stellata	starry catchfly
Silene virginica	firepink
Silphium integrifolium	rosinweed
Silphium laciniatum	compass plant
Silphium perfoliatum	cup plant
Silphium terebinthinaceum	prairie dock
*Sisymbrium altissimum**	tumble mustard*
*Sisymbrium loeselii**	tall hedge mustard*
*Sisymbrium officinale**	hedge mustard*
Sisyrinchium albidum	common blue-eyed grass
Sisyrinchium angustifolium	stout blue-eyed grass
Sisyrinchium campestre	prairie blue-eyed grass
Sium suave	water parsnip
Smilacina racemosa	false Solomon's seal
Smilacina stellata	starry false Solomon's seal
Smilax ecirrhata	upright smilax
Smilax hispida	bristly catbrier
Smilax lasioneuron	common carrion flower
Smilax rotundifolia	cat briers
Solanum carolinense	horse-nettle
*Solanum cornutam**	buffalo burr*
*Solanum dulcamara**	bittersweet nightshade*
Solanum ptycanthum	black nightshade
*Solanum triflorum**	cut leaved nightshade*
Solidago altissima	tall goldenrod
Solidago caesia	woodland goldenrod
Solidago canadensis	Canada goldenrod
Solidago flexicaulis	broadleaf goldenrod
Solidago gigantea	late goldenrod
Solidago juncea	early goldenrod
Solidago missouriensis	Missouri goldenrod
Solidago nemoralis	field goldenrod
Solidago ohioensis	Ohio goldenrod
Solidago patula	rough-leaf goldenrod
Solidago ptarmicoides	stiff aster
Solidago riddellii	Riddell's goldenrod
Solidago rigida	rigid goldenrod
Solidago sciaphila - ST	**cliff goldenrod - ST**
Solidago speciosa	showy goldenrod
Solidago uliginosa	swamp goldenrod
Solidago ulmifolia	elm-leaved goldenrod
*Sonchus arvensis var. glabrescens**	smooth sow thistle*
*Sonchus arvensis**	smooth sow thistle*
*Sonchus asper**	spiny sow thistle*
*Sonchus oleraceus**	common sow thistle*
Sorbus americana - SE,EX	**American mountain ash - SE,EX**
Sorghastrum nutans	Indian grass
*Sorghum bicolor**	sorghum*
Sparganium americanum - SE	**American bur reed - SE**
Sparganium androcladum	branched bur reed
Sparganium chlorocarpum - SE	**green-fruited bur reed - SE**
Sparganium eurycarpum	common bur reed
Sparganium minimum - EX	**small bur reed - EX**
Spartina pectinata	prairie cord grass
*Spergularia media**	salt spurrey*
Sphenopholis obtusata var. major	wedge grass
Spiraea alba	meadow sweet
Spiranthes cernua	nodding ladies' tresses
Spiranthes lacera	slender ladies' tresses
Spiranthes lucida - SE	**yellow-lipped ladies' tresses - SE**
Spiranthes magnicamporum	fragrant ladies' tresses
Spiranthes ovalis	oval ladies tresses
Spiranthes romanzoffiana - SE	**hooded ladies' tresses - SE**
Spirodela polyrhiza	geat duckweed
Sporobolus asper	rough dropseed
Sporobolus cryptandrus	sand dropseed
Sporobolus heterolepis	prairie dropseed
Sporobolus neglectus	puffsheath dropseed
Sporobolus vaginiflorus	wood sheathing dropseed
Stachys palustris var. homotricha	woundwort
Stachys tenuifolia	smooth hedge nettle
Stachys tenuifolia var. hispida	hairy hedge nettle
Staphylea trifolia	bladdernut
*Stellaria graminea**	common stichwort*
Stellaria longifolia	chickweed
*Stellaria media**	common chickweed*
*Stipa comata**	needle grass*
Stipa spartea	porcupine grass
Strophostyles leiosperma	wild bean
Symphoricarpos albus var. albus - SE	**snowberry - SE**

Appendix 2. Continued

Scientific Name[1,2]	Common Name[1,2]
Symphoricarpos albus var. laevigatus	snowberry
*Symphoricarpos occidentalis**	wolfberry*
*Symphoricarpos orbiculatus**	coralberry*
Symplocarpus foetidus	skunk cabbage
Taenidia integerrima	yellow pimpernel
*Tanacetum vulgare**	golden buttons*
*Taraxacum officinale**	dandelion*
Taxus canadensis	Canada yew
Teucrium canadense var. boreale	gray germander
Teucrium occidentale	wood sage
Thalictrum dasycarpum	purple meadow rue
Thalictrum dioicum	early meadow rue
Thalictrum revolutum	waxy meadow rue
Thalictrum thalictroides	rue anenome
Thaspium trifoliatum	meadow parsnip
*Thelesperma gracile**	green thread
Thelypteris noveboracensis - SE,EX	**New York fern - SE, EX**
Thelypteris palustris var. pubescens	marsh fern
*Thlaspi arvense **	field penny cress*
Thuja occidentalis - ST	**eastern white cedar - ST**
*Thymelaea passerina**	sparrow weed*
Tilia americana	basswood
Tofieldia glutinosa - ST	**false asphodel - ST**
Tomanthera auriculata - ST	**ear-leaved foxglove ST**
*Torilis japonica**	hedge parsley*
Toxicodendron radicans	poison ivy
Toxicodendron vernix	poison sumac
Tradescantia ohiensis	Ohio spiderwort
Tradescantia virginiana	Virginia spiderwort
*Tragopogon dubius**	goat's beard*
*Tragopogon porrifolius**	vegetable oyster*
*Tragopogon pratensis**	common goat's-beard*
Triadenum fraseri	Fraser's St. John's-wort
Triadenum virginicum	marsh St. John's wort
*Tribulus terrestris**	puncture weed*
Trichostema brachiatum	false penny
Tridens flavus	false red top
Trientalis borealis - ST	**star flower - ST**
*Trifolium hybridum**	Alsike clover*
*Trifolium pratense**	red clover*
*Trifolium repens**	white clover*
Triglochin maritima - SE	**common bog arrow grass - SE**
Triglochin palustris - SE	**slender bog arrow-grass - SE**
Trillium cernuum var. macranthum	**nodding trillium - SE**
Trillium erectum - SE	**ill-secented trillium - SE**
Trillium flexipes	white trillium
Trillium grandiflorum	large white trillium
Trillium recurvatum	red trillium
Trillium sessile	sessile trillium
Triodanis perfoliata	Venus' looking-glass
Triosteum aurantiacum	early horse gentian
Triosteum perfoliatum	horse gentian
*Triticum aestivum**	bearded wheat*
*Typha angustifolia**	narrow-leaved cattail*
Typha latifolia	common cattail
Ulmus americana	American elm
*Ulmus pumila**	Siberian elm*
Ulmus rubra	slippery elm
Ulmus thomasii - SE	**rock elm - SE**
Urtica dioica	common nettle
Utricularia cornuta - SE	**horned bladderwort - SE**
Utricularia intermedia - SE	**flat-leaved bladderwort - SE**
Utricularia minor - SE	**small bladderwort - SE**
Utricularia vulgaris	common bladderwort
Uvularia grandiflora	yellow bellwort
*Vaccaria pyramidata**	cow herb*
Vaccinium corymbosum - SE	**highbush blueberry - SE**
Vaccinium macrocarpon - SE	American cranberry
Vaccinium myrtilloides	Canada blueberry
Vaccinium oxycoccos - SE	**small cranberry - SE**
Valeriana edulis subsp. ciliata	common valerian
*Valeriana officinalis**	garden heliotrope*
Valeriana stichensis subsp. uliginosa - SE	**marsh valerian - SE**
Vallisneria americana	eelgrass
*Verbascum blattaria**	moth mullein*
*Verbascum thapsus**	woolly mullein*
Verbena bracteata	creeping vervain
Verbena hastata	blue vervain
Verbena simplex	narrow-leaved vervain
Verbena stricta	hoary vervain
Verbena urticifolia	white vervain
Verbesina alternifolia	yellow ironweed
Vernonia fasciculata	common ironweed
Vernonia gigantea	tall ironweed
Vernonia missurica	Missouri ironweed
*Veronica agrestis**	speedwell*
Veronica americana - SE	**American brooklime - SE**
*Veronica arvensis**	corn speedwell*
Veronica catenata	water speedwell
*Veronica officinalis**	common speedwell*
Veronica peregrina	purslane speedwell
Veronica scutellata - ST	**marsh speedwell - ST**
*Veronica serphyllifolia**	thyme-leaved speedwell*
Veronicastrum virginicum	Culver's root
Viburnum acerifolium	maple-leaved arrowwood
*Viburnum lantana**	wayfaring tree*
Viburnum lentago	nannyberry

Appendix 2. Continued

Scientific Name[1,2]	Common Name[1,2]	Scientific Name[1,2]	Common Name[1,2]
*Viburnum opulus**	European highbush cranberry*	*Viola sororia*	downy-blue violet
		Vitis aestivalis	summer grape
Viburnum prunifolium	black haw	*Vitis cinerea*	winter grape
Viburnum rafinesquianum	downy arrowwood	*Vitis riparia*	riverbank grape
Viburnum recognitum	highbush cranberry	*Vitis vulpina*	frost grape
Vicia americana	American vetch	*Wisteria macrostachya**	Kentucky wisteria*
Vicia caroliniana	wood vetch	*Wolffia columbiana*	common watermeal
*Vicia sativa**	narrow-leaved vetch*	*Woodsia obtusia*	common woodsia
*Vicia villosa**	winter vetch*	***Woodwardia virginica - EX***	**Virginia chainfern - EX**
*Vinca minor**	common periwinkle*	*Xanthium strumarium var. canadensi*	common cocklebur
Viola affinis	Leconte's violet	*Xyris torta*	twisted yellow-eyed grass
Viola conspersa - ST	**American dog violet - ST**	*Zannichellia palustris*	horned pondweed
Viola macloskeyi ssp. pallens	smooth white violet	*Zanthoxylum americanum*	prickly ash
Viola nephrophylla	northern bog violet	*Zea mays**	corn*
Viola obliqua	March blue violet	***Zigadenus venenosus var. gramineu***	**white camass - SE**
Viola pedata	bird's foot violet		
Viola pedatifida	prairie violet	*Zizania aquatica*	giant wild rice
Viola pratincola	common blue violet	*Zizia aptera*	heart-leaved meadow parsnip
Viola pubescens	smooth yellow violet	*Zizia aurea*	golden Alexanders
Viola sagittata	arrow-leaved violet	*Zosterella dubia*	water star grass
Viola septentrionalis	northern blue violet		

[1] Threatened or endangered species are in bold highlight: ST = state threatened; SE = state endangered; FT = federally threatened; FE = federally endangered.

[2] * = introduced species.